THE IMPACT OF MAJOR NEW ROADS ON AGRICULTURE: ECONOMIC AND PROCEDURAL ASPECTS.

A thesis submitted at the University of Aston in Birmingham for examination for the degree of Doctor of Philosophy.

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December 1977.

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Doctor of Philosophy, 1977.

Summary

Investigations were carried out to discover the scale and incidence of the impact of major new roads upon agriculture. It was found that resources are being wasted because agricultural considerations are not being given full recognition at any stage of the development of new roads. Two solutions were offered: firstly, in order to improve the position in the short-term, a booklet, entitled "Motorway, Trunk Road Development and the Farmer: an information pack for the guidance of NFU County Secretaries", was produced in conjunction with the National Farmers Union. This explained the administrative procedures involved and the problems likely to arise; the advice offered was based upon interviews with farmers, engineers and Ministry of Agriculture officials. It was assumed that once farmers were able to understand and manipulate the administrative framework they would be able to minimise their own, and hence national, agricultural losses. Secondly, attention was turned to the more fundamental issue of how the agricultural impact of a proposed scheme can be predicted and, therefore, included in the overall project appraisal. It was discovered that the current consultation between the Ministry of Agriculture and the Road Construction Units does not allow agriculture to be properly integrated into the decision-making. The work of Boddington demonstrated that it is possible to apply the analytics of agricultural economics to the problem of impact prediction. Surveys of two sections of completed motorway provided the empirical data upon which to build a refined predictive technique. The most important aspect of this new approach was that it allowed the effects of post-construction farm system reorganisation to be accounted for.

MOTORWAYS, AGRICULTURE, PROJECT APPRAISAL

To my Mother, who would have been

proud of this.

Acknowledgements

Without the assistance of Malcolm Bell, David van Rest, Michael Boddington, David Hellard, Christine Vick and Philip Shaw this thesis would never have been written. I offer them, and the many others who have been kind enough to spare time and effort, my sincerest thanks.

Abbreviations.

ADAS	-	Agricultural Development and Advisory Service.
APC	-	Associated Planning Consultants.
BRE	-	Building Research Establishment.
CAS	-	Centre For Agricultural Strategy (Reading University).
CLA	-	Country Landowners' Association.
CBA	-	Cost Benefit Analysis.
CoBA	-	Cost Benefit Analysis highway appraisal technique.
CPO	-	Compulsory Purchase Order.
DoE	-	Department of the Environment.*
DTp	-	Department of Transport.*
DV	-	District Valuer (Inland Revenue).
EEC	-	European Economic Community.
FBD	-	Farm Business Data.
FMS	-	Farm Management Survey.
GM	-	Gross Margin.
ICE	-	Institute of Civil Engineers.
IHE	-	Institute of Highway Engineers.
JAE	-	Journal of Agricultural Economics.
MAFF	-	Ministry of Agriculture, Fisheries and Food.
MMAC	-	Midland Motorways Action Committee.
MMB	-	Milk Marketing Board.
MoT	-	Ministry of Transport.
NFI	-	Net Farm Income.
NFU	-	National Farmers' Union.
RAPE	-	Rural Association for the Preservation of Essex.
RCU	-	Road Construction Unit (often with regional prefix).
RICS	-	Royal Institute of Chartered Surveyors.
RPS	-	Rural Planning Services.
SMD	-	Standard Man Day.
TLA	-	Third London Airport.
TRRL	-	Transport and Road Research Laboratory.

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* Until September 1976 the DoE had responsibility for all transport matters. At that time, however, the DTp was given independent status and took control of the "Roads Programme". Throughout this thesis the most chronologically appropriate department is used, although in practice the distinction makes little difference.

CONTENTS

PART V SUMMARY, CONCLUSIONS AND SUGGESTIONS FOR FURTHER WORK

PREFACE

1. Early in 1974 the Trustees of the Wolfson Foundation opened up a new source of research support in the field of Natural Resources:

> "The availability of natural resources, of which energy is now the most prominent feature, is of critical importance to the United Kingdom. We are dependent on imports for about half our food supplies and for more than three-quarters of all our industrial raw materials. The Wolfson Foundation is prepared to assist university groups who have imaginative but practical proposals for the further development of the United Kingdom's own raw materials, whether renewable or non-renewable, in order to reduce our dependence on supplies from abroad, either in the medium or long term." (1)

2. Dr. D.J. van Rest, of the Interdisciplinary Higher Degree Scheme (IHD) at the University of Aston in Birmingham, submitted a proposal for support to investigate "The Impact of Motorway and Other New Principal Road Schemes on Agriculture". He was invited to address assessors appointed by the Wolfson Trustees at a seminar in July 1974: on the basis of the address and the original submission an award was made and research began in October 1974.

3. Dr. van Rest's interest in this subject stemmed from having been involved with the anti-motorway lobby through such groups as the Midland Motorway Action Committee (MMAC), and the National Anti-Motorways Action Committee (NAMAC). His original hypothesis, which is discussed in full elsewhere (Chapter 2), was that agricultural considerations were not properly being taken into account during either the planning or construction of major new roads, and, as a result, national agricultural resources were being wasted.

4. The Wolfson Group as formed was based in the IHD Department (which is devoted entirely to postgraduate research) and adopted the research philosophy of that department. In essence, IHD research involves problem-solving within organisations; most students are engaged upon a practical piece of research within an organisation which is, in part, acting as sponsor as well as problem-owner. The basic IHD tenet is that real-world problems can only be satisfactorily solved in an interdisciplinary manner. Therefore, each student has a supervisory team drawn from both the most appropriate academic disciplines and the problem-owning organisation.

5. Having supplied the research funds the Wolfson Foundation played no part in the supervision of the project and did not specify a particular problem to be solved. Put simply the problem-owner was the nation because national agricultural resources were hypothesised to be at risk. Therefore the first stages of the research were both to define and specify the problem areas and obtain the (non-financial) support of a body which could act as a supervisory touchstone in order to ensure the continued practical relevance of the research.

6. Apart from Dr. van Rest, the Wolfson Grpup had two permanent members until September 1977. These were the research students M. Bell and A.S. Hearne. In addition, Dr. C.M. Vick acted as a full-time academic supervisor until September 1976, and two research assistants were employed for about six months each.

7. It was decided from the outset of the research programme that the Wolfson Group would work as an interdisciplinary team rather than operating a number of individual research projects. Problems were approached from an interdisciplinary viewpoint in order to reach the most satisfactory all-round solutions. Much of the fieldwork was carried out by both research students: the resons for this were twofold:

   (a) it was quickly discovered that farm interviews were best carried out by a two-man team;
   (b) in order that the two theses finally produced could be complimentary the same data (where possible) would be used for each.

   (It was originally intended that the two students would produce one joint thesis in order to best show all sides of the work and their interaction. Although, however, this was not contrary to University of Aston regulations the University Senate decided not to allow such a submission. Both students and supervisors alike feel that this has to be counted as a lost opportunity for an experiment in the field of doctoral research. As it finally turned out then the students split up the areas of research and, apart from Chapters 1, 2 and 3, wrote completely independent theses. As will be seen the three chapters written jointly tell the story of the first part of the research programme when the "problem areas" were being defined. Such a level of collaboration was well within the bounds of acceptability by Senate.)

The opinion is ventured that "team" research, although providing unusual administrative problems, is of the greatest value when examining multi-disciplinary, real-world issues. The interaction of ideas and personalities and the iteration of conclusions is undoubtedly a sure check upon suggestions made and solutions offered.

8. That the Wolfson Foundation decided to award research monies in the field of Natural Resources is indicative of the trends in thinking current both in 1974 and still. In Britain, the slowing in the growth of population combined with a dramatic rise in unemployment and inflation have ushered in the era of "planning for no growth". (2)(3) In Britain this has taken the form of severe cut-backs in the expansion of public expenditure, depsite the fact of a Labour Government. (That Milton Friedman was awarded the Nobel Prize for economics in 1976 is an important indicator of the breakdown in Keynesian economic planning (4).) At successive budgets and in successive Public Expenditure White Papers, the policy has been of restriction rather than expansion. The "Roads Programme" has suffered more than most sectors under this weight of thrift; and that there will be no reversal of the diversion of resources away from the Trunk Road Network is evident from both the January 1977 Public Expenditure White Paper (5) and the recently published Transport White Paper(6).

9. In addition, at a technical level, the very methods by which proposed road schemes are tested for economic and environmental viability have been subject of much criticism. The strength and depth of this criticism prompted the Government in early 1977 to appoint the Leitch Committee to investigate the current methods of Trunk Road assessment, obviously with the aim of improving them. <u>It is this background of an expressed need for increased care in the assessment of the resource implications of road building that gives the Wolfson Project both its immediate relevance and its practical context.</u>

10. Unfortunately, (perhaps because of the Wolfson Group's roots in and contact with the anti-motorway lobby), contact with those responsible for planning new trunk roads (DOE DTp/RCU's) was for much of the research time no more than formally superficial. It is perhaps the <u>major</u> achievement of the Group that when the research was coming to fruition and conclusions emerging that the DoE/DTp and RCU's were forced by the weight of findings, to turn to the Group for advice. This change of

attitude can be easily traced. In September 1975 the NFU organised a private seminar at their Headquarters in Knightsbridge to discuss the problems of "Road Construction and Agriculture". Despite the fact that the Wolfson Group was by that time working closely with the Land Use Department of the NFU and was advising upon the content of the seminar the DoE representatives refused to attend if members of the Wolfson Group were present. A year later, however, the situation had changed. In September 1976 the Roads Board of the DoE in conjunction with the Institute of Civil Engineers organised a Colloquium to discuss the subject of "Highways and the Environment". This was designed in order to inform those responsible for the planning of the new roads of the most up-to-date techniques available for predicting the environmental consequences of those roads. The collected company of speakers and audience cannot be described as less than illustrious: it was thus an indication of the Wolfson Group's improved status that its members were asked to give the "agricultural assessment" paper at this colloquium.

11. Subsequently the apparent status of the Group within the "establishment" improved: in May 1977 members of the Group were invited to give verbal evidence to Sir George Leitch and his above-mentioned Committee on Trunk Road Assessment. Finally, and most importantly, as the initial three-year research period was drawing to a close, the MRCU had to admit that it was unable to carry out a "proper assessment" of the agricultural consequences of a proposed Newark-By-Pass and asked the Wolfson Group to undertake the assessment. At the time of writing (October 1977) due to administrative difficulties it appears that this proposed collaborative exercise might not be undertaken. Nevertheless, the request from MRCU that this work be undertaken, because their consultants R. Travers-Morgan and Partners needed assistance, is proof of both the relevance and quality of work reported in this thesis.

part 1:

defining the research area.

Chapter 1:

Major New Roads and Agriculture:

The State of Knowledge.

1. INTERDISCIPLINARY RESEARCH AND THE LITERATURE REVIEW.

1.1 One of the duties of a doctoral student is, quite rightly, to demonstrate how his work relates to and takes forward previous research as reported in the published literature. For the inter-disciplinary student this task is of a somewhat different nature than when tackled by a "traditional" researcher. The subject matter of this thesis illustrates why this should be so; the "impact of major new roads upon agriculture" can be defined as a discreet area of research, but in order to properly examine all aspects of the problems which emerge it is necessary to draw upon a wide range of disciplines and subject areas. Foremost amongst these can be numbered:

- agriculture;
- agricultural economics;
- decision-making theory;
- project appraisal (cost-benefit analysis);
- the praxis of planning;
- the law relating to the compulsory acquisition of land and the payment of compensation;
- the theory and practice of British public administration;
- pressure group theory;
- the economics of highway construction;
- the design of highways.

1.2. The task of the student is to be aware of both theory and current practice in all of these fields and to apply the correct tools of analysis at the appropriate time. Thus, it is inescapable that as the research project progresses the student will turn to new fields and new concepts in order to find the means to solve evolving problems. The implication of this is that literature reviewing is a continual, but highly selective process. Such an approach naturally reflects into the structure of the thesis. Thus, this chapter focusses specifically upon the literature which is directly related to our title, whilst the results of reading into the traditional subject areas are recorded at the points in the thesis where they are most appropriate to the matters directly under discussion.

1.3 The task then of this Chapter is to report that work which devotes itself almost entirely to the subject of " new roads and agriculture".

2. THE LITERATURE EXISTING AT THE INCEPTION OF THE WOLFSON PROJECT.

2.1 The "British Farmer" appears to have been the first journal to take an interest in the subject of motorways and agriculture, publishing in 1964 an article (1) describing how the NFU had influenced the development of early motorways:

> "With the guidance of the NFU secretaries concerned, the construction of the arteries of our future transport system has proceeded fairly smoothly." (p.21)

The article, which was written by one of the journal's staff writers, gave the impression that the Union had been causal in a number of ways:

- it prompted the Government to upgrade the proposals for under/overpass dimensions;
- it made the Government agree to carry out (where possible) all remedial drainage work in advance of the construction of the road;
- it made the Government accept responsibility for fencing in perpetuity;
- "We had to speed up compensation payments. Normally, payment is witheld until all necessary legal documents are completed; events showed, however, that the considerable amount of documentation necessary was delaying completion for unreasonably long periods. It was as a result of the Union's submission to the Government that a 90% on-account payment of the agreed or anticipated sum should be made in advance of completion." (p.21)
- it made the Ministry agree that wherever practical the permanent fencing would be erected before construction work started;
- they instigated the system of Resident Engineers, with the function of overseeing the contractor's work.

This is not the place to test whether the claims to effective pressure group activity are valid. Whether they are or not is less important than the recognition that these specific issues existed. However, any hope that such matters would be more fully expanded was not sustained.

2.2 No other literature appeared until the "Farmers' Weekly" published a short article in 1966 (2). An example was given: the M1 extension from Crick passed through the Garendon Estate in Leicestershire for 4½ miles. It passed through 7 of the estate's 60 farms "absorbing 152 acres and splitting the block of land from end to end." The "Farmers' Weekly" journalist P. Gurney, summed up the situation with remarkable impartiality:

"Certainly invasion by motorway may mean the reorganisation of a farm which may not always be convenient. There may be permanent disadvantages. But once the motorway is finished and settled its broad effect on agriculture will not be very much worse than when the railways first came a century ago. Since most farmers are motorists they too stand to gain from this 20th century system for rapid communication."

2.3 An article entitled "Motorway Problems" appeared in the Essex Farmers' Journal in November 1974 (3). This was written by Philip Shaw, the Essex NFU County Secretary and related to the practical problems that occur for the farming community before and during the construction of a motorway. Shaw, quite naturally generalised from his own experience which focused mainly on various sections of the M11 (London-Cambridge) which were at differing stages of development. The first sentence of the article encapsulates the farmers' position faced with such development proposals at that time:

> "We are gaining in experience of the sort of problems which our members have to face when a motorway is built across their land."

In other words, the Essex farmers affected by M11 had no pool of knowledge upon which to draw and each was having to learn by his own mistakes. David Hallard (head of the NFU Lands Use Department in London) confirmed that this was the case nationwide and that the Essex farmers, having a very active County Secretary, were in a better position than most to face the difficulties. The point that at the end of 1974 each farming community had to learn afresh about the planning procedures and the problems associated with the imminent motorway construction cannot be made too strongly, and will be returned to.

2.4 The advice offered by Shaw was, above all, direct and practical:

> "The problems usually start when the decision is taken that there should be a motorway between Point A and Point B. At this juncture, we are many years away from the building of a road, but the Press usually pick up a decision of this kind and sometimes produce and publish maps showing roughly where such a road might go. At this time we always have the greatest difficulty in trying to convince our members that such a map in the local Press has no legal significance. This is especially the case when the final route turns out to be very similar to that suggested by a newspaper. There is nothing unusual in this happening; once you know the starting and finishing points one can make a pretty intelligent guess as to the route most likely to be favoured, and, if the Press-published route is to a small enough scale, it is possible at the end of the day to look as if you had inside information." (p12)

2.5 In a similar vein the article carries Shaw's members through initial planning procedure ("By the time you hear any more about the proposed road, a certain amount of preliminary consultation will have led the DoE to investigate - say - three alternative routes") onto the taking of bore-holes, the selection of a route and to the public inquiry. In such a short article advice was necessarily selective. It was, however, useful for the Wolfson Group to take this as an example of how to communicate with the individual farmer.

2.6 Regarding the construction period Shaw focused attention on a number of points, which we subsequently confirmed as being of prime importance.

(a) Fencing - it was pointed out that the fence should be put up before work begins, but warned: "We had examples on the M11 of construction work proceeding well ahead of any fence being put up. Apparently timber was short, but when one man threatened to stop work on the road, supplies of timber improved and a fence appeared." (!) (pp.15-16)

(b) Drainage - "Probably the most troublesome single item." (p.16) Shaw complained that motorway drainage was not adequately connected into farm drains, that culverts under the motorway were often inadequate and that new ditches and pipes were sometimes not deep enough to take either existing drainage or work planned in the future.

(c) Access - mention was made of the difficulties involved in obtaining both temporary (i.e. during construction) and permanent access to land severed from the main part of the holding by the motorway.

(d) Responsibility - Shaw emphasised the importance of knowing who to contact, about which problem, in order that they might be sorted out most effectively.

A final piece of advice was that "wise men will have been to their own valuer and their own solicitors, and taken their advice by this time." This recognition that the problems involved are complex enough to warrant professional assistance was well noted by the Wolfson Group and play an important part in subsequent thinking.

2.7 Shaw's article did much to point the way for the Wolfson Group in both context and style. Primarily it revealed that the farming community was in real need of comprehensive, concise and compact advice on all matters concerned with the construction of rural motorways. From this time onward Shaw became an important contributor to the Wolfson Group and much research was carried out in his county both on the schemes he had written about and others. His influence on the farming community caused us to be warmly received and the level of co-operation to be high. The flow of favours was by no means one-way; as will be seen, the Wolfson Group, having tested Shaw's theories, agreed that there was an urgent need for the procedures and problems of motorways to be explained to farmers and their representatives and decided to undertake the task. Shaw felt strongly this was of immediate use to him and his farmers, and would obviate the need to continue writing the series of articles, of which "Motorway Problems" was supposed to be the first.

2.8 Apart from these articles in the farming press directly relevant work was, to say the least, thin upon the ground. Weller in his excellent book "Modern Agriculture and Rural Planning" (4) touched upon the problem briefly, and the Royal Institute of Chartered Surveyors was responsible for two highly specialised booklets. The first, "Motorways: Procedures on the Acquisition of Agricultural Land" (5) was published jointly with the Chartered Land Agents' Society, the Chartered Auctioneers and Estate Agents' Institute and the Central Association of Agricultural Valuers. The second was written by RND Hamilton and entitled "Compensation for the Compulsory Acquisition of Agricultural Land" (6). (Both of these booklets refer to technical matters not dealt with in this thesis and so are not reviewed in detail here. Bell's thesis, which is the companion to this, deals with them.)

2.9 Gerald Rhodes in his book "Administrators in Action: British Case Studies" (7) writes of The Wentworth By-Pass which was planned and constructed during the 1950's, and indicates that farmers were given little voice in the decision-making processes during the pre-motorway phase of road development. One case study will suffice to demonstrate; when this scheme was first mooted in 1938, it was found that the line of the road would pass through Mr. Bishop's farmlands, separating his fields for grazing from his cowsheds. It was, therefore, agreed at that time that when the road improvements were made, new cowsheds

would be built on the severed land with perhaps an underpass for cattle and farm machinery. It was not, however, until 1955 that the scheme received financial approval and detailed planning went ahead. Mr. Bishop reminded the highway authority of the previous agreement and they informed the District Valuer (DV) who was responsible for handling claims for compensation. The DV pointed out that the cost of the cowsheds and underpass would exceed the amount of compensation payable. It was, therefore, decided only to build the cowsheds: this meant that the farmer would have to use public roads to gain access to the severed land. Enter the DV again who by this time had decided that even the buildings (which it was thought would cost about £ 6,500) would be worth more than the compensation payable. He did, however, suggest that the buildings be treated as accommodation works (i.e. carried out as part of the construction of the By-Pass) in which case he would have no objection to their construction. The highway engineers, therefore, contacted the Ministry of Agriculture which agreed to pay the standard grant (a third) on the buildings. The highway authority agreed to supply the other two thirds, about £ 4,000. However, a subsequent minute from the Divisional Road Engineer to the Highways (Trunk Roads) Division some 6 months later in October 1956 revealed another twist in the story:

> "The District Valuer has now discovered that the Ministry of Agriculture grant would not be one-third of the whole but one-third of the cost after deducting this Department's contribution! (Possibly we were a little optimistic to expect otherwise!) To add to the complication the builder's estimate for what was proposed appears to be higher than was anticipated. When the first builder's estimate, based on an architect's plan, was put to the District Valuer, the cost was of the order of £ 7,500 and he felt this was much too high. I agreed and verbally informed him that I considered £ 4,000 was the limit of the Department's contribution.
>
> The District Valuer therefore proposed as a settlement that the Ministry of Transport be responsible for either two-thirds of the cost of the approved buildings or £ 4,000 whichever was the less.
>
> Since it has been ascertained that the Ministry of Agriculture is working on a different basis from what was first understood, however, it is doubtful whether Mr. Bishop is prepared to accept the Ministry's approved design and find the extra money. In view of this the District Valuer has decided to drop the proposal for constructing the new buildings and to deal with the matter purely on a compensation basis.
>
> He estimates this compensation to be just about the prpposed £ 4,000 figure, and so far as I can ascertain this will leave Mr. Bishop to make his own arrangements for building cattle sheds on the eastern side of the By-Pass or alternatively to get rid of his cattle!

> It is understood that Mr. Bishop is likely to agree to the compensation and the only question then will be how quickly he can make arrangements for stopping his cows crossing the By-Pass. Presumably this will depend on how quickly he gets his money!" (p.42)

In April 1957 Mr. Bishop hired his own builders to construct the new cowshed: the next month he received the sum of £ 4,000 plus legal costs. (The reader is warned that, although there is no evidence upon which to decide whether or not this was an exceptional case for the time, the body of this thesis (especially the two Chapters which follow directly) indicates that since the setting up of the Road Construction Units in 1968 such ill-treatment of farmers has been widespread.)

2.10 There is then, little doubt that when the Wolfson Group formed there was an urgent need for work to be carried out upon the impact of major road development on agriculture. It may finally be asked whether there was any excuse for such an omission from current research. The answer is emphatically negative. The work of the agricultural economics department at the University of Reading upon the effects of the development of Milton Keynes (8) and the agricultural input to the third London Airport (9) deliberations (designed by Professor Wibberley and Boddington) had demonstrated that it was possible to bring analytics to bear upon the problems of development upon agricultural land. The work of Jones in North Wales (10), although falling into basic traps as regards compensation and relying on a basically descriptive approach, serves to reinforce this argument. Ideally, those responsible for motorway planning should have recognised the "knowledge-gaps", located the people able to tackle the problem and set about finding the relevant solutions. Instead, this task has fallen to the Wolfson Group which began operations some fifteen years after the first section of motorway was opened.

3. RECENT RESEARCH DEVELOPMENT

3.1 General interest in the subject of "motorways and agriculture" has recently been growing upon the more general tide of environmental concern. Thus, whilst the Wolfson Group was at work (during the period September 1974-September 1977) others have also been active. This activity has not, however, usually manifested itself in research and publication, but rather in working seminars and conference discussion. The Wolfson Group played a fairly prominent role in these deliberations.

The three most important landmarks were:

(a) A seminar organised by the NFU to discuss specific "motorway and agriculture" problems. Significantly, however, the DoE demanded that the Wolfson Group be excluded from this meeting. The Group did, on the eve of the seminar, brief the NFU delegates.

(b) A colloquium organised jointly by the DoE and Institute of Civil Engineers to discuss a wide range of issues pertinent to motorway route selection. The Wolfson Group was asked to give the "agricultural" paper.

(c) The Leitch Committee was set up in early 1977 to examine the problems of "Trunk Road Assessment". Although the primary focus of this committee was stated to be the efficacy of traffic modelling procedure, the Wolfson Group submitted specially prepared agricultural evidence. The result of this was that the committee called for further oral evidence from the Group.

3.2 In addition to this, Jefferson , Deputy Director of the SWRCU, was given the task of drawing up a report designed to indicate how environmental impacts of new major road schemes should be taken into account at the stage of final route selection. This Report, which was finished in mid-1976, was never removed from the confidential classification. The Wolfson Group was, however, allowed to examine the Agricultural Chapter and the overall impact matrix; the detail of the Report is reported in Chapters 4 and 7.

3.3 Others speaking at more open conferences have tended to be quite forthright in their opinions of how agriculture ought to be treated. Smith, a highway engineer asserted (11):

> "The evaluation of loss to agriculture can take the form of the loss of agricultural production to the nation due to the construction of a new road. Again an envelope approach is used for this assessment, the periphery line being the land acquisition line. The agricultural envelopes can be overlayed onto the land classification maps of the Ministry of Agriculture. Instead of subjectively scoring the various land classification areas within the envelope, costs of production based on an area of measurement can be made. Various universities today produce booklets containing information in this direction."

> "Thus for each alternative route the consequences can be taken as

$$AG = \Sigma (AG_1 \times C_1 + AG_2 \times C_2 \ldots\ldots\ldots\ldots AG_n \times C_n)$$

AG is the total costed agricultural loss of production where AG_1 - AG_n are the various agricultural classifications within the land acquisition envelope and C_1.....C_n is the production costs evaluated by compound interest methods to perpetuity or over a period of years." (pp.146-7)

The detailed reasoning why it was felt that this approach had been only half thought through will emerge in the main body of the thesis, but the main defects of it are:

(a) the inadequacies of the basic Land Classification

(b) the lack of direct relationship between grade of land and actual farm activity

(c) the lack of recognition that not just the land taken for the road might be affected

(d) the variability of costs within the agriculture

(e) costs would not appear to be the most logical measure to choose, output would give more indication of lost production.

3.4 At the time the Wolfson Group came together the Ministry of Agriculture (ADAS Wolverhampton) was beginning an investigation into farm crossings along the M6 in Cheshire and Staffordshire (12). Two and a half years later (Feb. 1976) the 10-page report was published. The investigation had two main objectives:

"(i) to assess, on the basis of their current use, whether the farm crossings provided by the highway authorities along the M6 in Cheshire and Staffordshire had justified their cost, and

(ii) to assess the effect of the motorway on the farms provided with crossings as regards changes in farm structure and agricultural production."

The paper pointed out that:

"It was considered important at the outset to try and establish the criteria against which the provision of agricultural crossings was assessed."

However, the unnamed investigator (who was, in fact, a retiring ADAS officer) found this difficult due to changes in personnel involved and so made the assertion that:

".....it is believed that the primary motivations were then as they are now, to meet the needs of agriculture and to preserve economic farm units, provided always that the crossings were economically justified."

This seems to be a circular piece of reasoning of the highest order and really gives no indication of what criteria in practice were or are employed. More telling is the statement that:

> "Research has also revealed that when the route was planned through Staffordshire this Ministry was not consulted after the design team had made provision for all the crossings included in this report, nor were we called upon to advise on the agricultural justification for them."

But,

> "Consultation arrangements on crossings are very different nowadays and Ministry advice is invariably sought before the design stage as well as at earlier stages in the route planning."

The conclusion from all this is that:

> "Whilst, therefore, the criteria in general terms may have remained virtually unchanged over the years, it would appear that interpretation may have been somewhat different when this portion of the M6 was planned."

Such was the standard of discussion throughout the paper. The factual information was not much more illuminating. A 48-mile stretch of the motorway was surveyed: in all there were 31 farm crossings serving 29 farms. Of these, 22 were bridges and 9 underpasses. Only one of the 26 occupiers seen reported any restrictions in the use of severed land as a result of severance, and in no cases did farmers state that the width of bridges and underpasses, or the height of the latter, were inadequate for agricultural purposes. Generally the existence of these accesses "tends to perpetuate the severed structure of farms."

The conclusions drawn from this most limited study do nothing to increase its quality:

> "It was never intended that this investigation should apply cost-benefit criteria in assessing justification for these farm crossings. With hindsight now, it is even more obvious that this would have been quite impracticable. What this investigation has shown is that nearly all the crossings continue to be used for agricultural needs on a scale that is not significantly different from that envisaged when they were first provided some 12 years or so ago. To that extent the crossings have justified their provision for farming purposes." (p.4)

Finally, however, it was admitted that:

> "The findings of this investigation point to the need for a larger scale, in-depth study on the impact of motorways on agricultural production. Whilst several of the farmers interviewed in this investigation claimed that agricultural production had suffered as a result of the motorway construction, no attempt was made to substantiate or refute their claims. The Aston University project referred to below may meet this need and obviate the need for a further MAFF study." (p.5)

Certainly the Ministry have not attempted any follow-up study and so must be judged on the basis of this one poor piece of work.

3.5 Finally, in this section we must turn our attention to the only article in a recognised academic journal on the impact of motorways on agriculture. Frost and three colleagues published their article (13) in September 1976: it was based upon a "short survey" which was completed in 1973. Two stretches of motorway were investigated, a short section of M56 south of Manchester, which at that time had been open for less than one year, and part of M6 between Warrington and Sandbach. In all, 47 farms were visited. At the time of publication of this article the Wolfson Group had been operating for two years (without hearing of this Salford research from any of its contacts with the MAFF, NFU or DoE), and so were able to measure its achievements against the conclusions already reached. The verdict reached was that this article did a disservice to the study of motorways and agriculture. The editor of the journal was approached and agreed to publish a reply article (14) from the Wolfson Group. The reading of both articles will indicate where it is thought that Frost was at fault. Briefly, however, the basic faults were:

(a) the survey appears to have been of a sample variety, but the basis of the sampling was not given.

(b) the questions posed were not well formulated. A lack of basic agricultural expertise was indicated.

(c) too much emphasis was placed upon individual uncorroborated farmers' replies. For example:

> "One said milk yield had become more variable and was generally about 5% less than the yield prior to the motorway. He attributed this to the vehicular noise and the unsettling effect it has on cattle."

If only one out of 47 thought this worth mentioning is it really worth repeating especially as a 5% fluctuation is well within the bounds of change farmers would expect anyway?

Again:

> "Cars and other goods are wrapped in polythene sheeting and sent north on trucks. As the trucks drive north and sheeting becomes torn, parts of it are ripped off and blown into fields. These sheets of polythene and polythene bags from other vehicles may be eaten by cows and cause death. <u>One farmer has lost at least one cow from intestinal obstruction caused by eating plastic.</u>" (Emphasis added.) "Many farmers expressed grave concern that they too would lose stock in this way and they continually collect plastic from their fields."

In the conclusions we find:

> "Costs to the farmer are increased by the time involved in collecting litter from his fields and the loss of cattle which eat litter and die."

(d) the word "cost" is mentioned a number of times throughout the article.

> "They (motorways) increase the inconvenience costs involved in farming land across the motorway and the opportunity cost of not using the best use."

However, no attempt is made at all to assess any of theimpacts in economic terms. It must be admitted that no precise tools exist for making such economic assessments exactly, (hence the need for one part of the Wolfson work), but there are approaches which can give meaningful results and ought to have been investigated; without such investigation it is impossible to state, as these authors do:

> "The reduced viability, the inconvenience, the time involved in collecting the litter and the changes to production could all be assessed in monetary terms."

Not only did the authors not attempt economic analysis, they did not collect the data which would make such analysis possible.

(e) Much more attention is given to those factors which can be more easily dealt with. Quantifying the easily quantifiable whilst sidestepping those factors which cannot be so readily examined is an error which should not be committed by researchers hoping for recognition. However, after missing almost the whole gamut of economic arguments the authors of this paper focus most of their attention and effort upon constructing tables of factors upon which information is readily available. These factors are those which the farmers have mentioned as being disturbing such as noise, litter, fumes, dirt etc.

(f) Despite the assertion that:

> "Farmers should receive compensation or subsidy to offset all of these effects, which act to make their farms less competitive and productive than their neighbours....."

no mention is made of the very complex compensation code that exists, let alone any assessment of how smoothly it works or how effectively it compensates.

Overall, the impression gained from this article was that the authors had not really set themselves specific objectives at the outset and so had ended up listing problems which sprang to the minds of farmers. In its place, the tracking down of specific problems can be a useful research approach, but not when the overall object is to give a balanced view of a field of research. (Anyway, by this time the Wolfson Group had already published its own list of problems in the form of Advice Notes to NFU County Secretaries of which much more will be told.)

3.6 This then, is the range of literature available before and during the life of the Wolfson Project, up to mid-1977. It can hardly be called an impressive list. In order that other ideas might be gathered a brief review was made of current practice in other countries. Preliminary letters indicated that the North American experience would be of most relevance to our needs. The work in Europe seemed not to be directed at our specific problem.

4. THE NORTH AMERICAN EXPERIENCE

4.1 The United States

4.1.1 Contact with the US Department of Agriculture proved most fruitful in revealing the extent of research carried out in that country into the impact of major highway developments upon productive agriculture. It appeared that the Department of Agricultural Economics and Geography at the University of Minnesota have been responsible for virtually all the work in the field. This research was carried out between the end of the 1950's and about 1963, in close connection with both the Minnesota State Highway Department with the "co-operation of" the US Department of Commerce, Bureau of Public Roads.

4.1.2 Gensurowsky and Smith's paper "How Farmers Adjusted to an Inter-State Highway in Minnesota" (15), published in September 1970, is of most direct relevance to our requirements. Between 1956 and 1958, an 8-mile length of the Inter-State Highway system was built through the farm country between Owatonna and Faribault, Minnesota. This research focussed on 3 separate but inter-related questions:

"1. how is farm size and shape affected by the Inter-State Highway?

2. how do farmers adjust to the changed layout of their farms?

3. are payments for acquired land commensurate with the damages sustained, or is there a substantial difference between the size of awards and the market value of the land?"

4.1.3 Compulsory Purchase for the highway affected 28 farms. In 13 cases the farmers' land was "trimmed"; in 15 instances the farmhouse was separated by the highway from other sections of the farm. The average land loss for each farm was 13 acres. However, the average loss for the 13 farms which had been "trimmed" was only 5.1 acres, whilst the loss for the 15 farms which had been split averaged 20.1 acres. The trimmed farms decreased in size by 3.3%, whilst those split were reduced by an average of 13.2%.

4.1.4 During the period <u>following</u> the land acquisition, 18 of the 28 farms altered in size or shape:

> "8 farms were sold and combined with other land in new shapes; 3 farms were enlarged through the addition of rented land; 2 farm tracts were combined into one unit; severed parcels of two farms were sold; two farms were enlarged by the purchase of several parcels; less land was rented by one farm."

4.1.5 In all, between 1955 and 1959 in the study area, 5 of the 28 farmers (18%) sold out and discontinued farming. Thus, land was released for redistribution: the result was an increase in average farm size during the study period. Additionally, the number of farms operated as "non-contiguous units" rose from 5 in 1955 to 12 in 1959. However, Gensurowsky and Smith assert that: "Because of increased mobility farmers can cultivate widely separated parcels of land efficiently."

4.1.6 With respect to "right-of-way awards" (i.e. compensatinn for compulsory purchase), it was found that per-acre payments for land taken from holdings <u>exceeded</u> the estimated per-acre market value of the farm. The payment in excess of market value was mainly attributable to damage payments. 9% of the total acreage of the 28 farms was acquired, yet compensation payments were equivalent to 52% of the estimated market value of the land and buildings.

> "One of the larger costs in this total was for buildings which were condemned and taken to make way for the Inter-State Highway. It seems apparent that highway costs might be reduced if highway planners avoided taking buildings. To this end, it would be helpful in highway planning to include economic and geographical data along with the more standard considerations of engineering and design."

4.1.7 Finally, it is worth recording that the 8-mile length of dual two-lane road required an average of 47 acres of land per mile. Thus "the Minnesota Highway Department acquired more acreage than would be involved in two

average-sized farm operating units in this portion of the State". (99% of all acquired land was in agricultural use.) In this context it is worth going on to quote a footnote in this paper.

> "Right-of-way men with the US Bureau of Public Roads estimate that on average 36-40 acres per mile will be needed for the construction of Interstate roads in rural areas throughout the nation..... these estimates are based on a projected width of 300-350 feet. In the study area in Minnesota the average right-of-way width exceeds 400 feet.....this segment of highway (is) somewhat atypical when compared with most planned Inter-State roads elsewhere...."

A number of points pertinent to the Wolfson Group research arise from this study and its place in US highway planning:

(a) The paper by Gensurowsky and Smith demonstrates a far greater insight into the pertinent problems of highway construction on agricultural land than that displayed by Frost and his colleagues in writing what we have described as the only publication of research findings on the subject in Britain before the Wolfson Group published parts of its work.

(b) No information is available as to why the University of Minnesota felt motivated to undertake such research work, but it seems fairly certain that at this time those with responsibility for planning US freeways had little knowledge of how agricultural matters ought to be treated.

(c) It must, however, be recognised that the approach adopted was descriptive more than analytical and focussed upon those issues which were easily quantifiable, rather than those which could not be reduced to numbers so efficiently. Thus, for example, great attention is given to readjustment in terms of post-acquisition land-trading, whilst the rearrangement of farm systems is totally ignored. In general, the methods of the highway planners were used in preference to those of the agricultural economist. This is even more obvious in other papers published by the same research group which have as the focus of attention traffic projections and the urban industrial impact of the freeways under investigation.

(d) A great deal of emphasis, however, must be placed upon the "individual farm impact" approach which these Americans adopted. This, it will be seen, is in direct conflict with the approach by the Ministry of Agriculture in Great Britain, where the overall agricultural patterns

are placed above individual interests. This is not the place to investigate the theoretical and ideological roots of such divergent approaches, but a good starting place would seem to be the difference between the strong ethic of capitalism and the related rights of the individual to be found in the United States, as opposed to the sense of "administrative fairness to all and favouritism to none", which seems to pervade thinking in the British Civil Service.

4.2 The second aspect of American work we felt it necessary to investigate was the Environmental Impact Statement (EIS). The Group undertook an analysis of the treatment given to agriculture in a number of typical EIS's. The initial selection of material was by an American researcher who had been a visiting member of the Wolfson Group. Useful information on the American approach was elicited. Most notably that the price to be paid for land is offered in advance of public debate, and that agriculture is treated strictly as an economic impact and not a vague socio-environmental one as in Britain. Methodologically there were no significant advances offered by the method which is directed more at open presentation of issues than detailed analysis. Indeed complex calculation would be out of place in a document for public information. The method's main advantage for agriculture resides in the systematic treatment it is given with the authorities being forced to garner information early.

4.3 Canada

4.3.1 The Canadians too, are attempting to erect a feasible framework in which to assess the viability and impact of major new road schemes. For example, the Ontario Government made an initial step towards enacting legislation requiring an environmental assessment for those projects having potentially significant impacts on the environment. Other Provinces are considering similar approaches.

4.3.2 I.V. Oliver (Head, Environmental Office, Ontario Ministry of Transportation and Communications), and J.J. Armstrong (Senior Environmental Planner with the same organisation), highlighted the important fact that:

> "very few, if any, of these initiatives have been, or are being taken, on a purely voluntary basis by the Governments concerned. A number of environmental groups such as the Sierra Club and the Environmental Law Association are applying continuous pressure on various levels of Government on a policy basis as well as on a project specific basis." (16)

The Environmental Assessment System (EAS) is just coming into operation in Ontario which:

> "....is definitely one of those sensitive areas of intensive farming where land take is a delicate issue."

The objectives of any EAS are:

1. To identify and evaluate all potentially significant environmental effects of proposed undertakings, at a stage when alternative solutions, including remedial actions and the alternative of not proceeding, are available to decision-makers.

2. To ensure that the proponent of an undertaking and governments and agencies required to approve the undertaking give due consideration to avoiding or mitigating any adverse environmental effects prior to granting any approval to proceed with an undertaking.

4.3.3 Reference to the booklet published by the Ontarion Ministry of Transportation and Communications "Highway 7, Kitchener to Guelph, Feasibility Study: Route Selection" (17) reveals that the fifth objective of the study was to minimise adverse impacts on agriculture. The rating each route received as a measure against this criteria depended very greatly upon the "effective number of acres of farmland lost" (Eff). This was calculated as follows:

Eff = R.W. + Sev - Spec - Z, where
R.W. = Acres of farmland taken by right-of-way
Sev = Acres of farmland lost due to severance
Spec = Acres of farmland held in speculation
Z = Acres of farmland zoned non-agricultural.

Happily, not all the work was of this rather quasi-scientific kind. Much showed practical empirical knowledge of severance - particularly that special agricultural crossings rarely proved economically worthwhile - and of the need to go to the individual farm level:

> ".....such items as effects of severance, effects on machinery movements between parcels of land, effect of partial loss of land on farm viability, are subtle impacts which our public participation programmes assist us in discussing with farmers on a one-to-one basis. These types of evaluation can also be included in our evaluation."

5. EUROPE

Work in the New World appears to have progressed much further than in the old. Apart from a library and journal literature search the pursuit of European research was undertaken through the EEC, OECD and Bureau Européan de l'Environment (BEE). Over the course of some 1½ years considerable numbers of subordinate and related institutions and organisations were contacted via these sources. Detailed work on land use policy and road construction was available but nothing on the nexus between them. Unlike North America with sizeable modern units split by roads, the concentration of work uncovered in Europe was on using roads and rural transport development as a means of rationalising old holding patterns. (See, for instance, the works of the Dutch Institut voor Culturtechneik en Waterhuishouding - Institute for Land and Water Management Research.)

6. CONCLUSIONS

The most important finding to emerge from this Chapter is that much work remained to be done when the Wolfson Group came together in September 1974. In addition, the work carried out contemporaneously with the Wolfson studies was of indifferent quality and added little to the store of knowledge. Thus, the work contained in this thesis, along with that in Bell's, forms the main corpus of knowledge upon this subject. However, in the absence of specific guidance from published literature the task fell to the members of the Wolfson Group of defining the problem areas to be investigated. How this task was approached is the content of the next Chapter.

Chapter 2:

The Problem Areas Defined.

1. INTRODUCTION

1.1 The purpose of this chapter is to describe the important exploratory work undertaken by the Wolfson Group which led to the selection of those issues most demanding of research attention. The areas of investigation finally chosen are those found in the theses of Bell and Hearne. Because of the interactive way in which the two research students decided to work this chapter is a reflection of their early joint activities and was written in draft by both of them.

1.2 Throughout the period of the research programme motorway constructinn was a highly controversial issue achieving national repute; a Transport White Paper (1) was published towards the end of the research. Dispute was to be found in many areas relating to the planning and construction of major new roads. Motorway research blossomed in academic institutions; for example, the Science and Society Department at Bradford University focussed much attention upon the Public Inquiry stage of proceedings, whilst the University of Surrey, with a DoE grant, concentrated effort upon Public Consultation. Meanwhile the North East London Polytechnic's "Motorway Research Project" worked upon the environmental implications of the Motorway Programme. (2)

1.3 Chapter 1 described in some detail the literature upon this specific subject and came to the conclusion that very little work of substance had been carried out prior to the formation of the Wolfson Group, and that this had not been substantively added to during the course of the research described in this thesis. Thus, the members of the Group had the task of examining the whole range of possible impacts before being able to select those most deserving of detailed attention. That is, an important original portion of the work comprises the delineation of the most appropriate areas for detailed study.

1.4 Dr. van Rest was responsible for setting up the Wolfson Group. His reason for doing so was that experience at Public Inquiries into proposed motorways (M40/M42 and M65) seemed to indicate that agricultural considerations were being given little weight in the planning of such roads. Thus, the basic hypothesis with which the group started to work was that "the true agricultural costs of a major new road were not being fully assessed by the promoting authorities of major new roads." The alternative implications of this statement are either the authorities did not know the true agricultural costs and so could not consider them,

or that the costs were known but not being considered for some other reason. It should, of course, be recognised that the implicit assumption behind this hypothesis is that if a true agricultural assessment was to be made the overall balance of cost and benefit would be significantly altered.

1.5 In order to obtain the "external supervision" essential to any IHD project contact was made with the NFU and a meeting arranged with the head of the Land Use Department at Knightsbridge, David Hellard. The contact with Hellard proved invaluable, for as the Group had no official sponsor, a "touchstone" was necessary in order to assess the quality and appropriateness of the project outputs. Hellard and his department have provided this touchstone throughout the duration of the research programme. In addition, and independently through contact with NAMAC, the Group was introduced to Philip Shaw, NFU County Secretary for Essex. The importance of both these contacts is expanded upon in Section 4 of this chapter; it is, however, useful to state here that the preliminary meetings between the Wolfson Group and Hellard and Shaw (late in 1974 and early in 1975) enabled a number of problem areas to be articulated.

1.6 Regarding the actual research priorities, Hellard, although not disagreeing with Dr. van Rest's basic hypothesis, felt that the immediate needs of the farming community were of a different nature. It appeared that his department had been the recipient of an increasing number of inquiries and complaints regarding major new roads, from both individual members and County Secretaries. These focussed around three issues:

(a) there appeared to be a high level of ignorance among members and County Secretaries about the procedures that surround the planning and construction of new roads.

(b) the disruption during the construction phase of new roads, recorded by Shaw in his Essex Journal article (3), were not just confined to that County but seemed to occur on a nationwide basis.

(c) the farming community at all levels expressed dissatisfaction with both compensation received from the Government for loss of land (and interest in land) and also at the way in which contractors seemed unwilling to settle third party claims for damage caused.

1.7 Hellard very forcibly made the point that, although he thought trunk road development a great threat to NFU members, his department simply did not have the resources to set in progress in-depth investigation upon these matters. Instead, he had been placed in the somewhat unenviable position of having to respond to "cries of help" from around the county; thus, each case of trunk road development he tackled, involved improvisation at the last minute. He also emphasised that very often the NFU had its hands tied in the question of the selection of a route because it could not afford to favour one route as opposed to another when both routes affected farms run by NFU members.

1.8 Thus, the Wolfson Group, in conjunction with the NFU, developed a number of initial hypotheses which set the research programme properly under way. These were:

(a) that agricultural considerations were not being given the appropriate weighting during the decision-making period of major road planning;

(b) that if agriculture was properly considered the overall balance of cost and benefit would be altered;

(c) that the agricultural community did not understand well the problems or procedures surrounding both the planning and construction;

(d) if advice on these matters was to be made available, the agricultural impact of new roads would be lessened;

(e) that farmers were not being properly compensated either for loss of interest in affected land or damage caused to remaining land by contractors during the construction period.

A fieldwork programme was devised to examine these issues which thus formed a basis for the attempt that was subsequently made to rank the various impacts.

2. TESTING THE INITIAL HYPOTHESES: THE FIELDWORK PROGRAMME

2.1 M16 (A10-A12) Public Inquiry

2.1.1 For those not actively involved in the planning processes leading up to the construction of a major new road the only point at which it is possible to examine the agricultural input to the decision-making model is the Public Inquiry. Thus, it was decided to attend a Public Inquiry in full to examine, as well as possible, the decision-making forces. Since the M40/42 Public Inquiry in 1973/4 the issues which may be discussed at this forum have been widened and so the examination of

the proceedings of any Inquiry in detail should reveal much of the promoting authorities' attitude towards the balancing components of the overall project appraisal which is carried out. In addition, daily attendance enables the researcher to hear all agricultural objections presented and the promoting authorities' responses to them.

2.1.2 A few weeks after the Wolfson Group began work, a major Inquiry was due to start. Through contacts with MMAC and NAMAC it was discovered that the M16 (A10-A12) Public Inquiry was due to be held in Epping and was likely to prove most illuminating as co-ordinated objections were being prepared by local action groups. (It should be recognised that vigorous opposition, although giving a Public Inquiry a particular shape, is necessary if analysis of the proceedings is to prove fruitful. Without opposition, the promoting authority is not forced to expose its thinking on particular subjects.)

2.1.3 At this time, at the very beginning of the research programme, the nature of work carried out was very much under the direction of Dr. van Rest. He decided that the Group should attempt to make a complete record of all proceedings at the M16 Inquiry by being in attendance from beginning to end. The reasons for this were fourfold:

(a) to introduce the Wolfson Group to the current state of the debate over motorway policy and planning;
(b) to test whether the application of time and effort would enable the techniques of project appraisal used by the ERCU to be successfully dissected;
(c) to examine the extent to which objectors could be helped by daily news reports;
(d) to gain access to farmers' records and thinking by collaborating over an objection.

It was expected that the proceedings would take no longer than 2-3 weeks; as it turned out, however, the Inquiry opened on December 6th 1974, but did not actually finish until July 1975. Because it was so prolonged the Group did not attend every day, but covered virtually all of the first half of the proceedings and the most relevant days after that.

2.1.4 Thus it was that a case study which was designed to be a brief testing ground for preliminary hypotheses grew into something of a more fundamental nature. For as the days went by, the evidence grew

more detailed and it became possible to almost completely dissect the way the ERCU had gone about planning this particular section of London's Outer Orbital Motorway. It must be emphasised that, whilst the evidence gathered could not prove a negative, there was considerable data to the effect that agricultural considerations were not being accorded adequate treatment. Without early indication of this conclusion, which was of central importance to the project, the coverage of the proceedings probably would not have been so extensive.

2.1.5 Because of its increased stature within the research programme the M16 Inquiry is reported in detail in a separate chapter; it is however, most pertinent to record here that neither the ERCU nor the farmers themselves seemed able to present, in any useful way, the implications for agriculture of either the chosen route or the objectors' alternative routes. The reasons for this are discussed in Chapter 5. Here we must note that this finding had important influence in haping thoughts upon how to assess the agricultural impact of a proposed road scheme.

2.2 The M42 (Solihull Section)

2.2.1 Some very early exploratory farm interviews were carried out upon the M42 (Solihull Section). This road was chosen for investigation primarily because of its convenience as regards the execution of fieldwork, being close to the University, and because contact with farmers was initially established through the MMAC organisation of which Dr. van Rest was a prominent member. It was partly because the hypotheses put forward by Hellard and Shaw very closely accorded with the results of the fieldwork on the M42 that they were given such great prominence in the planning of future work. It was, however, decided not to extend the M42 sample survey into a full-scale investigation. The reasons for this were twofold:

(a) Mr. R. Bridle, who was in charge of the Roads Programme within the DoE, offered co-operation upon the rest of the research programme if this apparently sensitive scheme was left alone;

(b) the farms of this area were undoubtedly plagued by many problems because of their position upon the "urban fringe", which would have served to complicate any investigation unduly.

2.2.2 Before the brief survey ended it was, however, possible to obtain the opinion of both the promoting authority (MCRU) and their contractors (Douglas). Both parties were at pains to play down the problems of construction. Mr. Manzoni, Managing Director of Douglas, went so far as to express the opinion that there were no real problems, merely

incidents, and that these could be (and indeed were) cleared up (usually by money payment) by either the site engineers or the insurers. That farmers and engineers involved on the same stretch of motorway construction could place such divergent interpretations upon events seems to be a clear indication that communications between the two sides had indeed broken down. This is a theme which occurred regularly throughout many of our farm interviews: farmers complained that those responsible for planning and constructing major new roads made little attempt to liaise with them. It was noticeable that on the few farms where liaison had taken place farms were able to keep functioning more smoothly.

2.3 M11 Contract 3 (Harlow-Bishop's Stortford)

2.3.1 During the early stages of the M16 Inquiry, and whilst M42 interviews were in progress, contact was made with David Hellard. This his views coincided with preliminary findings from both these pieces of fieldwork prompted the Wolfson Group to organise another survey of a stretch of motorway in order to further reinforce findings and gather additional evidence on extant problems. Both because of its proximity to the M16 Inquiry at Epping and because it was the section that Philip Shaw had written about (3), it was decided to carry out a survey of the M11 Contract 3 (Harlow-Bishop's Stortford).

2.3.2 This 10.7 mile length of dual carriageway three-lane road forms part of the London-Cambridge motorway. It was designed both to relieve the A11 and take traffic from an expanded Stansted Airport and was opened on 23rd June 1975, some three years after the beginning of construction and six months behind schedule. In all, 16 farms were affected by this section of M11. As might be expected in a fairly small area, the farming systems did not vary greatly. Only one unit, a 40-acre bullock-rearing concern is not predominantly arable. The range of farm sizes was markedly large spreading from 40 to 1326 acres; the average size, however, was 431 acres, a reflection of the arable characteristics of most units. All farmers were interviewed during two separate periods of fieldwork. The authority in charge of construction was ERCU and their consulting engineers were Atkins and Partners. The main contractors were Fitzpatrick and the earth-moving contractors, Dick Hampton.

2.4 M6 (Cumbria)

2.4.1 It was also thought necessary to examine the problems that hill-farmers faced during the planning and construction of a major new road. In all eight farms were interviewed upon a section of the M6 covering three contracts between the Lune Valley and Carlisle, which were constructed and completed concurrently, the last being opened in mid-1971. These schemes totalled 50 miles in length, but interviewing was concentrated in the hillier central area and around junctions. The farms were selected on the basis of having reported their difficulties to the NFU County Secretaries who in turn reported them to David Hellard.

2.4.2 The contractors on the schemes were, working northwards, French, Laing and Tarmac. Scott Wilson acted as consulting engineers throughout; information obtained from one of the Scott Wilson engineers is of general interest, and provided a useful starting point for investigation. The main factors that had to be contended with during the planning of the new road, he told us, were (a) gradients and (b) amenity considerations, particularly avoiding the boundary of the Lake District National Park. Agriculture, he maintained, was not considered until construction began, and not surprisingly, many problems arose. It was because so much attention was paid to the aesthetics of the scheme within the NWRCU, who knew that these were being closely scrutinised, that the contractors could behave badly towards affected individuals. It was clear that the RCU was totally committed to having the schemes finished on time and looking attractive (the Lune Valley section has indeed won awards on this score). Scott Wilson, it was reported to us, knew they would receive no backing if they attempted to be strict with contractors regarding the treatment of individual farmers.

2.5 A12 Chelmsford By-Pass

2.5.1 Although the evidence from the M16 Inquiry that emerged during the first few weeks of proceedings seemed conclusive, it was also apparent that the London Orbital was a motorway of strategic importance to both the promoting authority and objectors alike, and that because of this the picture of decision-making in action might have been somewhat obscured. Especially minor issues, although important to the process, may have been swallowed up by matters supposedly greater of national import. It was, therefore, decided that it would be of use to examine the proceedings at another Public Inquiry.

2.5.2 The A12 Chelmsford By-Pass Inquiry, which spanned a period of 5 months in mid-1975, was chosen. As with the M16 this Inquiry turned out to be far more informative about the decision-making processes involved than could have been expected at the beginning of the proceedings. Therefore, in order to give full justification to the findings, a complete chapter has been devoted to it. (Chapter 6.)

3. TESTING THE INITIAL HYPOTHESES: THE FINDINGS

3.1 From these preliminary surveys a number of very important conclusions emerged which served to shape the whole of the research programme from that time on:

(a) the promoting authorities reponsible for plans to build major new roads appeared to have no way of making an objective appraisal of the agricultural effects of proposed schemes;

(b) few farmers had any conception of the highway planning process and tended to enter it far too late to have any significant effect. The promoting authorities, arguing that the effects of blight would be too severe to do so, were reluctant to try andinvolve the farming community at earlier stages in the decision-making. As a general rule it seemed to be true that the later consultation occurred the greater were problems for individual farmers;

(c) Shaw was correct (3) in his assertion that drainage, fencing and access to severed land were the factors most remarked upon by farmers as causing problems during construction. This applied especially to drainage matters;

(d) however, as well as these problems, numerous others were mentioned also, trespass by the contractors on farmland being the one other most worthy of individual note;

(e) the farmers thought far more about the physical damage caused by the road than they did about the economic consequences. It would not be an overstatement to record that many of them felt much offended by the contractors attitude towards their farms.

(f) it appeared from the interviews that most farmers were greatly dissatisfied with the level of contact they had with both the planners and the contractors. In general they could understand that on a large project problems were bound to occur, the main complaint stemmed from the lack of communication channels through which problems could be solved.

(g) much distaste was expressed at the slow process involved in assessing the level of compensation to be paid, the final level of payment and the manner of settling third party damage claims.

(h) Mr. Manzoni's (Douglas) attitude to the construction of new roads explained the lack of liaison; he argued powerfully that the building of a motorway is a multi-million pound operation, where the contractor cannot afford to have men or machinery idle. Thus, it pays contractors to plan their work in the most effective manner for them, regardless of how farmers are affected. If damage is done in the process, then settling up through third party insurance claim is cheaper for the contractors than extensive bargaining and consequent delay. (It is then most important to record that our subsequent findings indicated that payments for such Third Party damage upon which Mr. Manzoni placed much faith were in many cases not ever forthcoming, let alone immediately.) Four major hypotheses, therefore, emerged about the actual construction of new roads on farmland:

- that there are few problems of a physical nature that the present technology of the civil engineering profession cannot solve;
- problems, however, do occur frequently because of a breakdown in farmer/contractor relationships;
- this breakdown in communication is due, in most part, to the contractors' desire not to delay work in order to negotiate;
- the mechanism for paying third party claims for damage caused does not work efficiently.

3.2 Also in this section it is necessary to record that meetings were held throughout our period of "problem definition" with both members of the civil engineering profession and MAFF. The engineers, in general, were reluctant to admit that many real difficulties existed. The one problem that they would concede to, however, was that of dealing, at the planning stages of a new road, with farm severance. Severance occurs when part of a farm is separated from the farm buildings by a new road. Because of the linear arrangement of land take for roads, severance is today a phenomenon almost entirely confined to this type of development. It would, however, have occurred during the "Railway Age". One important difference can be seen between the construction of the rail and road network; unlike the Railway Acts, the current Highways and Special Roads Acts do not place an obligation upon the promoting authority to replace all farm accesses. Thus the Highway Authorities have the discretion over

whether or not to provide such access, either in the form of a bridge or an underpass, across a new road. There is little doubt that highway engineers as a body saw farm severance as the main and almost exclusive agricultural problem they had to deal with, but that they had no consistent method for doing so. All other problems, as far as the engineering profession was concerned, were matters for compensation and could be left for the District Valuer's office to deal with. More specifically, the engineers' view of the situation was that the only other agricultural impact of a new road was that of land loss, and for this, market value compensation would be paid. In addition the more alert of the engineering fraternity were wont to point out that agriculture as a whole would benefit from the distributional capabilities of the new trunk road network.

3.3 Mention should also be made of initial contact with the MAFF. Introduction through the Wolfson Foundation was made at high level, but the first contacts with the Ministry did little to shape our thinking at the problem formulation stage. This was in the main, due to the cautious way the Ministry approached us. It was not until after our ideas had gelled and been reported to the MAFF that they made a positive contribution. (Contacts were made with the Chief Surveyor at Horseferry Road and Regional Surveyors in the West Midlands, South Western, South Eastern Regions.)

4. THE NFU AND THE WOLFSON GROUP

4.1 It will, perhaps, at this stage, be wondered why more <u>detail</u> has not been given of the results, especially of the farm survey work undertaken. The answer to this query is simple (and for the researchers involved rather gratifying). David Hellard, having seen the preliminary results of the surveys, made certain suggestions as regards the dissemination of the available information in order that the farming community might be made more aware of both the <u>procedures</u> and the <u>problems</u> involved in the <u>planning</u> and <u>construction</u> of a major new road. The main result of this increase in intensity of co-operation between the Wolfson Group and the NFU was the publication "<u>Motorways, Trunk Road Development and the Farmer: An Information Pack for the Guidance of NFU County Secretaries.</u>" The production of this booklet was, in the main, undertaken by the Wolfson Group and was based upon all the fieldwork results alluded to above as well as those from specially designed surveys set up after Hellard had suggested that the booklet be produced. It is in Chapter 3 then, that the detailed results of fieldwork are found because there the

story is told of how the "Information Pack" came to be written. Having said this it becomes fairly obvious that the NFU played an important part in the Wolfson project andindeed, acted as "problem owner". The consequence of this was that a highly useful, two-way flow of ideas and information was erected. It is then, perhaps, of use to examine in a little more detail the nature of the organisation with which we were working.

4.2 There are a number of studies (4) (5) of the relations between the Government and the agricultural industry generally. Yet, apart from an exposition on the workings of the Cheshire County Branch (6), little detailed work has been carried out to discover how the NFU functions either internally or as a pressure group. This is surprising, given the statutory role the Union has regarding the Annual Price Review. In the field of Land Use policy it functions more simply as a large, important body of interest. Thus the Wolfson Group had to learn as it went along about the functioning of the organisation, and adjust its research programme in accordance with what it learnt.

4.3 Within the NFU the Lands Use Department has responsibility for co-ordinating and implementing Union policy within a vast field. The Department exists solely at HQ level; no local equivalent is to be found within the County branches. The Union is a democratic structure and at local level there is a system of committees which have responsibilities for different issues; one of these deals with land use matters. Policy overall is set at the Annual National Conference and monitored during the year by a series of elected HQ committees to one of which the Land Use Dept. is responsible.

4.4 Individual County Secretaries are responsible within their areas for <u>all</u> matters relating to the welfare of their members to whom they report directly. Within each county are to be found a number of Group Secretaries; the prime function of these men (the Union is remarkably Chauvinist) is to run the Union's Mutual Insurance business. The degree to which they become involved in more general issues depends on both their outlook and their insurance selling technique. The proceeds of the insurance selling are, with the annual subscriptions, the prime source of Union finance. The proceeds are syphoned up from the Group Secretary to the County Secretary and on to the HQ.

4.5 Hellard made it clear from the outset that the NFU could enter into no direct <u>financial</u> commitment in the role of "problem owner" or sponsor. This was not a handicap to the Wolfson Group as it was thought to be

desirable to maintain the air of independence by using only the Wolfson research monies, and thereby allow the possibility of producing and disseminating results which the NFU would find unhelpful to their case. (That this has rarely been the case is, therefore, a measure of the justification of the NFU complaints.)

4.6 The style of operation of the department is reflected in the way Hellard felt the Wolfson Group and his department should work together. Three parameters received prominence:

(a) there was a need to lessen the work load of his department;

(b) results had to be of immediate relevance to current problems;

(c) the Land Use Dept. and the NFU should be seen to be providing the members with a useful service.

4.7 During the initial months of the project the liaison between the Group and Hellard became stronger with each side gradually understanding how the other could assist it in the attainment of its own aim. Thus it was that in mid-1975 he felt able to put more specific requests to the Group in order that the NFU might benefit from work carried out more quickly and directly. The proposals he put are interesting in that they well reflect the thinking within the NFU:

(a) that some form of "Code of Conduct" be drawn up in order to restrict motorway contractors within additional contractual obligations when working upon agricultural land. The success of such a Code would only be possible if the authority responsible for hiring the contractors agreed to include it in the contract documents;

(b) that an "Advice Manual" be drawn up with the objective of informing the farming community of the procedures and problems which accompany trunk road development;

(c) that an objective investigation of compensation provision be made by some independent body outside the NFU.

4.8 It was intended that these three pieces of work should be based upon fieldwork already carried out and additional, specially designed surveys. The Group agreed to undertake the work, primarily upon the assumption that by helping individual farmers to better cope with the procedures and the problems involved with the planning and construction of a new road, the loss of national agricultural resources would also be lessened.

4.9 It is important at this point to recognise the fundamental distinction between these two lines of action laid out in (a) and (b) above.

Put simply, the attempt to have a Code of Conduct accepted by the appropriate body is to attempt to change the existing administrative framework, whilst informing the farming community of procedures and problems is just to tell them how to operate better within this framework. The construction industry is highly organised in the field of contracts and contractual obligations; although contracts will differ from job to job this is primarily a matter of detail for there is a standard ICE contract which all approved contractors expect to be used. Thus to suggest any modification to the standard contract, which has been refined over a period of decades, is a dramatic move not to be undertaken lightly. On the other hand a continual stream of advice pamphlets emerges from NFU HQ designed to inform farmers about all types of issues, so that a trunk road advice manual would neither be unusual nor would it involve anybody except the NFU and its members.

4.10 As it finally turned out the request for a "Code of Conduct" became an issue of high priority in May 1975, because the Glamorgan County Branch of the FUW, faced with the imminent construction of an extension to the M4, put in a request to NFU HQ for such a document. Although time constraints were fearsome, in that only a couple of weeks were available for preparation of the document, it was decided to make an attempt to carry out the task. Hellard was prepared to give valuable advice:

> "As I see it the Code of Practice should fall into three parts. First, there should be a general memorandum of assurances from the Road Construction Unit or the Welsh Office as the case may be. Secondly, there should be an actual Code of Practice governing the activities of contractors and sub-contractors setting out in some detail issues which are perhaps already covered in specifications for contracts but which should be brought together in one place as agricultural considerations. Thirdly, there should be an advisory leaflet or perhaps an NFU circular to be sent to all farmers affected by any road contract which would include elements of both Stages I and II.
>
> Stage I: the memorandum of assurance would, for instance, deal with preliminary works and survey; the appointment of a Liaison Officer, an initial meeting with all affected farmers to establish liaison, the preparation of farm plans, schedule of works and impact of road scheme on individual farm units also detailing accommodation works, etc.; the establishment of an appeals procedure and safeguards for delays or emergency action; the claims procedure for damage caused during construction, and the final section dealing with procedure for checking works before the contract is handed over.

StageII: Code of Practice for contractors. This should deal with your points about discipline of contractors, the timetable for work standards for accommodation works detailed issues such as drainage, fencing, water supply and other services and should generally extract all those matters which may be covered in specifications in the contract or a general guidance from the Road Construction Unit or the Welsh Office to the contractor on the ways in which he should carry out the work to minimise impact on farmers and farming activities.

Stage III: the circular to affected farmers should give a brief resume of the road proposal and the assurances from the Road Construction Unit as to the ways in which impact on farmers would be minimised, an indication of the contents of the Code of Practice and a check-list of do's and don't's to assist farmers and agents in coping with road construction."

(Letter, 21st May 1975.)

4.11 Using existing fieldwork results and drawing upon the only such "Code of Practice" ever to have been adopted (7), a draft document for use on the M4 was drawn up, and Hellard endeavoured to have it accepted by the Welsh Office (the promoting authority) and the contractors, at least in principle, if not detail. It was at this point, however, that it became apparent that such a document was a political non-starter and that it would not, in the current climate of opinion, even be considered by those on charge of construction. Thus the attempt to change the administrative framework faltered at the first hurdle. Despite such a negative result, this was an important event in the shaping of the rest of the research programme, for it became immediately apparent that the farming community could, in general, expect to receive little help from the authorities in their attempt to minimise the impact of the actual construction phase of development; just as we had seen at the M16 Inquiry, they could expect little co-operation during the planning stages. Therefore it was decided that the primary priority from that time would be the development of an Information Pack describing all the possible procedures and problems throughout every stage of development of a major new road.

5. A RANKING OF THE PROBLEMS

5.1 In order that the research programme should continue on the most effective lines, it was necessary, having made a preliminary survey of the problem areas, to assess which were of most significance. In drawing up this "ranking of problems" it was important to bear in mind the terms of

reference of the Wolfson Grant as regards the nature of the research, for it will be recalled that the grant was awarded on the basis that the national resource implications of the construction of major new roads on agriculture would be investigated. Thus, to speak the language of the economist, we should be looking to the costs and benefits occurring to the National Farm (as opposed to the individual farm) because of the trunk road network. (It is also pertinent to point out that this "ranking" exercise was an integral part of the IHD First Annual Review, which is used by students and supervisors in order to examine the results of the first year's work, which then makes it possible to shape subsequent research. The main problem areas selected by the Wolfson Group for research are described below.

5.2 The Procedures involved in Planning and Constructing a Major New Road and the Problems Caused for the Farming Community.

5.2.1 Hypothesis: That the farming community does not fully understand either the procedures involved in planning and building a major new road or the problems that are likely to occur at the various stages of development.

5.2.2. Assumptions:

(a) The NFU HQ (Land Use Department) would be capable of assembling and disseminating the relevant information, but does not have the resources to do so.

(b) Those responsible for the construction of new roads are quite capable of solving the technical problems which arise on farmland.

(c) Due, however, to both a breakdown in communications between the contractors and the farmers, and the financial penalties for not keeping to the construction schedule, the contractors are disinclined to plan and execute their work in a manner that takes account of the needs of the farmers.

(d) the farming community cannot, in the immediate future, rely on assistance from those associated with the development of new roads and should seek to provide its own input and protect its own interests.

5.2.3 Because the NFU had placed so much emphasis on this problem and preliminary investigations had supported fully the initial Hellard hypothesis, it was decided that the aim of describing and explaining the procedures and problems should receive high priority in the research programme. Examining this component of the research from the standpoint of natural resource use, it can be argued, with full justification, that if

the farming community were able to better understand the procedures and anticipate the problems, then many of the difficulties would be lessened. From this, it could be sustained that the pattern of farming would be less upset and less production lost. Few prople would argue that the solution of current problems would create a greater loss of agricultural production, so that the question then arises by how much would the loss in production be reduced.

5.2.4 This was seen to be the point where the Group could make the most immediate and positive contribution because of the manifest desire of the farming community to have the relevant information. Although the point will be made more fully at the appropriate place, it is necessary to point out here that what was required was not a delicately balanced appraisal of the interaction between planners, contractors and farmers, but far more fundamentally, a comprehensive, stage-by-stage listing of practices and problems in order that farmers could be aware of the complete range of possibilities. An explanation of the likely incidence of various occurrences would be useful but not so important. (Such a guide to farmers' concerns, it was hoped, would also be useful to engineers.)

5.3 The Agricultural Input to the Highway Decision-making Process.

5.3.1 Hypotheses

(a) The true agricultural implications of the construction of a major new highway are not understood by either the authorities responsible for the developments or the farmers whom they affect, and therefore they cannot properly be taken account of in the overall project appraisal which is carried out on each scheme.

(b) The inclusion of an agricultural assessment would have an impact on the overall project appraisal balance.

5.3.2 Assumptions

(a) Given the way that traffic benefits are counted by road planners for the purpose of justifying the construction of a new road, it is unlikely that the size of agricultural disbenefits will cause a particular road not to be built. In other words, agriculture cannot be expected to greatly influence the debate over whether or not a new road is justifiable. (This assertion corresponds to Wibberley and Boddington's findings concerning the agricultural implications of the Third London Airport, as reported to the Roskill Commission (8).)

(b) This means that the stage at which an agricultural input can have most impact is to be found after it has been decided to construct a road, whilst the actual route is being selected.

(c) Those responsible for planning new roads are engineers by training and have little background knowledge about agriculture or farm economics.

(d) Land loss and severance are seen by the engineers as the two components of agricultural impacts, but of these only severance causes them problems, because they believe that land loss is covered by compensation payments.

5.3.3 If the explanation of procedures and problems was the most immediate task, then the aim of improving the agricultural input to the decision-making process was seen as the most important in terms of the conservation of the nation's agricultural resources. Here, the argument runs that if the true agricultural consequences of any route are identified it then becomes possible to reduce and perhaps minimise the level of impact. Thus the savings here are likely to be of a long term nature whereas those accruing from a better understanding of the operation of the system are, in the main, likely to be shorter lasting. Thus it would be hoped that once the true agricultural input is reflected in the system, the need for the farming community to be aware of all possible turns of events would be lessened. To this extent, then, the task of informing the agricultural community can be looked on as a short term attempt to minimise agricultural losses to the trunk road network, whilst the improvement of the agricultural input is the long term solution.

5.4 Compensation

5.4.1 The preliminary interviews indicated that farmers were dissatisfied both with the laggardly way in which compensation negotiations progressed, and (for the few who had settled) the total amount. Because the farmers affected by the sections of M11 and M42 selected for investigation had not yet finally settled their compensation payments, it was not possible to assess the reaction to them. The impression was given, however, by many of the farmers, that the final settlement was likely to be less than satisfactory. Thus again we began rather negative hypotheses:

(a) that procedures for negotiation of compensation payments are unnecessarily slow.

(b) that the final amounts paid in compensation do not fully reflect the economic losses on individual farm units.

5.4.2 It is important here to recognise the nature of compensation payments: they are primarily amounts of money paid to an individual farmer for the individual losses on the market value of his farm, or for the loss of his tenancy as an interest in land. Thus the aggregated compensation payments to all the farmers on a section of new road will not necessarily equal the national loss of agricultural resources consequent upon the construction of that road. Therefore it becomes important to compare the economic loss on individual farms with compensation paid:

(a) to compare the theoretical agricultural costings used in the planning and design stages with reality, and

(b) to assess the efficacy of payment in justly settling losses.

5.5 Planning Policy and the Secondary Effects of the Trunk Road Network.

5.5.1 Apart from the issues of cost benefit analysis and project appraisal which the Chelmsford Inquiry brought to light, and which are explained in Chapter 6, Leslie Ginsburg, of Associated Planning Consultants, who was appearing for one of the objecting bodies, drew attention to what is perhaps the most important secondary effect the new roads can have on agriculture. He argued very simply that farmland between existing urban areas and newly built roads becomes vulnerable to development pressures. Supporting this argument he pointed to specific examples of farmland which had been so trapped and which had subsequently been developed; for example: Lower Earley was trapped between Reading and the M4 and quickly "infilled", similarly with Cressex between High Wycombe and the A40 (M) and part of Worcester by the M5. These examples, he argued, were not unique and so care must be taken when routing rural roads near urban centres to take account of possible secondary impacts.

5.5.2 The intrinsic appeal of Ginsburg's arguments convinced both the Public Inquiry Inspector and the Wolfson Group. It was fairly plain from Ginsburg's substantive evidence in specific localised areas where such secondary land losses were larger than the losses to the road itself. However, in terms of national resource use it is of greater importance to know how widespread the phenomenon is and what overall impact it is having upon agricultural resources.

5.5.3 Relating this secondary impact to the published work upon urban fringe problems, it seemed valid to develop the hypothesis that even before development actually took place on potential infill land, problems such as trespass and vandalism would occur and the land might in consequence be "underfarmed". That farmers might "farm to quit" such land would not be beyond the bounds of possibility.

5.5.4 Naturally, local and national planning policies will play the all-important role in determining whether or not "vulnerable" land will actually be infilled. Land would only be subject to infill if the relevant planning authority decided either to allow it or carry it out themselves. Thus any study of the problem would require an understanding of the reasons for the relevant changes in planning policy.

5.5.5 This undoubtedly is an important area of study; it was decided, however, that as the problem was by nature at a secondary level, it ought to be placed behind elements of research already outlined in terms of priority. (The solution of the primary problems proved to be most time-consuming, and so it was only possible to make a few preliminary investigations upon this subject.)

6. THE PLANNING AND PROGRESSION OF SUBSEQUENT WORK

6.1 The most immediate task of the Wolfson Group was then that of informing the farming community about the likely progression of events surrounding the development of a major new road. (The completion of a sound piece of work on this task was also important first, to secure positive NFU co-operation for the rest of the research programme, and second, to prove our credentials to professionals in the field.) Work started on this task first, and for the opening phases of it all Wolfson Group resources were used. Even though preliminary fieldwork had proven Hellard's hypothesis, it was necessary to further reinforce the data base in order to ensure both that the initial findings had not been exceptional, and also that all possible problem areas had been uncovered. In addition, study had to be made of the relevant statutes and instruments in order that the true position as regards legal procedures could be discovered. It was decided that both the Wolfson research students would be involved at all stages of this part of the research. Thus, this is the section of the thesis upon which all stages of the work were carried out jointly by the two research students.

6.2 As regards the remaining areas of investigation outlined in Section 5 it was decided, because the University authorities would not allow the production of a completely joint thesis, to split up the areas of investigation. This author took on the task of examining the present agricultural input to the highway decision-making processes, and the way it could be improved. Bell devoted himself to examining both the efficacy of compensation procedures and the administrative network which surrounds the technical appraisal techniques. In order, however, to facilitate the necessary fieldwork

and allow the two theses to dovetail as far as possible it was decided that the major case studies (M40 and M5) would be undertaken by both researchers, although the data would be analysed with different objectives in mind.

Chapter 3

The Development of the "Information Pack"

1. BACKGROUND

1.1 The problem definition stage of our work (Chapter 2) revealed that the farming community in general was ignorant of:

(a) the procedures surrounding the planning and construction of a new road;

(b) the problems likely to occur;

(c) way in which to avoid or minimise problems.

The hypothesis was formulated that if the individual farmer could better understand the procedures and problems the agricultural impact of any particular road scheme would be lessened and, hence, national agricultural resources would be better employed.

1.2 David Hellard (NFU, Land Use Department) having seen that the result of the preliminary fieldwork supported well his contention that the farming community were "starved of informatinn" about all aspects of the planning and construction of new roads, made the suggestion that some form of "information pack" be drawn up in order to provide this data in a readily consumable form. From the "ranking of research problems" drawn up in Chapter 2 it can be seen that "the procedures involved in planning and constructing a major new road and the problems caused for the farming community" was highlighted as being of utmost importance. Thus, it was that Hellard's suggestion was met with a highly positive response.

1.3 This idea, however, posed an immediate question, in that there might be a danger of losing objectivity by directing the focus of attention just at the affected rather than the promotors of the scheme and thereby taking up a position of advocacy on behalf of the farming community, which would be unjustifiable both from an academic and practical viewpoint. This was the topic of considerable discussion with several members of the University; from this a number of counteracting points emerged:

(a) the concern in our case was not with achieving any particular end extraneous to the existing process, such as preventing a particular road from being built or opposing the conversion of a particular plot of land from its agricultural purpose. Our aim was one which fits strictly into the concept of interdisciplinary research, namely to remove the barriers between the parties involved and to aid useful dialogue;

(b) the emphatic non-acceptance of a Code of Practice (Chapter 2) for highway contractors working upon agricultural land was the clearest possible indication that the authorities responsible for promoting new roads were unlikely to aid themselves the farming community towards a better understanding of the processes involved;

(c) a distinction should be noted between maximising the opportunity for the fullest inter-communication within the extant system, as differentiated from attempting to change that system to suit the achievement of a given end. We would contend that it makes perfect sense to explore the extent to which existing systems can be improved before proposing changes; in other words the Department of the Environment has erected a process whereby new roads are planned and built. It should therefore be in the interests of all concerned that each of the participants in the process enacts his role to the full. Helping the farming community to better understand the system and therefore play a fuller interactive role is simply an attempt to improve the overall system:

(d) therefore those who would argue that the farmers, by receiving this extra assistance, are achieving an unfair advantage, thereby upsetting the balance within the decision-making process, must be ruled out of order because it ought to be the aim to help all participants increase their level of useful involvement.

1.4 Additionally, it should be recognised that the Wolfson Group was in need of continued NFU contact in order to both help the progression of further work through contacts and in order to test the contemporary relevance of research proposals suggested and solutions to problems offered. Thus, in this light the production of an I.P. can be seen as something with which the Wolfson Group could trade with the NFU in return for continued co-operation. Indeed, throughout the duration of the project there was a continual, if sometimes sporadic, dialogue between the Land Use Department and the Wolfson Group. It appeared that only pressures of time prevented David Hellard participating more than he actually did throughout the project. That the I.P., as finally circulated, proved to be a unanimous success must have had something to do with this.

1.5 "Motorway, Trunk Road Development and the Farmer: An information pack for the guidance of NFU County Secretaries" was first issued in May 1976. A revised and updated second edition was published for general sale in April 1977. This later edition is incorporated as Appendix A. Final publication took place a full eight months after the first draft had been completed. This time delay was due to the process of iteration between the Group and Mr. Hellard, which was required because it was decided at an early stage that the publication would be a joint one, even if the major part of the work would be undertaken by the Wolfson research students. Hellard and his team made comment and suggestions upon the preliminary and subsequent drafts of the I.P. and were also successful in obtaining the views of the RICS through the office of R.N.D. Hamilton. Advice was also sought from RCU's, project engineers, land agents, NFU county officials and other interested bodies. The Wolfson Group had the final word upon content and was responsible for the final preparation of the booklet. Hellard, on behalf of the NFU, readily accepted that there was a need to apply academic standards and constraints to the material published and on this score there was little need for decisive editing.

1.6 It is perhaps finally pertinent in this introductory explanatinn to draw the reader's attention to Section 2 of the I.P. "The Role of the NFU". Referring back to Chapter 2 it can be seen that (paragraph 4.6(c)) one of the parameters of the Wolfson/NFU co-operation, as laid down by Hellard, was that through the Wolfson Group the Lands Use Department, and the NFU in general, should be able to be seen to be providing the members with a useful service. Thus it was that Hellard made a convincing case for including the preliminary Section 2 which served to emphasise the importance of the NFU as a body in this context. The Wolfson Group were happy to see this section in the final publication because it reflected their views that co-ordinated agricultural effort was likely to bring greater benefit than individual efforts.

2. GATHERING THE EVIDENCE

2.1 Rigorous desk study and literature reviewing was undertaken to provide the detailed theoretical background. The task facing an "affected" individual in attempting to obtain and comprehend the range of legal and official literature was evident. Initial fieldwork, however, had indicated that the complexities of procedural theory waned before the realities of practice. For the deskwork the I.P. is its own evidence incorporating the most relevant references and being founded on the review of literature. The practical works however merit a much fuller discussion.

2.2 The first draft of the I.P. was drawn up in September 1975 and based largely upon the evidence gathered upon the "problem formulation" stages of the project. Therefore the results of the M42, M11 (contract 3) and M6 farm interviews were combined with the evidence from the M16 and Chelmsford Public Inquiries and meetings held with engineers, MAFF representatives etc.

2.3 As was explained in Chapter 2, concurrently with the preparation of early drafts of the I.P., the two Wolfson students were preparing formal "end of first year reviews" which were designed to formulate research programmes for the rest of the Project. It was in these reviews that the research priorities were "ranked". It was decided that evidence gathered in the time of "problem definition" would benefit from expansion. Thus, two further farm surveys were planned: the first of these again involved the M11 but this time not the Harlow-Bishops Stortford section (contract 3) but that immediately to the south between Loughton and Harlow (contract 2). The results of the contract 3 research indicated strongly that there had been a complete breakdown of farmer-contractor communications; in consequence, individual farmers had been confronted with a large range of problems. It was hypothesised that:

(a) the engineers and contractors have the capability and technology to avoid or quickly solve any problems that may arise during the construction of a major road upon a farm, but that,

(b) because of a breakdown in communications unnecessary problems arise.

The general opinion amongst the farming community was that this breakdown was due in the main to the uncompromising nature of the Contractors. It was decided that this hypothesis should be tested as rigorously as possible. The next section of M11 to be built (contract 2) had the advantage that, apart from a change of main contractors (from Fitzpatrick to Dowsetts) all other variables were held as constant as possible: ERCU were still the promoting authority, Atkins the consulting engineers and the road ran through the same type of Essex arable farmland, which was fairly low-lying and susceptible to flooding. The main question then was did Dowsetts manage to operate with fewer problems being created for the farmers? This section was, at 8 miles, a little shorter than Contract 3 and affected fewer (12) farmers. Because

of changes in standards and the abandonment of Stanstead Airport expansion plans this section was down-graded (immediately prior to the beginning of construction) from dual 3 lane to dual 2 lane carriageway. Construction began early in January 1977 and was nearing completion at the time of writing.

2.4 That Dowsett's were able to run their M11 contract with far fewer problems than on the Fitzpatrick scheme, indicated that our hypotheses were valid and that the most important factor in deciding the overall level of difficulty individual farmers could expect during the construction of a major new road was the approach of the contractor. It was thought, however, important also to ascertain how lack of communications would manifest itself in areas of animal-based farm systems. Because of good NFU contacts in Cheshire it was decided to select the A55 (Chester Southerly By-Pass) for the next investigation. As well as being an area of dairy farms this road was also not a motorway and so provided another interesting variable factor. The 6.9 mile length of by-pass affected 11 farms. Of these two were market garden units serving the City of Chester and the rest were predominantly dairy farms. Cheshire C.C. was in charge of the scheme and Sir Alfred McAlpine and Son (Northern) were the contractors. Work started on the £ 10.8m contract in January 1975 and was completed in late 1976. The major constructional feature of the road was the bridging of the River Dee, apart from this the dual 2 lane carriageway was constructed on almost completely flat land. The overall conclusions from this study conformed with the hypotheses set out above: more problems occurred on this section of road than on M11 Contract 2, but there were far fewer than on M11 Contract 3. McAlpines it seems, through prompting by a very active Resident Engineer, had made some attempt at least to dovetail their work with the running of the farms.

2.5 The M11 (Contract 2) and Chester By-Pass investigations were underway whilst successive drafts of the I.P. were being drawn and naturally all evidence that became available was incorporated in the text. The final draft was completed and printed in May 1976: at that time both additional surveys were still incomplete. However, to make our task here more straightforward it is intended to deal with the revised version of the I.P. which was issued in May 1977, by which time <u>all</u> fieldwork evidence had been gathered and analysed. The 1977

version was only different from that issued the previous year by virtue of the "Corrigenda". The limited scope of this addition is an indication both of the correctness of what was originally published and the lack of new evidence appearing from the later phases of the M11 and Chester surveys.

2.6 It is, finally, in this section important to make the point that although we have classified the M11, Chester, M6 and M42 investigations as farm surveys, the extent of information gathering did not stop with the farm interviews. Attempts were made to contact the relevant engineers and contractors. This was done in order to both obtain their opinion on the general nature of problems and also to give them the opportunity to answer specific charges against them made by the farmers. Unfortunately, this attempt to "trace-back" problems to their source was in the main unsuccessful, only one engineer could be persuaded to commit himself. Elsewhere nothing more than superficial contact could be made. The RCU's involved refused to grant interviews. Naturally though, background information was available from the local NFU representatives.

3. METHODOLOGY

3.1 As has already been stated for the M11 (Contracts 3 and 2) and the A55 (Chester By-Pass) surveys all affected farmers were interviewed, whilst on the M6 and M42 a sample survey only was carried out. Indeed for the first three case studies, most farmers were interviewed twice in order to ensure continuity of views over time. The interviews were formally established by individual letter and confirming telephone call: (a final reminding call had been found necessary for the exigencies of farming can easily lead to researchers being forgotten when more relevant issues arise!).

3.2 The M42 interviews were simply a general conversation with the farmers with more intensive questioning on those matters which seemed of importance. However, once the main problem areas had been defined, it was possible to construct a more formal questionnaire. This was initially drawn up for the M11 survey and subsequently modified and improved. The final version is shown in Appendix B. The questionnaire

was used as more of a checklist than in order to obtain precise answers to precisely worded questions. This accorded with our prime objective which was to locate as many of the problems and difficulties farmers had to face; therefore, it was essential to allow the interviewees to speak about the issues they thought to be of greatest moment.

3.3 On all surveys, except the M6, the two-man interview technique was used. The experiment with just one interviewer on the M6 demonstrated the difficulties involved in marshalling and retaining a constant stream of information: interviews took much longer than the average time on the other sections and more points were unclear in the subsequent writing-up of information and had to be rechecked by telephone or letter.

3.4 The point cannot be made strongly enough that this type of research is extremely time consuming and expensive. It takes a great deal of preliminary organisation to set up, for example, a week's series of interviews. Farmers are notoriously difficult to pin down, even if, when they are contacted, they are usually most helpful. It must be recommended that any investigator undertaking an extensive series of farm interviews should, if at all possible, work through the NFU branch in order to obtain initial recognition.

4. THE EVIDENCE UPON WHICH THE I.P. IS BASED

4.1 Route Investigation and Selection

4.1.1 Current procedures mean that just the planning of a new road can take well over five years: during this time, the surveys indicated, conclusively, that the farming community tends to be kept in the dark about the progression of events. The MAFF may be consulted by the RCU or County Council, but individual farmers most certainly are not. The result of this was that often in the Pre-Public Consultation days the first time the farmers really knew that something was afoot was when engineers appeared to survey their land as part of the process of route selection or final design. This surveying will take the form of both placing concrete pegs in the ground for siting aerial photographs and the digging of bore-holes to carry out soil analysis. Bore-holes appear to cause most problems as they take longer to dig than posts do

to erect and contractors are in many cases reluctant to fill them in. Although usually only 6"-12" in diameter, bore-holes may be up to 200 metres deep and so substantial drilling devices are necessary to carry out the work. Movement of this machinery across the land may cause a loss of crops depending upon the time of the year and the care with which the operation is carried out. It appears that the shock of work being carried out, about which the farmer has no prior knowledge, combined with an inconsiderate attitude on the part of the contractor, is the best recipe for causing a normally mild-mannered farmer to become irate. An initial bad farmer-engineer relationship is likely to grow rather than diminish.

4.1.2 To demonstrate the magnitude of the borehole problem we cite one particular case on M11 (Contract 3) where the farmer awoke one morning to find a man, his drilling equipment and a residential caravan camped upon his land without prior permission. In all four bore-holes were drilled: this took the man over three weeks (!). At no time were the holes fenced off and finally they were left unfilled. It was a matter of months, during which numerous phone-calls were made, before the holes were filled in. Compensation negotiations (for crops destroyed and use of land) had still not been completed at the time of last investigation (June 1976) even though the bore-holes had been made over five years earlier (!). No other case was nearly as bad as this, but the example allows us, and through the I.P., other farmers to be aware of the range of possibilities.

4.1.3 Even upon M11 (Contract 2), which ran more smoothly than any of the other cases we investigated, because the contractors went out of their way to improve on-site communications, communication during the period of route selection was virtually non-existent.

4.2 Public Consultation and the Public Inquiry

4.2.1 The Chelmsford By-Pass proposal was the first scheme to be subjected to the newly developed DoE system of Public Consultation, which was designed to involve the public in the selection of a final route (from a choice of 3 or 4 usually) which would then be worked up in detail and published as a preferred route. For Chelmsford this took place in 1973 and gave the public a choice of three routes: one to the north of the city, one more or less on the line of the existing by-pass close into the city centre and the eventually chosen Southern

Route. The Inspector's Report (1) contained comments on the consultation exercise which are most revealing:

> "I find myself by no means as clear as to its objective. Mr. Little (appearing for the objecting group R.A.P.E.) submitted that it had no value in relation to the conclusions I had to reach and asked me to ignore it. In the absence of other advice, this appears to me to be sound.....But it is, perhaps, not enough to dismiss the exercise as irrelevant to the conclusions I have to reach. In some respects it appears to have been positively undesirable, either because it introduced an extra stage in the procedures and thus delayed necessary action or because the conclusion emerging from it aroused hopes and expectations that may not be fulfilled." p.200

4.2.2 Conversations and interviews with the farmers involved at Chelmsford revealed a fatalistic approach to the whole Consultation Exercise; most of them expressed the opinion that they felt that the farmers would always "lose", simply because there were more people living in the city centre who wanted the new road as far from their houses as possible, than there were farmers who wanted to protect their land.

4.2.3 In addition, the A1-M1 Link Public Consultation Exercise was subjected to a brief survey by the Wolfson Group. This involved speaking to engineers and a sample of farmers at the travelling exhibitions and interviewing farmers who had <u>not</u> attended, who it appears were in the majority. The predominant reason for non-attendance cited was that the farmer felt that he could in no way influence the decision that was finally taken. However, it appears that those farmers who <u>did</u> attend and the NFU working behind the scenes might have had influence on the final decision to choose the least agriculturally disruptive route. (It is, however, hard to unravel precisely the decision-making processes at work here, because much debate raged over "environmental issues" and especially the preservation of Naseby Battlefield).

4.2.4 The evidence from the M16 (A10-A12) and Chelmsford By-Pass Public Inquiries is presented in detail elsewhere (Chapters 5 and 6). Although the Chelmsford decision was finally a victory for the farming community, the victory stemmed not from the individual farmers, but from the case presented by the NFU, the lack of ERCU competence and the attitude of the Inspector. In both these cases however, the evidence presented by the individual farmers was characterised by an inability to put across to the Inquiry the evidence that really mattered as regards influencing the decision, as opposed to merely obtaining sympathy. Of most farmers it can be said:

(a) they did not really understand how the decision-making system worked; and

(b) they did not know what real impact the proposed roads would have upon their farms.

4.2.5 Great difficulty arose when questioning farmers about the Public Inquiry. Two factors served to confuse:

(a) the time lapse between the Inquiry and the Wolfson interview;

(b) the confusion that exists between the general public inquiry into the Line Order, which is convened to examine the proposed route, and the inquiry to examine objections to the compulsory Purchase Order. (These may be taken either separately, which almost invariably happens in practice, or together, or in combination with assorted Side Roads Orders.)

For all the schemes we investigated the general conclusion was that the farming community adopted an apathetic attitude towards the general Line Order Inquiry and focussed almost all their attention and effort upon the CPO inquiry. The reasoning behind this was simple in that they felt the outcome of the line inquiry would <u>not</u> be influenced by their appearance, and that the only stage at which it was worth fighting was when the detail of land-take was under discussion.

4.2.6 From evidence that it was possible to obtain about actual Line Order Public Inquiries (Inspector's Reports were extremely helpful) a number of points of some importance emerged:

(a) cases that farmers present at Inquiries are, because of their brief <u>descriptive</u> nature, of little use to the Inspectors decision-making framework;

(b) much emphasis was focussed upon access to severed land and the provision of bridges and underpasses;

(c) little success was had in persuading the promoting authority to supply an agricultural access if they had not planned such provision prior to the Inquiry, thus emphasising the need for farmers to influence the essentially <u>political</u> decision-making process far earlier;

(d) some farmers employed Chartered Surveyors (i.e. their agents) to present the Inquiry objection. This appeared to have made little difference to the outcome: indeed, some farmers voiced the opinion that using the agent was a waste of money (fees are only met by the Government in the rarest of cases) and he could have done just as well himself. This appears to be due to the theoretical roots that the agents have in valuation and surveying rather than the techniques of project appraisal economics and cost benefit analysis.

4.2.7 Finally, the point should be made that although we indicate to farmers the need for analytic as opposed to descriptive cases at the Inquiry, it should be realised that, until the Wolfson Group, there had been no "post hoc" studies of the actual agricultural impact of a major new road. At the time the I.P. was being written the Group had only just begun to process the results of the M40 survey and was, therefore, in no position to offer detailed advice upon how to present such an analytical case. Thus, the main thrust of advice in the I.P. concerns being aware of proceedings, thinking deeply about the presentation of a case and using the Inquiry forum as a way of formalising agreements made beforehand. (We have examples of engineers not honouring agreements made prior to the Inquiry simply because they were never formalised.) The NFU and the Wolfson Group realise that the farming community needs supplementary information upon the preparation of a good case. The development of the "new approach to impact assessment" has provided a framework in which this advice can be given, and work is underway to provide a Public Inquiry supplement to the I.P. It will, however, play no part in this thesis.

4.3 Drainage

4.3.1 The hydrological problems of constructing motorways through farmland are, arguably, second only to the civil engineering details of construction in demanding technical knowledge. Despite general background reading in the subject there was worry that the problem might be beyond the technical expertise of the Group. This would have been a grave limitation given the importance of the subject. However, it soon became a working hypothesis that, rather than there being technical difficulties, problems arose from procedural and

communication difficulties. This point was put to farmers, academic hydrologists, the NFU and eventually the MAFF. All parties concurred. Problems arose from (a) contractors not taking cognisance of farm under-drainage; (b) not considering early enough what provision was required to marry the road and farm drainage systems and (c) in most cases, poor execution of the intended plan. This lack of communications manifested itself in a number of ways:

- A lack of knowledge about the existing drainage pattern on farms on the part of the contractors means that inadequate plans are drawn up.

- Farm field drains are often simply not connected to motorway drains.

- When the connections are made, water may on occasions even be expected to run up hill.

- Streams are often not cleaned out sufficiently so that they will not carry the very fast discharges from the motorway surface.

- Debris from the road surface is washed into ditches, causing oil/rubber pollution.

- No provisions are made for farms not losing land to the motorway, but which are affected by the run-off from the road by virtue of being "downstream" from the motorway drains.

- Field drains are broken by contractors' heavy plant moving across the farm.

- Contractors are most reluctant to return to the site once construction is finished, in order to put right errors made during construction.

- Some contractors place unwarranted pressure upon farmers by not involving them in the drainage reinstatement. (It takes a strong-willed farmer to demand a hole, once filled in, be dug out again to ensure that the connections have been made properly!)

4.3.2 The one technical difficulty to be regularly raised, most notably in low-lying land as at Chester was that the contractors set their main roadway drains at too shallow a depth to give farmers with adjacent land a chance, in the future, to redrain the land at a lower level than at present. Some farmers undoubtedly thought of this as the

most important impact of the Chester By-Pass after actual land loss. As can be seen from the I.P. itself this was treated as being a major matter of policy for the authorities concerned and beyond the bounds of the booklet, except for the inclusion of a warning:

> "It is important to ensure that the level of drains along the motorway or new road should be set low enough for the future needs of the area. To ensure the long-term implications of the road have been fully considered, members should seek the earliest possible consultations with the Regional Water Authority and MAFF's local land-drainage officer." (Para 4 10(f).)

4.3.3 In many ways it would have been advantageous to be able to recommend the active involvement of ADAS land drainage experts, but it was clear that both because of strict delineation of function and also a lack of will, they could not and moreover did not want to become involved. All MAFF responses to road authorities stemmed from, and stayed within, the Lands Arm of the Ministry.

4.3.4 The object of this section of the I.P. was to describe the best of the procedure as practiced, in order to encourage high standards. Certain pieces of advice, such as bringing in the local specialist contractor being the best of the procedure eventually adopted, rather than that first acceptable to the promoting authority. The recommendation was strongly supported by farmers and agents alike.

4.3.5 M11 Contract 3 was, and remains, the worst example of overall lack of drainage provision we have found. Undoubtedly, the main physical difficulty experienced by the farmers was the disturbance and reinstatement of the farm drainage pattern. Only three of the sixteen farmers had been contacted before construction began to find out the drainage characteristics of their farms, and the same number, indeed the same farmers, were given an opportunity to offer suggestions on how motorway and farm drainage might be integrated. Although a direct casual link cannot be established because of other influencing factors in operation, it seems very likely that the proliferation of drainage problems (fourteen farmers were adversely affected both during and since construction) was to some extent due to lack of early technical communication. The severity of problems encountered varied considerably, as did the type of problem. Fairly naturally, the main problem areas were found to be in the vicinity of the main water course. Two complaints,

above all others, were prevalent along the whole route: first, that drains at the base of the embankment running alongside the motorway were either inadequate or entirely missing. Second, the farms' drains were not picked up properly, usually because the new drains put in by the motorway contractors were not deep enough, but sometimes because no attempt appeared to have been made to do so.

4.3.6 Regarding the effect of drainage deficiencies for the fourteen farmers with problems: three said they had "moderate" effect on production and four thought the effect was one scale higher than this on the questionnaire employed at "noticeable"; three classified problems as "severe", and the "scarcely any" and "none" categories were occupied by one and three respectively. It has to be emphasised that references here are to short-term effects on fairly small pieces of ground, usually one or two corners of fields nearest the edge of the M-way, although in two cases there were complaints of changes in the level of the water table and the positioning of springs, obviously problems of a far more fundamental nature. An important finding, pointing to the need for specialist advice, was that almost every farmer had particular problems unique to his holding; these included becks that should have been cleared out, but were not; a floodgate which should have been erected, but was not; squashed mole drains; flooding; septic tanks not catered for and interference with fields whilst work was being carried out. All but one of those interviewed said that they had to redrain part or all of a field to counteract the changes brought by M11. Again, they mostly referred to fairly small areas, although one spoke of a 20 acrefield.

4.3.7 The general impression gained from most respondents was that procedural difficulties proliferated. It was argued that time and money could be saved by consultation before construction began and by the District Valuer and RCU agreeing to proposed schemes for rectification quicker. The contention about consultation seems to be borne out, albeit tentatively, by the two cases where there was prior consultation, and the farmers were given the opportunity to offer suggestions on how motorway and farm drains might be married, and where no subsequent problems appeared.

4.3.8 The close, often blood relations, between some of the affected farmers on Contract 3 and those on Contract 2 of M11, enabled some farmers to be better prepared to handle drainage problems. Two respondents had

prepared reinstatement schemes on their initiative prior to the beginning of construction and had had these accepted by the DoE and the D.V. Both farmers were fully content with the outcome of the construction period as regards draimage. Three more farmers on Contract 2 were consulted, prior to construction, by either the DoE or consulting engineers, presumably because of their position near the River Roding. These too can be classified as being "satisfied". Three more had not been consulted beforehand but were nonetheless satisfied and only two expressed dissatisfaction.

4.4 Access and Severance

4.4.1 It is often useful to draw attention tothe obvious and, perhaps, it is of use here to reiterate one ofthe themes of the I.P., that problems can be forestalled if discussed at an early enough stage in procedures. What is most important about the access and severance sections is their position in the I.P. before the section on the Public Inquiry. Too often, in fact, such matters were found to have been left as vague assurances or not considered at all until an inadequately late state. The aim of the I.P. was to provide the requisite information to permit optimal use of the existing system: this it was felt implied having most issues settled early on. The evidence gathered on severance is briefly summarised in Table 3.1, from which 3 major conclusions are warranted:

- in general "satisfaction" is much more pronounced amongst those who had their cases settled early. There are, of course, examples of cases where an early negative decision is given and generalised dissatisfaction is recorded;

- there are clear indications that similar procedural matters have been dealt with at different stages of the procedures. On M11 Contract 2 everything was finalised immediately before or after the CPO Inquiry, mostly by negotiation and mutual agreement. On Contract 3, by comparison, there was much greater emphasis laid on Inquiry decisions;

- No-one was satisfied with a last minute arrangement, even where considerable efforts had been made to provide for the farmer concerned.

TABLE 3.1: Decision-Making and the Provision of Access Facilities to Severed Land

Procedural Stage at which Decision Taken

Scheme	Line Inquiry: Farmer Satisfied(S)	Line Inquiry: Farmer Dissatisfied(D)	Between Inquiries: S	Between Inquiries: D	CPO Inquiry: S	CPO Inquiry: D	Immediately Post CPO Inquiry: S	Immediately Post CPO Inquiry: D	Immediately Prior to Construction: S	Immediately Prior to Construction: D
M11 Contract 2	0	0	1	1	2	1	3	0	0	4
M11 Contract 3	4	0	0	1	3	1	0	0	0	2
Chester By-Pass	4	2	0	0	0	0	0	1	0	3
M6	2	0	1	0	1	0	0	1	0	3
TOTAL	10	2	2	2	6	2	3	2	0	12

4.4.2 Table 3.2 refers to the problems of access provision, both temporary and permanent, illustrating the important issues arising. A few words of explanation will be illuminating: we have recorded above that farmers are prone to be psychologically upset by the constructinn of a road upon their land and this often prompts them to complain about those features of the intrusion which are most readily apparent rather than looking in depth at the true cost of the development. Thus farmers tend to focus much of their attention upon the ease of working the unit during and after construction, with the result that those with severed land tend to lay great store by having access facilities which in no way impede operations. Agricultural access bridges and accesses are built to standard specifications which unfortunately do not allow the largest combine harvesters through without taking off the table. Such a task of dismantling and reassembling, because it would be done only once or twice each year, would not in any way be a burden upon the farmers, but nevertheless they feel aggrieved at being put to this extra trouble. Similarly, those who are made to share accesses with public footpaths or another farmer feel upset, even though the actual disturbance this causes is minimal.

4.4.3 The important problem of brucellosis transmission on shared accesses or public roads is, by definition, geographically limited to eradication areas. The Lake District had been one and after NFU pressure Appendix C to the I.P. was accepted for use upon an aqueduct scheme. Nonetheless there was no consideration of the matter during the M6 contracts, nor at Chester, where the question of accredited and non-accredited herds did indeed come up. The British system of public administration tends to leave such problems for the individual or interest groups to bring to the attention of the Minister, usually through an Inquiry. It is hoped that the I.P. will serve the important purpose of helping those affected comprehend the system and issues.

4.4.4 Access across the construction site was a matter which caused a substantial number of farmers <u>real</u> problems. The contractors having signed the contract with the authority promoting the

TABLE 3.2: Problems Arising from Severance and Access Provision

Scheme	Inadequate Width	Shared	Danger of Brucellosis Transmission	Access Across Site	Need to use public roads	Fencing Inadequate
M11 Contract 2	0	1	1	4	4	1
M11 Contract 3	1	2	0	9	4	2
Chester By-Pass	1	2	1	5	2	1
M6 French	2	1	2	3	0	2
M6 Laing	0	1	0	1	1	0
M6 Tarmac/ Dowsett	0	1	0	0	2	0
TOTAL	4	8	4	22	13	6
Total as % of those with severed land	9.8	19.5	9.8	53.7	31.7	14.7

particular road scheme are at liberty to carry out the work required in any order they wish. Thus, we discovered that it was possible for farmers to be left without any access to severed land because the agreed bridge or underpass had not been built before the road causing the severance. In all fairness it has to be pointed out that where possible the contractors would allow farmers to move machinery and animals across the site, but often this was not possible because of work being carried out or the steepness of embankments and cuttings.

4.4.5 The need to use the public road network to reach the land severed was again often cited as being problematic. Here we came to recognise two types of problem: the first was similar to that described over shared accesses and inadequate width of bridges/ underpasses in that the farmers simply objected to the extra inconvenience, when in reality the farming pattern was disturbed very little. Secondly, however, we can record what appeared to be a real problem which manifested itself in economic terms; this concerned those farmers whose land was near to the major motorway/existing road intersections, for it was often expected that farmers would use such junctions as access points. This caused a number of our respondents to alter farm systems in order to minimise the number of journeys that had to be made.

4.4.6 Finally, we have to record that in some places the lack of fencing upon bridges made it possible for stray animals to wander (or, in the cases of steep embankments, fall down) onto the motorway verges. This possibility caused affected farmers to use additional men when moving animals in such circumstances.

4.5 Fencing

4.5.1 Standard highway construction contract documents place contractors under an obligation to fence off all land required for the construction before any other work begins. Shaw recorded in his "Motorway Problems" article (see Chapter 1) that work on the M11 proceeded "well ahead of any fence being put up". Thus, the efficacy of fencing arrangements was an important integral part of our investigations. The procedure followed by contractors on

all 4 of these case-studies was that of erecting a temporary fence, which is supposed to last during the construction period and which is finally replaced by a permanent fence when the construction is complete. This arrangement was adopted to avoid damaging the more expensive permanent fence. Temporary fencing usually comprises a simple rough post and (barbed) wire.

4.5.2 Farmers, in general, were much upset by the attitude of contractors towards the erection of fencing. Table 3.3 demonstrates the type and incidence of grievances aired.

TABLE 3.3: Problems arising from the Fencing of New Roads

	M11		A55	Total	Total as % of all Farms
	Contract 3	Contract 2			
Land not completely fenced off before construction.	14	2	5	21	52.5
Inadequate temporary fencing.	3	2	2	7	17.5
Permanent fencing inadequate.	1	0	2	3	7.5
Gates inadequate	4	1	0	5	12.5
No problems.	0	8	5	13	32.5

4.5.3 A number of points worth specifying emerge from this table:

- the most important problem to occur was that of not all the land required for construction being fenced off before construction actually began;
- the difference between Contract 3 and Contract 2 of M11 indicates that the change of contractor was the vital factor in determining the overall level of problems experienced.

- in general, the permanent fencing when finally erected was adequate for existent farming systems. The only complaints involved fencing which was not strong enough to keep in heavy stock. (It should, perhaps, be recorded that the permanent fence is often of much higher quality than a farmer's own fence.)

4.5.4 It is worth pausing here to note a paper entitled "A Survey of Motorway Fencing" published by the Building Research Establishment in 1976 (2). Although not specifically looking at the agricultural implications of the adequacy of fencing, this paper does allow us to take a view upon the long term efficacy of fencing. The paper is based upon the results of a survey of four stretches of motorway (Table 3.4.). Table 3.5 shows the state of decay that these posts had fallen into.

TABLE 3.4: The BRE Fencing Investigation

Motorway	Approximate age in years	Number of posts examined
M1	15	30
M5	14	25
M6	12	100
M50	14-15	25

TABLE 3.5: Percentage of Posts falling into different Categories of Biological Condition on BRE Study

	Sound	Slightly decayed	Moderately decayed	Severely decayed	Failed
M1	60	14	13	13	0
M5	12	25	38	0	25
M6	70	28	1	1	0
M50	4	0	32	48	10
All four motorways	51	21	13	10	5

The conclusion reached by Cockcroft, the BRE author, was that:

> "The survey has confirmed that the Department's specification is adequate to provide fencing with the envisaged life (50 years), but it has provided evidence that it has not always been effectively implemented in the past". (p7)

Table 3.6 provides much evidence to support this contention.

TABLE 3.6: Percentages of Posts conforming to the Department's Specification with regard to Quality, Size and Type.

	Quality	Size	Type
M1	90	100	100
M5	92	32	72
M6	90	100	65
M50	96	4	8
All four motorways	91	77	64

4.5.6 Cockcroft's conclusion illustrates the point we made above that the expertise appears to be available to solve problems that can occur on a farm during the construction of a new road, but that communications breakdowns and short-cutting by contractors does allow difficulties to occur.

4.5.7 What farming problems does inadequate fencing bring? They can quite simply be broken down into 2 groups.

- on arable farms the existence of a gap in the fencing means that the contractors' men are far more likely to trespass on farmland, deposit litter etc. However, once the construction period is over, the lack of fencing will be of little moment.
- on farms keeping animals the problem is more positive in the sense that animals escape either onto the construction site or onto the completed road. (The opening of part of the M6 surveyed was delayed because cows were found wandering across the road on the morning the Minister of Transport was due to perform the Official Opening Ceremony.) The Animals Act, 1971, Section 4 (1) lays the responsibility for such escaping animals upon the farmer, not the body responsible for the fencing. It was discovered in early fieldwork that the police have prosecuted a farmer whose cattle strayed on to the M6 at Birmingham because the contractors had not mended a hole in their fence.

4.5.8 Finally, mention should be made of the confusion which surrounds the planting of hedges: engineers will, it seems, on non-motorway roads give farmers the option of having a hedge planted alongside the permanent fence. This appears to be both for aesthetic reasons and in order to obviate the necessity for future fence maintenance. Dispute, however, arises over whether the hedges are planted on the farmside of the fence or the highway side. Evidence on the Chester By-Pass is that hedges were planted on the farm side and the first edition of the I.P. was so written (4.10(e) p14). The DTp, however, in a formal comment on the I.P. asserted that all hedges are planted on the road side of the fence-lines. At present the dispute is not solved.

4.6 Contractor Behaviour

4.6.1 The outstanding finding concerned with the behaviour of contractors, (and one which has been strongly borne out by supplementary evidence collected on the M40 and M5), is the consistency of views about their misconduct. In most cases, starting from the farm interviews and working back to the NFU, land agents and on M6 a consulting engineer, the story came across of firms who would not trim their policy to fit in with affected land-owners requirements. The exception to this general rule was M11 Contract 2, where Dowsett's it appears under strict instructions not to cause the friction Fitzpatrick had done on Contract 3, went out of their way to create good working relationships. This indeed is the exception that proves the rule that problems have communications roots rather than technical ones.

4.6.2 The worst example is, perhaps, to be found on French's M6 contract. The chief engineer had set a distinct tone of "getting on with the job" to his staff and refused any formal or informal direct contact with affected landowners. That virtually the full gamut of potential problems were cited is not only a measure of French's lack of concern to avoid them, it is as much a reflection of the residual anger and frustration of the farmers concerned. We found with the other studies that many farmers had experienced similar problems but did not mention, without prompting, those which were solved quickly. This was not the case on the French contract: even where there were considerable

long-term farm system problems they were given secondary place in the farmer's interview response to the displeasure at French's behaviour. Running throughout this story as we followed it, was the theme of a contractor determined to optimise profit and minimise delay by making no concessions to affected landowners. The NFU made early contact with French but were told by the site director that the firm had no intention of liaising with any outside parties at all. The intention was carried out to the full! According to NFU Group Secretaries and farmers alike Scott-Wilson were unable to exert any authority.

4.6.3 The Scott-Wilson engineer we interviewed was delighted to have the opportunity to express his concern at the arrangements on the scheme. French had made it clear, he argued, that they were out to make a large profit by completing the earth-moving ahead of schedule. Scott-Wilson were appalled at what were quite blatant contraventions of the contractual provisions regarding agriculture, but could elicit no support from NWRCU. In the last analysis the only weapon they had was to cancel the contract, halt the scheme and sue French for the excess cost. Mr. Crowther, the RCU Director, was not prepared to take such a step and Scott-Wilson were left "powerless and embarassed". (NWRCU consistently refused to answer letters or respond to phone calls concerning the study.)

4.6.4 The comparison with the other contractors on the M6 is striking because the complaints received about them were far less numerous and vehement. This appears to have derived from a genuine will to discuss problems and go some way toward meeting them. They employed specific liaison officers, an administrative arrangement of utmost importance, which found itself placed prominently in the I.P.

4.6.5 The M6 study supplied a cross-section of virtually the entire range of problems which could occur. It was apparent from the farm interviews that those on the Laing, Dowsett and Tarmac schemes who were <u>most</u> content had intentionally fostered relations with the on-site personnel. In some cases this had led to quite considerable fringe gains. Examples included drives being laid with "waste" concrete. This conclusion accorded with the evidence collected on the A55 and M11 studies. It was a carefully considered

decision, based upon this type of evidence, to distinguish in the I.P. between the need for informality when dealing with day-to-day construction issues and the importance of formal agreements when handling more important, lasting matters. In this latter category the problem of making "deals" with the contractors holds prime importance. Arrangements which had originally looked most favourable to the farmers had soured rapidly when the contractors broke the contractual rules. The most frequently occurring incident was that of contractors not "restoring" land which had been rented for use as a soil tip to agriculturally viable condition, but we also found many examples of misuse of farm equipment etc.

4.6.6 On M11 (Contract 3) these matters were to the forefront of farmers' thought. Of the 16 farmers, all but four made private contracts, the one farmer who did not employ his usual agent to handle motorway negotiations, was advised by that agent not to enter into such private deals. It might well be that he had experienced some of the numerous unpleasant possibilities before. These private deals can best be broken down into renting or selling land to be used for soil dumps or borrow pits and getting certain jobs done around the farm, usually in return for some favour carried out to benefit the contractor. The second classification of private agreements were naturally not too deeply discussed by the farmers as presumably they did not want to prejudice any outstanding compensation claims, but we were able to find instances of hard roads laid down, ponds filled in, ponds dug, etc. often to the great satisfaction of the farmer. Satisfaction, however, was much less widespread when talking about soil dumps and borrow pits. There was only one farmer who would admit to doing well out of leasing a field so that material could be taken from it. The payment was very good, and the ground restored in reasonable shape, and although a crop has yet to be grown on it, there seems little doubt that it will grow. Others were much less happy; the backcloth to this discontent is that grave mistakes were made in the assessment of suitable earthwork material that was needed at the various points on the route. Thus hasty arrangements had to be made throughout the construction. The farmers who were renting land out naturally felt the backwash of these miscalculations and

most lost their land for much longer than they first anticipated, and although they had penalty clauses built into these private contracts, the general opinion was that these were not stiff enough, giving the contractor no incentive to move off the land. In addition to this we found cases of too much spoil being put onto a site, thus compacting the topsoil and leaving large mounds, often where the agreement had been made in the hope that a field could be levelled off. Most of the farmers affected in this and similar ways said they regretted making such deals and wished they had kept their land in its original state.

4.6.7 M11 Contract 3 was a sad story regarding farmer-contractor relationships; Fitzpatrick were almost universally felt to have developed an institutionalised form of avoiding responsibility, "buckpassing" as it was generally termed. Thus problems again fell to the Consulting Engineers, Atkins, who, however had problems of their own: the 1974-5 Appropriations Accounts of the House of Commons record (3):

> "(i) <u>M11, Stage 3 (Harlow-Bishops Stortford)</u>
> The M11 Motorway was designed and its construction is being supervised by Consulting Engineers on behalf of the Eastern RCU. The road is being constructed in four separate stages and soil surveys over the whole route were carried out by specialist contractors between 1966 and 1970 at a cost of £ 142,900. The contract for the 9.74 miles of Stage 3 was let in October 1972 at a price of £ 7.105m. and was due to be completed in October 1974. The completion date was subsequently extended to June 1975 and the latest estimated cost is £ 10.750m. The increased cost includes £ 1.400m. for variations to work in the Bill of Quantities due to the discovery during construction of substantially more unsuitable material than was allowed for, and £ 1.377m. for the consequential disruption of the contractor's work programme. A Departmental review showed that the under-estimate of unsuitable material arose from the scope and interpretation of the main soil survey. The soils report was not a good one and, furthermore, in interpreting it, the Consulting Engineers had lacked foresight in not appreciating or following up all its implications. The Department concluded, however, that the Consulting Engineers had not lacked the "reasonable skill, care and diligence" contractually required of them."

4.6.8 The lack of will by Fitzpatrick allied with Atkins problems created what might be termed a "responsibility void". Amongst farmers there was agreement that neither the RCU representatives nor the consulting engineers who were on site really had the time or the expertise to deal with the agricultural problems as they arose, and so, when asked all agreed that some form of agricultural liaison officer would be of great use working in this on-the-spot capacity. Two farmers even went so far as to suggest that the farming community as a whole could have saved money if they had paid for such an expert themselves, although the general feeling was that the contractors or RCU should bear the cost. Atkins had appointed an engineer with the task of acting as a general public relations/liaison man but he was felt by the farmers to be powerless both institutionally and personally.

4.6.9 The difficulty of actually proving damage or disturbance, when farming expediency required that it be made good quickly, was a major one. The farmers on the M11 were lucky, as they readily acknowledged, in having two dedicated land agents working on their cases. These agents were unequivocal in stating that the difficulties of the contract had turned out much worse than they had anticipated. They had both prepared for the construction by drawing up "statements of condition" for individual farms so that subsequent impacts could be irrefutably identified. This excellent idea was incorporated into the I.P. as was the point made by both of them and many other experienced valuers that a detailed diary of events is an almost essential pre-requisite of specific damage claims.

4.6.10 The I.P. thus recognises in this section that motorway construction is only a part of a greater process of planning, designing and eventually compensating. The "Construction of the Road" section, therefore, looks back to matters which should have been previously settled and forward to the eventual "catch-net" of compensation.

4.6.11 Mr. Manzoni, Director of the M42 contractors, Douglas, in an interview made the point that there will always be issues during anything as complex and hectic as motorway construction, but they should not become problems: rather they should be sorted out by direct negotiation between farmer and contractor. There were he admitted substantial amounts of money to be made from "cutting corners", but if good liaison channels of communications existed then the issues would not become problems.

4.6.12 The realism of this was emphasised on M11 Contract 2. The County NFU was very conscious of the Contract 3 failings and, therefore, took matters up early with ERCU. Soon after Dowsett's were appointed as contractors a meeting was held at which farmers and their agents met the principal figures amongst the contractors. Dowsetts set out to minimise the development of "problems" with a puissant senior engineer as liaison man and, above all, by ensuring that he was available at most times. The farmers on the section, who were worried in advance by tales of problems which had arisen on Contract 3, found that difficulties were corrected quickly and effectively.

4.6.13 In the final analysis the advice given in the I.P. emphasising reasonableness, establishing relationships, and the need to keep a diary and establish a "record of condition" is a recognition of the weakness of the farmers' position at this stage of proceedings. At the time when he is faced with the difficulty of re-establishing his farm system around a major road he also has to farm in an alien environment. To have problems righted he has to deal with a network of contractors, consultants and public authorities which often seems unable or unwilling to settle disputes. Not to put the point over delicately, if a contractor wishes to act awkwardly there is little in practice the farmer can do about it. The Chester By-Pass illustrated this well: the farmers were well organised in advance, had agreed with the NFU to co-ordinate their cases through one experienced land agent andcould be fairly categorised as comprising generally very aware farmers. McAlpines, it seemed, had done a good job of setting up a liaisnn system and making contact with the individual farmers. Nonetheless a number of issues became long-running problems. Most outstanding amongst these were dust and drainage. Bowsers to dampen the dust were promised but our observation and farmers reports indicate that only a token effort was made. As on the other contracts the farmers who avoided drainage problems were those who made time to build up a good working relationship with foremen and inspect work as it was being carried out. Contractors were, however, reluctant to hold up their work in order to obtain the farmers' seal of approval and so drains, badly connected, were covered up before inspection. Only one farmer had success in "persuading" McAlpines to expose drains already covered in.

4.7 Communications

4.7.1 The I.P., in an attempt to improve the decision-making process of road planning, by making readily available the best and most up-to-date data and advice required to help the individual inform and communicate with the decision-makers. It is then a communications aid to the agricultural community, but will, hopefully, also serve to inform that relevant authorities of the issues that concern farmers.

4.7.2 A number of assumptions evidently underpin the approach:

- the farming community desires to have the information;
- better involvement of the agricultural community will help to lessen overall agricultural losses to road development;
- that there is inadequate information at present.

The first two assumptions are fundamental to the Wolfson research and are discussed in relation to the period of "problem formulation" (Chapter 2). The third assumption, however, merits attention here. The complex, disparate official sources from which the picture of road planning in the I.P. is culled are not the end of the official output. The DoE/DTp puts out 2 brochures for public consumption which are of interest to farmers; these are:

- "Public Inquiries Into Road Proposals" 18pp
- "Land Compensation Your Rights Explained, No. 4, The Farmer and Public Development" 21pp

Both are small in size and, more importantly, are only concerned with the later, formal stages of procedure and make no attempt to go into the practicalities of decision taking and the setting up of communication channels. Put simply, it is assumed you want to present a case and know what to say, just as it is assumed you have lost land as required by a CPO and are in the process of preparing a claim. There is no provision outside the I.P. for an understanding of road planning as a process, and a process which can be influenced.

4.7.3 Too often the outstanding problems found on fieldwork arose because there had been no knowledge of them at an early enough stage to accommodate them into original plans or contract documents or set up communication or liaison machinery to deal with them. In informal conversations, with RCU engineers during the fieldwork the desire to meet agricultural requirements was strongly expressed, however, the formal line was that repeated by Mr. Carrington of MRCU in his letter of comment on the first edition of the I.P. when he argued that

agricultural considerations are given full weight through consultation with the MAFF. In the strict sense of compliance with the specific wording of the Highways Acts this is probably true. In any wider sense it is not and this letter expressed in reserved official form an acceptance of the I.P.'s role in expanding communications:

> "We feel that the report is a useful document in that it sets out the procedures followed by the Department when promoting new road schemes. It also contains such good information and good advice which will be invaluable to the farming community."

4.7.4 One of the more important meetings on this theme was with an ex-DoE engineer who strongly emphasised that he and his former colleagues would have welcomed an opportunity for continuing inter-communication with affected farmers. Of all the issues facing them agricultural impact was the one they were least able to accommodate within the structured assessment practices employed. It was to be expected, he emphasised, that the official response from DoE would be one of placing emphasis on the formal procedures - as indeed it was - nonetheless the engineers would welcome farmers coming direct to them at sub-unit level regarding their own schemes. This view accorded with others gained "off the record" and was incorporated into the I.P.

4.7.5 Our evidence points clearly to the conclusion that the moment of least resistence for an authority was not at the public inquiry when policies tended to be stoutly defended, but immediately before when there was a possibility of dispensing with the objection altogether. In order to optimise this relationship, however, farmers needed to be informed of the limits within which the engineers were working. Hence the length and importance of Section 4.10 "Prior to the Public Inquiry" in the I.P. By the final stage of precise routing a roads promotor needs to be fully informed of the effects of alternatives. Not only is this so that Farm A or B can be properly accommodated, but so that the route comparison and assessment is fully informed. In the last analysis that input must come from the individual farm itself. And that, broader, argument forms the burden of the Wolfson Group approach as developed in the rest of the thesis.

5. THE LEAFLET FOR FARMERS

5.1 The I.P. was written specifically for NFU County Secretaries although the second edition (due to public demand) was made more generally available. It was however, decided at an early stage that it would

be of use if, when specific road schemes were announced the County Secretaries had a circular to give the affected farmers.

5.2 Thus it was that "Roads and the Farmer: Some Practical Advice" was written. A copy is found as Appendix C. This was based upon the same fieldwork and evidence as the I.P. itself and puts over the same message, albeit in a much truncated version. Again the Wolfson Group undertook the main drafting task, but, in distinction from the I.P. the NFU Land Use Department took charge of the final preparation and content of the document. This decision was both political (the NFU was to pay for this publication whereas the Wolfson Group paid for the I.P.) and practical (Hellard felt that he better understood how to communicate with individual farmers.)

6. SUCCESS OR FAILURE

6.1 The I.P. and the leaflet for farmers are documents that must speak for themselves. The content and style must appeal to the audience at which they are directed otherwise they are of no use, no matter how well researched or written. In this sense both documents must be counted as undoubted successes. This is best reflected in the response of the County Secretaries which can be seen in two forms:

- a number of County Secretaries wrote to Hellard expressing their gratitude for the document. Only one expressed positive dissatisfaction and this was with the presentation rather than the content;
- perhaps more indi ative than this is the fact that the enormous flood of inquiries about roads to Hellard and his team, which had been continual before the issuing of the I.P., dried up almost entirely after the issuing.

(The I.P. originally sent simply to County Secretaries was accompanied by a list of planned roads for the whole country broken down by county. This was the first time such a list had been compiled and it was, apparently of great use to the County Secretaries.)

6.2 In addition, we record that a number of RCU's offices of the MAFF, the I.H.E. and the RICS expressed the view that the document would be of "great value" to the agricultural community.

6.3 It was the response from the County Secretaries and other bodies that prompted Hellard to suggest an updated version of the I.P. be printed. After careful consideration it was decided that in order to take on board all the points made by those who were prompted to comment it would not be necessary to rewrite the I.P., but that the addition of Corrigenda would suffice. The length and content of the Corrigenda is an indication of the "correctness" of the first edition.

part II :

agriculture and highway planning – the present system.

Chapter 4.

The Theoretical Basis of Project Appraisal Techniques Employed In Major Road Planning.

".....it is better to know what it is that one should know, even if one cannot know it, than to know something irrelevant."

E.J. Mishan.

1. INTRODUCTION

1.1 The decision to build, or continue building, a motorway network in Britain has to be made politically. It is not for us to question here whether the political decisions taken upon this subject already have been based on sound socio-economic arguments.* However, successive Governments have laid down standards which individual schemes must reach before being built. It is the purpose of this Chapter to examine the theoretical underpinnings of the techniques of project appraisal employed by highway promoting authorities to ensure planned roads meet the required standards.

1.2 It is perhaps pertinent to point out here that, although the Government has erected what might be termed this "safety mechanism", those who are responsible for carrying out the appraisals are also those who are developing new project appraisal techniques and are, most importantly, the people who advise the Government on what technique to employ and what standards to set. It is this strong element of vested interest which is at the heart of the recent civil disturbance at public inquiries, but it is also important in our context of endeavouring to actually influence the process of decision-making to understand the biases at work. For it is important to realise that this Chapter, although in the main only a review of available literature, is essential to the remainder of the thesis. Our main objective is to go as far as possible along the road of developing a new agricultural input to the highway decision-making process: in order to do this it is necessary to understand not only how agriculture is taken account of but also how the agricultural input is balanced-off against other factors. The two chapters following this demonstrate, by the use of case-study material, how the procedures work in practice: the purpose of this Chapter is to explain and criticise the theory behind the practice.

1.3 The basis of all project appraisal techniques used by highway planners is that of Cost Benefit Analysis. Therefore, we begin with a survey of the theory of CBA.

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* The author does, however, argue elsewhere that this has <u>not</u> been

2. COST BENEFIT ANALYSIS - THE THEORETICAL BASIS

2.1 The present level of Government expenditure, much of it on long-term, large-scale, capital-intensive projects, combined with the growth of the Welfare State, deeper public scrutiny of public decision-making, and the development of economic theory, has enabled the "art" of cost/benefit analysis (CBA) to expand massively in recent years. Such expansion is inevitably accompanied by controversy, evidenced by a substantial literature on the theoretical and practical problems involved in such an analysis.

2.2 CPA is a method of ".....setting out the factors which need to be taken into account in making certain economical choices.....the aim is to maximise the present value of all benefits less that of all costs subject to specified constraints." (1). Thus CBA purports to describe and quantify the socio-economic advantages and disadvantages of a policy in terms of a common monetary unit. With this basic concept it is possible to pose four questions which, somewhat arbitrarily, contain all the problems and possibilities of CBA.

(1) Which costs and benefits are to be included?
(2) How are they to be valued?
(3) How should they be aggregated over time?
(4). How should the results of the analysis be used to make decisions?

2.3 The Philosophical Underpinning: the Pareto Optimum

2.3.1 Self (2) describes certain economists as "Econocrats":

> "Econocracy.....is the belief that there exist fundamental economic tests or yardsticks according to which policy decisions can and should be made. Thus stated, econocracy is much more ambitious, and consequently more dangerous to the public than any kind of technocracy." (p5)

He goes on to assert that the "supreme example of econocracy" is the art of CBA. In the light of such a contention it is important to consider the philosophical argument that the econocrats use to justify their approach to CBA. The approach used is to turn to welfare economics and employ the Pareto Optimal criteria. A Pareto improvement takes place "if some economic rearrangement makes one or more people better off without making anyone worse off." (3), or, "if one or more individuals in society can be made better off without any other individual being made worse off." (4). Pareto optimality will exist if no further changes of this kind are possible.

2.3.2 The way in which economists interpret the Paretian concept in the context of CBA is to assert that if the benefits accruing to those who are "gaining" are of sufficient magnitude that they could pay those who are "losing" the equivalent of their loss, then the project under discussion will be worthwhile on the basis of being a Pareto improvement. Translated into the usual CBA terms this means that having added up all benefits and costs, the presence of a net benefit indicates that the "gainers" are receiving benefits which could pay all the losers the equivalent of their loss whilst some benefits would still remain.

2.3.3 There are, however, a number of objections to the use of the Pareto criteria as the cornerstone of CBA:

(a) It is assumed that all gainers and losers can be located and the extent of their gain or loss be exactly measured. This, in itself, seems unlikely, but it also raises questions over whether the individual is the best judge of the utility or disutility he receives.

(b) The Pareto test clearly ignores any resultant changes in income (welfare) distribution. For example, a change which makes the rich better off by £ 250,000 at the expense of the poor who are made worse off by £ 100,000 still produces a net benefit, or gain, of £ 150,000. As such it is unlikely to find favour as being a gain to the community as a whole - at least, not unless it is to be accompanied by observations on the resulting distribution, and even by recommendations in this respect.

(c) Perhaps most importantly it has to be realised that those employing the Paretian approach in theory are not allowed to apply it in practice. Compensation is payable to certain people suffering disutility from any project, but even those who drafted the legislation would not contend that all losers are paid the complete extent of their loss.

2.4 The Measurement of Costs and Benefits

2.4.1 Assessing the costs and benefits of a proposed project in the public sector "simply" means measuring all the effects that will be caused by the implementation of that project, by placing a monetary value on them so that they might be aggregated and compared one with another. There, however, the simplicity ends, for a formidable array of problems arises at every stage of trying to implement this for

even the smallest of projects. Basically it is necessary for the monetary value placed on the costs and benefits to reflect society's valuation of the final goods and resources involved. Two immediate questions arise: (a) if markets for the relevant goods and services exist, will the current market prices reflect society's valuation? (b) if market prices do not exist, how are surrogate prices to be derived, which, in turn, will reflect social valuations? Thus, the problem of imputing money values or prices to any given cost or benefit turns around the setting-up of shadow prices to reflect the true social opportunity cost of using resources in a particular project, when either the market prices for the resources are affected by imperfections in the market, or markets simply do not exist.

2.4.2 It is not the purpose of this account, to go into great detail over the problems that exist in measuring costs and benefits. However, a brief reminder of the well-rehearsed arguments will be useful. This can best be done by looking in turn at the problems which surround first, the market prices, and second, the formulation of shadow prices to be used when market prices do not exist.

A number of factors exist which will serve to distort the true market price of any factor involved in an investment decision. Most important among these are (5):

1. a monopolistic market;
2. unemployed resources within the economy;
3. indirect and direct taxes, levied either nationally or locally;
4. foreign exchange valuations and exchange rates;
5. some investment projects are large enough to influence the price prevailing in the market place for the commodity involved;
6. the existence of a consumer surplus for any commodity; (this means that the consumer would be willing to pay more than the prevalent market price to obtain the goods.)

Economists have attempted to find ways around all these problems, but it must be reported that there is little consensus amongst the major protagonists.

2.4.3 The shadow pricing of non-market goods throws up even more disputes and problems. Here we must deal with both collective public goods and the external effects of any project. Market prices clearly cannot

be used to value net benefits which are not capable of being marketed. The key point is that some goods and services supplied by the Government are of a collective nature in the sense that the quantity supplied to any one member of the group cannot be independently varied; thus, though individuals may differ in their marginal valuation of a given commodity, they all consume the same amount, in that each unit is consumed by all of them. It has long been recognised that any attempt to get customers to reveal their preferences regarding collective goods founders on the rock that the rational thing for any individual consumer to do is to under-state his demand, in the expectation that he would thereby be relieved of part or all of his share of the cost without affecting the quantity obtained. So that, where commodities are supplied at zero or non-market clearing prices which bear no relationship to consumer preference, there is no basis for arriving at investment decisions by computing the present value of sales.

2.4.4 There is little doubt that E.J. Mishan has been one of the strongest campaigners against the trend adopted by Self's "econocrat" of quantifying the quantifiable (i.e. some of the direct costs and benefits) whilst ignoring the unquantifiable, which category is usually comprised the <u>externalities</u> of the project. The point he makes is a strong one, for he does not contend that the external effects of a project should be counted in for the sake of economic neatness, but, that by counting them in the whole cost-benefit balance will be upset and far fewer projects would be undertaken than when only direct net benefits are recorded. (6)

> "As several conscientious economists have pointed out, the outcome of all too many cost benefit studies follows that of the classic recipe for horse and rabbit stew which is made on a strictly fifty-fifty basis - one horse to one rabbit. No matter how carefully the rabbit is chosen for its flavour, the taste is sure to be swamped by that of horse-flesh. The horse, needless to say, represents those "other considerations" which seldom take up more space than a sentence or two in a footnote, or in the preamble against the expert's detailed and quantitative analysis which is the scientific rabbit, one invariably having all the earmarks of exacting professional competence. On this recipe, standard for practically all transport studies, I should have no difficulty in producing impressive estimates of net benefits over costs for almost any conveivable traffic project in the London area, beginning with a four-lane highway through St. James' Park and a ramp over Buckingham Palace." (p7.)

He then goes on to answer the question as to whether it is possible to measure such external intangibles.

> "The answer is: yes, in principle. A conceptually exact measure would add together the minimum sums each family in the country would be willing to accept to reconcile it to the destruction of this area of natural beauty. And not only each family now living. As the destruction of natural beauty is virtually irreversible, the loss suffered by future generations would also have to be added to the total reckoning. Such calculations are currently impracticable. But even the most conservative guess of the total loss on this principle - which is, strictly speaking, the correct economic principle - would swamp any measure of net traffic benefits the Minister could come up with. By the same logic, a conservative guess of the social costs of the supersonic booms would be enough to reverse a decision based on a conventionnal cost-benefit study". (p7.)

2.4.5 It is then hardly surprising that economists have shied away from attempting to measure the vast gamut of externalities which exist for each project subjected to CBA. It would be hard enough to define and isolate all such external effects; if this could be done satisfactorily then it would be necessary to establish society's preferences for various goods; and finally, some way would have to be formed of quantifying them, on a basis comparable with the quantification techniques employed to measure the direct costs and benefits. Undoubtedly, at present, this cannot be done and it is, according to many writers, never likely to be comprehensively achieved. This is severe condemnation of CBA as a conceptual approach.

2.4.6 Even when the vast problems concerned with valuing marketable and non-marketable goods have been listed, the whole story is not told, for we have to examine the difficulties that are common to both categories. There are two major factors to deal with here. First, the impact of the distribution of wealth and income, and the incidence of costs and benefits. Two basic questions have to be asked. Should allowance be made for the inequalities of wealth and income distribution? If so, what weighting system should be employed to ensure the greatest possible redistribution of benefits? Second, we must recognise the effect of the risk and uncertainty involved when trying to enumerate possible benefits and costs in the future. There is no reason to argue that public investment projects are free of uncertainty or risk. This element of doubt must be contended with in the assessments of annual levels of benefit and costs, in the assumptions about project length of life and in the discount rate.

2.5 The Aggregation of Costs and Benefits over Time

2.5.1 Are we to give the same value to benefits and costs which, within the probabilities we feel are tolerable, will accrue in twenty years' time as we give to those which will accrue next year? The simple answer, and the justification for adopting a discounting procedure is no. Future costs and benefits become increasingly less important to the community over a period of time. Put another way, as long as benefits can be reinvested so as to produce further benefits, it will always pay to have returns earlier than later. Thus, the social discount rate is the key to the aggregation of costs and benefits flowing from any public investment project. The aggregation of costs and benefits over time will produce a Net Present Value (NPV) of the scheme involved.

2.5.2 The real problem here focuses around the choice of an appropriate social discount rate. The Government sidesteps the theoretical issues by laying down an official Treasury discount rate; at present this stands at 10%. Much work has been carried out, however, upon a way of accurately determining the theoretically correct discount rate. A number of alternatives exist, but there is no general consensus upon which is the correct one. Indeed, discussions about theoretically derived social rates of time preference and social opportunity costs do not cut much ice in most empirical work, and Prest and Turvey (1) were not able "to discover any cases where there was any convincing complete application of such notions".

2.6 The Criteria for Decision-Making

Suppose we have a number of projects with a positive NPV, how are we to decide between them? A number of alternative approaches have been offered.

(a) Benefit-Cost Ratios

Any project is potentially worthwhile if NPV > 0; where projects are mutually exclusive the project with the highest value of NPV should be selected. When funds are constrained, the issue is a little more complex. The objective is that of maximising the combined NPV of the projects chosen. If the constraint is confined to expenditures in only one period, the correct rule requires projects to be ranked by their benefit/cost ratios, i.e. by the ratio NPV(B)/Ki - where Ki is the constrained expenditure in the relevant period. Where funds are rationed

beyond a single period, no simple rule will suffice. The objective remains that of maximising the combined NPV of the chosen projects, but programming methods are required for the general solution.

(b) Single or First Year Rate of Return

In some circumstances the computational requirements involved in obtaining an NPV are so great that it is not feasible to produce more than a single year rate. Analysts then turn to the ratio of user benefits in a given year to the total capital cost of the scheme. (It is not necessary for it to be the first year, although the technique is often labelled thus.)

(c) The Internal Rate of Return (IRR)

This rule requires that the percentage rate of return implicit in the benefit and cost flows of the project be calculated and then compared with the social discount rate, which is derived independently.

3. COST BENEFIT ANALYSIS AND TRANSPORT PLANNING

3.1. The previous section outlined the basic theory of CBA and some of the difficulties involved. It is possible to be more specific in critical analysis when the frame of reference is narrower. Thus, this section is devised to demonstrate the most important deficiencies of CBA when applied to transport economics. The field is obviously still very wide and the literature voluminous: some of the more interesting CBA studies include Foster and Beesley's work on the Victoria Line (7), Hall and Smith's analysis of the possible conversion of railway track to narrow gauge roads, to be used as busways (8), Quarmby's assessment of the possible benefits of building a barrage across Morecambe Bay(9) and Else and Howe's paper upon the withdrawal of certain railway services(10). There is, however, little doubt that the Roskill Commission (11) into the siting of the Third London Airport is the grandest CBA ever attempted, certainly in Britain, perhaps in the world. As such, it has been exposed, also, to the greatest attention by critics. This is useful for our purposes: virtually all the criticisms that are voiced about CBA when used in transport appraisal were levelled against Roskill and his fellow Commissioners. Thus, an analysis of this criticism will serve to highlight the practical defects that exist.

3.2 The Roskill Commission was established in May 1968 to investigate the relative merits of different locations for London's third airport (TLA). The Commission detailed a research team to produce a CBA of the relative merits of the 4 short-listed sites - Cublington, Thurleigh, Nuthampstead and Foulness, all sites being within 50 miles of London. (One of the most unusual aspects of the study was the absence of any measure relating to most of the benefits for the 4 sites. Some benefits were measured but were entered into the final analysis as negative costs. Thus it is possible to argue that choosing between the four sites is misplaced in that none of them may fulfil the criterion of having positive net benefits.) Mishan(16) criticises this approach but lays more emphasis on the fact that the initial brief to the Commission did not allow for the possibility that a decision could be taken to the effect that no airport should be built. This he calls the "major defect" of the report; but, it is not unusual for the economists in this field to be working within a pre-conceived political framework which excludes the possibility of the proposal under review not being required at all.

3.3 Moving on from this most important broad criticism to the actual "nuts and bolts" of the CBA itself, there are a number of distinct areas to deal with:

(a) The need to make unjustifiable assumptions

To establish the demand for the TLA it was necessary to forecast the growth in air traffic in the medium-term future. This in itself was difficult enough, but the analysis had to be taken a stage further with assumptions being made about the use of regional airports within Britain. It was decided eventually to deprive the potential future users of a chance to use Birmingham or Castle Donnington, offering them only Luton or Manchester, as alternatives. Such an assumption has been heavily attacked by many critics mainly because the decisinn was taken outside any parallel decisions upon regional airport policy, or regional planning policy. As such it was completely arbitrary.

(b) The use of unproven modelling techniques

In order to distribute future passengers between the airports they would be "allowed" to use, it was necessary to predict how passengers would choose between them. These forecasts were based on a "gravity model" which Pearce (4) describes as "a widely used

but dubious engineering construct" (p75). Gravity models assume that the volume of traffic between a geographical area and an airport is determined by the "attractiveness" of the airport and the difficulty of travelling there (the "deterrence" effect). Pearce goes on:

> "Unfortunately, gravity models do not have a good history of accurate prediction. In a survey of several studies Heggie has concluded that "gravity and interactance models..... give a very poor explanation of observed traffic flows. The margins of error are so wide that they cannot consequently be accepted as a valid means of explaining present traffic behaviour or of predicting future traffic patterns"." (p75)

The use of the gravity model was bound to have caused criticism of the Commission; the use of a model simply because it is the only one or best available is an approach which, rightly, finds very little favour.

(c) The use of money as a standardised measure

Self (12) contends that CBA gets its plausibility from the use of a common monetary standard. He warns, however, that the common value of the £ derives from its use in actual transactions. Outside these transactions:

> ".....common values cannot be presumed, and symbol and reality become easily confused. The greater part of the figures used in this type of analysis represent notional values which will never be adequately tested or validated by actual exchanges, and which are highly arbitrary in the sense that a very wide range of values can plausibly be predicated, depending upon innumerable opinions and assumptions." (p251)

Self asserts that to call these opinions and assumptions £'s is to "engage in a confidence trick".

Such an adverse judgement can perhaps best be substantiated by referring to the Commission's attempt to calculate the "consumer surplus" on a property which would be affected by noise or, alternatively, on the "recreational" behaviour of those likely to be injured.

(d) Aggregation

Colin Buchanan, himself one of the Roskill Commissioners, felt compelled to write about his and the other Commissioners' efforts:

> "Where I begin to get into difficulties....is over the aggregation of costs to produce a "batting order"....with some twenty items included in the analysis, and a diversity ranging from direct costs which will actually be paid out to fully notional costs which will never be paid out, I have to confess that the process has been stretched beyond my ability to understand what the total really means." (11) (p15)

Buchanan is not alone in holding the view that to aggregate a large number of diverse factors that have had monetary valuations placed upon them constitutes an unjustifiable and incomprehensible approach. Much of the work on developing alternative approaches to CBA have been based upon just this criticism: most prominent amongst the alternative techniques have been Lichfield's Planning Balance Sheet (13) and Hill's Goal's Achievement Matrix (14). Most simply put, the process of adding up the scores arrived at to give one or two alternative totals is compounding the errors that may have been made when imputing the modified market prices or the shadow prices to the individual items. Given that in a CBA of a scheme of any size many of the elements to be aggregated will be of a substantial size, small percentage errors in the original calculation will cause large real differences in the sizes of the elements to be aggregated. Roskill went one stage further in that the final results were presented in a totally comparative form with only total cost differences being given. A number of authors make the point that, although such figures do demonstrate the seemingly great difference between Cublington and Foulness (£ 197 million), this amounts to less than 5% of the real costs. For the other 2 sites the difference is only just over 2%, so great are the total costs involved. Only the very bravest econocrat would contend that a 5% error could not be found in calculations such as these. The 2% difference must be considered insignificant. (Table 4.1)

Table 4.1: The Real and Comparative Differences in Overall Cost of the 4 Potential TLA Sites. (£ million)

	Cublington	Foulness	Nuthampstead	Thurleigh
Aggregate cost differences(10)	0	197	137	88
Aggregate Total Costs (13)	5433	5632	5569	5520

(e) The Importance of Time Savings in the Calculations

Table 4.2 gives a breakdown of the real costs of the 4 alternate sites.

Table 4.2: The Absolute Figures Underlying Table 1 for High Time Values only (£m) (15).

Row		Cublington	Foulness	Nuthampstead	Thurleigh
1	Airport construction	301	315	297	283
2	Extension of Luton	3	20	3	3
3	(i) Airport services	37	23	37	29
	(ii) Airport services taxying	89	82	84	81
4	Meteorology	7	2	4	3
5	Airspace movement costs	1899	1906	1934	1929
6	Passenger user costs	2883	3090	2924	2922
7	Freight user costs	20	34	25	20
8	Road capital	24	29	28	29
9	Rail capital	15	38	24	12
10	Air safety	1	3	1	1
11	Defence	73	44	49	105
12	Public scientific establishments	4	3	24	30
13	Private airfields	13	5	18	20
14	Residential conditions (noise, off-site)	23	10	72	16
15	Residential conditions (on-site)	11	0	8	6
16	Luton noise costs	0	11	0	0
17	Schools, hospitals and public authority buildings (inc noise)	8	2	12	10
18	Agriculture	8	11	16	10
19	Commerce and industry (inc noise)	1	4	2	4
20	Recreation (inc noise)	13	0	7	7
Totals		5433	5632	5569	5520

It can be seen that items 5 and 6 "airspace movement costs" and "passenger user costs" consistently make up about 88% of total costs for all sites. These items refer to costs accruing due to time spent in the air and passenger user costs refer to those incurred travelling to and from the airport. The basic theory behind the use of time-savings in transport CBA's of all kinds is that any time-saving occuring because of an improvement in the transport network constitutes a positive gain to the community. It does not matter how small the time-savings are, the assumptions are that the worker will be able to

do more work and those taking a leisure trip will enjoy greater leisure because they arrive earlier. The logic of this system is that 60 people arriving at their destination 30 seconds earlier than usual because of a transport improvement would be taken as being equivalent to one person arriving 30 minutes earlier. In the TLA context Buchanan, who felt strongly enough to submit a dissenting minority report, wrote (11):

> "I do not feel that I have ever properly fathomed the basis of user travel costs and I still feel intensely suspicious of the role they play in the whole analysis. I cannot in spite of all the arguments to the contrary, avoid the conclusion that since the rail travel times from Central London to Cublington and to Foulness would be 39 minutes and 44 minutes respectively ....that all traffic originating from Central London and all foreign visitors could as easily use Foulness as Cublington, and that the difference would be utterly immaterial to the great majority of travellers." (p155)

Mishan (16) agrees:

> "Notwithstanding assertions to the contrary, indivisibilities of time are important here. If the delay were of a full day, it could matter to the individual firm though, again, it might not matter that much for the country. If the difference in delay were of an hour's duration, one might think up circumstances in which it would matter. But such circumstances would not be relevant to the choice under consideration in the Report. If Foulness is chosen, it is not to be supposed that many firms could make profitable use of the extra hour or so of representatives' time saved in travelling to the airport. To most firms, I should imagine it would make no difference at all; the representative would have to get up a little earlier on the appointed day and travel a little longer." (p458)

It is also possible to challenge the values that were placed on the time savings. A value of 46 shillings (£ 2.30) per hour was placed on business travel in 1968, rising to 72s. (at 1968 prices) by the year 2000. For leisure passengers, in contract, a mere 4s.7d. (23p) an hour was deemed appropriate. Both figures were assumed to rise over time at 3% pa. Mishan (16) remarks:

> "Clearly there is some margin to be got by playing around with such figures, and this makes any choice on economic grounds alone appear somewhat less than satisfactory."(p457)

(f) The Treatment of "Externalities"

Criticism has been levelled at both the valuation of those "externalities" which have been taken into account and also at the omission of certain disamenities altogether. This is hardly surprising given the basic theoretical difficulties

involved. For example, a great attempt was made by Roskill to take account of the effect of noise upon the areas surrounding the four proposed sites. To assess the effect of noise on homes, the Commission compared the value of houses in noisy and quiet areas and added in the removal costs. They allegedly took account of not only direct costs, but also the value people put on their homes over and above the market value (the Consumer Surplus). Stern (15) calls this "meaningless" as the Commission itself admitted that many people are unwilling to move for any monetary consideration whatsoever. Also, as Mishan (16) points out, it is wrong to attempt to calculate the cost of noise by comparing similar property in noisy and quiet areas, because there are few or no areas which are quiet now and always will be. Indeed, as noise spreads, Roskill's cost differential will diminish.

> "On the day when the whole country is submitted to a uniform high level of noise, the Roskill Commission will be able to establish that noise costs nothing and in time 1984 style will proclaim that "noise equals peace". (15) (p919)

Mishan (11) illustrates those environmental externalities which have been omitted from Roskill's "Felicific Calculus", by citing the "destruction of natural beauty" and "loss of life". Per million passenger miles fatalities may be falling, but what matters in a cost-benefit calculation is the expected rise in absolute numbers attributable to the rise in numbers of passengers brought about by a TLA. If thechoice of Foulness implied fewer passengers, loss of life would be correspondingly smaller also - this the Commission did not take into account. Expressing grave concern for the fate of the Vale of Aylsbury should the TLA be sited at Cublington, Buchanan (11) commented:

> "This is the way in which we could, within a period of years effectively ruin the environment of this island, that is to say by a series of individual decisions (each one apparently essential to our economic survival) which in their accumulation produce a country which is not worth surviving in." (p153)

A comprehensive CBA cannot afford to ignore the social and amenity costs inflicted by new air travel facilities, simply because they cannot be reduced to a series of numbers.

> "If they appear intractable to existing methods of computation, the economist must say so, in which case an otherwise favourable cost-benefit calculation must be deemed inconclusive." (16) (p469)

(g) Discounting Procedure

As the Government lays down a statutory discount rate of 10% there is no point in quibbling with its use. A useful examination can, however, be made of the discounting dates involved. According to the Commissioners the congestion costs at existing airports will shoot up rapidly between 1981 to 1983, to a point when they would greatly exceed the savings which the community would gain by putting off expenditure on the airport. This affects all calculations.

> "If we assume that the third airport has to open in 1975, then discounted values are only about half those which emerge if the opening date is taken at 1982. In other words the apparent disadvantage of Foulness goes down." (17) (p305)(emphasis added)

Table 4.3: Total Net Costs Discounted to 1982 and 1975

£m	Cublington	Foulness	Nuthampstead	Thurleigh
1975 Total Net Costs	2264.6	2385.2	2273.9	2266.3
1975 Total Net Costs as differences from the lowest cost site	0.0	120.6	9.3	1.7
1982 Total Net Costs	4416.0	4651.0	4434.0	4419.0
1982 Total Net Cost as differences from the lowest cost site	0.0	235.0	18.0	3.0

Source: 17, p.305

The figures in Table 4.3 demonstrate the powerful influence the discount time-period has over the final result of any aggregations. An arbitrary choice can have a decisive influence for, although relative differences will not alter, real differences can be enlarged or reduced quite dramatically.

(h) The Consideration of "Social Equity"

Mention was made in the previous section of the "Pareto optimum" concept and the way some theorists see its relationship with CBA. There is little doubt that the Roskill Commission did nothing to avoid the pitfalls mentioned. If the business travellers and the

holiday-makers bound for the West-Indies are shown to benefit, after paying their fares, from the TLA, to such an extent that they could more than compensate the victims of aircraft spillover, the cost-benefit criteria are met. But full compensation is not paid, and how could it be when no attempt is made to locate all the disbenefits and associated "losers"? The former continue to enjoy the profit and the pleasure; the latter continue to suffer the disamenities. Buchanan (11) concerns himself with the distributional effects of the proposed TLA:

> "The second confirmatory argument for Foulness springs from the point which I have already touched upon, namely the possibility of using the airport as a means of promoting equality of wealth and opportunity. Looking at the present case from this angle I can see absolutely no convincing reasons for locating the airport at Cublington or indeed at Thurleigh. There are no pressing social or economic problems in these areas that need the airport for their solution.....On the other hand the location of the airport at Foulness could, in my view, make a very powerful contribution to one of the biggest social problems in the country, namely that of east London." (p.157)

3.4 The above is a fairly comprehensive, although not complete, summary of the main criticisms that have been made about the work carried out by the Roskill Commission. It is perhaps a useful reflection that in 1977 the Government has no intention of building a TLA (the plan to build at Maplin having been dropped), but there are plans to expand either Birmingham or Castle Donnington Airports, which Roskill saw fit to ignore for future use. Most of the objections to the use of CBA in transport assessment have been revealed, albeit briefly. When we came to examine the techniques employed in motorway appraisal it will be of interest and use to realise how many of the defects in that field coincide with those found at the Piccadilly Hotel, where Roskill and his colleagues sat for so long taking evidence.

4. THE EVALUATION OF MAJOR ROAD SCHEMES

4.1 This section is not designed to be a detailed investigation of the techniques used in the evaluation process employed by the DoE. The aims are more wide-ranging and include primarily an assessment of which factors are taken into account and how they are weighted and compared with each other. Economic models for appraising road schemes were introduced into use in this country within the then MoT in 1963. These models were subsequently modified and codified and issued, in 1967, in the form of Technical Memorandum T5/67 (18).

This was metricated in 1971 with the advent of Tech Memo H1/71 (19). Two years later the DoE introduced the computer package COBA which is a program designed to operate the basic H1/71 model, although various sophistications have been built in and the whole package is being continually updated with COBA Advice Notes. By mid-1977 16 such Advice Notes had been issued. The main body of this section will focus on the general operation of COBA. Before going on to examine this computer package, however, it is illuminating to take a look at the much remarked upon M1 study (20) which was the first appraisal of a motorway scheme in this country. The analysis was, however, retrospective, being carried out not:

> "with a view to deciding whether or not the London-Birmingham motorway should be selected as a profitable scheme, but it was undertaken as a subject of research to see whether reliable methods of assessing both the traffic that would flow upon it and the economic value of the scheme could be devised." (p iii)

4.2 The M1 Study

4.2.1 The study was separated into two distinct parts, with the "Traffic Investigation" being carried out by Coburn and the "Economic Assessment" undertaken by Beesley and Reynolds. The main function of the traffic investigation was to provide estimates of the amount of traffic likely to transfer to the London-Birmingham motorway and of the consequent saving in vehicle time. This data was then used in the economic appraisal in order to calculate the expected rate of economic return. It was estimated that the time saved by existing traffic transferring to the motorway would total about 1.6 million vehicle-hours per annum. Additionally, reduced congestion on existing roads would save, it was calculated, 0.4 million vehicle hours per annum. It was also recognised that journeys would often be increased in length because of the transfers necessary to reach the motorway: the total annual increase would be of the order of 13 million vehicle-miles. On the basis of comparative accident rates on motorways and general-purpose roads in other countries, accident savings were estimated at about 520 casualties per annum including 20 fatalities; it was recognised however, that these savings would be offset by some increase in accident rates per mile travelled for traffic remaining on existing roads.

4.2.2 The approach to the economic cost-benefit assessment can be simply described. The costs were taken to be just the direct capital costs incurred in construction and maintenance. Benefit measured

revolved alternatively around the time saving element calculated by Coburn.

Table 4.4: Estimated Savings (-) and Increases (+) in Annual Costs resulting from Construction of the Motorway

	Changes in £000's per annum		
	1st assign ment	2nd assign ment	3rd assign ment
Savings in working time by traffic transferring to motorway	-453	-624	-766
Reduction in vehicle fleets (1)	- 80	-161	-227
Change in fuel consumption for vehicle-mileage transferred to motorway	-117	- 84	- 18
Change in other operating costs for vehicle-mileage transferred	-200	-200	-200
Costs of additional vehicle-mileage incurred in transferring to motorway	+229	+307	+375
Reductions in cost to vehicles remaining on old roads	-128	-128	-128
Total vehicle costs	-749	-890	-964
Reduction in accidents	-215	-215	-215
Maintenance costs of motorway	+200	+200	+200
Benefits to generated traffic	-113	-136	-147
Net annual measured savings (2)	-877	-1041	-1126

Notes (1) "Reduction in vehicle fleets" is deemed to have occurred because time-savings allow more trips to be madeper vehicle.

(2) No value is placed upon saving of non-working time, although this was measured at 1.87, 2.23 and 2.64 million man-hours per annum for the 3 assignments.

Table 4.4 is drawn from material presented at various places throughout the section on economic assessment. The three assignments are based upon three different sets of motorway traffic average speed assumptions; Coburn asserted that the first assignment with the lower speeds was most realistic.

4.2.3 It is important at this stage to recognise that, on average, nearly 85% of net benefits from the 3 assignments are due to time-savings for drivers both on and off the motorway. Beesley and Reynolds recognised the nature of the benefits they were measuring:

> "The maximum time saving expected in any one class of vehicle is about half-an-hour per journey, with an average saving of 14-20 minutes per journey for the 3 assignments; much of the total savings are therefore the product of small savings and many journeys." (p49)

They go on, however, to assert that there are compensating effects in divisibilities of journeys:

> "It is sometimes argued that a reduction of half-an-hour in a journey of, say, 8 hours will not enable 8-hour journeys - or shorter journeys - to be undertaken, thus saving fewer resources than estimated. On the other hand, there may be travellers and operators who must tolerate wasted time of vehicles, etc. because additional journeys are not possible within conventional working hours. In this situation a small reduction in journey time of half-an-hour may enable additional journeys of several hours to be undertaken at little extra cost, thus saving more resources than predicted. In this connection, the distance between London and Birmingham (about 110 miles) is such that a small reduction in journey time might lead to a considerable growth of return journeys instead of single journeys in one day, with consequent savings in transport costs." (p49)

The capital cost of construction was taken to be £ 23,300,000 (£ 338,000 per mile); this gave a rate of return of 3.8%, 4,5% and 4.8% for the three assignments. Table 4.5 demonstrates the effect of valuing non-working time at various rates upon the economic rate of return calculation.

Table 4.5: Rates of Return Including Values for Non-work Time saved

Value of non-work time (shillings)	Assignment I	Assignment II	Assignment III
	Rate of Return (%)	Rate of Return (%)	Rate of Return (%)
2	4.6	5.4	5.9
4	5.4	6.4	7.1
6	6.2	7.8	8.3
8	7.0	8,3	9.4
10	7.8	9.3	10.5

Finally, the future growth of traffic was taken into account; it was estimated that the rate of growth would be 6% per annum. The ultimate rates of return would thus be:

Table 4.6: Rate of Returns including Future Traffic Growth

Year	%
1960	9.9 - 15.2
1965	17.6 - 27.3

In order for the construction of the motorway to be economically worthwhile, it must be shown that the rate of return obtainable is greater than the current rate of interest and greater than the rates of return obtainable in other uses of capital, including other road improvements. The first condition was easily met. Of the second Beesley and Reynolds wrote:

> "It is more difficult to consider whether the second and more rigorous condition is satisfied because little is clearly known about the rates of return obtainable.....Included with a selection of 9 smaller road-improvement schemes given by Glanville and Smeed and calculated on a roughly comparable but less comprehensive basis, the comparison is less favourable to the motorway.....In the long term, however, with increasing traffic and its greater reserve of capacity, it would be expected that the comparison with smaller short-term improvements would be more favourable to the motorway."

4.3 The COBA method of appraisal

4.3.1 The appraisal technique set out in T5/67(18) as modified by H1/71(19) relied upon an Economic Rate of Return (ERR) calculation for decision-making. This involved calculating the return in an assumed year of opening of the scheme as a percentage of total capital cost. The use of the 1st year ERR was an advance on previous methods of assessment enabling schemes that yielded high traffic benefits in relation to their capital costs to be identified and implemented. But the benefits from a road scheme are only recouped in full over a considerable number of years. Table 4.7 shows a simple example:

Table 4.7: Benefits over time accruing from a road scheme

Year	Capital Cost	Benefit
0	1000	0
1	0	400
2	0	500
3	100	600
4	0	700

The first year ERR for this project would be 400/1000 or 40%; by the end of the fourth year the return has risen to 700/1100 or 64%. The DoE considered that prospective variations (upwards or downwards) in return over time are reflected in the assessment used in order to give a better measure of total economic value and to enable a more accurate choice to be made between different schemes. For this purpose a single year rate of return figure will not suffice. The alternate appeared to be some form of discounting technique:

> "the use of discounting offers substantial advantages in the selection of the best schemes to implement, since economic returns can vary considerably over time between different projects. For carrying out discounting calculations on a routine basis it is sensible to use a computer program." (21)

4.3.2 In order to introduce a discounting mechanism to road appraisal, the Highways Economic and Modelling Analysis Division within the DoE produced the COBA (COst Benefit Analysis) computer program. From 1 April 1973 all schemes costing more than £ 1 million were required to carry out a COBA assessment at both the Preliminary Report and Firm Programme Report stages of development. Exactly one year later the limit was lowered to £ 250,000.

4.3.3 Although the COBA manual describing the manner in which the program has to be operated is lengthy and involved, the essence of the procedure is basically very straightforward. There are several distinct stages:

1. forecast the level of traffic in the base year without the facility proposed;
2. estimate the usage of new alternate facility alignments by predicting traffic flows;
3. estimate the differences in "benefits" between the alternatives and the "do-nothing" situation;
4. estimate the cost of construction of the facility and the necessary expenditure upon maintenance;
5. extrapolate both benefits and costs into future duly using the Treasury Test Discount Rate of 10% over a period of 30 years;
6. make an investment decision on the basis of the NPV's so obtained (22).

The rest of this section is devoted to expanding, explaining and criticising this process. First, it can be noted that the COBA assessment is couched completely in economic terms, with all other (social) issues being ignored entirely. Costs are narrowly defined as those incurred building and maintaining the road. Benefits are those accruing to the traffic using the affected network. (23)

4.3.4 These benefits are divided into three categories, (24):

(A) Time-savings:

These are measured for both business and non-business time. The values of the former are based upon the average wage rates of the groups of travellers involved, factored up for that part of overheads which can be identified as directly varying with such time savings. "Non-business" comprises a variety of different sorts of activity, ranging from the journey to work on one hand, to pure recreational trips on the other. There is much dispute over how such time should be valued: at present COBA relies on empirical tests carried out by various bodies to give average national data.

(B) Accident Savings:

These are calculated on the basis of lost output medical costs, police and administrative, damage to property, plus an allowance for pain and grief. Currently the value put on a life is £ 39,300.

(C) Savings in Marginal Operating Costs of Vehicles:

Here account is taken of fuel consumption, tyre wear, maintenance costs and depreciation expense.

(Two other computer models are used apart from the COBA program: the first of these is used to forecast the amount of traffic that is likely to exist at any given time and the second has the task of distributing or assigning the forecasted traffic to the road network as it would exist. Both of these aspects of road planning have come in for severe criticism with even the basic concepts and data used coming under fire. This is not the place to debate these points, but we must record that the traffic benefits as forecast by the COBA program may well be based upon incorrect traffic data.)

4.3.5 As regards the importance of the various benefit elements, Searle, the senior Economic Adviser to the DoE, has calculated that, in general, 80% of all benefits accrue from time-savings, with the remaining 20% coming from savings in accidents, with

> ".....the savings in the costs of operating vehicles being positive or negative, depending on the features of the particular scheme." (24)

Thus, as with the M1 study, we find that time savings are by far the pre-eminent factor in the cost-benefit equation. Breaking the benefits down one stage further Searle writes that the 80% time-benefits are comprised 51% business time and 29% non-business time. Of the 29%

the greater part (17%) is made up of savings made of journeys involved only with leisure.

4.3.6 Once total benefits and costs over time have been ascertained a Net Present Value of the Scheme can be calculated:

NPV = PVB - C; where NPV = Net Present Value
PVB = Total discounted benefits
C = Costs of construction and maintenance.

The test criterion at present in operation is that NPV and NPV/C should be positive. The ratio NPV/C is also used as "a ranking measure of relative acceptability". The choice between various schemes is made on the basis of INCREMENTAL ANALYSIS, (25). Again, this is a simple procedure:

1. Those schemes which have an NPV/C less than the acceptable minimum are eliminated;
2. Rank all remaining alternatives in descending order of capital cost;
3. Take the two lowest cost schemes and calculate the incremental NPV/C ratio thus:

$$\frac{NPV_2 - NPV_1}{C_2 - C_1} = \frac{NPV}{C}$$

4. If this ratio exceeds the accepted minimum, the extra expenditure is justified and the first scheme is eliminated;
5. Continue the process, taking each scheme in turn, until all have been considered, and the best "economic solution" has been found.

An example. Suppose we have five alternatives:

	PVB (£m)	C(£m)	NPV(£m)	NPV/C
A	1.7	0.7	1.0	1.43
B	1.2	1.4	-0.2	-0.14
C	3.8	2.1	1.7	0.81
D	7.5	3.5	4.0	1.14
E	8.8	5.0	3.8	0.76

Take the acceptable cut-off as 0. Scheme B is eliminated. Ranking in order of descending cost gives:

E $\frac{3.8}{5.0}$ D $\frac{4.0}{3.5}$ C $\frac{1.7}{2.1}$ A $\frac{1.0}{0.7}$

Now try C-A: $\frac{1.7 - 1.0}{2.1 - 0.7} = 0.5 > 0$ Eliminate A

Try D-C: $\frac{4.0 - 1.7}{3.5 - 2.1} = 1.64 > 0$ Eliminate C

Try E-D: $\frac{3.8 - 4.0}{5.0 - 3.5} = -0.33 < 0$ Eliminate E

D is selected as the best scheme despite not having either the highest NPV/C or lowest C.

4.3.7 The most noticeable omission from COBA is that of any cost considerations except those of construction and maintenance. All "externalities" are thus ignored; commentators often group these together under the heading "environmental":

> "....the most important consideratinn that is external to the COBA economic analysis is the interaction between the road and the general environment. To include it would involve placing social values upon changes in landscape, noise, intrusion etc. Rather than involve these subjective valuations in the economic analysis, it is intended that the decision makers should weigh environmental factors against any calculated economic benefit inherent in choosing a particular scheme." (26) p3

It is important, however, to recognise that there are impacts which COBA ignores which ought not to be described as environmental. Destruction of beautiful landscape is environmental damage, but let us not forget that the same land is also often being productively farmed. Loss of farmland is an economic not an environmental loss. Similar reasoning can be applied to other economic effects such as the impact upon local industry. Judge and Button (22) assert that this partial approach to analysis has great dangers;

> "in the absence of any explicit trade-off technique this could easily lead to an over-emphasis of the tangible costs and benefits at the expense of those less easily measured; readily available statistics are a powerful tool in argument, whilst qualitative factors prove difficult to compare."

However, late in 1976 the publication of COBA Advice Note 15 (27) entitled "Incremental Analysis of the Evaluation of Environmental Effects", did go a small part of the way towards rectifying the balance. The aim of the paper was to show, by the incremental analysis technique explained above, how some order of magnitude can be placed on environmental (i.e. non-traffic) considerations in order that they might influence the final decision between alternate routes.

4.3.8 The technique can best be described using an example:

Alternate Schemes	C(£m)	PVB(£m)	NPV(£m)	NPV/C
X	1.4	3.9	2.5	1.79
Y	1.6	4.2	2.6	1.63
Z	1.8	4.1	2.3	1.28

The additonal expenditure on route Y over X is justified in user benefit terms since the incremental NPV/C = 0.5. But it is not justified to build Z because the incremental NPV/C for Z over Y is -1.5. Thus, on this basis Y is the most economic scheme. However, suppose that Y is more damaging "environmentally" than Z .
How can we assess whether or not the extra expenditure (1.8-1.6) £0.2m is justified in economic terms? The DoE answer is simple: a minimum valuation of £ 300,000 ($NPV_Z - NPV_Y$ = £ 0.3m) must be placed on the net environmental benefits (NEB). Using the Treasury TDR over a 30 year period, as with the rest of the COBA analysis this means that the NEB must be worth at least £ 31,830 per annum to recommend route Z over route Y. This example dealt with the case where a more expensive option produced NEB over a cheaper option. Now consider the case where a more expensive option has a positive incremental NPV/C but produced a net environmental disbenefit. This can be illustrated by considering the choice between routes Y and X, where Y is at an environmental disadvantage. Here, the recommendation of route X over Y would rest upon the judgement that the NEB of X over Y was worth at least £ 0.1m ($NPV_Y - NPV_X$) in foregone net traffic benefits. This technique is undoubtedly useful, not just for "environmental" consideratinns, but for all factors other than traffic benefits which should be taken into account, but two points need to be made finally. First, no attempt is made to offer suggestions upon the specific valuation of "environmental externals" and, second, this analysis does not place these elements on anywhere near the same level of importance as the traffic benefits. It might be said that technique described in Advice Note 15 is merely a statement of commonsense. It is to be hoped that this is how those using COBA were operating it anyway. If not, they now have to. Finally, it seems that due to the possibility of quantification of agricultural impact the application of such cost differential analysis in our specific field may be more feasible than for (real) environmental side-effects.

4.3.9 Mills in an article, which attempted to compare actual traffic flows on the Wellington By-Pass with those predicted by the DoE appraisal techniques, concludes on COBA (28):

> "....the COBA procedure still has a large number of practical shortcomings and difficulties. But to put these criticisms into perspective, we must consider the use made of the analysis. Under present circumstances, at least, it seems unlikely that the size of the DoE's budget for road construction is affected much, if at all, by the computed NPV ratios. In that case, the results are used only for the ranking of projects which compete with each other for a share of the (fixed) limited budget, and for the ranking of alternate project designs for a specified road link. Errors introduced by aggregation, for example, may have little or no effect on such ranking procedures." (p14-15)

Remembering Mishan's "horse and rabbit stew" of the previous section, we may safely conclude that he would not agree with this optimistic conclusion from Mills. And indeed, the element of doubt should logically ride in Mishan's favour, for until a great deal more is known about the way in which externalities can be assessed and integrated into the appraisal framework, the highway engineers cannot be certain they are not selecting the wrong routes and schemes using their biased techniques.

4.3.10 The inability of COBA and the RCU's to accurately measure and predict the environmental effects of a proposed scheme can be seen to be working <u>against</u> them in certain cases. An example will serve to demonstrate the problem: this is drawn from the proposed Newark By-Pass scheme, which we have already recorded that the MRCU asked the Wolfson Group for advice upon. Before the recent (June 1977) announcement by the Secretary of State of a "preferred route" for this by-pass, four alternatives had been under consideration. Table 4.8 demonstrates the economics of the alternatives:

<u>Table 4.8:</u> The Predicted Economic Returns from the 4 Alternate Routes for the Newark By-Pass.

	Red Plan	Purple Plan	Blue Plan	Brown Plan
Construction Costs (1975 prices £m)	7.4	7.0	8.9	8.6
Land Cost (1975 prices £m)	2.3	0.9	0.3	0.4
Total Cost (1975 prices £m)	9.7	7.9	9.3	9.0
Possible Additional Cost (+£m)	1.6	Nil	Nil	Nil
Total Discounted Cost (£m)	4.3	3.5	4.0	3.9
Benefits (£m)	4.8	3.9	4.1	2.3
NPV (£m)	0.5	0.5	0.1	-1.6

Table 4.8 cont.

	Red Plan	Purple Plan	Blue Plan	Brown Plan
NPV/C	0.11	0.14	0.02	Neg.
Inc NPV/C	Neg.	-	Neg.	Neg.
First Year Benefit/Cost Ratio (%)	7.6	7.5	6.4	2.0
First Year Benefit/Cost Ratio 10%	1986	1986	1988	1997

Source: 29

These details confirm conclusively that none of the schemes as measured by the COBA method of appraisal would produce "value for money" until the mid 1980's and even then the returns would not be large. Yet there can be little doubt that the centre of Newark has a network of roads completely unsuited to carrying heavy flows of through traffic and would greatly benefit environmentally from a by-pass. There seems to be a strong local consensus on this point and it appears likely that when the scheme comes to inquiry the debate will not focus around the issue of "need" but simply that of routing. However, despite the existence of this consensus the MRCU have it seems (30) a hard time convincing the DTp accountants that the scheme is worthwhile. It can easily be seen why this should be the case; for most schemes they are able to point to a positive NPV and 1st year rate of return of well over the test rate of 10%. This being the case it is possible to conveniently forget the unmeasured externalities which may well serve to reduce the "goodness" of the scheme. Therefore to approach the DTp with a scheme which is economically non-justifiable and argue that it is environmentally desirable is to change the rules of the game which have grown up with the use of COBA. In other words because COBA only measures traffic benefits upon the proposed new road and <u>not</u> the relief within the town centre, either in terms of traffic or the environment it cannot expect to be reflecting the most important factors in the situation.

4.3.11 Finally, we must record that COBA according to the DoE is not suited for application to all highway schemes. In particular it is not used for the appraisal of the largest inter-urban schemes. As we will see from the M16(A10-A12) Inquiry evidence, for such schemes "full traffic modelling is undertaken. This means only that a

greater degree of precision is exercised in counting traffic flows on proposed and existing roads, rather than using preconceived formulas in a computer programme. However, in these exercises no attempt is made to even translate the predicted flows into monetary terms. Again all other issues are treated in an "ad hoc" manner as and when they arise. The DoE has had in use for a number of years a National Traffic Model which is comprised a suite of FORTRAN programs, and can model and evaluate the whole of the traffic process, from the generation of trips, through their distribution to different destinations and their assignment to specific routes. The use of such modelling methods is currently being extended in a major programme of setting up Regional Highway Traffic Models for each of the 6 RCU's. (Since 1970, the MRCU has had available its own Midland Regional Synthesised Traffic Model.)

4.4 The Jefferson Report

4.4.1 Some two years after the beginning of this research, it was made known to the Wolfson Group that Jefferson (head of the SWRCU) had, in company with a working party appointed by the DoE, produced a report indicating to highway engineers how the environmental impacts of a new road scheme might be predicted. Although the report was for internal consumption only, by mid-1977 its contents had been widely leaked: the Wolfson Group had been the recipients of informed disclosures. As the evaluation methodologies recommended in the report are now being widely used within the RCU's, it is important for us to be aware of, if not the detail of the techniques, then the general approach. What follows is an amalgam of evidence gleaned from MRCU engineers and two papers presented by Jefferson at different conferences.

4.4.2 Jefferson, himself, sums up (31) what he sees as the aims of environmental assessment methods:

> "2.1 The ultimate goal for any environmental assessment method must be a procedure which will quantify the environmental benefits and disbenefits in monetary terms so as to allow them to be incorporated in the COBA equation with the result that a more realistic and complete assessment is made. Many believe that this is an impossible goal but various methods are being researched and are to be encouraged. But until they have been developed, calibrated and accepted, the road engineer's sights must be set somewhat lower although hopefully his more limited aspirations may ultimately give a lead to methods which will allow the development of expressions in the desired monetary terms.

"2.2 These limited targets can be considered as three-fold:

(i) The identification of environmental factors which can make a significant contribution to the overall decision process;

(ii) The expression of each significant factor in a way which will allow its individual impact on alternative alignments to be compared;

(iii) The expression of all these factors in a way which will allow their collective impact on alternative alignments to be compared.

2.3 Target (iii), if achieved, will give to the decision maker an environmental ranking for schemes and for alternative alignments within a scheme which could be set alongside the economic ranking obtained from COBA. This would still leave the decision maker with a problem of weighting one ranking against the other in order to come to a conslusion. Until a common unit of value measurement - money - can be applied to the two assessments of economics and environment, subjective decisions will have to be taken. But they will at least be taken with an acknowledgement of environmental benefits and disbenefits and will not be based solely on those aspects against which a monetary value can currently be placed.

2.4 Unfortunately no common unit of value or numeric system has yet been found which can be applied satisfactorily to the various environmental factors and target (iii) would appear to be still out of reach. Even identification of the various factors is open to debate and there are many opinions as to the order in which these factors should be ranked. The debate widens even further when their individual valuation - target (ii) - is considered, but this paper attempts to suggest a simple starting point from which better methods may be developed." (pp2-3)

4.4.3 Nine different environmental factors were considered by Jefferson. In no particular order they were:

Noise
Air Pollution
Visual Effects
Danger
Land Take
Ecological Aspects
Vibration
Severance
Temporary Environmental Effects.

The first point to make is that agricultural impact is taken under the heading of "Land Take". The detailed approach to agricultural impact taken by Jefferson is more appropriately discussed in Chapter 7. Here we are not concerned with the techniques recommended for the measurement of the individual factors, but our interest focusses instead upon the way in which Jefferson feels that the individual factors should be traded off against each other

and, more importantly against the traffic benefits which are said to accrue from the building of a new road.

4.4.4 It is apparent that Jefferson does not agree with Mishan's "horse and rabbit stew" contention:

> "It is by no means certain that in relation to scheme evaluation the impact of the results will be of sufficient weight to justify the resource effort involved in determining them." (32)

Thus, it is envisaged that this framework of appraisal will be very much at a secondary level, only being applied to those schemes which produce positive COBA results. There is, however, far less certainty upon how the various trade-offs can be made. At present, the most refined approach suggested by the working party appears to be that of a matrix using different weights for individual factors and grading each impact by degree of severity. Aggregation of an ordinal scale then gives an overall impact. For example:

Degree of Impact (1-5)	Noise (Weights)	Pollution (Weights)	Land Take (Weights)	Visual Effects (Weights)	Total	Impact Index
Route A	3	2	1	4	10	32
Route B	3	4	2	1	10	35

4.4.5 However, given the (apparent) precision with which the traffic predictions are carried out and the monetary values which result, it is extremely unlikely whether such environmental evaluation will often be decisive in route selection.

5. CONCLUSIONS

5.1 Peter Self (2) writes finally in his work on the "econocrats":

> "it is to be expected that future historians will be surprised at the credence and importance accorded to economics in 1970's." p203.

Such a statement implies that the author believes decision-makers and those who advise them will place more reliance in methods other than supposedly sophisticated applications of welfare economics. He suggests that non-quantitative techniques of planning could be far more effectively utilised. Will Self's prediction come true in the field of highway planning? There seem to be forces moving in two opposite directions: the

current work devoted to erecting the Regional Highway Traffic Model is designed to improve the sophistication of traffic predicting and therefore indicates increasing reliance upon quantitative processes which ignore non-quantifiable factors. However, the work of Jefferson and his "environmental" working-party suggests that there are those within the DoE/DTp not completely immune to the plea for a more wide-ranging appraisal technique. Nevertheless, it must be said that non-traffic issues, whether or not considered in Jefferson's framework, are (and will be) accounted for very much at a secondary level of analysis after the best routes have been chosen on traffic grounds.

5.2 Where does this leave our aim of improving the agricultural input to the decision-making model? Fundamentally it has to be recognised that in order for agriculture to make any impact upon the appraisal methods currently in use the input employed will have to be couched wherever possible in quantitative, monetary terms. Descriptive statements of physical impact will not be able to be taken on board simply because the quantitative framework will not allow it. In other words it will be necessary to accept econocratic approach to appraisal adopted by highway engineers, no matter how distasteful this is, because our brief and resources allow us to go no further.

5.3 These conclusions are drawn from the published work upon the theory of highway appraisal techniques. We now turn to examine the praxis of the situation.

Chapter 5:

The M16 (A10-A12 Section) Public Inquiry: planning a part of the London outer orbital.

1. BACKGROUND

1.1 Dr. van Rest decided, for a number of reasons which are outlined in Chapter 2 (para 2.1.3) that the Wolfson Group should record extensively the events of the M16 (A10-A12) Public Inquiry which opened in Epping in December 1974. It was expected that the Inquiry would be a fairly brief affair, however, the Inspector eventually sat for 89 days (the second longest highway inquiry ever at that time). A decision was taken to extend the Wolfson Group coverage of proceedings and although finally not every day was attended, all relevant days were and most Inquiry documents were obtained.

1.2 The Inquiry was made so lengthy primarily because of the existence of two co-ordinated objecting groups with substantial (although they would argue insufficient) funds available to hire expert witnesses and counsel. It was the depth and scope of their objections that forced the ERCU, the promoting authority, to reveal a great deal about the way in which it had gone about the task of planning this section of the London Outer Orbital. This report of the way in which the ERCU went about their task would not have been possible without these strong objections from "The Alliance Against M16" and NAMAC (in association with FoE).

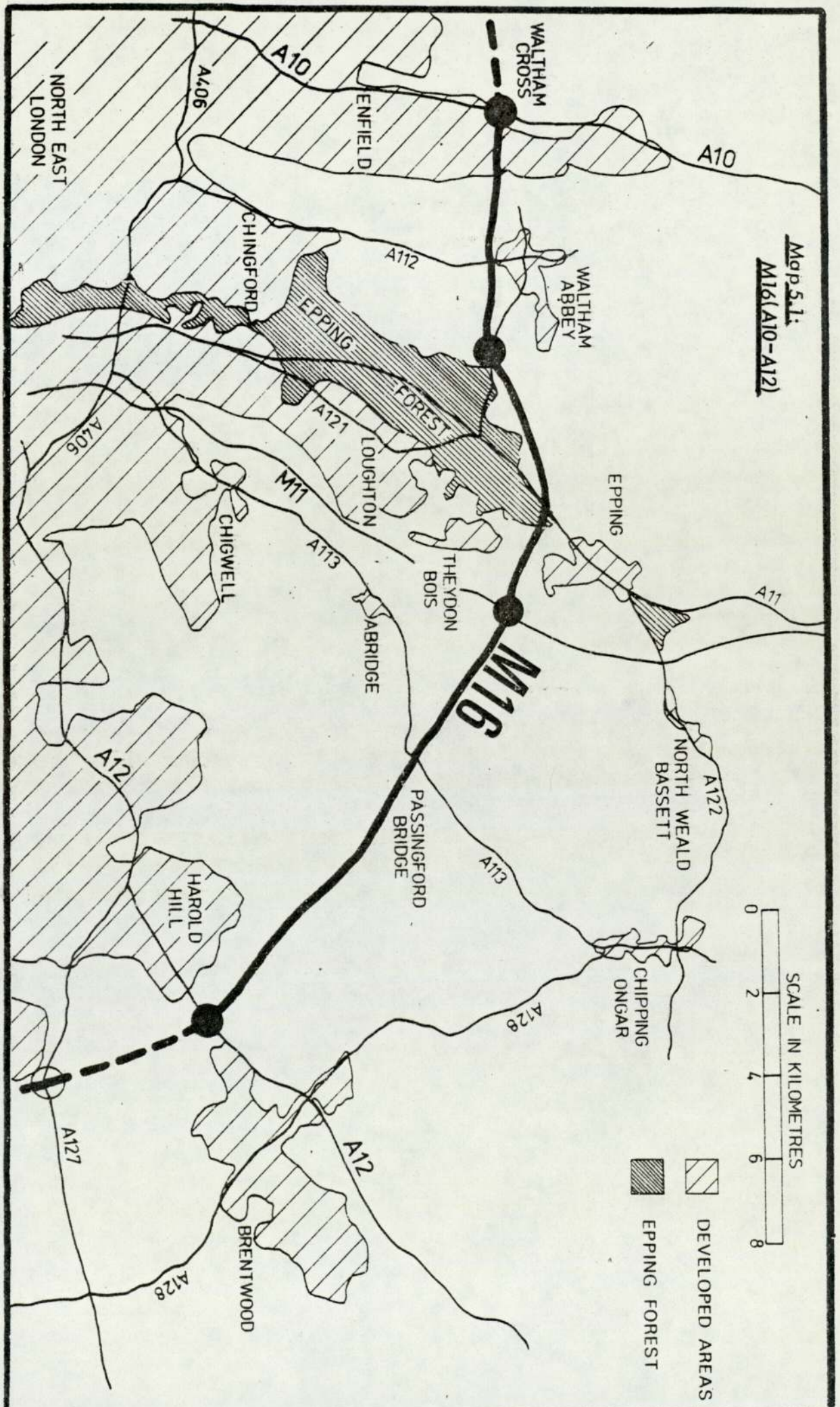
1.3 Because of this huge, unexpected release of information it was possible to fulfill three inter-related aims:

(a) to examine how the appraisal framework adopted by an RCU appears to operate in practice;

(b) to examine the quality of the agricultural input to the decision-making process;

(c) to estimate the weight given to agricultural evidence as compared with other factors.

1.4 Map 5.1 shows the route for this section of the M16. The proposed route, had according to Mr. Lawrence, the chief engineering witness, for the ERCU, a length of 15.74 miles (1), and would have dual 3-lane carriageways separated by a central reserve and flanked by hard shoulders and verges. The overall width would be 116 feet. Interchanges with other roads were to be provided at five points, the A10, A121, A11, M11 and A12.


Map 5.1:
M16(A10-A12)
WALTHAM CROSS
A10
ENFIELD
NORTH EAST LONDON
A406
CHINGFORD
A112
WALTHAM ABBEY
EPPING FOREST
A121
LOUGHTON
M11
CHIGWELL
A113
THEYDON BOIS
EPPING
A11
M16
ABRIDGE
A122
NORTH WEALD BASSETT
A12
PASSINGFORD BRIDGE
HAROLD HILL
CHIPPING ONGAR
A128
A127
BRENTWOOD
SCALE IN KILOMETRES
0
2
4
6
8
DEVELOPED AREAS
EPPING FOREST

2. THE ERCU FOUR STAGE DECISION-MAKING MODEL

2.1 There are well-rehearsed arguments about the dangers of drawing generalised conclusions from case-study work; thus it will not be asserted that the four stage model which is outlined below could serve to explain the behaviour of all RCU's when designing a motorway route, or that it can even explain a constant ERCU policy. However, it can be hypothesised that as the particular ERCU staff employed on the M16 (A10-A12) were experienced in this type of task, they were using the best manner of procedure available at the time. A description of the model is therefore of great use.

2.2 The four stages can be described quite briefly:

(a) Interpretation of Government policy statements concerning the motorway network and its component parts, in order to assert Parliamentary backing for a particular road.

(b) Selection of the most appropriate route.

(c) Justification of both the need for the road and the particular route at the same time.

(d) Detailed design: including amelioration of some of the more noticeable detrimental physical and socio-economic aspects of the chosen route.

The most controversial aspect of this model is that the selection of a route is held to precede any evaluation of whether there is sufficient economic justification for building the road. Naturally, the proof on this point cannot be conclusive given that we only have evidence available from Inquiry proceedings, not internal detail from the ERCU offices. We do, however, feel that the Inquiry evidence is strong enough to support the contention. The evidence is now presented in a stage-by-stage description and analysis of the model.

2.3 Stage 1: Government Policy Interpretation

John Newey, Q.C. outlined in his opening statement (2) as leading counsel to the ERCU, those elements of Government policy which the ERCU had drawn upon when deciding to put the M16 (A10-A12) into their programme of roads to be built. These can be broken down into three categories:

(a) The "historical" statements concerning the need for an orbital for London. These dated back to 1904 and included, most importantly, Abercrombie's Greater London Plan, which called for concentric ring roads to be built around London over a period of 50 years.

(b) Current Government policy concerning the motorway network and its component parts. For this he had to rely upon what many people, critics and supporters of the motorway programme alike, regarded as an outdated Transport White Paper (3) and Peter Walker's 1971 House of Commons Statement (4).

(c) Local Government Plans and Policies:

- the County Development Plans for Middlesex, Hertfordshire and Essex have shown provision for an outer orbital (D ring) ever since they were drawn up.
- the Greater London Development Plan Inquiry Committee recommended that Ringway 3 should be constructed. This still finds support although plans for the other two rings they recommended have been abandoned.

2.4 Stage 2: Routing

2.4.1 The prime concerns of any RCU, or other promoting authority when routing a road are the engineering constraints and "obligatory guidance" laid down in "The Layout of Roads in Rural Areas" (5). However, between any two points there will be a number of routes for which it would be possible to engineer routes and more than one which will meet the obligations laid down. It is not the purpose of this section to describe these parameters; the aim is to see which factors other than engineering considerations contributed to the final selection of the ERCU route.

2.4.2 In simple terms, the best route as regards traffic flow (and often cost) will be the straightest possible. Our attentions are therefore directed at discovering why the road deviated from the most direct routing. In particular, it is important to record whether agriculture played any part in this decision to deviate. Newey again, in his opening statement, (2), confirmed the existence of important routing constraints, by isolating those factors of primary importance in the ERCU selection of a route. The largest single constraint was Epping Forest:

"A route through where the Forest is at its widest and most wooded would best maintain the general line of the London Orbital and would be the most satisfactory from the traffic and civil engineering points of view.....Such a route would, however, be very damaging environmentally. The route selected was therefore one further north skirting the main part of the Forest and all its wooded area, but passing through land which is within the jurisdiction of the conservators of the Forest, who are the Corporation of London....at four places....." (p.13)

2.4.3. It is interesting to quote at some length Newey's next section which is entitled "Other Constraints":

"Apart from Epping Forest other constraints include houses and factories, farms and field boundaries. The Department has done its best, but it has not been possible to avoid them all....."

"Some inter ference with industrial and farming units must occur. One particular industrial unit which causes concern because of the high cost which may be involved is a scrap-yard.....which lies just to the east of the London-Cambridge railway line on the east side of Bullsmoor....

"The Department has sought the advice of Messrs. Husband & Co. who act as engineering consultants in respect of many scrap-yards, and it may be that a small southern movement of the line of the motorway will help considerably, but such a movement may afect laboratories owned by a subsidiary of British Oxygen Company Ltd., and also land owned by the Lee Valley National Park.....The Department would welcome confidential discussions with the owners concerned." (p14)

This quotation does not do an injustice to the balance of Newey's argument. The scrap-yard was accorded two full paragraphs whilst "Industrial and farming units" warranted only a nine-word sentence. The weighing of priority is unmistakeable.

2.4.4 It is possible from the evidence given at the Inquiry to ascertain the most important, non-engineering constraints used by the ERCU. These were, from west to east along the route:

1. The junction with A10 was fixed by the previous section of M16 (A110-A10).
2. A route had been preserved since the drawing up of the original County Development Plan through the Bullsmoor Estate.
3. The scrap-yard, mentioned above.
4. A Ministry of Defence "Explosives Research and Development Establishment" (ERDE) south of Waltham Abbey.
5. Epping Forest.
6. Estern end fixed by junctinn with M16 (A12-A13) section.

It would, of course, be an oversimplification to assert that these were

the only factors taken into consideration by ERCU when routing the road. Nevertheless, these were undoubtedly the most important and their combination with the engineering constraints in operation and the design standards serve to explain virtually the location of the whole route under consideration.

2.4.5 This view is supported by Mr. Hollis, one of the ERCU team at the Public Inquiry who spoke to a conference run by the Institute of Highway Engineers on the routing of M16 (A10-A11) some eight months before the Inquiry opened. (6)

> "In the case of Epping Forest, conditioned only by the siting of the junctions with the A11 and M11, any one of a number of feasible routes might have been chosen. However, the unique character of the Forest as a national asset has been recognised and a decision taken to affect it as little as possible." (p.11)

And:

> ".....the fact that a more direct route through the forest has not been chosen means that in both capital investment and annual travelling costs compensation is being paid. To avoid the Forest entirely would not only greatly increase both these elements of cost, but would also provide a route that would be less effective in reducing congestion on the existing roads, and hence the overall environmental benefit achieved would be less." (p13)

2.4.6 These conclusions indicate strongly that agriculture played no part of importance in the routing decision. Such an assertion is supported by both the make-up of the ERCU "team" at the Inquiry, and their behaviour. For most of the time at the Inquiry there were at least ten ERCU "employees" dealing with objections. This team included, admittedly, leading counsel, his junior and the Treasury Solicitor's representative as well as two purely administrative secretaries/assistants. All the rest of the "team" were either permanent ERCU staff or consultants employed especially to deal with certain aspects of this road. Mr. Lawrence the chief ERCU witness dealt with the aid of his assistants, with the objections raised over engineering and planning matters. Three major consultants were used: Mr. Newlands dealt with traffic modelling, Mr. Colwill, from TRRL, handled matters to do with pollution and Mr. Patterson was called in as a landscape architect. The most important aspect of this line-up from our point of view is the complete lack of any agricultural expert witness. It is quite understandable that there should be a traffic witness employed, but to call in both pollution and landscape witnesses whilst omitting agricultural expertise demonstrates that

agriculture is given lower priority than the other two issues.

2.4.7 Mr. Lawrence on Day 5 of the Inquiry, whilst answering questions of elucidation from Mr. Hamer (National Motorways Action Committee) asserted that the ERCU had taken account of the extent of land-take (note: not specifically agricultural land-take) and had tried to minimise it. Additionally, they had consulted the MAFF as they "always do" and "borne the needs of agriculture in mind in our route location". There was however, no further elucidation upon the detail of how this was done; throughout the whole of his explanatory opening proof (1), Mr. Lawrence only once, briefly, mentioned agriculture at all. To compound the vagueness of this evidence, Mr. Lawrence at a later stage in the proceedings confessed to not knowing which of Grade 3 or Grade 5 land, as classified by the MAFF, was of higher quality, (7).

2.4.8 Finally, the point remains to be made that there is a positive side to the discrimination against agriculture outlined above. For it must be recognised that the decision to route M16 around Epping Forest has the effect of pushing the motorway onto more agricultural land than would be the case if the route ran directly through the Forest. Amenity value was being traded off directly with agriculture; unfortunately the trade off was never made explicit by the ERCU and, given the apparent lack of knowledge about the probable agricultural impact of the route, it was probably never made consciously at all. The trade off that was most likely to have been considered by the ERCU was that between the wrath of the amenity societies if the Forest had been split in two, and the agricultural community, if the Forest were avoided despite the increased agricultural land take. And undoubtedly, the assessment of this trade-off was the correct one, as will be proven when we examine the strength of the agricultural cases. That there was still a furore about "despoliation" of the Forest despite the ERCU route was due to a disagreement over what constituted the Forest and what function it served; the ERCU chose the correct side to back in order to reduce objection, but did not go far enough to appease them. Indeed, whilst still wishing to build the road they could not have gone far enough to appease those who wanted to "save" the Forest.

2.5 Stage 3: Justification and Evaluation

2.5.1 The content of most objections to this scheme concerned not the precise routing details, but whether or not the road was actually needed at all: in order to counter this challenge to their scheme the ERCU, over the period of the Inquiry, produced a number of functions which the M16 was supposed to fulfil. Foremost amongst these were:

1. To be part of the solution to London's traffic congestion
2. To be part of the National motorway network
3. To provide a transport link to Maplin Airport
4. To provide a route to the ports
5. To act as a distributor for the Channel Tunnel
6. To be part of a national lorry route network
7. To assist the economic development of the South-East
8. To provide environmental benefits by relieving towns and villages of traffic
9. To increase access to recreational areas, especially the Essex and Kent coast areas.

2.5.2 Objectors might well be forgiven for thinking that the justification for building the road would be advanced in these terms. For example, it might have been expected that an economic appraisal would be given to demonstrate what an effective Lorry Route this road would make, or again, how the Balance of Payments would beimproved by the advent of a new link to the ports. For, had not the Secretary of State decreed (4) that there would be an economic appraisal of the links in the national motorway network proposed? It will, however, come as no surprise to those who have studied Chapter 4 that this was not the way in which ERCU went about their task.

2.5.3 Our argument that route selection preceded justification is based on two pieces of evidence:

(a) Mr. Newlands, the traffic witness employed by the ERCU, was only briefed a short while before the Inquiry began. At that time the route location must have been virtually finalised.

(b) The nature of the justification carried out was such that an exact route had to be tested.

2.5.4 Chapter 4 shows that the Government demands an economic appraisal of all road links be carried out. It is, however, up to the promoting authority, working within the directives of the DoE, to use whichever appraisal technique seems most appropriate. In this case the ERCU did not use CoBA; this is not surprising for this method of appraisal is not supposed to be suited for application to the much larger schemes. However, the ERCU did not use any form of economic appraisal at all. Instead, a complete traffic modelling exercise was undertaken. The model used by Mr. Newlands (8) gave out results which indicated that from west to east, the number of vehicles for a 16 hour average August day in 1993 on the various sections of the M16 (A10-A12) would be 81,000, 91,000, 100,000, 111,000, 90,000 and 120,000 (9). (All these figures are well above the usually accepted levels of traffic for a dual-3-lane motorway (10).) Traffic was assigned to the M16 on the basis, purely, that use of the motorway would save time on the journey under consideration. In order to calculate aggregate journey times Mr. Newlands had to know the exact length of the proposed route; so that to complete his work he had to wait until the exact route had been selected. In order to communicate what order of magnitude the time savings would be Mr. Newlands prepared a special paper (11) on the relative journey times from Wrotham to Birmingham with and without use of M16 in 1993. Using the M16 the fastest possible journey would be 182 minutes, not using the M16, the fastest possible time would be 192 minutes. It is the aggregation of journeys with such time savings that causes Newlands to predict such a large traffic flow upon the M16.

2.5.5 It is important to understand not the technicalities of the traffic modelling exercise, but its nature: for although the technique is purported to be more sensitive when measuring traffic flows than CoBA, it does not even attempt the crude economic analysis which is to be found within the CoBA package. Thus there was no attempt to translate traffic flows into aggregated cost savings, there was no Net Present Value calculation carried out and so, finally, there was no attempt to compare NPV with capital costs or calculate economic rates of return. It should, incidentally, be recalled at this stage that CoBA makes allowance for increased "running costs" of vehicles to be balanced against the time savings.

The traffic modelling process employed by Newlands took no account of the possibility that time savings might well be coupled with a longer journey covered at a higher average speed thus incurring extra costs.

2.5.6 Despite the criticism levelled at CoBA in the previous chapter it does seem to have certain advantages over "traffic modelling". By going a stage further than traffic analysis into, albeit crude, economic analysis it does enable all parties concerned to estimate the size of costs and benefits under consideratinn. This is especially useful if environmental benefits are going to be assessed in the sort of framework set out in CoBA Advice Note No. 15 (12). It is also of importance to recall that one of the prime reasons CoBA was brought in to supercede H1/71 (13) was that it was thought a discounting appraisal technique would be of far greater value than an economic rate of return calculation which focuses on just one year at some period during the life of the project under inspection. Traffic modelling such as that carried out by Newlands over a 15 year design period focuses attention on just one year and is therefore a set-back from the CoBA technique.

2.5.7 It is interesting to note the Inspector's comments on economic appraisal. On Day 4 (14) of the Inquiry he is on record as saying that he found CoBA appraisals "of very limited value" and especially so where there is no clear cut alternative with which to make comparisons. He added, however, that he felt it "surprising" that no evidence of cost comparisons had been presented. At this stage of the Inquiry the only cost figures that had been given had come from Mr. Lawrence (1) and were very simply the capital costings (Table 5.1) of the ERCU route.

Table 5.1: Estimate of Cost of ERCU Proposed Route

Roads	£ 19,672,000
Structures	£ 19,693,000
Land	£ 3,760,000
Total	£ 43,125,000

2.5.8 A final important point needs to be made about the ERCU approach to justification; although their case rested very heavily on the forecasted traffic levels there was another "weapon" they were able to bring to bear. The point was made by Newey (2) early on and repeated by Lawrence and Newlands throughout the proceedings that if the A10-A12 section was not to be built the orbital would then contain a gap, and what came to be called a "wet-end situation" would arise. This would be because the Secretary of State had already decided that the sections of M16 either side of the A10-A12 section should be built. The logic of this argument is irrefutable: if it is Government policy to build a motorway network which includes a London outer orbital then it is ludicrous to omit one link. Traffic that had diverted onto the M16 would have to fight its way across a 15-mile stretch of London in order to regain the next section of the orbital. This, however, is also the logical inconsistency in the DoE approach: if the Secretary of State decrees individual road links should be economically justifiable, then roads which obviously form a homogenous entity such as an orbital should not be split up for such investigation. The M40/M42 Public Inquiry set an important precedent by hearing evidence pertinent to the "heed" for the motorway. Before this only objections to the route chosen would be heard. At inquiries since then objectors have quite rightly considered themselves at liberty to question the "need" for the road under discussion. The Outer Orbital (M16/M25) has been divided up into over a dozen discreet sections for Inquiry. (The final number is not settled.) If the objectors challenge the need for any one section successfully, and convince, ultimately, the SoS, the orbital will take on, to say the least, a somewhat peculiar appearance. (Burroughs work on the Central Electricity Generating Board's administrative arrangements for the "supergrid" public inquiries (24) indicates (pp232-3) that this tactic of dividing up large scale projects is not unique to the London Outer Orbital.)

2.6 Stage 4: Design and Amelioration

2.6.1 If agriculture was given low priority during the routing stage of the planning of M16 it might well be asked were any provisions made at the design stage which would serve to some extent to ameliorate the agricultural impact of the motorway? The ERCU most certainly recognised that the route proposed would have

detrimental effects upon certain aspects of the environment through which it passed. In order to reduce such disbenefits a number of proposals were proferred (1).

(a) Where the route followed a preserved line through the Bullsmoor Housing Estate, because of the proximity of houses and a school it was proposed to put the road in "cut and cover" tunnel. The tunnel which would stretch for a distance of 585 metres would be covered in soil and planted in some manner. (6)

(b) A second tunnel of 200 metres was to be provided where M16 crossed the A11 at Bell Common in order to maintain the continuity of the Forest. The motorway had, of course been designed to cut the Forest at this, its thin est, point.

(c) It was proposed that culverts and a bridge would be provided to ensure that the Epping Forest deer would have access between both the open land surrounding the Forest and the Forest itself.

(d) Accoustic fences and earth bunds were to be provided wherever it was considered that the noise environment would warrant it. This usually meant where the noise level was predicted to rise above the compensatable level of 68dB(A). (Land Compensation Act, 1973) in 1993.

(e) Tree planting was proposed to enhance the visual aspect of the motorway from the surrounding areas.

2.6.2. Again, our analysis of the agricultural input to the decision-making may be briefly stated: there was none. The most obvious indication that agricultural amelioration was being attempted would be some description of the arrangements that had been made to cope with farm severance i.e. the splitting up of farm holdings into 2 or more parts by the road, with parts being on opposite sides of the road from the farm buildings. But despite the ERCU's apparent willingness to provide deer with such access there was no mention of how any of the farms might cope with their severance problems. Neither were any other aspects of farm difficulties discussed.

2.6.3 It is interesting to pause for a moment to examine the DoE approach to environmental appraisal: individual decisions when analysed can be most revealing about the processes involved. For example the preferred route cut Epping Forest at Bell Common: in order to preserve the continuity of the Forest at this point the ERCU had proposed that the motorway be put in cut and cover tunnel for a distance of 200 metres. This would have cost £ 1,374,000 more than if the road had been left in cut and the cover had not been provided. The ERCU were then implicitly putting a value of over £ 1 1/3 million on the preservation of the continuity. The City of London proposed that, in order to preserve the Forest even better, the Bell Common tunnel should be extended from 200 to 450 metres. This, however, it was estimated would cost £ 2,493,000 more than the ERCU solution and £ 3,867,000 more than the "open-cut" solution. There is no logical reason or economic rationale dictating that the "continuity of Epping Forest" should be valued at £ 1⅓m, £ 2½m or £ 3¾m. The choice was made by ERCU on the basis of a value judgement which was never explained and probably never could be. There was, however, great tenacity on the part of Mr. Larence when it came to protecting the value judgement. Roy Gregory (16) described this approach some years before the Inspector took his seat for the M16 Inquiry:

> ".....in an argument we all claim that what suits us best is also right in terms of more disinterested and high-minded standards. Not only do we claim it, usually we believe it. Their objectives and interests being what they are, it is hardly surprising that developers adopt a scale of values rather different from that of other sections of the community intensely preoccupied with the problems of preserving amenity. If the difference in cost to the developer between sites A and B is £x, it is not long before he honestly and genuinely comes to believe that the loss of amenity entailed in choosing A is really not worth £x, the additional expense that would be incurred in avoiding it by going to B instead." (p.15)

2.6.4 Evidence was also presented at the Inquiry which would suggest that, as with the routing stage of development, during the amelioration exercise agriculture was implicitly traded off against amenity on the basis that agricultural land was "worth less" than amenity land. A good example of this can be found by examining the fate of certain playing fields at Waltham Abbey. The proposed route would require some 16 acres of these playing fields. Because of the existence of the orbital road on the County Development Plan

there was no obligation upon the ERCU to replace the land. Nevertheless, it was suggested that nearly 7 acres of land owned by the local authority, but currently being farmed could be used in part replacement for the lost playing fields.

2.7 Any summary of the role of agriculture plays in the "4-stage model" of ERCU decision-making need only be brief. At none of the stages does agriculture play any significant part whatsoever. It might have been thought that agricultural considerations had a special part to play at stages 2 and 4, but even here that was not the case. If anything agriculture was discriminated against almost unknowingly by the ERCU; for whilst they were attempting to placate the apparently unplacatable amenity societies by shifting the route and endeavouring to supply replacement recreational ground, more agricultural land was being lost than need have been the case. Such a result could be acceptable even to the agricultural community had the trade-off been done explicitly on a well-fefined and well-explained basis. Unfortunately, the ERCU seemed not to have realised what they were doing.

3. THE INQUIRY DEBATE

3.1 The main implication that can be drawn from the previous sections of this chapter is that the agricultural input to the planning of M16 (A10-A12) by ERCU was minimal. This being the case if agriculture is to have any effect on final route selection and design of this section of motorway the Inspector will have to be presented with sufficiently strong agricultural cases to make him recommend certain alterations on agricultural grounds. This section then is focussed upon exploring the type of agricultural case that was presented and the ERCU response to it. Before beginning such analysis it will be of use to make three preliminary remarks:

(a) Far more time out of the 89 days that the Inquiry sat was spent discussing the need for the road than was spent discussing routing possibilities. This was due to the weight of evidence on "need" presented by the two principal objectors, "The Alliance Against M16" and the "National Motorways Action Committee/Friends of the Earth."

(b) Far more attention was focussed upon the A10-M11 section of the route, than on the section further east. Again, this is due, in part, to the "Alliance" which felt unable to stretch its resources past the M11 junction. As the bulk of affected farmland lay in this eastern section there was a built-in imbalance working against the agricultural interest.

(c) It would not be an overstatement to conclude that the battle over the "need" to build M16 (A10-A12) was fought primarily on the grounds that the ERCU had laid out - those of traffic requirements and transport policy. The aims of the two main objecting groups were, however, different: the Alliance's contention was that the construction of <u>any</u> road near Epping Forest would destroy its present function. NAMAC were out to make more general points about the defects in both transport policy and the traffic forecasting techniques employed by the ERCU and, by implication, all other RCU's and traffic consultants. It is this advantage that the promoting authority has of being able to chose the grounds over which the "battle" will be fought which is perhaps one of the most interesting aspects of the Inquiry procedure. Mrs. Woods, leader of the Alliance, and most of her fellow members, had no wish to learn about the technicalities of traffic forecasting. But still they had to: presenting a case based upon the impact the proposed route would have on the Forest alone would have undoubtedly met with much sympathy from the ERCU and Inspector alike; but, the sympathy would have stemmed from the fact that the ERCU would feel perfectly secure that the central pillar of their case was not being challenged.

3.2 Agriculture was mentioned by both major objecting groups, it was, however, afforded lowly status. The complete NAMAC/FoE agricultural evidence reads:

> "The section of the M16 which is the subject of this Inquiry covers approximately 230 Ha or 568 acres. Over a third of this total is accounted for by junctions alone. Theydon Interchange, the junction between the proposed M16 and the M11 covers 45 Ha or 111 acres.

> "A conventional estimate is that it requires one acre of such land to provide the total food requirements of one person. Thus Theydon Interchange would mean losing the capacity to feed 111 people. Apart from motorway junctions which consume such large amounts of land, motorways also divide farms and market gardens and leave patches of open land which are uneconomical for agriculture of any sort."

The Alliance agricultural evidence was a little more substantial. Mrs. Woods in her evidence devoted only a short paragraph to the "Use of land":

> "At present we produce approximately 50% of our food....As a result (of the 1972 UN Population Limitation Conference) all countries pledged themselves to aim for self-sufficiency in food. Land taken for development is so often good or at least medium agricultural land, roads - including this one - certainly come into this category." (18)

But, as well as this general summing up, the Alliance also used a local farmer as an agricultural expert witness: the bulk of this was devoted to outlining current agricultural policy and indicating that the Government considers that a continuing expansion of food production in Britain would be in the national interest. Mr. Padfield, the Alliance's witness, devoted only a small section of his proof to an examination of how individual farms would be affected by the proposed route. Acreage losses were given for seven affected units alongside the present farm sizes. Additionally, "as an indication of the loss of agricultural production", for three farms an estimate of net output loss was made:

Farm	Net Annual Loss (£)
Great Gregories Farm	982
Gardners Farm	1,521
Coopersale Hall	3,253

It was asserted that the yield from these three were "not less than the National or Essex yield per acre and in the majority of cases they are significantly higher". Notwithstanding the difficulties the Alliance had in keeping their agricultural members loyal, the opinion is ventured that Mr. Padfield having once taken the step from a descriptive to an analytical proof of evidence should have gone much further with his analytics. As it was the information given was too limited either to cause the ERCU any trouble or to prompt the Inspector to take much notice.

3.3 It must be added also, that the biggest defect in the Alliance case concerned agriculture. The only place that the Alliance thought it politic to suggest a shift in horizontal alignment should M16 be built was at the western end of the route south of Waltham Abbey in order to avoid a new housing estate. This route necessitated crossing the farm owned by Messrs. Davis, who counter-objected. In cross-examination it became patently obvious that no work at all had been done by the Alliance's witness (Dr. John Manning)on this.(19) In fact Dr. Manning and the Alliance were made to look rather foolish and no better than the usual "keep it off my doorstep" amenity societies. Undoubtedly the trade-off between the estate residents and the farmland had been made implicitly by the Alliance, but sufficient evidence had not been gathered by them to be able to present a logical, overt case on the matter.

3.4 The Individual Agricultural Cases of Objection

3.4.1 The messages that emerge from this section are unmistakeable: the individual farmers were disinterested in representing themselves at the Inquiry (only 5 from a possible 15 appeared); those who did present evidence in objection were characterised by an inability to focus upon those most central to their needs. Additionally little help was available from the NFU.

3.4.2 Philip Shaw, Essex County Secretary for the NFU outlined the problems the farming community faced when confronted by a large motorway development, in a meeting prior to the opening of the Inquiry. He made the point, that has subsequently been reiterated to us at frequent intervals, that the NFU cannot, as a representative body usually become involved in decisions concerned with routing of roads. To do so would mean that the NFU representative involved would be seen to be favouring one group of farmers to the detriment of others. (This is not always the case as our analysis of the A12 Chelmsford By-Pass Inquiry will show, but it is the rule rather than the exception). Thus Shaw, who must be categorised as one of the most informed NFU officials upon highway development, had to stay out of the Epping discussions.

3.4.3 Shaw also predicted that there was likely to be only minimal representation from affected farmers. The reasons he gave for this were:

(a) Many farmers were hostile to the policy of the Alliance Against M16, which was directed at stopping the motorway entirely. The farming community tends towards supporting a motorway network and felt that there was a need for some form of orbital route. Thus, in order to minimise the effect of the M16 when built they wanted it routed through Epping Forest, which the Alliance were endeavouring to protect.

(b) As was stated above the Alliance was not interested in spreading its influence farther east than M11.

(c) Farmers in close proximity to London become rather fatalistic about development proposals, of any kind.

3.4.4 Philip Lowe has recently argued (20), in most persuasive fashion, that:

> "....the evident effectiveness of many amenity societies may preclude other environmental groups with different social compositions from influencing official planning policies.... political organisation will magnify the difference and inequalities of the social structure and the activities of local environmental pressure groups will tend to accentuate existing disparities between the favoured environments of the powerful and wealthy and the degraded environments of the deprived." (p35)

It would be an exaggeration, perhaps, to put the Essex, green-belt farmers into the "deprived" category, but the point can well be made that the impotent position of the NFU organisation left the individual farmers open to the dictates of the larger amenity groups which presented objections, most notably the Alliance. This was seen in both the extent and type of objections offered. (Again a contrasting conclusion will be possible about the Chelmsford By-Pass proceedings.)

3.4.5 Table 5.2 is designed to demonstrate the extent and type of cases presented by the farmers (or landlords) themselves. The manner of tabulation obviously has defects, foremost amongst which is the lack of any weighting or ranking device which would serve to separate the important aspects of each case from the supporting evidence. However a number of important findings do emerge. Primarily, it has to be recognised that only 5 farmers from about 15 affected by the route felt motivated enough to present a case in objection to the ERCU route. Three others presented cases in opposition to alternate routes: Mr. Davies has already been mentioned in

Table 5.2: A Typology of Cases Presented by Farmers at M16 Inquiry

FARMER	GROUNDS OF OBJECTION										
	Objection to ERCU Proposed Route								Counter Objection To Alternative Routes		
	NON-AGRICULTURAL			AGRICULTURAL							
	M16 not needed (1)	Amenity Violation (2)	Landscaping necessary (3)	Effect on "National Farm" (4)	Disruption to farm system Descriptive (5)	Disruption to farm system Analytical (6)	Severance/ access problems (7)	Specific design feature harmful (8)	Agricultural Descriptive (9)	Agricultural Analytical (10)	Non agricultural (11)
Fowler	X	X		X	X		X	X			
Watt					X		X	X			
McTurk											X
Collins		X	X	X	X		X	X			
Church Commissioners									X		X
Copthall Estate	X	X			X						
Davis									X		
Padfield							X				
TOTAL	2	3	1	2	4	0	4	3	2	0	2

connection with the Alliance alternative; the Church Commissioners objected to a minor route shift in the eastern section of the route and Mr. McTurk objected to Mr. Watt's proposal for a side-road alteration. We will deal primarily here with the cases in objection to the ERCU proposal.

The first point to make is that a good agricultural case should focus upon only those issues of relevance to the continued good husbandry of the farm involved. The individual farmer must not get involved with issues that are either non-agricultural or relate to Government policy. In the first of these areas he has no competence, in the second the RCU has no brief. Thus columns (1) - (4) in Table 5.2 describe issues with which the farmer (or the agent, who often presents the case) must not become embroiled. However, at M16 such issues according to the tabulation were as almost important numerically as those issues in columns (5) - (8) which should have been uppermost in any presentation. And, even more importantly, examination of the proofs of evidence leaves no doubt that the weight accorded these "traffic, amenity and natural resource" issues was as heavy, if not heavier, than the real agricultural considerations. In addition, perhaps the most telling single measurement of the content of the agricultural cases is the zero in column (6)(and similarly in column (10)). It was felt important to make this distinction between "descriptive" and "analytical" because the Inquiry procedures find it most easy to take on board the latter, whereas the farmers all tended towards the former.

3.4.6 Mr. Collins was undoubtedly the farmer who stood to lose most from the construction of the ERCU route: the M16 would intersect with the M11, already under construction, upon his land. The complications of the motorway junction would mean great land-take and a very high degree of severance. Mr. Collin's proof (21) covered four foolscap sides of paper and ran for 20 paragraphs. Of these only 2 paragraphs were allotted to a description of how the farm system would be affected; it is worth quoting these in full in order to demonstrate the inadequacies of a "descriptive" case:

"9. The main enterprise consists of two herds of dairy cows, one on each farm, totalling 300 in-milk cows, and 225 followers being reared as replacements. The national average for England and Wales is 36 cows per herd and the average yield is some 200 gallons per cow per year lower than ours. All the land is sown to grass, mainly for summer grazing, the surplus being cut for silage or hay for winter feeding. In addition 250 beef cattle are produced annually and there is a breeding herd of 600 sows and gilts producing 10 to 12 thousand pigs per year.

10. Thus, it is obvious that a very considerable capital investment is involved, the major proportion being in the dairy enterprises, which will become severely unbalanced if the M16 is built as proposed."

The presentation of such a case has two very important implications:

(a) there is little basis of evidence for either the ERCU or Inspector to make decisions about the amelioration of the effect of the road upon the farm by incorporating certain design features such as special agricultural accesses.

(b) Once the traffic benefits of the scheme have been counted and the route chosen the public inquiry becomes an arena where "environmental" benefits and disbenefits are weighed against each other in debate. The Inspector will then report the facts of the debate and his opinion of the relative merits of the arguments forwarded to the Secretary of State. Therefore by presenting an inadequate case the farmer, as well as doing himself a disservice, is also depriving the Secretary of State of information without which he cannot make informed judgements about the trade-offs involved in route selection.

Naturally, much will be said in subsequent chapters which will expand upon what we think is the best approach to the presentation of an "analytical" assessment of the impact of motorways upon agriculture. However, as an introduction to that it may be recorded here that such an assessment must include some form of economic appraisal of the effect of the loss of part of the farm. Much thought ought (!) to have gone into the planning of a particular farm system, in order that the "best" system can be arrived at. The information gathered at that stage can be employed to give an impact assessment. The "descriptive" approach of simply explaining the farm system and asserting that it will be severely harmed is of little use to any of the parties involved.

3.4.7 Perhaps the best agricultural proof presented came from Mr. Watt and his agent. (22) It is worth describing this in a little detail in order that the implications of approach may be fully understood.

Not unexpectedly Watt's general case was weak:

> "Mr. Watt objects to the proposed motorway on the ground that it will cause severe severance of the farm coupled with the loss of a considerable area of good agricultural land."

However the rest of the proof was much improved by the focussing of attention upon one specific issue:

> "....main objection is to the proposed Weald Road extension to the Chequers Road which will cause the loss of further land and isolate an area of approximately 14 acres together with the farm buildings at Wrights Bridge between the motorway and the Weald Road extension."
>
> "The proposed Weald Road extension is considered by Mr. Watt to be totally unnecessary as with some improvement to the existing Coxtie Green Road.....the cost of constructing this road and the loss of good agricultural land could be avoided."
>
> "The extra distance for traffic would be approximately of one mile."

As well as asking for the Coxtie Road side road route to be considered instead of the Weald Road extension Watt also asked for two other points to be taken into account.

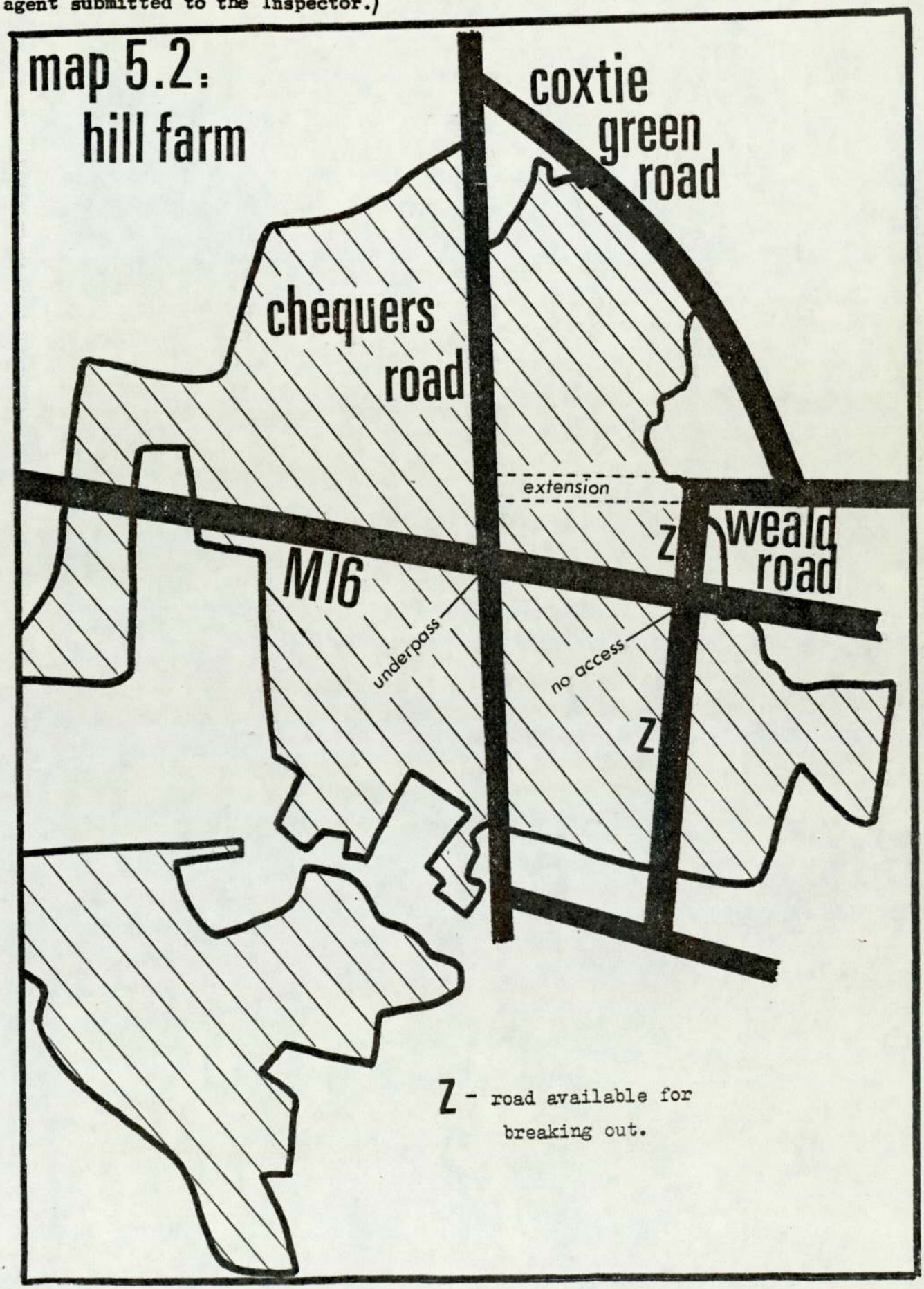
1. The breaking out and return to agriculture of the redundant section of Weald Road.
2. The widening of the bridge span at Chequers Road to enable it to incorporate an agricultural underpass.

Mr. McTurk (a farmer) objected (23) to the use of Coxtie Road not on agricultural grounds but on the grounds that the cost of improvements necessary before Coxtie Road could take the expected traffic flows plus the extra travel costs of the diversion made it uneconomic not to build the Weald Road extension.

The ERCU agreed with McTurk "on the grounds of both traffic flow and safety", (47) that the Weald Road extension should remain. They also felt it would be uneconomic to implement Watt's other proposals:

> "Enlargement of the subway to enable cattle to pass through would cost an additional £44,000. Such work could be carried out as accommodation works by agreement with the District Valuer, but on present information the expenditure of such a sum for this work would appear difficult to justify."

(Map 5.2 (below) is a diagrammatic representation of the plan Mr. Watt's agent submitted to the Inspector.)



And

> ".... only approximately 100 metres on the north side of the motorway could be broken out. This would cost £ 1670 and would return approximately 0.14 Ha (0.35 acres) to Mr. Watt. However, the total area which would result would be of doubtful use, as it would be of an irregular shape and would have an electricity pylon in the middle.
>
> "To the south of the Motorway, only a very small portion of Mr. Watt's land would remain between the new and existing Wrightsbridge Road. There would seem to be little point in breaking out the old road unless GLC, the owner of the land to the east of the existing Wrightsbridge Road, were to buy the land. Even so the cost of breaking the road out would be £ 2750 for the return of some 0.54 Ha (1.35 acres) of land. This would make the work difficult to justify financially."

The negative reaction of the ERCU is quite economically justifiable: this is, however, not the prime point to emerge from Mr. Watt's case. Most important to record is that the ERCU were forced to respond to the specific issues raised by Watt whereas they were able to ignore the impact on the farm as a whole because this was stated so generally.

3.4.8 This pattern is recognisable throughout the agricultural cases, as Table 5.3 demonstrates. The explanation is very simple: the ERCU are in a position of having to defend their proposal in the eyes of the Inspector. If, therefore, specific challenges or alternatives are forwarded they have, in order to preserve the supremacy of their line, to produce evidence, in rebuttal. It is not, however, necessary to defend against statements of impact which are of little substance. Finally, to complete the links in the chain it should be realised that the Inspector (and so the Secretary of State) only receive information upon those issues which are debated during the Inquiry. Thus they will have, for example, much information upon how a side road will affect Mr. Watt's farm, but none at all upon how M16 will disturb the holding.

Table 5.3: ERCU Responses to Specific Agricultural Points made by Farmers Objecting to the ERCU Route

Farmer	Specific Point Made	Response		
		Positive	Negative	None
Fowler	1. Need for larger access		X	
	2. Need for special drainage work	X		
Watt	1. Side-road alteration		X	
	2. Widen underpass		X	
	3. Breakout disused road		X	
Collins	1. New system of concrete roads to minimise severance		X	
	2. Move M11/M16 interchange away from farmhouse	X		
	3. Regrading of embankments to allow cultivation	X		
Copthall	None			
Padfield	1. Alter access/footpath provisions	X		
	TOTAL	3	6	0

3.5 The M16-M11 Theydon Interchange: decision-making at work.

3.5.1 The M16 (A10-A12 Section) crossed the M11 on the land of Mr. William Collins whose evidence we have already examined (para 3.4.6). The ERCU published route contained a proposal for an elaborate M16/M11 junction, permitting all turning movements except south-to-east and east-to-south. However, well into the second half of the Inquiry the ERCU witnesses stated that as a result of a review of the national

motorway construction programme, construction of the proposed M12 motorway between South Woodford and Brentwood would be deferred and that it would be necessary to incorporate provision for south-to-east and east-to-south movements in the Theydon Interchange, so that an alternative route would be available via M16 and M11 when the A12 was congested. The Department, therefore, prepared new designs for an alternative free-flow (i.e. all turning movements are possible) cyclic design.

3.5.2 Although this new design was put before the Inquiry in March 1975 work had started on it in January, according to a paper presented at a recent highway engineers' conference, by one of the ERCU staff responsible (25). This meant that for three months, whilst the Inquiry was in progress the ERCU were designing a new interchange without informing any of the objectors or the farmer involved! As it finally turned out the new design required far less land (15 acres were saved) and it was possible to move the centre line of the M16 40 metres further away from Mr. Collins' farmhouse and buildings. The strain upon Mr. Collins could undoubtedly have been lifted somewhat over this crucial period if he had known of these plans. Additionally, the "Alliance Against M16" would have been put to far less expense, as a great deal of time was spent by their experts redesigning the original junction proposal with the intention of minimising land-take, intrusiveness and cost.

4. THE INSPECTOR'S REPORT AND THE DECISION

4.1 During the final drafting of this Chapter (October 1977) the Secretaries of State for the Environment and Transport announced their decision to go ahead with this section of the M16. As is the custom, the Inspector's Report (26) was published at the same time as the decision letter: meticulous reporting of all the evidence meant that the Report ran to more than 1000 pages. Had the decision been unexpected or the Inspector's reporting more favourable to agriculture it may have been necessary to recast this Chapter. This, however, was not the case and all that is needed here is to report briefly a number of specific points of interest.

4.2 The Inspector took the view (contrary to the evidence of the Alliance and NAMAC / FoE) that the vehicle ownership forecasts, despite theoretical inadequacies, are likely to continue to provide a valuable indication of the rate of traffic growth, and that, although the

economic climate and the world fuel situation introduce considerable uncertainty, no better predictive tool is available. He accepted that by solely using journey-time the Department may have assigned too much traffic to the scheme, but believed that the error of over-estimation in the Department's traffic predictions is unlikely to be greater than 15%. The Secretaries of State concurred with this decision.

4.3 It was argued at the Inquiry that the Department's proposals were inconsistent with the Green Belt status of most of the area traversed by the proposed route. The Inspector, however, found that green belt policy has from the first recognised the proposal for an orbital road, and concluded that the M16 would not affect the therapeutic value of the Green Belt to Londoners.

4.4 The Inspector was of the opinion that the ERCU had chosen the best point for the M16 (M25) to cross the Forest (at Bell Common), but recommended that the objectors case for a 450 metre tunnel rather than the 200 metre one proposed by the ERCU should be upheld. The Secretaries of State agreed with this recommendation. (Referring back to paragraph 2.6.3 it can be seen that the Inspector and the Secretaries of State placed a value of £ 2,493,000 more than did the ERCU upon the continuity of Epping Forest. What price rational decision-making!)

4.5 Inspector and Secretaries of State alike rejected the Alliance's alternate route. (It is interesting to note that the Inspector reported all the Alliance evidence under the heading of "Alternate Route D2", whereas it will be remembered that the alternative route played very much a secondary role in the Alliance's case which mainly challenged the need for the motorway. The opinion is ventured that this is because the Inquiry framework as at present constituted can find no proper place for such a well-organised challenge of need and so has to deal with the evidence in a more usual manner.)

4.6 The amended design for the M11/M16 (M25) junction put in by the ERCU found favour with both the Inspector and Secretaries of State.

4.7 An Inspector's report takes on a formal shape; after all the evidence has been reported the Inspector records first his "Findings of Fact", then his "Conclusions" and finally his "Recommendations."

The M16 (A10-A12) "Recommendation" was that the scheme as presented should be built with a few minor amendments. It is of interest to us, however, to examine the part played by agriculture in the Inspector's decision-making processes: for this we turn to the "Findings of Fact" and the "Conclusions". The reader should not be surprised given what has gone before when we report that the role of agriculture was minimal. The "Findings of Fact" ran to 58 A4 pages: apart from a few brief mentions in relation to individual farms the complete agricultural content covered only two short paragraphs:

> "From Sewardstone Road (A112) in the west to the Brook Street Roundabout (A12) in the east, amounting to some 85% of the length of the published schemes, the road would pass largely through agricultural land. The classification of most of this land by the Ministry of Agriculture, Fisheries and Food is in Grade III. Although the Department has had some success in locating the road close to farm boundaries, several farm units would suffer serious severance.
>
> One farmer with a large holding, Mr. W.A. Collins, asked that embankments should be graded back and soiled with gradients suitable for mechanical cultivation in order that adjoining land should be kept in agricultural production right up to the motorway fence line. The Department undertook to arrange this."

Of the 28 pages of "Conclusions" agriculture again warranted only two short paragraphs:

> "Objectors claimed that the construction of the published schemes would be contrary to the recently announced policy of the Government to increase the home production of food (Food From Our Own Resources, Cmnd 6020). This is not a matter on which I am competent to comment.
>
> The attention of other farmers should be drawn to the request of Mr. W.A. Collins that embankments should be so graded as to permit cultivation up to the motorway fence line. A short-term agricultural disadvantage during the constructional period would be more than offset in the succeeding years; this is a very sound arrangement provided it does not involve the importation of filling material."

The extent of the agricultural content of these two sections of the Report has to be weighed against the 23 pages devoted to "environmental" considerations. There is no doubt where the balance of interest and influence lies.

5. CONCLUSIONS

5.1 General

(a) There are undoubted dangers in drawing generalised conclusions from individual case studies. However, the Chelmsford By-Pass evidence will be compared and contrasted with that of the M16 in order to lessen the possibility of gross misconception.

(b) The nature of the present administrative system is that any sectoral input such as agricultural evidence can be entered into the decision-making process by either the promoting authority or the affected interest. It is, however, usually necessary for the affected interest to make out a case strong enough to stand rebuttal from the promoting authority. In other words the authority appear at the inquiry with an entrenched viewpoint; it is the objectors responsibility to convince the Inspector (and SoS) that his opinion is correct.

5.2 The ERCU Project Appraisal Model

(a) It is possible to resolve the different aspects of project appraisal as carried out by ERCU into a four stage model:

- interpretation of Government policy
- selection of most appropriate route
- justification of both route and road
- detailed design

(b) Route selection preceded justification because it is necessary to know the exact route in order that the justification technique chosen can be employed.

(c) Justification and evaluation is carried out entirely in terms of traffic benefits.

5.3 The ERCU Project Appraisal and Agriculture

(a) Agriculture does not play a significant role at any stage of project appraisal.

(b) Amenity considerations outweigh agricultural ones even to the extent that agriculture is positively discriminated against in order to preserve amenity. (Amenity considerations themselves are far less important in the overall balance than traffic benefits.)

(c) Even if they desired to have a more comprehensive agricultural input the ERCU had not the expertise to prepare the relevant evidence.

5.4 The Farmers' Evidence

(a) This was lacking in both quantity and quality.

(b) It is possible that the existence of large amenity groups and impotence of the NFU, influenced the decisions of certain farmers over whether to appear personally or not - many who might have been expected to appear, did not.

(c) Individuals cases that were presented focussed upon the wrong issues. Emphasis was given to amenity issues which was not warranged, whilst the agricultural sections of all proofs were descriptive rather than analytical.

(d) The ERCU only felt it necessary to respond only to specific issues that were raised, such as access provision. The lack of hard analytical evidence upon the potential impact of the M16 on the farm system deprived all parties of the chance to make informed trade-offs about all environmental benefits and disbenefits.

5.5 The Decision

(a) Neither the Inspector's Report nor the Secretaries of States' decision was surprising except for minor details. At the end of the Inquiry very few of the objectors really expected to stop the road being built. The 1977 Transport White Paper indicated that the Government's policy was to build the London Orbital - this ended all hope the objectors may have had.

(b) The reporting of the fate of agriculture occupied only a small place in the Inspector's Report: this accurately reflected the role it played at the Inquiry.

Chapter 6.

The Chelmsford By-Pass: a case-study in highway decision-making.

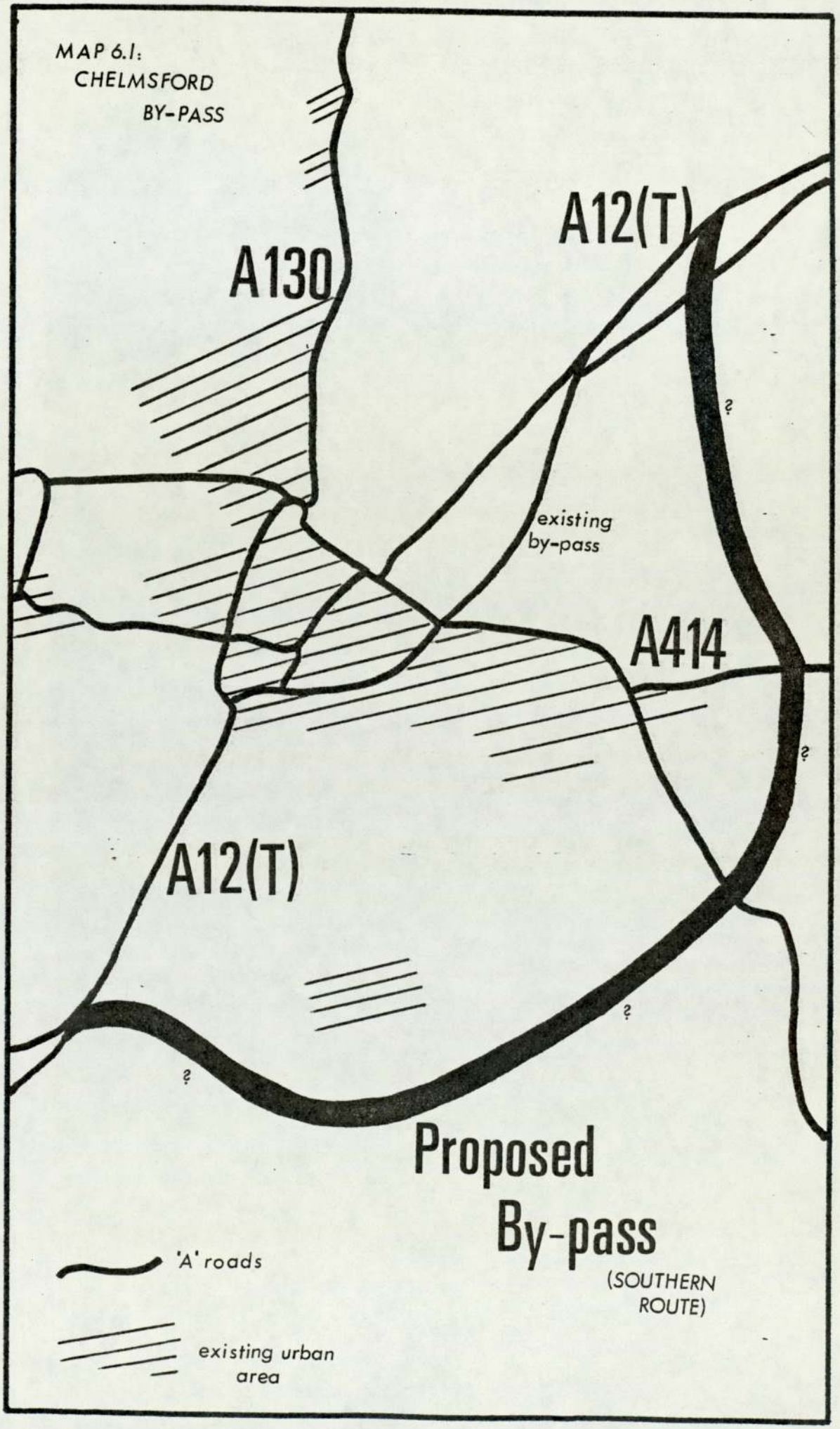
1. INTRODUCTION

1.1 The description of the proceedings of the M16 (A10-A12) Public Inquiry in the previous chapter revealed much about both the workings of the ERCU's project appraisal technique for strategic motorways and the place of agriculture within that technique. It was basically learnt that agriculture was very much a "second class" consideration, being poorly represented by both the promoting authority and the farming community. In order to test these findings it was decided to record in detail the events of another public inquiry. As it turned out, again the choice made was extremely fortunate and a great deal was learnt about the decision making processes involved in highway planning.

1.2 On 22nd April 1975, "Public Local Inquiries" were opened at the Civic Centre, Chelmsford, into the proposed A12 Chelmsford By-Pass. The Inquiry closed 5½ months later but there had only been 27 days when evidence was heard - the rest of the time proceedings were closed because of the Inspector's illness. Map 6.1 shows the route proposed by (once again) the ERCU; it ran through 8.6 miles of the Essex countryside (mostly farmland) to south and east of the city, joining the recently constructed Margaretting and Springfield/ Boreham By-Passes. (Throughout this report it is called the Southern Route). This was the first scheme to be subjected to the process of "Public Participation" at the stage of route selection. This took place in 1973 and gave the public a choice of three routes: one north of the city, one more or less on the line of the existing by-pass close in to the city centre, (the Central Route) and the eventually chosen Southern Route. It is also appropriate to note at this early stage that the Inspector had been in the Ministry of Agriculture from 1945 to 1970 - this was to prove decisive.

1.3 There were a number of reasons for selecting this Inquiry for "in-depth" investigation:

(a) its close proximity to the M16 Inquiry and the M11 fieldwork which occurred simultaneously, enabled the Wolfson Group to function most effectively;


MAP 6.1:
CHELMSFORD
BY-PASS
A130
A12(T)
existing
by-pass
A414
A12(T)
?
?
?
?
Proposed
By-pass
(SOUTHERN
ROUTE)
'A' roads
existing urban
area

(b) contact with both David Hellard and Philip Shaw enabled us to know that, unlike at Epping, the NFU would be presenting a consolidated agricultural case;

(c) the scheme proposed was of a different type to that of the M16. Its smaller scale implied that the Inquiry would be shorter, the data more manageable and, perhaps the issues would be more clear cut;

(d) a chance was presented to examine the CoBA system in operation as it had been used to appraise the economic return of the scheme;

(e) Dr. van Rest was approached by Associated Planning Consultants (APC), who were acting for one of the major objecting groups, with the intention of the Wolfson Group providing agricultural evidence for the overall objection. As it turned out, because the NFU presented a co-ordinating agricultural case, advice from the group was not necessary, but the initial interest sparked by APC served to indicate that this would be a most informative case-study.

1.4 The Secretary of State's decision upon this scheme was announced in July 1976: it concurred with the basic recommendations made in the Inspector's Report (1):

> "I recommend that the Department should take no action on its proposals for a southern route and that it should, instead, re-examine the possibilities of a central route, giving the traffic an economic advantage which it accepts, but causing less environmental damage than the Central Routes that it has hitherto envisaged." (p215 F)

1.5 Our main tasks in this chapter are to examine:

1. the ERCU approach to project appraisal when CoBA analysis is available.
2. the quality of the agricultural input to the process from both the ERCU and the objectors.
3. the way agricultural considerations were treated by the Inspector in his role as a decision-taker.
4. The reasons for the Inspector's negative decision, including the extent to which agriculture played a part.

2. THE ERCU CASE FOR A CHELMSFORD BY-PASS ON THE SOUTHERN ROUTE

2.1

> "The existing A12 through Chelmsford is not suitable for the volume or type of traffic that the route will carry in future and considerable delays already occur at times on this road. There is a need to provide a new route to a standard commensurate with the role of the A12 in the Natinnal Strategic Network." (2) (p2)

On this basis the Chelmsford By-Pass was admitted into the DoE "Trunk Road Preparation Pool" in March 1968, and over 7 years later came to Public Inquiry.

2.2 With the benefit of hindsight we can construct a framework in which it is possible to examine all the component elements of the Inquiry discussion and decision. Despite the fact that Essex C.C. were in favour of the northern route, the ERCU selected the southern route and most of the Inquiry debate was between the merits of that and some central route along the line of the present By-Pass, close to the city. The balance that had to be drawn between these two alternatives was one of economic benefit and environmental disbenefit, and the "net benefits" of the two routes had to be compared in order to select the "best" scheme. In order to carry this out systematically all the elements would have to be analysed thus:

Route	Traffic Benefits (1)	Capital Cost (2)	Damage to Urban Fabric (3)	Agricultural Loss (4)	Aesthetic (5) Disamenity
Central					
South ern					

In this framework the net benefit for each route is represented by $(1) - \left[(2) + (3) + (4) + (5)\right]$. Whether or not the ERCU conceptualised the problem confronting them in this way, these are the factors they would have had to consider either objectively or subjectively, consciously or subconsciously. The analysis in subsequent sections demonstrates that the weighting of important factors was subjective (some might argue subconscious) rather than

objective and that agriculture as with M16, was poorly treated in the initial route selection exercise.

2.3 We have already reviewed (Chapter 4) the theoretical workings of CoBA. The ERCU following the CoBA manual (3) saw fit to apply it to the Chelmsford By-Pass. However, despite the fact that this economic appraisal had been carried out, the ERCU's chief witness (Mr. Ketley, Group Engineer) saw fit to present, in his opening proof, a justification for the by-pass purely in terms of traffic-flows. (Table 6.1)

Table 6.1: Traffic Flows on the Existing A12 and the Proposed Chelmsford By-Pass

(veh/day)

(a) Flows on By-Pass

	1969 *	1994
Margaretting to Galleywood	11,000	24,000
Galleywood to A130	13,000	27,000
A130 to A414	16,000	35,000
A414 to Boreham Interchange	15,000	34,000

* Had By-Pass already been constructed.

(b) Flows on Existing A12

	1975	1994	
		With By-Pass	Without By-Pass
Army and Navy Roundabout to Sandford Road	26,500	10,000	61,000

2.4 Mr. Ketley let these figures speak for themselves, offered no interpretation of them and gave no indication of their economic implications. More important, however, was that although the factors laid out in our assessment of the "balancing exercise" (para 2.2) were mentioned individually, no attempt was made to demonstrate how the "trade-off" had been carried out by the ERCU as it surely must have been to assess the "net benefit" of this route. It was, however, admitted by the ERCU that the construction of the Southern Route could not be carried out without causing both environmental harm and damage to agricultural holdings. The extent, however, of

the agricultural evidence was, as with the M16 proposal, far outweighed by the attention paid to the environmental witnesses: Mr. Leo Kramer, a Landscape Architect employed by the DoE and Prof. Ralph Hopkinson, an independent Environmental Design Consultant. Despite the fact that almost all the proposed route ran through presently operative farm units, no agricultural consultant was employed. During the early part of the Inquiry in consequence and by default, Prof. Hopkinson became responsible for offering agricultural judgements. (It is interesting to note that Hopkinson was engaged only after the initial start-date of the Inquiry and so could have played no part in route selection.)

2.5 Hopkinson went to great length to describe the new "objective Landscape Attractiveness Index" which his consultancy had developed and used to assess the present visual climate along the proposed route and likely change should the proposed by-pass be built. When questioned on agriculture, however, he had no objective tools available; he felt that there were "no guidelines by which the disturbance to agricultural activity could be measured for comparative purposes". He would only go so far as to say that, for the proposed route, the disturbance to agriculture was great. It is at once both strange and understandable that Hopkinson should adopt this viewpoint; strange, because it might be logically expected that if it is possible to draw up an objective index capable of measuring visual attractiveness which, by nature, is judged aesthetically, then it should be possible to construct some form of agricultural impact index simply because agricultural performance is usually measuredin real monetary terms. The omission is, however, understandable simply because Hopkinson was not an agricultural expert and had no experience in the field. Thus it was that very early on in the Inquiry the ERCU put themselves in the untenable position of not being able to challenge, with any claim to expertise, the agricultural evidence presented. Mr. Ketley as leader of the ERCU case, became responsible for replying, but made merely a token gesture. This prompted the Inspector to write (2):

> "Whilst I fully appreciate the difficulties I would make the general point that it is a pity if expert evidence of any kind is not subjected to cross-examination by someone who is at least advised by experts." (p210)

2.6 After the NFU had presented their objection, the ERCU realised the full implication of their lack of agricultural expertise. The response was positive: a consultant was approached with a view to retaining him to rebut agricultural evidence at the Inquiry. The consultant having read the relevant proof gave grounds on which the NFU could be legitimately rebutted but he could not be called to give rebuttal evidence as he had not given evidence in chief. (4) This put the ERCU in an extremely frustrating position: they had expert opinion that the NFU case was overstated, but could not present it because they had no-one in their ranks who would be able to answer questions under cross-examination. Expert opinion has to be seen to be coming from an expert.

2.7 The role that the Ministry of Agriculture played is also important, but in a negative sense. No MAFF representative appeared at the Inquiry, therefore it must be assumed that their contribution had been made before the Inquiry opened, which means during the period of route selection. That the ERCU was so totally lacking in expertise and indeed evidence upon agriculture at the Inquiry is a good indicator of the extent and quality of the MAFF input, or perhaps that MAFF opposed the ERCU route choice, so that the ERCU had no access to expert information.

David Hellard summing up on behalf of the NFU (1), asserted that the sole part played by MAFF had been the preparation of the General Land Use Map and, because of this minimal involvement, the RCU had received no expert agricultural advice on the land quality and farming activities in the area affected by the proposed road. This assertion was not denied.

3. RAPE VERSUS CoBA: THE BALANCE OF ECONOMIC BENEFIT

3.1 The Rural Association for the Preservation of Essex (RAPE) despite its general title, was formed solely in order to object to the proposed Chelmsford By-Pass. APC were retained in the form of Peter May and Leslie Ginsburg as expert witnesses and Mark Sullivan as case co-ordinator. The central focus of the RAPE objection was that the Southern Route was undesirable, both because of the environmental damage it would cause, and because the existing A12 (with modification) could be expected to cope with the likely future traffic levels far more effectively and cheaper. It was in fact

asserted by May that it could be made to cope if the necessary policies of traffic restraint were to be brought into effect in Chelmsford (6). The central route as proposed by ERCU was dismissed by May and Ginsburg (7) as being over-designed and thus causing extensive environmental damage. As regards agriculture, RAPE decided to give their full support to the NFU case and added nothing to it.

3.2 It is interesting to reflect upon the nature of the RAPE case. It rejected both the ERCU's Southern Route and the Central Route presented at the Public Consultation Exercise. The essence of the case was the rejection of the need for a new by-pass, but because, in official terms, an alternative was presented in the form of upgrading the existing A12 the Inquiry debate was not couched in the emotive terms that the M16 was. Thus, unlike the M16 Inquiry that at Chelmsford was not held up repeatedly while basic, fundamental issues of whether the new road was actually needed were discussed.

3.3 The point has been made that the CoBA results were not presented to the Inquiry as part of the ERCU's opening case. Mr. Little who co-ordinated the RAPE case before and during the Inquiry, told the Inspector that he found this omission "remarkable" (1). Despite repeated requests Mr. May, the RAPE traffic witness only received a copy of the CoBA computer print-out on May 7th (1) after the Inquiry had opened. (In a special section in his report, the Inspector was most critical of the ERCU for witholding information from objectors). When, however, the CoBA data had been analysed by May, two very important conclusions emerged. According to ERCU the existing journey from Margaretting to Boreham on the existing A12 takes 12 minutes 11 seconds off-peak, and the same journey by their southern by-pass would take 9 minutes 56 seconds, i.e. a saving of 2¼ minutes. May discovered that this favourable time differential upon which the ERCU case was primarily based was due simply to delays on two junctions on the A12 in the city centre. May argued that if these two junctions were to be improved "any economic justification for the southern by-pass would disappear." (5)

3.4 Secondly, and perhaps even more important, the subjecting of the RAPE alternative route to CoBA analysis demonstrated that it had a much higher economic return than the Southern Route. In his final rebuttal Mr. Ketley (8) was forced to admit this. Table 6.2 is abstracted from his evidence.

Table 6.2: Comparison of Southern By-Pass and RAPE Route

Costs	Southern By-Pass	Rape Route
Land	£ 1.01 million	£ 1.68 million
Roadworks and Earthworks	10.67 "	3.01 "
Structures	3.67 "	3.80 "
Statutory Undertakers Alterations	1.35 "	0.96 "
TOTAL	£16.66 "	£ 9.5 " approx.
Land Take	126 ha (312 acres)	9.15 ha (22.3 acres)
Property demolition (no.)	7	37
Design Standard	70 m.p.h.	70-60-50-40- and under
NPV of benefits obtained	£23 million	£41.8 million
$\frac{NPV}{C}$	2.05	6.5
1st year Economic Rate of Return	16.4	41.0
Construction delays to traffic	Very low	£12.5 million
Construction period	2 years	3 years

The differences between the two schemes is quite remarkable at all levels of analysis. (It would, in the light of such evidence, be easy to conclude that the ERCU had a vested interest in focussing more attention on traffic flows than CoBA).

3.5 Referring back to our balancing framework, which was erected in para 2.2. it can be seen that if the Central Route had greater traffic benefits and lower capital costs then it must have been thought by the ERCU that the balance of non-traffic disbenefit lay with the Southern Route. This, indeed, is what all the ERCU witnesses argued. Let us examine the contention in more detail. From Table 2 it can be seen that the net discounted benefits from the RAPE route amounted to £(41.8 - 9.5) million or £ 32.3 million, whilst the

equivalent figure for the ERCU route was £(23 - 16.6) million, £ 6.4 million. Such figures indicate that for the ERCU to select the Southern Route the non-traffic disbenefits of the Central Route must have been £(32.3 - 6.4), £ 25.9 million larger than for the chosen route. Given that the Southern Route could not be entirely without disbenefit (as indeed Prof. Hopkinson's evidence indicated), the disbenefits of the Central Route must have amounted to at least £ 26 million. The evidence presented by the ERCU at the Inquiry indicates that the problem was never articulated in these terms by the decision-makers. The trade-off must therefore have been made subjectively, in which case it may be wondered whether the ERCU ever realised the value of the disbenefits they were assigning to the central route. Additionally, for our purposes, it should be noted that the trade-off was made without knowing the true agricultural cost of the Southern Route.

3.6 Mr. Ketley (6) felt, however, that an attack on the Southern Route based on CoBA was unjustified. His reasoning was most interesting:

> "The CoBA method of assessment has limitations in its application, and these are set out in the CoBA manual. The results should not be taken as indicative of the actual economic situation, but only used as a general pointer." (p46)
>
> ".....because CoBA does not operate detailed urban speed/flow relationships there is difficulty in evaluation of the benefits of the flow differences in the central area of Chelmsford.... CoBA is thus generally of doubtful validity when used in situations like Chelmsford."
>
> "In the present state of the art it is not possible to overcome these problems. Although no doubt, future research will help to overcome these problems it is not possible for this scheme, and in any case, it is debatable whether such improvements would greatly assist decision-making further." (p13)

(Our background investigation of CoBA in Chapter 4 seemed to imply that those responsible for the programme had a great deal more confidence in its operational capabilities than does Mr. Ketley!) More specifically on the RAPE alternative route, he commented:

> "It can be seen from these results that the A4 (RAPE) route shows an apparently superior economic return than the Southern By-Pass. This has been achieved by an almost total disregard for any reasonable standard of highway engineering design."

"The bulk of Mr. May's evidence on the CoBA aspects seeks to show that only the delays at the Army and Navy Roundabout and Sandford Road are the problem and if these delays were removed there would be no justification for the Southern By-Pass. It should be remembered that although the CoBA programme deals with junction delays and link transits separately for convenience, in practice it is not possible to have junctions without links or links without junctions."

"The basic problem facing this Inquiry is whether these junctions and the links between them can be improved sufficiently, whilst taking due regard to the traffic, environmental and all other factors. In general terms if problems exist at one or two major points in a network, it is not necessarily the right answer to assume that the solution to the problems must be tackled by physical improvements at those points."

3.7 What of the Inspector's opinion on this matter?

"22.45 The facts are summarised in paragraph 20.58 which calls attention to the Department's statements that the losses on accidents and the less good NPV for the Southern Route reflect nothing more than its greater length. If this is so, it casts some doubts in my mind as to the value of the CoBA assessments. I feel I should also call attention to the CoBA exercise in relation to the Stock Interchange. I have found that a full interchange should be retained; but the turning movements are relatively small and the interchange would not, on the face of it, appear to be one of the most important features of the Southern Route. But the CoBA exercise shows a first year ERR for the interchange of as much as 187%. Perhaps even more surprising is the calculation that its omission would reduce the first year ERR on the southern route as a whole from 16.4% to 11.2% which is little more than what I have described as the "pass mark" (11.34). I find this somewhat hard to credit and am left wondering what the effect on the first year ERR for the southern route would have been if I had accepted representations to delete both the B1007 and the A414 interchanges." (1)

3.8 These remarks on CoBA and the rest of the evidence relating to route selection meant that the ERCU emerged from the Chelmsford Inquiry with a much tarnished reputation. It might be speculated that had they been more open initially about the CoBA analysis and the trade-offs implicit in their selection of the Southern Route, then their case would have been viewed with more sympathy by Inspectors and Objectors alike.

4. THE CO-ORDINATED AGRICULTURAL CASE

4.1 The point was made in the previous chapter that the NFU is often placed in an untenable position when it is necessary to oppose new trunk road developments. Unlike the "impartial" Ministry of Agriculture, the Union cannot be seen to be favouring one group of farmers to the detriment of another. Thus, where alternate routes for a proposed new highway both, or all, run through

agricultural land, the NFU cannot, irrespective of the relative merits of the schemes, be seen to be favouring one route as opposed to another. To do so would serve to place both subscriptions and reputation at stake. It has already been noted that the Chelmsford case did not conform to such preconditions: the alternative to the agricultural southern route was the urban central route. Therefore the way was open for the NFU to appear as a body, led by David Hellard and guided behind the scenes by Philip Shaw, to oppose the southern route and consequently shift the emphasis to the central route where no agricultural interest would be harmed. As with the M16 report the primary focus of this chapter is to examine in detail the agricultural evidence presented and the way in which it was treated by both RCU and Inspector alike.

4.2 Hellard led the NFU's case, the main proof of evidence, however, came from P.W. Trumper (7). If the RCU were lacking in expertise Mr. Trumper most certainly was not:

> "My name is Peter William Trumper. I am a Fellow of the Royal Institution of Chartered Surveyors and a Past Chairman of their Agricultural Division. For five years, until it was reorganised in 1973, I was a member of the Agricultural Advisory Council, a small body appointed by the Minister of Agriculture to advise him on a wide range of matters concerning the Agricultural industry. In 1970, the Council produced and published a report entitled "Modern Farming and the Soil", which is acknowledged to be the current authority on this subject. For seven years, until last year, I was Chairman of the Council of the Farm Buildings Centre. Since 1953 I have been a partner in the firm of Clutton's, Chartered Surveyors, of 5, Great College Street, Westminster S.W.1. My firm also has offices in Bath, Wells, Harrogate, Oxford and Canterbury. As senior agricultural partner I am responsible for co-ordinating the management of more than 250,000 acres of land let to tenants: my partners and I are also concerned with advising landowners, tenants and owner-occupiers throughout the British Isles on agricultural matters including farming, forestry, farm buildings, buying and selling and letting land."

4.3 Trumper's evidence will be examined in detail both for its technical content and the way in which it was presented. First, he challenged the MAFF's land classification of the area, which the RCU had employed to indicate that the land of the area was "only" grade 3 or 4. Pointing out the general defects of the system (which we record in Chapter 5), Trumper gave his own classification of the area based on hand auger borings. The summary of findings were:

Grade	Miles
I	2.0
II	1.0
III	5.3
Gravel	0.3
	8.6

Emphasising very strongly the point that land classification gives no indication of land utilisation, Trumper told the Inspector that the impact of the by-pass upon the workings of individual farm units had to be given prime importance in the appraisal exercise. He argued:

> "Management, of course, is a "short term" factor, in that it may vary from generation to generation. But fixed equipment, farm structure and access are things which endure almost as long as by-passes. They are, therefore, things which require serious consideration in any proposal to take land away from agriculture."

4.4 In all 15 units would be affected: Table 6.3, which lists these along with the basic impact of the proposed southern route, is drawn directly from Trumper's proof.

Table 6.3: Farms Affected by Southern Route

Farm	Owner	Farm Size (Acres)	Acres Affected		
			Taken	Severed	Damaged
1. Webbs	S.R. Magness	296	3	41	15
2. Durrants	D. White	60*	7	1	9
3. Whitebridge	A.R. Smith	125	1	1	-
4. Lodge	R.H.Currie & Co.	134*	9	16	14
5. Crondon Hall	F.Wreathall & Sons	360*	20	24	36
6. Wood	C.G.Cottey & Son	160*	13	21	14
7. Parklands	K.E. Howard	380	36	69	15
8. Baddow Park	H. Kilean	35	5	4	5
9. Great Mascalls	R.J. Hodge & Son	800	44	90	28
10. Sandon Hall	J. Barr & Sons	400	16	70	3
11. Sandon Lodge	F.B. Speakman & Son	450*	21	-	34
12. Hammonds	P.F.P.U.T.+ (Tenant: S. Thorogood & Sons)	500*	24	54	27

Table 6.3: (cont.)

Farm	Owner	Farm Size (Acres)	Acres Affected: Taken	Severed	Damaged
13. Springfield	D. Fleming & Son	500	12	13	14
14. Nabbots	W.P. Bucknall & Son	26*	9	21	-
15. Boreham	P.F.P.U.T. (Tenant Co-Partnership Farm)	2048*	58	87	68
		6724	278	512	282

* also farms other land

\+ Pension Fund

4.5 Under the heading "An Assessment of the Damage" Trumper lists a number of factors which "should be taken into account" when assessing the agricultural damage which the southern route would cause:

- Loss of 278 acres of farmland;
- severance of 512 acres away from main part of the farm;
- 282 acres will be made difficult to work because of their awkward shape;
- 8 of the farmers have land away from the main block which will suffer because access between one farm and another will be more difficult,or because the balance of the business as a whole is upset;
- each farmer worker will be made slightly less efficient because his area of activity has been reduced. In the same way the very substantial investments of "landlords" capital in land and buildings, and "tenants" working capital in live and dead stock and tenant right, will become less efficient.

4.6 Drawing these factors together Trumper argued:

"A scheme like this represents permanent damage done to British Agriculture. It is impossible to quantify this damage in a single figure. Perhaps the best way of illustrating it is like this. If one assumes that the severed and affected land is equivalent to being one fifth "lost" to agriculture, or that a farmer would rather have four convenient acres (than five inconvenient ones) then, the loss can be expressed thus:

	Acres
Land taken	278
Land severed and damaged (one fifth of 794)	159
Equivalent acres "lost" to British Agriculture	437

"This is to be compared with the 70,000 acres or so which are taken out of agriculture each year for urban development. It is a large area to sacrifice for one road project. But I stress also that this route interferes, to a greater or lesser extent, with the economy of 15 farms totalling more than 6000 acres."

4.7 This then is Trumper's expert evidence: on it we must judge the NFU's technical case for preserving this particular tract of agricultural land. What judgements should be made?

(a) The overall agricultural case benefited greatly both from being co-ordinated and aggregated and from having the NFU openly sponsoring it.

(b) It was unlikely that the ERCU team at Epping had any more agricultural expertise than at Chelmsford, but only at Chelmsford was this defect made apparent to the Inquiry. The NFU appearance was responsible, in large part, for the expose.

(c) More negatively, however, it has to be noted that Trumper did not carry out any real economic prediction of the likely impact of the Southern route on the individual holdings. Not surprisingly, given his valuers credentials, he placed far more emphasis upon land loss and comparative valuation. Thus severed land was valued as being 20% less valuable than non-severed land. Such an assessment takes no account whatever of the possible different degrees of severance. We deal with these in detail elsewhere, (Chapter 8), here it is sufficient to point out that 15 acres which is completely land locked without any means of access would not be equivalent to 15 severed acres with direct access across a specially built agricultural access bridge. The contention that "a farmer would rather have 4 convenient acres than 5 inconvenient ones" is a mere supposition which again depends upon the degree of severance the potential use of the land, the availability of other better-placed land etc. Certain factors pertaining to the economic dislocation of individual units were mentioned, but no attempt was made to define either their weight or incidence.

(d) It is shown in Chapter 7 that the assertion of 70,000 acres annual land loss to urban development is both imprecise in definition and inaccurate, probably by a factor of 2.

(e) It seems unlikely that given the time available (one month), Mr. Trumper could have carried out a comprehensive enough survey to have complete faith in the "revised" land classification he presented.

(f) Overall it may be said of the technical content of Trumper's evidence that it was based on the valuation ethic; although certain economic consequences of the construction were mentioned no attempt was made at quantification of potential loss because Trumper thought it "impossible". Although Trumper indicated that the true impact assessment had to be in terms of the individual units he gave the Inspector no hard data with which to make such assessments.

4.8 In the absence of valid rebuttal from ERCU such evidence went "unchallenged" to the Inspector. The totality of the Inspector's view of the agricultural evidence will be discussed later, suffice it to say at present that he accepted Trumper's view of the costs of severance:

> "Finally, Mr. Trumper assessed the effect of severance and badly shaped fields that it would be difficult to work, as equivalent to one-fifth of the acreage so affected. This, added to the area actually taken for the road, was the basis of his claim that the total loss caused by the road was equivalent to 437 acres of agricultural land. This, again, was not challenged by Mr. Spokes, though Mr. Ketley ventured to suggest that Mr. Trumper might be exaggerating. Much effort is devoted by professional persons or bodies to the measurement of factors such as visual intrusion and landscape attrativeness; and it occurs to me to comment, since farm severance is so frequently a feature of road development, that it might be helpful if there were to be some generally acceptable measure of its effect on farm management and food production. It is an old saying that the fields nearest to the homestead get the most manure. Mr. Trumper's assessment is equivalent to a production of 32 cwt. of corn per acre from fields that could be expected to produce 2 tons an acre if they were accessible; or, may be, his view would be that yields would be closer than this but that the difference in net output would be accounted for by extra costs, including unproductive travelling time. Any general assessment that might be used as a yardstick would, of course, need to be qualified with reference to measures to reduce the effects of severance. In this particular case, the assessment of 20% does not seem to me unreasonable if, in the absence of direct access,

> the journeys of Mr. Howard to his severed land on Parklands Farm, or of Mr. Hodge to the remoter part of Pontlands Farm are typical. For permanent damage to food production that would result from the southern route is equivalent to the loss of 400 acres of agricultural land. The output from this area would, of course, be lost forever; and the country would, each year, have to import an equivalent extra amount of food with the consequential effect on our balance of payments deficit."

4.9 The mechanics of decision-making over this point are fascinating; there is no doubt that Trumper did not base his "expert" assessment upon specific empirical findings, but rather on his generalised valuer's experience, and that the argument was taken to its extreme. Still the Inspector, seemingly anxious to demonstrate that his agricultural expertise was of high order, accepted the argument and attempted to justify it from his own experience. It is interesting to speculate whether or not the Inspector would have maintained the same view had the ERCU produced an agricultural witness of equal standing to Trumper, who refuted the "one-fifth loss" argument.*

5. THE INDIVIDUAL FARMERS' CASES

5.1 It will be remembered from the M16 Report that two main conclusions emerged about the individual farmers' cases. First, that the cases presented did themselves and their farms a grave injustice and, second, that the ERCU only felt obliged to answer specific points and thus were able to ignore all "general" statements of farm condition. Given the higher level of NFU involvement at Chelmsford and the opportunity to learn from M16 it might be hypothesised that the farmers affected by the southern route had the opportunity to acquit themselves better than the farmers appearing at Epping. The question to be answered is, did they take this opportunity?

5.2 The first important point to make is that all the farmers on Trumper's list, except one, appeared to give evidence. In addition, others who may be classified as small-holders and part-time farmers also appeared. This is direct contrast to the M16 inquiry where only a minority of potentially affected farmers decided to represent themselves. Thus the overall weight of agricultural evidence at the Inquiry was quite substantial. What then of its quality?

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* Norman Dombey in an article in "The Planner" (8) argues that perhaps the role of the expert is open to abuse and that expert judgements made without evidence and only based upon opinion may be inaccurate. Trumper's evidence seems to bear this out.

5.3 Table 6 in the M16 chapter details the specific points made by farmers who attended the inquiry and the response from the ERCU. It is difficult to make such a comparison in the Chelmsford case because by the time that the individual farmers came to give their evidence the ERCU had, more or less, abdicated their right to challenge agricultural evidence. That presented by farmers was better than that presented at Epping but it still tended towards the descriptive rather than the analytical. Still too often, the approach adopted by the farmers when speaking for themselves was emotional rather than factual, and tended to give too much attention to non-agricultural issues. A good example of a bad case was that presented by Mr. Barr of Sandon Hall. His complete case read:

> "We wish to formally object to the statutory orders for the construction of the Southern By-Pass (A12) between Margaretting and Boreham.
>
> Our reasons for objecting are, on the environmental aspect, the devastating effect this will have on this rural part of Essex, which will be swallowed up under the network, permanently dividing vital agricultural land and farming enterprises, causing inefficient working of the land and therefore loss of income to the industry, also disrupting the amenity value and life in the village and surrounding residential dwellings.
>
> On a personal basis, as both landowner and farmer, the whole economic structure of our farm will be upset by making the business an unviable unit, with a large acreage cut off from the rest of the farm, having insufficient access and thereby causing a totally unbalanced enterprise.
>
> The route affords no relief to the present alarming "bottlenecks" through the centre of the town, and the upgrading of the present original A12 is, in my opinion, the only acceptable solution to the whole problem."

5.4 When analysing the M16 agricultural cases we applied the criteria of "utility to the Inspector": i.e. how could the Inspector use the evidence presented by the objecting farmer in making the decisions that were required from him. There can be little doubt that evidence such as Barr's would be of little value to an Inspector even though he will faithfully report back to the SOS what was said. Those farmers, who had observed closely road developments in Essex were able to present far more pertinent evidence. The two "best" proofs came from G.W. Magnay speaking as manager of "Co-partnership Farms Ltd." and M. Hodge, Great Mascalls Farm. Magnay had the dubious advantage of already having "coped" with the Springfield-Boreham By-Pass across his farm. (Part of this earlier By-Pass was to be

superceded by the Southern Route!) Using this experience he was able to predict many problems that the new By-Pass would bring, both during construction and after. The "core" of his evidence is quoted below:

> "From our experience with Springfield-Boreham By-Pass I can see from a farming point of view, that the proposed Southern By-Pass could cause even more serious problems. Co-partnership Farms will lose 54 acres of land and will have to contend with 2 large inter-sections; one with the existing A12 and one with B1137 road. The main farm centre will be isolated from the rest of the land and about 130 acres will be severed. The only access to this severed portion is down a residential road which has cars parked on both sides making it impossible for farm traffic - especially large modern farm implements and combines - to get to the severed land. On top of this, the land loss and severance affects the best land (identified by Mr. P. Trumper as Grade 1 land), which produces the market garden crops and is capable of double cropping. Based on our own up-to-date figures, the loss of valuable farm land would mean a loss of food production to the extent shown in the table below:

Crop	Yield Per Acre (Tons)	Gross Output for 54 acres (Tons)
Wheat	2	108
Sugar Beet	18	135
Potatoes	15	810

> If instead of arable cropping, the land was used for livestock, this 54 acres could produce 15 tons of prime beef (that would be 33,600 lbs) or 5,400 gals. of milk (that would be some 43,200 pints) in a year. A further alternative would be the production of heavy crops of good quality cabbages, sprouts, beans and peas. By anybody's standards, this land is capable of producing a significant amount of food for home consumption. The loss of land is not large enough to necessitate a reduction in our permanent labour force but it could lead to the reduction of casual work for local housewives. As Mr. Trumper has already said, the main result would be that less efficient use would be made of the existing labour force. This would certainly be true for us.
>
> The common denominator of road construction on this scale is not only the physical loss of farm land, but the disruption of farm management and efficient food production. Last, but by no means least, is the sheer psychological pressure on the farmer."

5.5 It cannot be denied that Mr. Magnay in his proof outlined all the likely important physical problems that the Co-partnership Farms would suffer if the Southern Route were to be built and indeed, he went some way further than this to give the Inspector an idea of

how much agricultural output would be lost. Two points of criticism can be made, however: first, it perhaps would have been of use to the Inspector to know more about the 108 tons of wheat. It could, for example, have been said that its value in 1975 was over £ 6,000. Speaking in money terms as well as physical terms could have ensured that the Inspector understood its exact significance. Second, and perhaps more important, that Mr. Magnay, although outlining well the problems his farm would face, made no attempt to offer possible solutions, which would ameliorate the position. Thus there was nothing the Inspector could do other than weigh this evidence along with the rest which denied the need for the Southern Route. Had it been decided to go ahead and build the Southern Route despite the Inspector's recommendation it would undoubtedly have put Co-partnership Farms in a difficult situation as regards access and accommodation works.

5.6 Michael Hodge, of Great Mascalls Farm, was also most aware of the likely physical impact of the Southern Route upon his farm and made particular play of the way in which the unit would be severed. In addition he felt able to quantify, at least part of these losses, in monetary terms:

> "In financial terms, I estimate the loss of land would represent a gross loss of annual income of £ 7,500 at present prices. But the loss does not end there, because it is not merely a loss of that much production per annum, it is the loss of efficiency which is also involved. This is because the loss of production will in no way be matched by a reduction in overhead costs. In fact, I can see no prospect of reducing either labour or machinery costs as a result of the reduction in acreage."

Although the Inspector reported this evidence, more attention at the Inquiry was focussed upon the area of land severed to the east of the Southern Route, and whether an agricultural access bridge should be provided. It soon became apparent that the ERCU had fallen down on this aspect of agricultural assessment also. The Inspector (1) records:

> "Mr. Ketley said it had not been possible to ascertain with any certainty from informal discussions with the Ministry of Agriculture and the District Valuer, whether an agricultural overbridge would be justified on compensation or other grounds. If the Southern Route were confirmed, negotiations on access to the various parts of the farm could continue."

5.7 It is, perhaps, not unfair to criticise the RCU for not having settled such matters before coming to Inquiry. The cost of such bridges should be counted into any benefit-cost equation of the preferred route, as should the costs accruing to the farmer, if the bridge is not built. (It should be recorded that this was not an isolated incident for none of the disputes over such access accommodation had been settled.) In all fairness it ought to be pointed out that even if 5 bridges were to be eventually justified on the Southern Route, the final cost of their provision would be unlikely to exceed £ 300,000. This constitutes just less than 2% of the cost of the whole scheme.

6. THE INSPECTOR'S REPORT

6.1 It was recorded in Paragraph 1.4 that the Inspector's basic recommendation was that no action should be taken on the Southern Route and that the Central Route should be re-examined with the object of retaining the traffic and economic advantages which CoBA demonstrated it had, but reducing the environmental damage. The SOS concurred with this viewpoint. Having assembled, albeit briefly, the evidence relevant to our study and made the appropriate points about the quality of the agricultural input, it is now pertinent to examine the effect the agricultural evidence had upon the Inspector and his recommendation.

6.2 The Inspector writes in his "findings of fact":

> "The item that weighs most heavily in the scales against the Southern Route is the direct loss of agricultural land and the damage that would be caused by severance."

There is thus no doubt that agriculture occupied a prime place in the Inspector's thoughts and, presumably, the making of the all-important recommendation. It is necessary, however, to go one level deeper in our analysis and ask why the Inspector thought that the detrimental effects of the preferred route on agriculture would be so great. The answer to this question is to be found in the report's "Conclusions":

> "I find a certain substance in the criticism made by the National Farmers Union that agricultural interests had been insufficiently taken into account. I would first call attention to the effect of proposals such as the Southern Route in inhibiting long-term investment. One example is that of Mr. Hodge, who has accepted an

economic need to increase his dairy herd from 40 to 100 cows, but feels unable to act so long as questions of access to different parts of his holding, if the road were to be constructed, are unresolved. Another example is that of Messrs. Thorogood and Sons, who feel it necessary, owing to the road proposals, to defer replacing their portable irrigation unit by an underground main. The steady increase in domestic food production since the war had depended in no small part on investment decisions such as this; so even as a proposal, the road could have an effect on food production."

6.3 Displeasure was very evident both in what the Inspector said during the Inquiry and what he wrote in his Report about the "number of matters affecting particular farm units.....left in the air, as matters for discussion with the District Valuer". The point was expanded more than once; for example:

> "Mention was made of the payment of compensation to individual owners and occupiers; but it needs to be said that the Inquiry is not concerned with this but with the damage to farming and food production from the local and national standpoint of which compensation may ultimately give some measure."

This statement well encapsulates the fallacy put forward at both Epping and Chelmsford by the RCU's that certain matters pertaining to agriculture (and indeed, other "environmental" issues) need not be considered at the Public Inquiry because they can be dealt with by compensation. There are two very important points to make here:

(a) It is disturbing to find a government department using such an administratively convenient way of side-stepping problems. The promoting authority of any scheme should, bearing in mind relative costs, do all in their power to minimise the impact of public developments.

(b) By leaving a number of such issues out of the overall social cost-benefit appraisal the authority is biasing the results of the appraisal in favour of the proposed scheme. At present in order to assess likely agricultural costs the District Valuer is simply asked to give the approximate level of compensation which will be payable. However, as Bell argues in detail, the level of compensation does not and cannot be equated with national loss. Additionally, the estimate made can only be a rough one. It would perhaps be argued in defence, by an RCU engineer, that the calculation of all such compensation payments would make very little difference

to the overall cost of a large civil engineering project. In most cases this, indeed, would be true; however, the Chelmsford By-Pass debates expose the important flaw in this argument. Because of the balance in economic benefit between the Southern and Central Routes the selection of the "preferred route" was determined by non-traffic impacts. Thus the environmental costs were not being weighed against the capital cost of the scheme or the NPV of the traffic benefit, accruing, but against each other. In such a case all non-traffic benefits and disbenefits must be accounted for either quantitively or qualitively and then balanced out. The omission of any major impact will necessarily bias the balance made. Given all these matters (not forgetting of course the Inspector's belief in Mr. Trumper's severance argument) it is not surprising that the Inspector saw fit to conclude that:

> "the Department did not establish that decisive weight should be given to environmental reasons in favour of a southern route, overriding the traffic and economic reasons in favour of a Central Route. Without wishing to minimise the environmental problems that any Central Route, however carefully designed, would cause, my view is that the Department under-estimated the damage a southern route would cause to the environment in general and to agriculture and food production in particular."

7. SUMMARY

It is perhaps useful to briefly summarise the events surrounding the rejection of the ERCU preferred route for the Chelmsford By-Pass.

(1) The ERCU Southern Route has lesser economic and traffic benefits than the Central Route proposed by RAPE, the NFU and other objectors.

(2) Even in comparison (using CoBA) with the existing A12, the Southern Route only produced net economic benefits because of large delays at two junctions on the A12. Even partial removal of these junction delays would mean that in terms of CoBA analysis there would be no justification for the Southern Route.

(3) Thus, it emerged that the RCU had chosen the Southern Route because the environmental disbenefits were greater for it than for any Central Route.

(4) This assessment had been made, however, with incomplete evidence about the supposed environmental disbenefits. In particular no real attempt had been made to assess the agricultural damage which would be caused by the Southern Route.

(5) The Inspector realised that this environmental balance had not been properly made and so ruled against the preferred route, indicating that he thought greater potential net benefit lay in the construction of a modified central route. This realisation stemmed from the strong objections made by RAPE and the NFU, which were made at the objectors' expense. (It should be noted that although the objectors have in theory "won" their case, none as yet have received any of their costs from the Department of Transport. It appears that this is due, in part, at least to the wording of the Inspector's Recommendation which does not mean that the ERCU have to completely abandon the Southern Route. At present they are in the process of comparing a revised Central Route with a revised Southern Route.)

8. CONCLUSIONS

8.1 We have finally to draw conclusions about both the quality of the agricultural input and the way in which it was accommodated within the project appraisal framework.

8.2 Regarding the quality of the agricultural evidence a number of points can be made:

(a) the RCU input was negligible (in saying this there are obvious implications for the Ministry of Agriculture's involvement.)

(b) the contribution of the individual farmers was greater than had been the case at the M16 Inquiry in the sense of the weight of evidence. Nearly all those potentially affected by the Southern Route appeared and many of these also actively supported both the NFU and RAPE cases. However, having said this, it must also be recorded that the quality of the individual proofs was little better than those found at Epping. The same faults of imprecision, description rather than analysis, and a lack of asking the RCU for specific remedies to problems, appeared time and again.

(c) the NFU case finally appeared to be most authoritative because the Inspector took on board many of the points made by both Trumper and Hellard. Indeed, it must add much weight to the overall agricultural case if a solid, co-operative, objecting, front can be presented. However, it must be admitted that the evidence presented by Trumper stretched the bounds to which "experts" ought to enforce their expertise. This was especially evident in the methodology adopted by Trumper to assess severance costs. If the RCU had had an agricultural expert of their own to rebut the NFU evidence it is unlikely that the Inspector would have finally shown such a healthy regard for it.

8.3 As regards the place of agriculture in the decision-making process, the Inspector's statement that it was the item that weighs most heavily in the scales against the southern route leaves no doubt that it was of prime importance. The relationship between the impact of the southern route upon agriculture and the Inspector's recommendation not to go ahead with this route was not, however, simplistic. Other factors were also important in leading the Inspector to his final decision. Four in particular stand out:

(a) had RAPE not challenged the traffic predictions and the CoBA analysis produced by ERCU it would never have emerged that the Central Route had potentially far greater economic benefits than the Southern Route. And, had it still been implicitly assumed by the Inspector that the Southern Route gave the best economic return the environmental and agricultural factors would probably have held much less sway in the overall decision-making.

(b) had the ERCU not let the agricultural objections go by default the Inspector would not have been able to place so much weight upon Trumper's evidence, in particular.

(c) due to their lack of responsiveness to objectors requests, the "covering up" of the CoBA results, and the inability to answer agricultural evidence the ERCU undoubtedly lost favour with the Inspector. This could not have improved their chances of having the "preferred route" supported.

(d) the Inspector, with his Ministry of Agriculture background, professed to have a degree of agricultural expertise, which perhaps most Inspectors would not claim. It was the combination

of all these factors (and others of lesser import) which led to the final recommendation by the Inspector. We have, of course, no way of knowing why the SOS decided to accept the recommendation, but it could be argued that the evidence was not marginal enough to warrant a valid reinterpretation.

part III:

the correct approach to agricultural impact prediction.

Chapter 7

A Framework For Assessing The Impact of Major New Roads Upon Agriculture.

1. BACKGROUND

1.1 The M16 (A10-A12) and Chelmsford By-Pass Public Inquiries demonstrated much about the way a particular Road Construction Unit attempts to take agricultural considerations into account when planning major new roads. Although the nature and outcome of these two Inquiries was very different, the common element for present purposes was that the agriculture input was mishandled in both cases, by both RCU and farming community alike.

1.2 It is pertinent to record here then that sections 7(2) and 11(6) of the 1959 Highways Act decree that agricultural considerations must be taken into account at all stages of the planning and design of major new highways. Conversations with the ERCU engineers responsible for the M16 and Chelmsford schemes revealed that they had, in their terms, fulfilled this statutory obligation by consulting with the Ministry of Agriculture. Although these engineers, and those on other schemes, felt the obligation fulfilled they were not reluctant to admit that they would have preferred a more positive reaction to their requests for information from the MAFF. The role of the MAFF is, thus, significant.

1.3 The picture of the MAFF-ERCU consultations that supposedly took place prior to the Public Inquiries was not revealed in detail to us, but an attempt has been made throughout the course of the research to maintain close contact with the MAFF, in order to understand both the philosophy behind their actions in this field and the actions themselves. Contact has been at both national and regional level. Those responsible ultimately for framing policy to deal with development of agricultural land are to be found in the Chief Surveyor's office. During our three year research period there were two Chief Surveyors, Messrs. Lofthouse, and Sayce, but the policy expressed showed no break. A letter from Mr. Lofthouse's staff demonstrates the position in March 1975:

> "My colleague, Mr. P.J. Huguet and I, have studied the papers with interest and unless I summarise you unfairly it would appear that the individual farmer is not consulted sufficiently by this Ministry when motorways and other new road schemes are being considered. Whilst I can appreciate how you have reached this conclusion, I feel that perhaps the Ministry's role is not entirely understood. In your consultations with the Regional Surveyors you will have been told that this Ministry is consulted and that this consultation amounts to the principle means for giving effect to the Government's

"policy in respect of agricultural land which is to "ensure that as far as possible land of a higher agricultural quality is not taken for development where land of a lower quality is available and that the amount of land taken is not greater than is reasonably required for carrying out the development in accordance with proper standards." (DoE circular 71/71 - Development of Agricultural Land.)

Motorways and most new roads are designed to very demanding engineering specifications. Very frequently this Ministry is consulted at an early stage, in confidence, on the choice of routes which, for engineering reasons would be acceptable. At this stage we indicate which route will avoid higher quality agricultural land and hopefully, also, use the least amount. Also, at this stage the proposal is in confidence and this precludes discussing the route with individual farmers.

When once the main route has been decided the promoting authority lifts the embargo of confidentiality and the route becomes common knowledge. It is usually possible to obtain some degree of alteration, even at this stage. It is very limited and frequently no more than half a mile in either direction. But, if the Ministry is consulted again, we can now discuss the individual farmers. It is no part of our function to fight the battles of individual farmers but nevertheless, in these circumstances and with detailed knowledge of the effect of the proposed line upon individual holdings, it is possible to advise the road authority in such a way as to ensure that as little harm as possible is done to individual farm units."

1.4 In order to fulfill this policy of "safeguarding the best land" the MAFF have developed the Agricultural Land Classification of England and Wales. Mr. Sayce at a recent meeting with the Wolfson Group (May 1977) reaffirmed the MAFF's commitment to the use of the Agricultural Land Classification maps. All other factors he emphasised were of <u>short term</u> nature when compared with land quality and so need be taken into account very much at a secondary level of analysis. Mr. Sayce emphasised strongly that his field officers play an important, active role in highway decision-making and, as a matter of course, examine <u>all</u> agricultural implicatinns of proposed new routes, even if factors other than land loss and quality are given little weight in the final assessment. As will be seen from the case-study work later reported, our researches found evidence to back this contention almost non-existent. (At best Mr. Sayce appears not to know how his field officers operate.)

1.5 The use of the Land Classification System reflects the underlying philosophy of the MAFF that the most important factors which have to be taken into account when considering the agricultural implications of a planning decision are the extent and quality of the land-take involved. So important do these factors appear to be that they are given prominence to the exclusion of all other possible measurements of impact. Thus we must ask how good a planning tool are the Land Classification Maps.

2. THE MAFF LAND CLASSIFICATION

2.1 Peters (1) writes:

> "A fundamental problem facing land use planners is accessibility to information. Hence the attractiveness as a working device of a nationally known land classification map...." (p198)

This being the case it is important that the primary task of any group desiring to produce an agricultural land classification scheme to ensure its utility to planners. The measure of their achievements must be against this criterion. In January 1962, the Agricultural Land Service Research Group held a conference to discuss general problems of agricultural land classification and the possibility of devising an improved system for land use planning capable of application over the whole of England and Wales. The conference was unanimous that the subject merited further study, and so a Study Group was organised and began work in November 1962. The terms of reference were:

> "1. To consider and define the requirements for an up to date agricultural land classification system, based on national standards but capable of application to small areas.
>
> 2. To collect and process what relevant data there is and, where practicable, prepare agricultural land classification maps of a standardised kind." (2)

In the light of the system of classification that emerged twelve years later it is perhaps useful to quote some of the findings of the Study Group fairly closely:

> "Our first task was to consider the most suitable system of classification for advising on the release of agricultural land for urban development....the ministry's policy is to steer urban development away from the areas likely to be of the greatest agricultural value in the long term..... ....we decided that a classification which took account

> "of the permanent physical properties of land influencing crop production, i.e. site, soil and climate, would be most suitable for our purpose.....At the same time we recognised that a physical classification would be subject to many limitations. We agreed, therefore, that the possibilities of instituting a supplementary economic classification which would give some indication of the productivity of the physical grades in financial terms, should be explored."(p2)

Thus:

> "The first and basic stage is a Physical Classification. Under this land is classified in one of five grades according to the extent that physical factors such as climate, soil and site impose long-term limitations on use. The second stage is an Economic Classification based on standard net outputs. This is designed to measure the cash value, at fixed prices, of the average agricultural output per acre directly attributable to the land, assuming standard management and fertiliser practice.....
> "The final step is to interpret the economic assessments of the physical grades. There are difficulties in doing this because the standard net outputs of areas.....may vary significantly due to differences in the pattern of farming." (pp3 and 4)

2.2 On the basis of the Study Group's report, in 1966 a small group of research officers in ADAS began to survey England and Wales. According to Anne Dennis (3), all relevant information was examined including soil maps and memoirs, drift geological maps and aerial photographs. Additionally, expert advice and much help was obtained from other officers in ADAS and from members of the Soil Survey of England and Wales. Fieldwork was carried out and by mid-1974 the survey was complete, the results were published, with permission, on Ordnance Survey Maps, Outline Edition (7th series) scale 1 inch to 1 mile. The maps show urban land, non-agricultural land and five grades of farmland.

2.3 The five grades of farmland are defined purely on a physical basis; this means in practice that the grades relate simply to what crops could be grown upon the land. Both the present use of the land and, despite what the Study Group recommended, the economic implications of the grades are completely ignored. Thus Grade 1 comprises "land with very minor or no physical limitation to agricultural use", while Grade 5 has "very severe limitations" and is "generally under grass or rough grazing, except for occasional pioneer forage crops."

2.4 The main criticisms which can be levelled at the classification are:

(a) it does not reflect productivity but flexibility: Grade 1 land is different from Grade 2 only in the sense that it could produce a wider range of crops. It cannot be held that for all crops which can be grown on both types of land Grade 1 will produce consistently higher yields;

(b) the classification does not reflect current land usage.

(c) there has been no attempt to spell out the implications of the various grades in economic terms. Thus no real weighting can be attached to grades with the result that planners can do nothing more than talk in terms of "good" and "poor" land.

(d) the division of the grades as it turned out is not of great use: 48.9% of all land in England and Wales falls into Grade 3 whilst only 2.8% is graded into the top category. In some individual counties such as Gloucestershire, Leicestershire and Northamptonshire the Grade 3 land forms more than 80% of all the farmland. The MAFF itself admits that:

> "Whilst this may faithfully reflect the moderate degree of limitation associated with certain widespread geological formations and their characteristic soils in areas where the climatic factors are neutral, it is not a particularly helpful assessment to staff making land use decisions."(4)

On the basis of the recognition of this defect, the MAFF have now taken on board the task of breaking down Grade 3 into three sub-divisions. Although the work has not yet been completed an ADAS Divisional Surveyor has intimated (5) that about 70% of Grade 3 will fall into the highest subdivision 3a. Thus about a third of all land will be in this group; it remains to be seen how the new classification will work in practice, but this author is sceptical of its chances of improving matters.

(e) Another shortcoming the MAFF admit is that it is (3):

> "not always feasible to pick out with any degree of accuracy areas of different quality of less than about 200 acres..... It would not be reasonable to expect a generalised national map to give the answer for every small parcel of land. Also for this reason the scale of the published land classification maps should never be enlarged."

Anne Dennis in her most revealing article goes some way to explaining the rationale behind the classification by stating that:

> "....they (the maps) form a good basis for strategic planning and enable objective judgements to be made." (p41)

Strategic planning is not defined in the article but it seems almost certain that it does not refer to anything less than broad structure planning in its formal sense. Thus, by their admission the Ministry Land Classification holds nothing for the planning department concerned with day-to-day development whether this is a small by-pass or a large industrial estate. The DoE agrees with this assessment:

> "These maps are of particular value for strategic planning purposes but they are not suitable for use in evaluating individual sites." (6)

This being so it is perhaps surprising to discover the contents of the "Jefferson Report".

2.5 The Jefferson Report (7)

There is evidence of recognition within the DoE establishment that the MAFF input to road planning decisions in the form of Land Classification is inadequate for the purposes of road planning. Jefferson of SWRCU was commissioned by the DoE to prepare a Report upon the ways the approach to environmental assessment in general could be improved. Agricultural assessment fell within the scope of Jefferson's brief. His approach was to attach weightings to each of the 5 grades of land found within the MAFF classification. He describes this as a Productivity Index.

Jefferson's Productivity Index

MAFF Land Grade	Weighting (per acre)
1	20
2	18
3	10
4	3
5	1

Mr. Sayce (now Chief Surveyor at Horseferry Road) was instrumental in devising this weighting index, but in a meeting with the Wolfson Group Sayce admitted he was dissatisfied with the way the Index was being used. Our objections, however, go deeper than his:

- the index is based upon the Land Classification and therefore has the same problems in use as the Classification maps;
- the use of a weighting index does not surmount the objection that the Land Classification refers to land flexibility rather than current usage;

- no indication is given of how the index is to be integrated into the decision-making process. For example, the whole Jefferson environment impact measurement technique was tried out upon the Okehampton By-Pass proposals; a number of alternative routes were tested and the Agricultural Productivity Index ranged from 593 to 833. However, no indication was given as to the way a score of 771, for example, can be compared with a score of 815 or how either of these are to be compared with the other elements in the project appraisal?

Jefferson's work represents a partial recognition of the problem, but not a real solution. Despite this, however, it is being used by the DTp in order to make agricultural assessments; therefore it takes on greater importance in the context of this work. A meeting was arranged with Mr. Jefferson in Taunton in order that we might hear his more detailed views upon the "Productivity Index". He was not slow to admit that his system was not perfect or to praise the effort made to develop an "alternate system" having read what was an early draft of Chapter 12 of this thesis. However the main point that emerged from this meeting was that Jefferson did not think it was worth the RCU's time or resources to develop or utilise a more sophisticated method of agricultural appraisal because agriculture very rarely played an important part in the decision-making. This is a stand of fundamental importance: it will be returned to.

2.6 Our contentions upon the deficiencies of the land classification schemes in Britain and the way they are used are borne out by the German experience of classification and valuation.(8) The sophisticated system which has been operating in the F.D.R. since 1934 serves to demonstrate how a system can be used not only to distinguish certain soil types, but also to assist in land-use planning, land taxation and probate, assessment of collateral for loans, the determination of rents and pricing for sale and purchase. Additional uses include providing planning evidence for, amongst other things, motorway routing.

2.7 Although this policy of the primacy of land quality is well-defined at Horseferry Road, there is a lack of communication with the regional MAFF officers about the actual operation of the system. It appears that because the Land Classification Maps are not an

obviously useful planning tool the MAFF officers directly responsible for giving advice to planning authorities have to develop their own ways of doing so. In other words, because of a lack of central direction on the problem, they are being forced to attach their own interpretations (or "weightings" to the economist) to the grades of land and thereby carry out implicit trade-offs.

2.8 Thus it can be asserted with some force that despite the intention of doing so the MAFF have fallen short of providing a useful planning tool. Our investigation has, however, to be more fundamental than this. The question that has to be answered is "If the Agricultural Land Classification System could be improved so that it became a useful planning tool, would it be the best tool to reflect the nation's loss of agricultural resources from planned new trunk roads?

2.9 This author's answer to this question is most certainly negative. The basic contention here is that the national agricultural impact of a road development can best be reflected in current project appraisal methods by measuring the economic losses at the individual farm level on any particular route and aggregating them. Such an approach is in direct distinction to the MAFF philosophy and stems from four important inter-related factors:

(a) the loss of land to major roads is not of significant proportions to upset the future demand/supply balance for food;

(b) because of this the MAFF land classification, which measures the potential flexibility capacity of agricultural land, as opposed to actual patterns of farming, is irrelevant in this context of planning and economic decision-making.

(c) the nature of the techniques of project appraisal used in highway planning place far more attention on present day trends in socio-economic activity than they do on future production and consumption.

(d) the evidence from the M16 and Chelmsford Inquiries indicated that only in very highly exceptional circumstances will agriculture ever be decisive in determining whether or not a new road is needed on an overall balance of cost and benefit. Therefore the point at which agriculture will play a part is when a particular route is being chosen. Our contention is that "land take" is a very blunt tool to employ when comparing such alternate routes.

3. THE EXTENT AND SIGNIFICANCE OF AGRICULTURAL LAND LOSS TO URBAN DEVELOPMENT.

3.1 In order to assess the importance of the loss of agricultural land to road development it is necessary first to examine the land loss associated with all forms of urban development. That much debate has, and is, taking place about the level and significance of this loss is due to the lack of a comprehensive data base:

> "Experience shows that departments are handicapped in the exercise of their functions by the lack of comprehensive, comparable, and regular quantitative information on land-use changes in this country. There has been a marked increase in recent years in public concern about natinnal environmental issues and particularly the extension of urban development. This commonly leads to pressure for the Government to take action, which is often supported by widely varying statistical guesses on the rate of land consumption for urban development." (Emphasis added) (9)

3.2 The first Land Utilisation Survey conducted by Dudley Stamp, between 1931 and 1933 provided the earliest coherent basis for an urban land use estimate. However, with hindsight, Stamp himself admitted (10) 30 years later that the definition of urban land use employed did not correctly represent the area of urban land that existed. Fordham goes so far as to write (11):

> "Stamp's measurement will not be pursued further, both for the reason he gave himself, and because the method of measurement used is not clear. Stamp describes it as the "ordinary method" of tracing paper ruled off in small squares; which may mean systematic point sampling or quadrant sampling, but he does not indicate its density or other aspects of the technique."

3.3 Alice Coleman's "Second Land Utilisatinn Survey" grew directly from Stamp's work. The second survey was initiated in 1960; Miss Coleman has subsequently recruited and trained about 3,000 volunteer surveyors, and during the 1960's, the whole of England and Wales was surveyed in detail on a 1:10,000 scale. In the 1970's additional sample resurveys have been undertaken. Despite her tremendous diligence and perseverance, Miss Coleman's work has come in for much criticism. Most of this focussed around the point that the methodology applied is nowhere near as rigorous as the survey was comprehensive. This is due to the lack of methodological advance from Stamp's first survey. Additional criticism is levelled at the time span over which work was carried out; critics point out that it is possible that the situation could have changed dramatically over the 16 years of the survey.

3.4 "Agricultural Statistics", an annual MAFF publication has included since 1966/7 a section on changes in land use, focussing naturally on losses of agricultural land. The figures are based upon acreages returned by farmers on June 4th each year. However, here too, there are problems: the raw data is not available before 1969 in order to make and check historical assessments. Additionally it seems that many farmers do not take the task of completing the forms as seriously as they might, despite the statutory obligations attached to them. The Ministry admit:

> "Such information is not exhaustive and individual annual figures may be unreliable." (12)

However, Best still feels that arguments about the accuracy of these data are:

> "....concerned only with precision within rather narrow limits. Taking a somewhat wider view, it has yet to be demonstrated that the general magnitude of the figures and their scale of variation from year to year since the end of the war are not valid representations of the actual situation." (13)

3.5 Best's estimate for the urban area in the UK in 1950/1 represented a great improvement over its predecessors. (The method and results are to be found in various places but the most useful source is to be found in the book published with Coppock. (14).) For the first time the method used to derive the results was described in detail, a fact which also permits criticism in a way which previous estimates do not. In the light of criticism levelled at Best's work it is important to point out that most of Best's data came to him already processed by the Ministry of Housing and Local Government. Thus a large part of the weakness of Best's estimates was outside his power to alter. Although the technique employed by Best was basically simple, both its operation and the required variations were highly complex. The whole concept was based on the assumption that population density was positively correlated with settlement size. Exact procedure varied over the 6 categories of urban land, but the basic approach remained constant. This involved making sample calculations of population density relating these to urban areas for the settlement involved via the known population size and simple multiplication. Extrapolation was nationwide. The main criticisms which may be levelled at Best's work are:

(a) The linear relationship between population density and size of settlement is far from proven; contrary evidence has yet to be reconciled.

(b) The sampling procedure was subjective and not capable of statistical testing. This means that no precise statement of accuracy can be made regarding Best's estimate, and leaves open the possibility that due to bias, a wrong estimate was produced.

(c) The sampling took place over the period roughly from 1949-57 and no correction for urban growth was made.

3.6 Fordham, Best's main critic, attempted to avoid the methodological traps that Best laid for himself by making direct measurements of urban areas and by producing estimates whose accuracy can be tested.(11) (15) The source chosen was Ordnance Survey maps as these alone, of the available secondary data sources, allowed time-series analysis, because of the fairly frequent revisions of the One Inch Series. The One Inch Series was used to provide a time-series estimate for a randomly chosen sample of about 200 of the (then) 1200 administrative urban areas of the UK. A detailed breakdown of urban uses was made by using the 25 Inch Series within administratively urban areas, and the slightly less detailed 6 Inch Series for built up land in the administratively rural areas. Although Margaret Anderson (16) has criticised Fordham for being too scathing of Best's work when his own contained possible errors amounting to "several per cent of the total urban area", it should be recognised that these two writers are the main primary sources available on this subject.

3.7 Moving on to examine the actual picture of changing land use patterns the reviewer has his task made much easier by the work of Peters, who in 1970 (1), in writing the definitive work on land use studies, covered "the inventory of British Land Use". Thus all but the latest work is handily summarised. Tables 7.1 and 7.2 are condensed from Peters' article.

Table 7.1: Changes in the Major Land Uses of England and Wales 1935-60

	Agriculture		Woodland		Urban Development		Unaccounted		Total
	000 Acres	%	000 Acres	%	000 Acres	%	000 Acres	%	000 Acres
1935	30,380	81.8	2,120	5.7	2,800	7.6	1,830	4.9	37,130
1950	29,920	80.6	2,370	6.4	3,600	9.7	1,240	3.3	37,130
1960	29,440	79.3	2,540	6.8	4,000	10.8	1,150	3.1	37,130

Table 7.2: Net Losses of Agricultural Land to Other Uses (England and Wales).

Average Per Year Lost to (Acres):

	Building/ construction	Sports Grounds	Allotments Woodlands	Service Depts/ Misc	Total
1934/5 -39/9	50,000	10,600	15,000	N/A	75,600
1939/40-44/5	15,200	4,500	101,500	17,900	130,100
1945/6 -49/50	32,800	8,900	37,000	19,600	24,300
1950/1 -54/5	35,400	4,000	7,500	22,600	54,800
1955/6 -59/60	32,000	2,500	3,000	19,900	51,400
1960/1 -64/5	35,100	3,000	3,600	16,200	59,700

The conclusions which Peters draws about this data include:

(a) "The interpretation of the final results is, of course, made particularly difficult by the existence of considerable areas of land "unaccounted for". Clearly the amounts involved here, particularly in early years are such that a clear picture of changes in use cannot be drawn." (p176)

(b) "Care must be taken, in measuring gains to the agricultural area, not to include cases of more comprehensive recording land previously in agricultural use but escaping the statistical framework." (p177)

(c) "The current position is one in which about 45,000 acres of land is passing from agriculture to urban use each year in Great Britain. A further 60,000 acres of which the largest part is clearly rough grazing land, is moving into forestry whilst small net returns are still occurring in the remaining category."

3.8 These overall conclusions coincide fairly well from those drawn from "Agricultural Statistics". The question which remains about this national picture is have new results been obtained since Peters was writing in 1970? To answer this we have to look at three sources:

(a) Best's later work. This is well summarised in "The Extent and Growth of Urban Land" (17). The main conclusions here are that:

(a) "In England and Wales the (urban) areas amount to 1,409,000 hectares or 9.9% of the land surface." (This related to 1961.) (p9)

(b) "The most recent estimates (for 1971) obtained by updating, are 1,650,000 ha for England and Wales."

By simple subtraction it can be seen that for the decade 1961-71 urban areas expanded 141,000 ha or 348,000 acres. This equates with a loss of agricultural land of 34,800 acres per annum.

(b) R.C. Fordham's (11) results arrived at from careful scrutiny of ordnance survey maps agree more closely with Best's later, more conservative estimates, than the earlier, larger assessments.

Table 7.3: Fordham's Urban Land Estimates 1951-61 (England and Wales)

Acres	Administratively Urban	Administratively Rural	TOTAL
1951	1,751,000	1,205,000	2,956,000
1961	2,018,000	1,307,000	3,325,000
Increase	267,000	102,000	369,000
% Increase	15%	9%	12%
Annual Increase	26,700	10,200	36,900

(c) Alice Coleman's estimates; these were well summarised in Miss Coleman's recent lecture to the Royal Geographical Society "Is Planning Really Necessary?" (18)

Table 7.4: Coleman's Land Use Changes Estimates for England and Wales (Acre)

	1933	1963	Change per annum
Total settlement	2,696,572	4,022,575	+ 43,200
Total Improved Farmland	26,380,153	25,143,625	- 41,227

3.9 Thus to summarise:

1. Since Peters was writing in 1970 estimates have been proferred which revise downwards the rate of loss of agricultural land to urban development. The lower end of the range is now marked by Best's estimate of 34,800 acres per annum for the period 1961-71.

2. Even Alice Coleman's estimate only just over reaches the 40,000 acres per annum by including inter-war year changes which were notably higher than those since 1945 have been.

3. It seems likely that the rate of agricultural land take is not increasing and may even be slightly diminishing, although given the inconsistencies in available primary sources this point would not be pressed too far.

4. Although these inconsistencies do exist because of the diversity of approaches but similarity of results it can be concluded with fair certainty that about 40,000 acres of productive agricultural land in England and Wales are being taken for urban development each year.

3.10 Thus we have a rather strange but nonetheless pleasing situation; for despite the problems of both data availability and accuracy and alternate approaches to method it may be fairly said that the conclusions that the various writers have arrived at closely match. A much firmer base for further work has been obtained than might have been expected.

3.11 This assessment,is however, only one side of the story for it is also necessary to examine future demand for land. This can then be matched against the potential supply in order to locate the existence of any shortfalls. Two such "land budgeting" exercises have been carried out. The first came from Angela Edwards who, in collaboration with Wibberley (19) improved and updated her initial paper (20). The second emerged from the newly-created Centre for Agricultural Strategy at Reading University under the guidance of Bowman (21). Wide ranges of forecasts for individual elements of an equation such as the "Land Budget" will naturally lead to a large range of possible future circumstances. Thus both Edwards and Wibberley and CAS are prompted to present the reader with a number of summary tables which emphasise the different elements of the land equation. More illuminating in our context are the verbal conclusions:

(a) Edwards and Wibberley

"There is nothing in this analysis to support any prophet of doom - nothing to help those who insist that Britain is bound to be heavily overcrowded by the end of the century and without the natural resources to support the people it will contain. Unless we have been wrong on all our estimates and assumptions there should be enough land area for us to use.....no serious conflict arises unless the demand for food grows by more than 70% and land loss to agriculture exceeds the forecast loss of 10% of food production potential.....Population growth is the important factor in determining the demand for food, whereas personal income growth has little significant impact.....we as a nation can expect with some confidence that changes can take place in the agricultural sector which will make it possible for us to meet the level of demand for home-produced agricultural products expected and at the same time reduce the area of land in agricultural use so that it can be available for other uses.....the size of British agriculture can increase gradually should economic conditions warrant it, but any

pressures for a large-scale additional contribution to replacement of food imports will inevitably lead to pressures in land use. It is necessary therefore to weigh the net contribution which agriculture can make to the balance of payments situation against the pressures in land use this would create for other sectors of the economy." (pp 107-110)

(b) CAS

"A major conflict between competing land uses by the end of the century may not be inevitable, but land scarcity is very likely. Assuming that agricultural output grows by 2.5% to 3.0% a year, then despite a slow contraction in the area available to farming, growth in demand for food and loss of land from agriculture would have to be comparatively high to create a severe overall conflict in land use by the year 2000.....If as a matter of policy, the Government decides that this country should become approximately 80% self-sufficient in indigenous food supplies, then it would be much more difficult to reconcile the conflicting claims on land.....although the choice of income elasticity, income growth rate or population trend is relatively unimportant, the anticipated level of self-sufficiency and the trend in Productivity are critical to the analysis as a whole.....The outcome of the analysis is clear. Given an expected population of 61 million, a growth in output per unit area of 15% per year, an anticipated growth in real disposable incomes of about 2% to 3% a year, and a land transfer to non-agricultural uses approaching 10% of the present agricultural area, it should just be possible to maintain the existing ratio of domestic production to total requirements.....the situation is not one in which there is room to manouevre." (p16)

3.12 From Table 7.5 it is clear that:

(a) CAS population forecasts are between 9% and 20% lower: Edwards and Wibberley asserted that population level is an important variable, CAS disagreed; whichever assertion is correct it is clear that population forecasts revised downwards should not lead to a more pessimistic interpretation.

(b) Forecasts of increased food demand are fairly well in step when the different base years are taken into consideration.

(c) Income growth forecasts are overlapping.

(d) Estimates of size of agricultural land area in 2000 vary little, at about 10% smaller than today.

Table 7.5: A Comparison of the Parameters used in the Two Land Budget Exercises carried out for the UK.

	Edwards and Wibberley	Centre for Agricultural Strategy
BACKGROUND		
Base year	1965	1976
Forecast year	2000	2000
DEMAND FACTORS		
Population size by 2000 (millions)	67.4 - 69.7	58 - 61 - 64
Real income growth (% per annum)	2.5 - 3.0 (likely) (2.0 also used)	0 - 1 - 2 - 3 - 4
Increase in food requirements by 2000 (%)	32.6 - 41.0	16 - 25
SUPPLY FACTORS		
Output increase per acre (% per annum)	2.0 - 2.75 (higher end more likely)	1.5 and 3.0 (former much more likely)
Size of agricultural land area in 2000 (% of total area)	75.25	68 - 76
SELF SUFFICIENCY LEVEL IN 2000 (%)	65 - 70	75 - 80

(e) CAS assessed that increased output per unit area could only be expected to grow at 1.5% per annum whereas Edwards and Wibberley thought that a growth rate of 2.5% much more likely. This downward revision is critical when all the elements of the "land equation" are brought together.

(f) The two sets of authors disagree over the level of self-sufficiency likely to be prevailing in 2000. This, too, is a critical issue in the overall balance. The difference arises because CAS decided to follow what has been described above as "global" approach and so envisage a situation in which the UK will not be able to import all the food it wants 25 years hence.

3.13 Thus, in order to reconcile the two conclusions, we have to examine the issues of likely growth in productivity and possible levels of self-sufficiency. Regarding first the likely growth in productivity:

(a) ".....the Government are satisfied that the net product of the agricultural industry, which has increased at a rate of some 2½% a year over the last decade, is capable of continued growth at a rate at least equal to this....." (Food from our own resources, para 26) (22) (This refers to a period up to the early 1980's.)

(b) "The EDC believes, in the light of its assessment so far of the availability of physical resources and the scope for greater efficiency, that this (2½ p.a.)projection of output can be achieved; it represents no more than a continuation of the growth rate for the past decade." (Agriculture EDC. Interim report to NEDC) (23)

(c) The NFU in its paper "Farm and Food Policy for the next five years" sets out possible scenarios of future production and concludes about them:

> "They constitute a growth of the industry's net product at a rate of around 2½% per annum for the next five years."(24)

(d) The final Report of the Agriculture EDC (Land Use Policy) asserted:

> ".....overall productivity growth is unlikely to slow down if the recommendations of the other EDC working groups are put into effect." (25)

The sources, then, that might be expected to be able to foresee such things best, do not agree with the CAS assertion that growth is likely to slow to about 1.5% per annum. This is not to say that CAS will be wrong: in these heady economic days forecasting is a dubious business and it may well be as they assert that "The critical leading edge of agricultural production is slowing down." It cannot be said yet that the CAS opinion is proven on this point: until further evidence comes to light, especially in the form of the farming community admitting its estimates are high, the 1.5% assessment must be cansodered rather pessimistic.

3.14 Any conclusions upon the likely levels of self-sufficiency must be far less decisive, for the number of factors contributing to the degree to which the UK can feed itself is vast. Indeed, one of the main factors is the level of future home production which hinges on the rate of productivity growth, if there is a disagreement over this then there is very likely to be disagreement over self-sufficiency levels. Also involved, however, are balance of payment calculations, availability of food imports and their prices, dietary habits, etc., such issues are by no means to be settled by economists

alone because increasingly politicians are influencing the making of decisions concerning primary production. It is also important to distinguish between the "need" to increase self-sufficiency above its present level and the "ability" to do so. The CAS see a need to increase the level to about 80% because of the likely difficulties in obtaining imports due to physical shortages and rising prices. This is the nub of the CAS argument: the ability to become 80% self-sufficient has to be based upon the agricultural land area not decreasing more than about 10% because any other deficit could not be made up by productivity increases. Thus remove either the 80% or 1.5% assumption and the whole situation becomes much less critical. A table in the CAS report (p69) shows that assuming (a) 10% land loss by 2000 and (b) a population of 61 million (the middle prediction) that

(a) taking productivity increase at 3% per annum it would be possible to increase self-sufficiency to 90% even with a 4% p.a. growth in real incomes!

(b) at the 1.5% level it would be possible to nearly reach 80% self-sufficiency provided real income growth was kept very low. More realistically, at 2-3% p.a. real income growth, it would be possible to reach 75% self-sufficiency.

3.15 Thus neither the figures produced by Edwards and Wibberley nor the results of the CAS report really paint such a bad picture: should 10% of agricultural land be lost by 2000 when the population will be around 61 million it will still be possible to reach 80% self-sufficiency with real incomes growing at 2-3/annum, and agricultural productivity growing fairly slowly at 1.5-2%/annum. A pessimistic outlook really is not justified at the present time, and this conclusion forms the framework in which to assess the importance of land loss to trunk road development. It is finally pertinent to record the most recent (June 1977) views upon this subject which are to be found within the EDC Report (25):

> "....the Group considers that land losses and constraints are unlikely seriously to impede the achievement of the output projections postulated in the White Paper ("Food From Our Own Resources") largely because it believes that if the recommendations of the other EDC working groups are put into effect, then increases in output per hectare will continue at much the same rate as in the past. It thinks that this variable is far more important for an assessment of the land equation that population growth, economic growth and income elasticity." (p14)

4. TRUNK ROAD DEVELOPMENT AND AGRICULTURAL LAND-TAKE

4.1 Members of the Wolfson Group have made the first and only accurate measurements of the land-take on specific, completed sections of the motorway network. Others, however, have made what they consider to be "educated guesses". It is perhaps illuminating to take examples from both sides of the fence, as it were; Whelan, Group Engineer at MRCU, speaking at an ICE conference (The integration of a Motorway into the National Environment, 6th July 1976) maintained (26) that trunk roads and motorways "accounted for only 2-3% of the 100,000 acres of agricultural and amenity land "lost" to development in England and Wales each year." On the other hand, J.E. Maher, "Surveying Technician" for ADAS at Oxford wrote in February 1975 outlining the MAFF's role in the selection of a route for the M40 extension from Oxford to Birmingham (27):

> "All of these routes through Oxfordshire average over 30 miles in length and accepting the accuracy of the statistic that a new motorway will swallow up at least 100 acres for every mile then it looks as if the proposed new motorway would require at least 3,000 acres of agricultural land" (emphasis added).

Given that about 100 miles of the trunk road network is built, on average, each year, we have here fairly widely diverging views. Whelan is arguing that about 2,500 acres will be taken annually, whilst Maher asserts that 10,000 acres is a more accurate estimate. Who is more correct?[a]

4.2 Table 7.6 demonstrates the Wolfson Group's findings upon this question; it has been constructed from both reference to Compulsory Purchase Order documents and results of fieldwork carried out by the Group. (The fieldwork is reported in greater detail elsewhere.)

Table 7.6: Land Loss to Motorway Development

Scheme*	Length (Miles)	Land-take (acres per mile) Total	Agricultural
M11 (Harlow-Bishop's Stortford)	10.7	28.5	25.9
M40 (Stokenchurch-Waterstock)	9.5	37.3	32.3
M40 (Beaconsfield-Gerrards Cross)	8.0	49.0	33.3
M5 (St. George's-Edithmead)	8.8	49.1	44.1
Weighted Average	9.3	40.1	32.9

* All dual 3-lane "Special Roads"

[a] Mr. Horam, Secretary of State for Transport, has recently announced in the House of Commons (36) that average land-take for motorways is 20 acres per mile and service areas require 20-30 acres.

4.3 By taking dual 3-lane roads for our illustration it is possible to delineate the uppermost level of land-take. Thus it seems fairly safe to conclude that total land-take for new highways will not, on average, much exceed 40 acres per mile, and that agricultural land-take will not exceed 33 acres per mile on average. It seems unlikely, because of the nature of these two roads, that land take on any road will be greater than on M5 (St. George's-Edithmead) and M40 (Beaconsfield-Gerrards Cross); both these have large, complex junctions and very wide embankments and cuttings. (It is of course likely that if motorways are constructed on already developed land that development will be resited on other agricultural land. It might therefore be argued that the distinction between categories of land-take in Table 7 is unwarranted.)

4.4 Given that about 100 miles are added to the trunk network annually in England and Wales, an average annual agricultural land-loss to motorway and trunk road development is unlikely to exceed 3,300 acres or 8-9% of total losses to all urban development. The network in England and Wales, when completed, will total about 5000 miles, the total agricultural land-take will be, at 33 acres per mile, about 165,000 acres. This is less than 0.6% of all agricultural land within England and Wales. More practically, however, it seems that at most there are 2000 miles of the total network left to be constructed: this will consume about 66,000 acres of agricultural land over a period of about 20 years.

4.5 Alice Coleman writes (28):

> "The net gain in transport (land) has been 16 times as great as the net gain in housing (land), and the gain in roads 22 times as great. It is public consciousness of this sacrifice of houses to the demand of the car and the juggernaut that has given rise to the "homes not roads" movement. If the road building at this rate were to be sustained indefinitely for the whole country, the entire surface of England and Wales would become one great continuous mass of roads in 670 years or half so covered in 365 years. This fanciful picture indicates the tremendous scale of the current road building effort. It will have to be brought to a halt soon and it may already be time to stop assuming that new roads are automatically desirable." (p102)

Miss Coleman is to the forefront of those who argue that the land of this country has never been more vulnerable to misappropriation and misuse than the last 30 years when, ironically, the system of

planning and legislation and control have been evolving. As with the pessimism of the Centre of Agricultural Strategy that of Miss Coleman should not be over-emphasised. It seems that in the field of transport especially Miss Coleman is far from the mark, even in her latest publication. There is little excuse for this: a 1972 Government publication, "Natural Resources, Sinews for Survival" stated that major trunk roads take up 40 acres of land per mile (p51). Investigations indicated that this was a guestimate and not based upon empirical evidence: nonetheless it proves to be fairly accurate and if Miss Coleman and, of course, all others who adopt a similar line of thinking were to match this figure with known Government road network proposals they would have come up with results similar to those presented here.*

Apart from Best's (34) rather inconclusive evidence there is little detail about the quality of land taken for, or vulnerable to, urban expansion. The best working hypothesis, however, seems to be that because most expansion occurs upon flat, valley-bottom land it will inevitably tend to occur upon the better land. As major roads often follow the line of least resistance, the same argument will apply, but perhaps to a lesser extent because of the linear arrangement of the land-take.

5. THE AGRICULTURAL BENEFITS OF THE MOTORWAY NETWORK

5.1 The point is often made by the road promoting authorities when faced with agricultural objections at Public Inquiries that the agricultural industry does receive benefit from the motorway network in the form of speeding up distribution and so reducing costs attached with the movement of both output and inputs. This view was echoed and summarised by the DoE representative at an NFU's "Road Construction and Agriculture" seminar:

> "Farmers and nurserymen have a particular interest in a fast and efficient distribution service since much of their produce is perishable. The M5/M4 and the M5/M6 brought London and the Midlands within a few hours reach of farmers in South West England and incidentally, the farmers of Brittany, France, were amongst the first to realise the opportunities these new motorways were creating. Roads from Brittany to the rest of France are still fairly poor compared with the motorway system in this country, and the Bretons decided that it was worthwhile introducing a new ferry service to Plymouth to take advantage of the motorway system. How much more opportunity, therefore, exists for farmers in the South West

* Weller in a book (37) published in 1967 asserted that the net loss to farmland from major road construction would be about 30 acres a mile (p139).

"who do not have the additional burden of the ferry service? There was a further advantage, easily visible to those who live in East Anglia when, over the last two months or so, lorry load after lorry load of straw has been delivered by road to Devon and Cornwall."

5.2 A great body of literature exists upon matters relating to distributional patterns and costs. To review this without advice would have been misguided. It was decided, therefore, to first take the guidance of Professor Pickard of Wye College as to the validity of this line of argument. Pickard was most scathing of the simplistic relationships constructed in the above quotation: for example, the Roskoff Ferry was in existence before the M5 and the motorway network could, he argued, have only been a small link in the decision-making chain.

5.3 Pickard presented two main lines of argument to refute the DoE thesis:

(a) Benefits to agriculture from transport "improvements" either on the micro or macro level have to be measured interms of cost savings. However, the complexity of both agricultural pricing methods and the country's transport infrastructure make it virtually impossible to break down costs into their component parts. Therefore it would be equally difficult to attribute any relative cost changes to one change in conditions such as the building of a motorway. The DoE therefore can have no statistical support for their arguments.

(b) Because the DoE have no statistical evidence, they must rely upon descriptive analysis. There has undoubtedly in recent years been a "marketing revolution" in Britain, with a dramatic growth of out-of-town wholesale depots. These have been growing at the expense of traditional markets, such as Covent Garden. The impetus behind the change of emphasis is the growth of supermarkets and their demand for standardised products. Such standardisation means that the primary function of the old markets, finding prices at which <u>all</u> quality ranges of products will be sold, becomes obsolete. The removal of this constraint means that markets were best sited in areas where land is cheap and transport accessible. Pickard believes, however, that out-of-town wholesale markets would have grown up without such a motorway network as we have today. This is not to say that motorways have not had <u>localised</u> effects on agriculture: for example, the

building of the M2 greatly simplified the problems of the Isle of Thanet and gave it a new lease of life agriculturally. However, such major influences are the exception rather than the rule.

6. THE CORRECT APPROACH TO "IMPACT ASSESSMENT"

6.1 It does on the basis of the evidence presented above seem valid to conclude that the trunk road network, as existing and planned, does not form a threat to the ability of this country to feed its population now or in the future. Also, conversely, it is unlikely that the additions planned for the network will greatly benefit the National Farm by improving channels of distribution.
THUS OVERALL IT IS ASSERTED HERE THAT THE FUTURE DEVELOPMENT OF THE TRUNK ROAD NETWORK WILL NOT AFFECT STRATEGIC AGRICULTURAL CONSIDERATIONS EITHER IN TERMS OF BENEFIT OR DISBENEFIT.

6.2 The logical extension of this argument is that the strategic agricultural consideration of extent and quality of land-take cannot expect to play a significant role in deciding whether new links should be added on to the trunk road network always provided that the network does not greatly exceed the size at present foreseen. In other words the question of agricultural land-take will not influence the decision of whether or not a new road is needed on the balance of cost and benefit.

6.3 Does this then mean that agriculture cannot play any part in the decision-making processes? Of course it can and must, but we argue that consideration of the agricultural implications of any proposed new road link should not focus upon the long-term strategic issue of extent and type of land, but examine instead the immediate issue of the economic impact of the link upon existing farming practices and pattern and that these matters should be taken into account when selecting the best route. The basic reasoning behind this contention is that if strategic gain or loss is not to be had then attention should focus upon the most immediate possible costs and benefits. This philosophy matches exactly that of the economists who devised the project appraisal framework in which highway schemes are assessed, and in which, because of the adoption of a 10% test discount rate weighs the current economic climate far more heavily than future production and consumption possibilities.

6.4 Thus we are arguing that land loss should be assessed not in terms of production potential but on the basis of current usage. In addition it would appear to be essential not just to examine the land lost to the road but also the effect on land economically attached to the lost land by being within the same farming unit. If all such land was to be counted in to the "extent of impact" measurement we should be dealing with a far greater area. Using generalised figures it is possible to gain an idea of this area; if it is supposed that on average, four farms are "affected" by each mile of major new road and that the average farm size is about 150 acres, then 600 acres of farm land are likely to be affected by one mile of motorway development. Taking a network of 3,500 miles of high class road as comprising the "network" then about 14,000 holdings comprising 2,100,000 acres will be affected in all. Looking at the problem in a more immediate way, if it is assumed that 100 miles of road are being added to the network annually, then 60,000 acres of farmland and 400 farms are being troubled by motorway development each year. This is not a suggestion which the engineering fraternity would find completely alien; we have already recorded in Chapter 2 that engineers are worried by, and pay special attention to, agricultural severance. Although their understanding of the subject seems to be minimal it should be recognised that the consideration of severance marks the acceptance of the principle that those responsible for planning new roads should take account of agricultural implications outside the fence-line. To deny any other elements of such farm disturbance would be an act of extreme arbitrariness on the part of the engineers.

6.5 In order to ascertain the total agricultural impact of any proposed scheme it would appear to be necessary to establish the likely economic impact upon each individual farm unit, the aggregation of these impacts will give the overall impact. It should be recognised and borne in mind throughout the whole of this thesis that although our argument that national impact is accurately reflected by the aggregation of all individual impacts, the individual impacts that are counted are only those which can be counted as national losses (or gains). Michael Frost (29) writes:

> ".....the procedure of valuing land as the present value of the profit to be obtained from it, may appear slightly surprising at first sight; however, it is exactly the procedure that is adopted for shares in industrial companies, business investments, etc."

However, the discussion that followed Boddington's paper to the Agricultural Economics Society, "The Evaluatinn of Agriculture in Land Planning Deceisions" (30) indicated that the analytics of such operations were not well agreed amongst active agricultural economists.

6.6 Although Boddington asserted in this paper that:

> "It is probably true to say that no attempt to include agriculture in a full-scale traditional cost-benefit analysis had been made until the establishment of the Roskill Commission on the Third London Airport."

the pioneering work of Ward and Wibberley, now nearly two decades past, should not be forgotten. In 1957 Ward (31) published a paper entitled, "The Siting of Urban Development on Agricultural Land". The paper was generally concerned with the loss of small areas of land to urbanisation and he proposed that a cost benefit analysis should be carried out comparing the reduction in net farm output on the one hand with any marginal increase in development costs, resulting from having to build elsewhere, on the other. Thus:

Let A be a site with a higher gross output in agriculture than another site B, and less expensive than B to develop for urban use.

Let C_a be the capital cost of developing site A and C_b be the capital cost of developing site B.

Then $C_b - C_a$ will give the additional capital cost of developing site B.

Let R_a be the annual value of gross output less variable costs on site A in agricultural use, and R_b be the annual value of gross output less variable costs on site B in agricultural use. Then $R_a - R_b$ will be the benefit to the community of retaining the better site in agricultural use.

Now let V be the capitalised value of $(R_a - R_b)$. Then:

If V is greater than $(C_b - C_a)$ site A should be retained in agriculture;

If V is less than $(C_b - C_a)$ site B should be retained in agriculture;

If V is equal to ($C_b - C_a$) then the choice between the 2 sites is a matter of economic indifference.

Ward applied his methodology retrospectively to 2 case studies and concluded that the sites chosen for development were the correct ones. Wibberley (30) expanded upon this work and made a case for the agricultural retention of 3,075 acres at Lymm as opposed to allowing their development as a Manchester New Town.

6.7 Thus Wibberley was prompted to write as far back as 1959 (32):

> "The type of cost benefit approach used in these two cases is of particular value in cases of alternatives in land-use planning where parts of farms, rather than the whole, are involved. The use of budgets to show the real effects of severance and pruning of an existing farm business is pertinent, for example, to proposals for new and improved roads. The effect of a new motor-way on local agriculture is not measured purely by the acreage of land taken out of cultivation. The additional effects of farm severance are important especially when alternative routes for any road are being considered. This severance aspect can be measured by these farm budgeting techniques as they record the fact that on a "per acre" basis the loss of part of a farm can be relatively more serious than the loss of the whole of it." (p100-101)

6.8 It will be seen that much of the work reported in subsequent chapters will rely for a theoretical base upon the work of Ward and Wibberley. In all fairness the author would like to emphasise that this does not mean that other techniques of analysis developed have no merit, merely that they are inappropriate in the context our study is set where the development in question is likely to require only a part of any of the farms it affects. Thus Alice Coleman's "Scope and Fringe Analysis", (28), Boddington and Wibberley's "value added" work for the Roskill Commission (30) and the agricultural zoning (33) in the Strategic Plan for the South East are all pioneering works which unfortunately do not have the correct specific focus for our purposes. It is, however, appropriate to examine briefly the controversy which surrounds the capitalisation of agricultural values.

6.9 Capitalisation

6.9.1 Discount Rate

We have discussed elsewhere (Chapter 4) the rationale behind discounting, so that here we need concern ourselves with only the selection of the appropriate rate to discount agricultural costs and benefits. Debate has, and is, raging over two sequential questions:

1. Should agricultural flows be discounted at a lower rate than other elements in particular social cost benefit exercises?

2. If so, which rate should be used?

Those arguing for a preferential rate were led by Wibberley (32) who cites two cases to back his contentions:

1. The Dutch experience in reclamation work where the selling value of reclaimed farms is roughly one half of the capital costs involved. Since reclamation is undertaken on the basis of democratic, elective decisions the inference is that Dutch society has implicitly chosen a "social" discount rate equal to one-half the market rate.

2. British experience suggests that we are also prepared to spend sums, notably on hill-farming improvement, and in other measures which can be represented as an attempt to replace food lost from urbanised acres, which are roughly double the observed agricultural market values of land taken for urban use. Wibberley asserts that this may well imply working on the basis of a social rate of discount which is one half of the market rate;

Peters (1) comments on these contentions:

> "These are potent arguments precisely because they attempt not only to make the case for the use of a low discount rate but also provide some indicator of how it might stand in relation to market rates.....Despite this, however, one is left with a certain feeling of uneasiness in that the rate of return derived from the relationship between rents and land values... is, in itself, frequently below other rates of interest and far removed from, for example, the "trial rate" employed in investment appraisal in public enterprises."

Many commentators (35) are to be heard voicing their support for preferential treatment for agriculture; most of them base their assertions on a feeling that because of the fixed supply of land such preferential treatment is warranted. However, at present it has to be recognised that the logical arguments are on the side of those <u>not</u> advocating differential treatment. Foremost amongst these arguments is the contention that <u>Social</u> discount rates are just that; <u>economic</u> considerations do not have great sway when deciding upon a suitable level for the rate; the decision must rest with those who assess what social policy we should have i.e. the government of the day. The setting of a 10% level for all factors is, therefore, the reflection of a government policy

which desires that agricultural land be treated equally in the rationing of scarce resources, either because of, or in spite of, economic arguments. It would, however, perhaps be economically sound to argue that this standard rate of 10% might be modified for different components within a particular cost-benefit analysis by the extent to which productivity is likely to grow in the future. Thus for agriculture the suitable discount rate would be 7.5%. It should, however, be recorded first, that it is necessary to apply such adjustments to all components in any project appraisal sinultaneously, secondly, that this would prove a particularly difficult (perhaps impossible) task and thirdly the Treasury would need to be persuaded of the appropriateness of the concept before it could be applied generally. Therefore although this possibility is recognised the remainder of this thesis adopts the usual 10% rate.

6.9.2 The Time Period

Many of the arguments concerning the irreplaceable nature of land forwarded in defence of a differential discount rate are far more appropriate to apply to the argument that the time period over which the capitalisation should be carried out ought to be longer for agricultural land than other elements. Indeed, it is almost generally accepted in theory that this ought to be done, although it does not happen yet in practice. However, it must be recognised that, while discounting at 10% capitalised, sums will grow very little after 30 years.

Table 10: The Present Value of £ 10 per Annum According to Discount Rate and Period (34)

Discount Period (Years)	Discount Rate (per cent)			
	1	5	10	20
10	94.7	77.2	61.4	41.9
20	180.5	124.6	85.1	48.7
30	258.1	153.7	94.2	49.8
40	328.3	171.6	97.8	49.9
50	392.0	182.6	99.1	50.0

Source: Boddington, M.A.B., "The Assessment of Agricultural Land", in Edwards and Rogers Agricultural Resources.

7. PLANNING THE SUBSEQUENT RESEARCH

7.1 Having developed these basic assumptions it was possible to outline the requirements of the rest of the research programme. The decision to measure the agricultural impact of any section of the trunk road network in terms of the aggregation of individual farm impacts meant primarily that an attempt had to be made to discover the types and extent of farm level impact of farms already built. To this end, sections of the M40 and M5 were investigated. From the results of this work which is reported in Chapters 9, 10 and 11, it was possible to draw up a methodology by which it would be possible to predict the likely agricultural impact of any new trunk road scheme.

7.2 Any work which is carried out designed either to measure or predict the agricultural impact of a new trunk road must find its roots in the discipline of agricultural economics. The use to which the tools of this discipline are put to will emerge in the body of the thesis, it is however of use to mention here issues which were thought to be of immediate relevance to the progression of the research programme.

7.3 Investigations highlighted four areas which required preliminary attention:

1. The relationship between farm size and economic performance.
2. The extent to which farm income measurements are useful as indicators of performance.
3. The factors which are likely to be most decisive in influencing levels of farm productivity.
4. Decision making and planning on the individual farm unit.

Appendix E contains the results of the relevant literature searches.

7.4 Before, however, turning our attention to the selected case-studies, the readers' attention will be drawn to the work of Rural Planning Services, which may be described as constituting the first and only attempt to apply economic theory to agricultural impact predictions in relation to roads.

Chapter 8:
The Approach of "Rural Planning Services"

1. INTRODUCTION

1.1 Our examination of both the theoretical and practical DoE/RCU approach to motorway and trunk road assessment demonstrated the lack of an agricultural input of any quality or objectivity. Either agriculture is afforded the scantiest of attention (M16) or the issues at stake are mishandled (Chelmsford). Reports of other Public Inquiries have shown that these inadequacies exist nationwide.* However, the work of M.A.B. Boddington and his consultancy Rural Planning Services (RPS) is a notable exception to this general conclusion. Boddington seems to be alone amongst practitioners in the attempt to apply analytical methods provided by agricultural economics to the problem of impact prediction. For this reason the Wolfson Group chose to work in fairly close liaison with RPS for the duration of the second half of the research programme. This arrangement was most beneficial to both sides: the Wolfson Group was able to take the most enlightened approach being practically employed and use it to formulate working hypotheses. Boddington was able, from the Wolfson Group survey conclusions, to estimate whether the method he was employing was a good predictive tool.

1.2 RPS has been involved in work upon a number of highway schemes:

(a) M25 Westerham Interchange.
An economic appraisal of the effect of the proposed interchange upon the Squerryes Estate, for J. St. A. Warde.

(b) M20 Harreitsham to Westwell Section.
An assessment of the impact of the alternative routes upon the agricultural industry and the farms in the vicinity - for the SERCU.

(c) A55 Colwyn Bay/By-Pass.
An evaluation of the agricultural cost of the Colwyn Bay By-Pass for Colwyn Bay Borough Council.

(d) M1 Kirkhamgate to Dishforth.
An agricultural economic trade-off between four alternative corridors proposed for the M1 extension, undertaken entirely as a desk study, for the NERCU.

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* For example the Beverley By-Pass Inquiry (1976): this was a NERCU scheme.

(e) A2 Canterbury By-Pass.

A cost-benefit analysis of the need for farm accommodation works, an analysis of farm severance and an agricultural economic trade-off between two alternative routes - for the SERCU.

(f) Little Hadham By-Pass.

An analysis of the impact of the proposed Little Hadham By-Pass northern alternative on the economy of Church End Farm - for R.G. Collins, Esq.

It is not possible, or desirable, here to examine in detail all these case-studies; our approach will be more selective. Firstly, the details of the A55 evidence will be explored because this represents the most explicit statement of the basic techniques Boddington has developed. Secondly, the Little Hadham By-Pass case will be described, both because it demonstrates how the "gross margin" prediction methodology operates in detail and because this author was responsible for preparing the detail of the report. Thirdly, certain aspects of the Canterbury By-Pass work will be examined because it demonstrates how Boddington was able to carry forward the theoretical and practical calculation of severance costs. (Again on this study the cases chosen for examination were worked through by this author, who also had a hand in developing the methodology employed.)

2. A55 TRUNK ROAD: NORTH WALES EXPRESSWAY

2.1 In March 1975 RPS was engaged by Colwyn Bay Borough Council to prepare evidence upon the agricultural implications of 2 routes (A and B) it was proposing as alternatives to the Welsh Office preferred route for the North Wales Expressway. RPS began work on April 1st and the Inquiry opened on May 20th: in that time over 50 farm interviews and the consequent analysis had to be carried out.

2.2 Table 8.1 demonstrates the make-up of the evidence presented by Boddington.

Table 8.1: The RPS A55 Case

Category of Evidence	Number of Paragraphs
Topography and Geology	2
Climate	3
Soils	4
Land: Classification and Loss	6
Impact on Individual Farms	34
Conclusions	3
TOTAL	52

There is no doubt then that Boddington placed far more emphasis upon what we have termed medium-term economic issues rather than the long-term strategic agricultural consequences of road construction. This, however, is not to say that degree of land loss played no part in the analytical assessment, but that it was looked at from the point of view of current usage rather than strategic potential.

2.3 Boddington enumerated five types of "effect" which a motorway can have on a farm unit:

1. direct loss of land to the road;
2. the creation of small areas of land which are no longer economically viable;
3. a range of severance problems;
4. a range of problems with water supplies and drainage;
5. temporary disturbance during road construction.

This list was, however, narrowed in two ways: first, categories (1) and (2) were held to constitute total land loss and so the same method of analysis was used for both. Secondly, categories (4) and (5) were dismissed as not being important enough to significantly influence the overall calculations. Thus, Boddington was left with land-loss and severance: these will be dealt with separately.

2.4 Land Loss

It is this aspect of the RPS A55 case which made the greatest strides forward in terms of analytics, for it is at this point that Boddington uses a novel application of gross margin analysis:

> "The road will remove a proportion of land from each farm affected. As a result farmers will probably have to reduce the size of certain enterprises. When this happens profit is not reduced pro rata with acreage since the farmer will simply save on those elements of cost which vary directly with the size of the enterprise - such things as fertilisers, seeds or animal feeds. There will be a number of costs (fixed and overhead costs) which he will not be able to reduce and these will have to be carried on on a smaller area of land or size of enterprise."

This technique he had first developed when assessing the impact of the M25 Westerham Interchange, but on nothing like the scale required here.

Having decided upon the method of analysis the mechanics of the operation itself were simple if somewhat laborious. All farms were surveyed with the intent of ascertaining their type and size. Whole farm* (as opposed to enterprise) gross margins were established for each farm. This was done by using standard average data for farms of the relevant size and type. Such data was available from three sources:

1. "Farm Business Data", University College of Wales, Aberystwyth, Dept. of Agricultural Economics, 1973-4.(1)
2. MAFF, "Farm Incomes in England and Wales, 1972-3"(2) HMSO, 1974.
3. Nix, J.S., "Farm Management Pocketbook" 6th ed. (3) Wye College, 1974.

The loss to the Net Farm Income of each unit could be calculated by multiplying the standard gross margin per acre by the acres of land to be lost to the motorway. The original Net Farm Income for any given size/type of farm could also be obtained from the standardised sources. The final level of monetary impact would have to be adjusted for the reduction in rent payable.

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* Total gross output less total variable costs.

Table 8.2: A Gross Margin Calculation of the Impact of Land Loss due to Motorway Construction.

I Current Situation of a Farm of 100 Acres

	£/annum	
Gross Receipts	10,000	£ 100/acre/annum
Variable Costs	2,000	£ 20/acre/annum
Gross Margin	8,000	£ 80/acre/annum
Rent	1,000	£ 10/acre/annum
Gross margin less rent	7,000	
Other fixed costs	4,000	
NET FARM INCOME	3,000	

II New situation after 20 acres loss

	£/annum	
Gross receipts	8,000	£ 100/acre/annum
Variable costs	1,600	£ 20/acre/annum
Gross margin	6,400	£ 80/acre/annum
Rent	800	£ 10/acre/annum
Gross margin less rent	5,600	
Other fixed costs	4,000	
NET FARM INCOME	1,600	

In this example Net Farm Income has been reduced by £ 1400. This 47% reduction was caused by a 20% land loss.

2.5 Gross margin calculations were carried out for each of the potentially affected farms, and detailed tables presented to demonstrate the differences between the two routes. Table 8.3 is extracted from the appendices in which these tables appear.

Table 8.3: RPS A55 Case-Summary of Financial Loss due to Land Loss

£/annum	Present Total Income	Potential Income Loss
Common Route (A&B)	166,119	13,391
Route A	65,372	7,196
Route B	66,872	9,793
Link Road	8,472	1,631

Thus Route A will incur a total Net Farm Income loss of £ 22,218 per annum: this 9.3% loss of income results from a 4.7% loss of land (330.86 acres). Route B would lead to a Net Farm Income loss of £ 24,815 per annum: this represents 10.3% of total income and results from a 5.7% land loss, or 366.57 acres.

2.6 Boddington then went on to examine the effect of "Farm Severance":

> "Severance may affect a farm in many different ways. If the road goes through the middle of a farm a portion of the land remaining will be isolated, to a degree, from the farm. This may involve the farmer in lengthy journeys to reach fields which were once close to hand, thus giving rise to an additional cost in travelling time, vehicle running expenses and the loss of grazing for a milking herd. These sorts of problems are most acute if the land involved is important grazing land for a dairy herd; .....Arable use of severed land is probably the least affected."

Time constraints and the lack of a precise methodology prevented Boddington from making calculations of severance impact: "A subjective evaluation has been made of this factor....." This was carried out on the basis of degree of difficulty involved in travelling to severed land:

Table 8.4: A55 Severance Impact Framework

Degree of Severance	Explanation	Symbol
Negligible	Journey to severed fields is increased by less than 1 mile	neg.
Marginal	Journey to severed fields is increased by between 1 and 2 miles or Vehicular access to certain fields becomes difficult.	*
Severe	Journey to severed fields is increased by over 2 miles.	**

Boddington himself admitted that this method of analysis is "a rather blunt instrument", because it takes no account of precise length of journey, nature of journey or the number of times the journey would have to be made each year.

2.7 It was, however, possible for Boddington to analyse more precisely one particular form of severance.

> "The most severe form of severance occurs when a part of the farm is completely cut off without access. Unless an accommodation bridge is built, or other provision made, a land-locked piece of land may be lost to the farm."

Where apparently land-locked pieces of land were encountered a separate calculation was made using the gross margin technique, on the basis that the land was lost to the farm unit forever. Route A would land-lock 254.02 acres causing an income drop of £ 16,510 (6.9%), Route B would only land-lock 154.56 acres; the income loss would be £ 9,706 or 4.02%.

2.8 The overall results of the study were presented in two different ways. First, there was a breakdown of individual farm impact. In order to aggregate loss of land and severance-impacts for each farm the income loss was given a "star-rating" similar to that found in Table 8.4 which was used to measure severance.

Table 8.5: A55 Income Loss "Star-Rating".

Level of Income Loss	Symbol
Less than 1%	neg.
1 - 10%	*
10 - 20%	**
20 - 30%	***
30% and over	****

The "star-ratings" for severance and income-loss were combined for each farm, thus giving it an overall impact assessment. This is shown in Table 8.6 which is extracted from Boddington's final summary table.

Table 8.6: Degree of Farm Impact Resulting from the Alternate Routings of A55.

Severity of Impact		Route A	Route B
With access to land-locked areas.	neg.	2	3
	*	22	19
	**	15	16
	***	7	7
	****	5	7
	TOTAL	51	52
Without access to land-locked areas.	neg.	1	2
	*	21	17
	**	10	13
	***	8	7
	****	11	13
	TOTAL	51	52

Here the guide given for interpreting the symbols reads:

* income effect should be rectified by marginal intensification over 1 or 2 years - effect similar to year-to-year variations in farm incomes;

** income effect will require considerable intensification to rectify;

*** income effect requires major reorganisation of farm business to rectify changes in farm enterprises and investment in more intensive new enterprises; farm may go out of business;

**** farm will almost certainly go out of business.

2.9 The second method of overall assessment employed by RPS was that of presenting the aggregated figures of land-loss and income loss (Table 8.7).

Table 8.7: Comparison of Routes A and B (with link road).

		Route A	Route B
Land-loss + field corners	(acres)	330,86	366.57
	(%)	4.7	5.2
	(£NFI)	22.218	24.815
	(%)	9.3	10.3
Land-locked	(acres)	254.02	154.56
	(%)	3.6	2.2
	(£NFI)	16.510	9.706
	(%)	6.9	4.02
Grade of land	2 (acres)	36.62	36.62
	(%)	11.1	10
	3 (acres)	247.54	241.34
	(%)	74.8	65.84
	4 (acres)	46.7	88.61
	(%)	14.1	24.16

2.10 Boddington's final recommendation reads:

> "Although Route B appears preferable to Route A in terms of parameters in which it scores over Route A, it is probable that Route A gives the best overall performance:
>
> - it takes less land
> - it costs less in terms of net farm income
> - it leaves a higher proportion of marginally affected farms
> - it leaves a smaller number of severely affected farms
> - it affects fewer farms altogether." (para 52.)

3. CHURCH END FARM AND THE A120 LITTLE HADHAM BY-PASS (ESSEX)

3.1 It is, perhaps, appropriate at this point to examine in more detail how the RPS gross margin predictive methodology functions. This author was asked by Boddington to use the technique in order to predict the effect of a small village by-pass upon just one farm, so that the farmer could object to the scheme: the working through of the method in detail was highly instructive. (The following paragraphs are extracted from the final report presented by RPS to the objecting farmer, Mr. Collins.)

3.2 Farm Size and Type

Church End Farm comprises 380 acres arranged in a contiguous unit along the northern side of the A120 at Little Hadham. The holding is bisected centrally by the River Ash flowing N.E.-S.W. The river is bridged at two points on Church End Farm. Mr. Collins is primarily involved in cereal andpotato production, combined with a barley-beef fattening enterprise; (i.e. the beef are, in the main, fed on barley grown on the farm.)

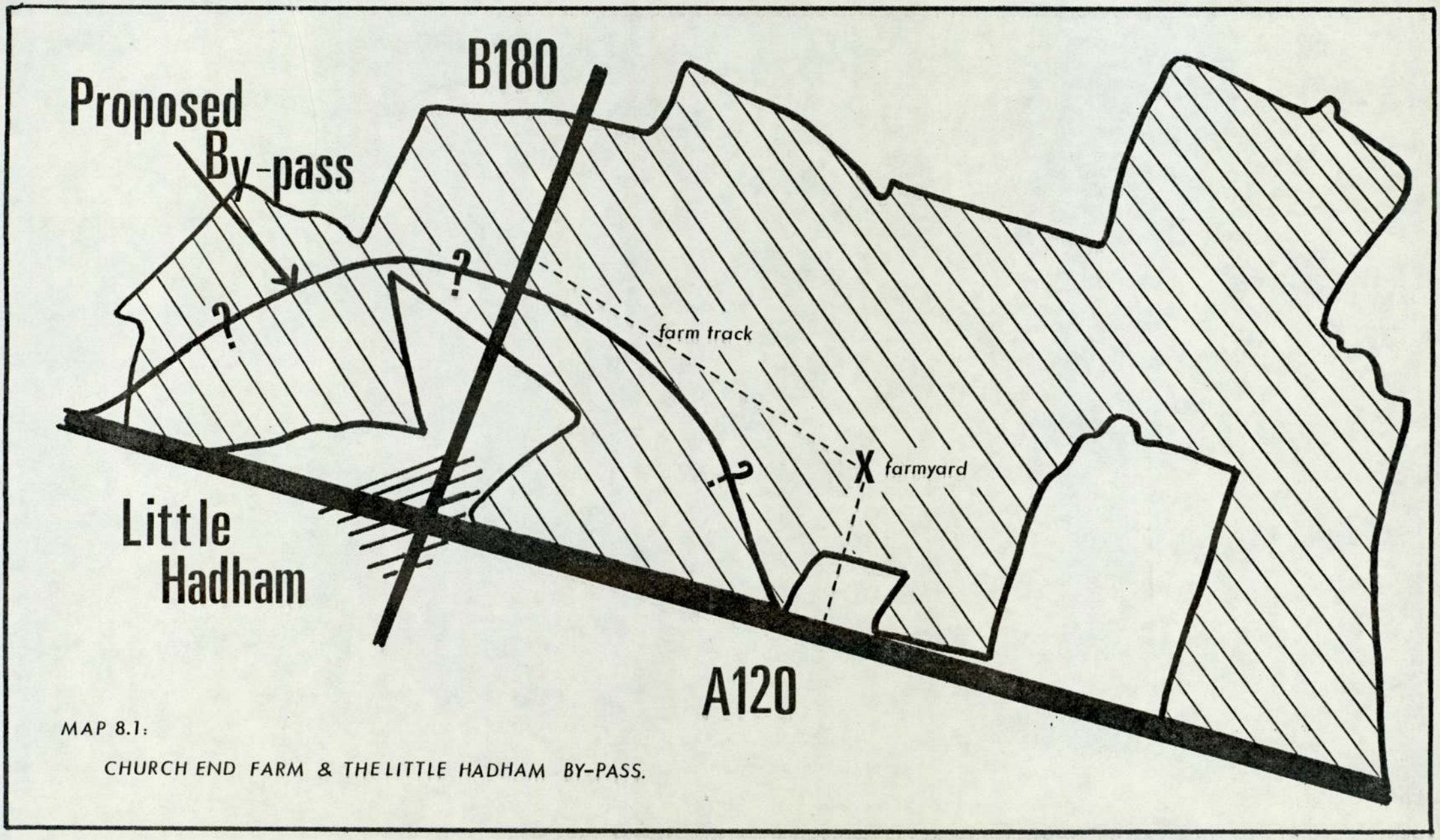
1976 was a typical year for Church End Farm:

Table 8.8: Land Use at Church End Farm 1976

Land Use	Acreage	% of Total Area
Winter Wheat	160	42
Spring Barley	116	30
Potatoes	75	20
Grassland	11	3
Buildings, roads etc.	18	5
TOTAL	380	100

The general rotation employed is two years wheat, 2 years barley, followed by a year of potatoes. The grassland is permanent pasture. The barley-beef unit usually comprises about 150 head at one time. The beasts are purchased locally at 12 weeks and 200 lbs. and sold at 12 months weighing about 5½-6 cwt, (deadweight). Apart from Mr. Collins, who manages as well as owning the farm, the labour force comprises: 3 full time regular male workers (45 hrs/wk), 2 casual, males (50 hrs/wk; 5 wks/yr), 4 casual, females (32 hrs/wk; 40 weeks/yr).

3.3 With this information the farms theoretical labour requirements can be matched against labour availability. This is done using the standard man day (smd) unit, which is defined as the amount of work which can be done in an eight hour day.



MAP 8.1:

CHURCH END FARM & THE LITTLE HADHAM BY-PASS.

Table 8.9: Farm Labour Requirements.

Crop	Acres	smd/unit	smd/requirement
W. Wheat	160	2	320
S. Barley	116	2	232
Pots.	75	15	1125
Grassland	11	0.5	5.5
Livestock	**Head**		
Beef 1 yr	150	2.5	375
		sub-total	2057.5
		Maintenance at 15% of sub-total	365
		TOTAL	2422.5

Table 8.10: Labour Availability.

	smd
Mr. Collins	250
3 men: 45 hr. x 49 weeks	826
2 men: 50 hr. x 5 weeks	62.5
2 women: 32 hr. x 40 weeks	640
TOTAL	1778.5

Thus, the labour shortfall can be seen to be 644 smd, or over 2 full-time men. This indicates that the farm is being run efficiently.

(It often proves useful to compare the physical and financial performance of a unit with regional and national averages, for similar farms. For the purposes of such comparisons, which will be made in subsequent sections, Church End Farm falls into the University of Cambridge (Dept. of Agricultural Economics) category of "Mixed Cropping" and the Ministry of Agriculture classification of "General Cropping".)

3.4 Physical Performance

3.4.1 Any assessment of a farming unit's viability must take account of physical as well as financial considerations. Two distinct skills are involved: those of the cultivator and those of the marketer. Financial measures assess both skills together; in order to split them down the physical component must be examined in isolation.

Table 8.11: Crop Yields - Church End Farm and the Regional Averages

cwt/acre	1973	[1]	1974		1975		1976	[2]
	C.E.F.	AVERAGE	C.E.F.	AVERAGE	C.E.F.	AVERAGE	C.E.F.	AVERAGE
S. Barley	37	33	33	30	35	27	33	-
W. Wheat	38	35	40	42	43	36	35	-
Potatoes:		224		238		132		-
early	109		137		112		115	
maincrop	263		289		116		115	

Notes: 1. Average of all "upland" farms in Cambridge region. (As opposed to fenland farms.)

2. Not yet published.

3.4.2 Table 8.11 demonstrates both the absolute and comparative performance of Church End Farm over the past four harvests. A number of conclusions can be drawn from the data as presented:

(a) the spring barley yields for Church End Farm have been consistently above average, fluctuating around 35 cwt/acre;

(b) the wheat performance has been slightly less impressive falling below the average in 1974, and fluctuating over a wider range: (35-43 cwt/acre);

(c) although potato returns are not directly comparable, it seems that the Church End Farm results have been around the average, or perhaps slightly above it.

OVERALL IT WOULD BE HARD TO CHALLENGE THE ASSERTION THAT CHURCH END FARM YIELDS HAVE BEEN ABOVE AVERAGE.

3.4.3 For the barley-beef, the average marketing deadweight in 1976 was 550 lbs., the beef having been bought in at an average of 210 lbs: this represents a gain of 340 lbs. or 1.94 lbs/day. The only standard information average information available for comparative purposes is somewhat outdated; this gives average liveweight gain as 2.4 lb/day. It might be concluded that the performance on Church End Farm is somewhat above average.

3.5 Economic Performance and Viability

3.5.1 An analysis of the impact upon agriculture of any planning proposal must attempt to isolate the effect of proposed development upon

the viability of the farm business. Thus it must be strongly emphasised that each farm affected by a planning proposal or alternate proposals, ought to be subjected to a full scale physical and economic analysis to test its capacity for surviving the proposal with something like its normal viability.

3.5.2 There are a great many economic indicators available to measure a farm's financial standing and a wealth of comparative data to provide regional and annual yardsticks. Tables 8.9 and 8.10 demonstrate without doubt that Church End Farm with labour availability of 1778.5 smd certainly constitutes a full-time commercial holding. It is important however, to go deeper than this and look at the actual performance of the unit and assess its viability more specifically. First, the overall measure of Net Farm Income can be derived fairly simply from farm accounts, and is designed to indicate the return to the farmer and his wife for their own labour and management and the return on "tenant-type" capital. The following table gives a comparative summary of the relevant NFI levels:

Table 8.12: Church End Farm Income Performance: Regional and National Comparisons (£'s)

	Church End Farm	Regional[1] Average	National[2] Average
1972/3	8000	6688	8998
1973/4	11000	15352	15574
1974/5	11380	12768	18995
1975/6	32000	14782	not published

Notes:
1. University of Cambridge, "Farm Management Survey" (4) (annual) - Group B "Mixed Cropping".
2. MAFF "Farm Incomes in England and Wales" (annual) - "General Cropping", 1800-2399 smd. (2)

3.5.3 Farm incomes are not remarkable for their stability: thus, we have the regional average more than doubling 1972/3 to 1973/4, but dropping back 17% in the following year and, finally, climbing back 15% in 1975/6. Such fluctuations were less marked on Church End Farm. This is surprising for it is usually expected

that an individual result would fluctuate more than the average of a series of which it forms part. This stability is also surprising when we consider that 1972/3 and 1973/4 can really be said to comprise part of the "settling-in" period for Mr. Collins at Church End Farm. Another 2 or 3 years data would be of great use; however, using the data available, it seems possible to fairly conclude that the unit promises to be a particularly healthy one.

3.5.4 The expenses of moving to a new farm do not end with the purchase of land and buildings. Each farmer has his own ideas of how an area ought to be farmed and will want to capitalise accordingly. Since moving to Little Hadham in 1971 Mr. Collins has spent over £ 68,000 on machinery, building and drainage improvements. The first two of these elements are sensitive to the size of a holding: the loss of land may lead to over-capitalisation. Drainage is sensitive to the shape and topography of fields: loss of land may mean that a field may have to be redrained, regardless of whether the existing drains are 2 months or 20 years old.

3.6 Probable Impact of the Proposed Northern By-Pass

3.6.1 Attention will focus specifically on alternate route 1, as, at the time of writing this, it seems to be the most favoured. (Map 8.1)

3.6.2 Land Loss

There are obvious difficulties here and, for that matter, throughout this sectinn, in that no exact routings or engineering details are at present available. Evidence from other road schemes, however, allows reasonably accurate assessments to be made. Reference to plans so far made available indicates that Route 1 will run nn Church End Farm for a distance of about 1¼ miles. Land take for junctions can often be fairly high; however, no possible junction designs are yet available so no estimate of likely land take at the eastern junction (part of which will be on Mr. Collins' land) can be made. Given, however, the nature of the road itself it is hypothesised that the junction will be "at grade" and of an unassuming nature, thus not greatly swelling the land take.

TO ESTIMATE THAT CHURCH END FARM WOULD LOSE ABOUT 30 ACRES IS TO SET A REALISTIC UPPER LIMIT. (It also seems reasonable to assume that none of the permanent pasture will be lost.)

3.6.3 The impact of the loss of this 30 acres must be looked at from two standpoints:

1. the potential income loss due directly to the loss of a proportion of the holding.
2. the potential costs of a part of the holding being severed from the main area of the farm and the buildings.

3.6.4 Income Loss due to Land Loss Direct

30 acres constitutes 7.9% of Church End Farm's total area; this does not, however, mean that NFI is likely to be reduced by a similar propotion. It is important to recall the distinction between fixed and variable costs; over the short and medium term it is not possible to reduce the level of fixed or overhead costs. Thus, only variable costs can be reduced to adjust any land loss and subsequent lost output. The measure of gross output less variable costs is known as the gross margin. It is a well tried and tested measure in farm business accounting, usually being applied to individual enterprises, but also being employed on a "whole-farm" basis.

The gross margins for enterprises on Church End Farm can be calculated from figures supplied by Mr. Collins.

Table 8.13: Gross Margins, Church End Farm, 1976

£'s	Acres	Gross Output	Variable Cost	Gross Margin/acre
Barley	116	13,500	3,145	89
Wheat	160	21,000	4,794	101
Potatoes	75	53,750	15,853	505
Beef	150 (hd)	55,667	35,096	137 per head

Such gross margin figures indicate that for every acre of barley lost NFI will be reduced by £ 89. Similar statements may be made for other enterprises. Using such data it is possible to hypothesise about the income losses likely to stem from the loss of 30 acres from Church End Farm. (N.B. the beef are fattened indoors in an intensive unit and so are independent of the acreage of grassland.) Naturally, there are two extremes: if the potato acreage were to be reduced by 30 the potential loss would be £ (30 x 505) or £ 15,150 in one year. Alternatively, if 30 acres of barley were forfeited the loss would be £ (30 x 89) or

£ 2,670. It is possible to be more precise than simply giving this wide range. Given the constraints and importance of regular rotation, it seems reasonable to make the assumption that the crops will be reduced in rough proportion to the quantity at present grown. (It also seems reasonable to use the average gross margin over the past four years for potatoes in order to remove the effect of the recent high prices gained for the crops.) Thus the total potential loss for one year equals:

	Gross Margin	Acres Lost	Income Loss
Barley	89	9.5	846
Wheat	101	14.0	1414
Potatoes	339	6.5	2204
	TOTAL	30	4464

Regarding beef loss potential, Mr. Collins will either buy in more feed or cut back on head fattened, because of the reduced barley acreage. The second situation is more easily dealt with: if 9.5 acres of barley are lost this will constitute about 8% of the total barley acreage. Thus it is likely that 8% of the herd will not be replaced; this is 12 head. The gross margin per head in 1976 was £ 137, so that potential income loss is £ 1,644.

Thus, we can calculate the possible total income loss at £ 4,464 plus £ 1,644, or £ 6,108 for one year. This amounts to 19% of the very high income level in 1975/76, and 54% of income in 1974/5. (Over 50 years at 10%, this sum capitalises at about £ 61,000.)

3.6.5 Severance Costs

Estimates indicate that about 60 acres of the Unit (15.7%) will be separated from the farm buildings and the main area of the farm. Severance can affect farms in a number of different ways, different units generate individual problems. Many of these costs cannot be quantified and so any overall assessment of severance must always be an admixture of the subjective and the objective. The severed 60 acres on Church End Farm will be divided into four parcels, 2 of about 24 acres and 2 of about 6 acres. The problems, however, do not end with these areas (or awkward parcels of land are also

left on the "farm-side" of the proposed by-pass.) Overall two conclusions upon potential severance on Church End Farm are of use: (a) the actual direct economic costs of extra travel and work time are likely to be very low but (b) the farm planning will be greatly inconvenienced because of the size and shape of fields that will remain. Thus for example the rotation will be upset and the planning of daily work become more difficult. ADMINISTRATIVE INCONVENIENCE WILL BE HIGH.

3.6.7 Overall Impact of Route 1

1. The probable income loss will be of significance in the economy of the farm.
2. Inconvenience due to severance will be very high even if direct costs are fairly low.

3.7 The Probable Impact of other "Northern" Routes

3.7.1 Table 8.14: A Comparison of Route 1 with the probable Impact of Routes 2A, 2B, 3, 4

Route	Land Loss Area	%	Income Loss	Land Severed (Acres)	Degree of Severance[a]	Overall Impact
2A	30	7.9	4,464	50	0	0
2B	18	4.7	2,678	38	0	-
3	25	6.6	3,720	25	0	-
4	9	2.4	1,339	8	--	---

Note: a. + impact worse than route 1
- impact less than route 1
0 impact same as route 1

3.7.2 Table 8.14 summarises the situation as regards the other four "northern" routes. The table has no great claim to complete accuracy, but where it is most useful is in its comparative nature. Overall impact is assessed through the aggregation of the two elements of land/income loss and severance costs. Income loss is calculated proportionally from the results obtained for route 1. The severance impact was also assessed in the same subjective way as for Route 1.

3.7.3. Thus, if we were to rank the alternatives in order of preference for Mr. Collins (assuming any road is to be built) then undoubtedly the route that would have least affect is number 4; this would be followed by 2B and then 3 with 1 and 2A equal last causing most "harm".

3.7.4 The situation is then one of balancing agricultural losses against the demands of other sectors. Route 4 will cause most damage to the village itself and is unlikely to gain great general support. It must, however, be recognised that although 2B follows 4 on our ordinal ranking 2B is a much more inferior choice agriculturally. In other words the gap between 4 and 2B is much greater than that between 2B and 3 or even 3 and 1/2A.

4. SEVERANCE

4.1 For both the A55 and the Little Hadham By-Pass the agricultural impact analysis carried out was a mixture of analytical and descriptive techniques. The descriptive techniques were mainly applied to the assessment of agricultural severance. It was felt by both Boddington and this author that a methodology could be developed which would be capable of removing much of this descriptive element. Efforts were therefore combined in order to achieve this. Much of the theoretical basis of the work was developed from findings of the M40 study which was underway concurrently and which is reported in chapters 9 and 10. It is, perhaps, also useful to remind ourselves of the important point, which runs through much of this thesis, that although we will be examining severance costs on individual farms we will only be counting those costs which accrue to the nation. Therefore the aggregation of the individual farm will measure the overall loss to the "National Farm".

4.2 Severance can be very simply defined: it occurs when part of a farm holding is separated by the road development from the farm buildings and the rest of the land. A range of different types of severance can be distinguished.

(a) land severed but farm has own access via bridge or underpass;

(b) land severed but farm has use of shared access (either with another farm/s or with a public footpath or bridleway);

(c) land severed with access only available along the public highway network;

(d) land severed and land-locked (i.e. access to land is only available if land belonging to somebody else is crossed);

(e) field corners made unviable because of small size;

(f) replacement land may be purchased some way from the main holding.

4.3 Various costs can be isolated which accrue directly from severance:

(a) extra travel distance for men, machines and animals to reach the severed land;

(b) the loss of production from land that becomes either unviable or inaccessible;

(c) costs associated with the need to rearrange the farm system, because some fields become too small or irregularly shaped for certain enterprises;

(d) expenses incurred due to the need to licence drivers and vehicles to use public roads.

4.4 Of these costs (d) can usually be ignored because of its relatively insignificant nature in most cases; (b) can be treated as land loss and so dealt with by the same method as that employed to assess the importance of the direct land loss; similarly, with (c) such system changes can be looked upon as part of the overall readjustment and thus analysed along with the overall farm readjustment. This leaves (a) as the only substantial cost unique to the effects of severance. Thus, the basic premise was developed that severance costs can be directly equated with such extra travel costs. It was in this area that both Boddington and the Wolfson Group decided to focus methodological effort.

4.5 The question was then how to quantify these travel costs in monetary terms. The three basic variables to be accounted for are:

1. the amount of land severed;
2. the extra round trip distance to the land;
3. the number of trips per acre needed to husband the land.

Boddington undertook the task of assessing for most crops and animal systems how many trips per acre would be needed over a year. For arable land this was done on the basis of aggregating the various trips for different operations carried out. The results are shown in Table 8.15.

Table 8.15: Round Trip Requirements for Major Crops

Crop	Return Trips Per Acre
Salad onions	100
Hops (machine picked)	70
Beetroot, lettuce, peas (for market-green)	30
Dessert apples, pears	25
Cooking apples, plums, other top fruit	20
Brussel sprouts, cabbages, cauliflowers	20
Sugar Beet	11
Carrots	10
Maincrop potatoes	9.7
First year grass cut for silage	8.3
Subsequent year grass cut for silage	7.9
Early potatoes	5.9
Maize for silage	5.3
Vining peas	3.5
First year grass cut for hay	2.9
Spring cereals	2.5
Winter cereals	2.4
Subsequent year grass cut for hay	2.4
Field beans (spring)	1.9
Field beans (winter)	1.8
Kale (not cut or grazed), oil seed rape (spring)	1.3
Oil seed rape (winter), first year ley (not cut or grazed)	1.1

Source: Leat, P. and Boddington, M.A.B. "Guide to Farm Severance by Motorways", R.P.S. Internal Working Paper, 1976 (5).

For animal systems a slightly different method of analysis was used because it was necessary to take account of the degree which particular sized paddocks could be grazed. For example:

"Dairy Cows

A one acre paddock will support the average sized herd of 40 dairy cows for 1-3 days, with 3-6 weeks regrowth during the main grass growing season. If it is assumed that one acre provides one day's grazing a month, there will be seven days grazing per season (April to October inclusive). A 10 acre field on a paddock system might be expected to give 70 days grazing a year. With two return trips to the field each day there would thus be 140 return trips a year required, or 14 per acre, to move stock to and from the farmstead."

Table 8.16 summarises the conclusions for animal enterprises.

Table 8.16: Round-trip requirements for the Major Animal Systems

Enterprise	System	Return Trips/ Acre/annum	Notes
Dairy cows	Extensive	10	on foot
	Paddock	15	on foot
	Strip	20	on foot
Beef cows	Extensive, inwintered	3)	
	Paddock, inwintered	4.5)	
	Extensive,outwintered	6)	
	Paddock, inwintered	13.1)	most trips
		)	would be
Store cattle	Extensive, inwintered	3)	made by
	Paddock, inwintered	5)	vehicle
	Extensive,outwintered	6)	but some
	Paddock, outwintered	13)	would be
		)	with
Sheep (ewes)	Extensive, inwintered	5)	animals
	Forward	)	on foot
	creep,inwintered	10)	
	Extensive,outwintered	8)	
	Forward		
	creep,outwintered	15)	

Source: Leat, P., and Boddington, MA.B., "Guide to Farm Severance by Motorways", R.P.S. Internal Working Paper, 1976. (5)

4.6 Having this information it was then possible to draw up a range of possible severance costs. This was done by this author: the results are shown in Tables 8.17 and 8.18. The assumptions and sources of information are given with each table.

The major conclusions to emerge from these tables are:

(a) severance costs for arable farmers are unlikely to be high except in extreme circumstances;

(b) severance costs for dairy farmers are likely to be much higher at all distances;

(c) if the costs accruing annually were to be discounted in perpetuity at 10% it can be seen, given the average cost of an accommodation bridge or underpass is about £ 70,000, that only for dairy farms with very severe severance problems could it be justifiable to provide such an access facility.

Table 8.17: Extra Travel Time to Severed Arable Land and the Related Costs

Extra round-trip distance (miles)	Approx travell time (mins)[1]	Aggregate Time and Cost Involved	Spring/Winter Cereals[2] (Acreage severed)			Maincrop Potatoes[3] (Acreage severed)		Lettuce[4] (Acreage severed)	
			50	100	150	10	30	10	20
1	15	Time (hours per annum)	31	62	93	24	72	75	150
		Cost (£/per annum)[5]	78	155	233	60	180	188	375
5	38	Time	79	158	237	61	183	190	380
		Cost	198	395	593	153	458	475	950
10	67	Time	140	279	419	108	324	335	670
		Cost	350	698	1048	270	810	838	1675

Assumptions and Sources

1. Average travel speed taken from our empirical evidence: Speed for 1 mile - 4 mph. Speed for 2 miles - 5 mph. " " 3 " - 6 mph. " " 4 miles - 7 mph. " " 5 " - 8 mph. " " 6 miles - 8.5 mph. " " 7 " - 9 mph
2. 2.5 round trips/acre/annum.
3. 9.7 round trips/acre/annum.
4. 30.0 round trips/acre/annum.
5. (a) Labour costs: overtime rate £ 1.29/hour (Nix. J., "Farm Management Pocketbook-Seventh Edition", Wye College, 1976.) (3)
   (b) Tractor costs: £ 1.26/hour
   (c) Overall costs rounded off at: £ 2.50/hour, i.e. it is assumed all work is carried out by one man and tractor.

Table 8.18: Travel Time to Severed Pasture (Used for Grazing Dairy Cows) and the Related Costs

Extra round trip (miles)	Time (1) (mins)	Aggregate Time and Cost Involved	Extensive Grazing (10 trips per acre per annum) Acreage severed				Paddock Grazing (15 trips per acre per annum) Acreage severed				Strip Grazing (20 trips per acre per annum) Acreage severed			
			10	30	50	70	10	30	50	70	10	30	50	70
1	40	Time(hours)	67	200	333	467	100	300	500	700	133	400	667	933
		Cost (2) (£s per year)	172	516	859	1205	258	774	1290	1806	343	1032	1721	2407
2	80	Time	134	400	666	934	200	600	1000	1400	266	800	1334	1866
		Cost	346	1032	1718	2410	516	1548	2580	3612	686	2064	3442	4814
3	120	Time	201	600	999	1400	300	900	1500	2100	400	1200	2001	2799
		Cost	519	1548	2577	3612	374	2322	3870	5418	1032	3096	5163	7221

Assumptions: 1. Walking time - 1½ mph taken as a standard average speed to walk animals.

2. Labour costs - 2 men at overtime rate i.e. a total of £ 2.58 per hour.

(These costs, of course, only accrue from increased travel and do not include lost yield due to either energy lost in walking or lost grazing time.)

5. THE A2 CANTERBURY BY-PASS

5.1 Having devised this technique which it was thought would be capable of identifying and measuring the costs of severance on an individual farm, it was then necessary to test the "model". RPS was commissioned by SERCU, at the time this severance work was being carried out, to prepare evidence with regard to agricultural objections that were likely to be raised over the proposed Canterbury By-Pass. Much of Boddington's work focussed upon comparing the chosen route (B on the Consultation Document) with that further away from the city (Route C) as this was much favoured by potential objectors. This involved the calculation of the impact of the proposed routes upon all individually affected farms; such calculations naturally included an assessment of severance impact. In order to demonstrate the method of calculation of severance costs we have mainly extracted one farm's case study from the number that were carried out. (The work on the particular case was carried out by this author.)

5.2 In order to place this scheme in context, however, it is perhaps useful to have to hand a few background details. The SERCU chosen route was 4.7 miles in length, passing to the south of Canterbury. It formed an important and integral part of a series of road improvement schemes along the A2 from the end of the M4 at Boughton to Dover and, as such connected directly into the recently completed Harbledown and Bridge By-Passes, which therefore formed the start and finish points of the by-pass. Two other alternative routes had been considered at the Public Consultation stage (1973/4): one had been closer to the city and one further away.

Table 8.19: The Quantity (Acres) and Quality of Agricultural Land along Routes B and C

	Route B	Route C
Total Land take	106.2	125.3
Grade 1	38.0	27.1
Grade 2	59.9	82.9
Grade 1 + 2	97.9	110.0

5.3 Boddington estimated that the total annual severance costs on Route B would be £ 18,900 whilst those on Route C would be £ 14,300.

Table 8.20 shows the distribution of these losses.

Table 8.20: Costs Associated with Severance on the Canterbury By-Pass

	Number of Farms	
Annual Costs	Route B	Route C
No severance	4	4
Less than £ 100	2	1
£ 100 - £ 999	3	5
£ 1000 +	3	1

The overall severance costs were arrived at by aggregating the losses likely to occur on the individual farms. In order to demonstrate the method one of the case studies will now be described in detail.

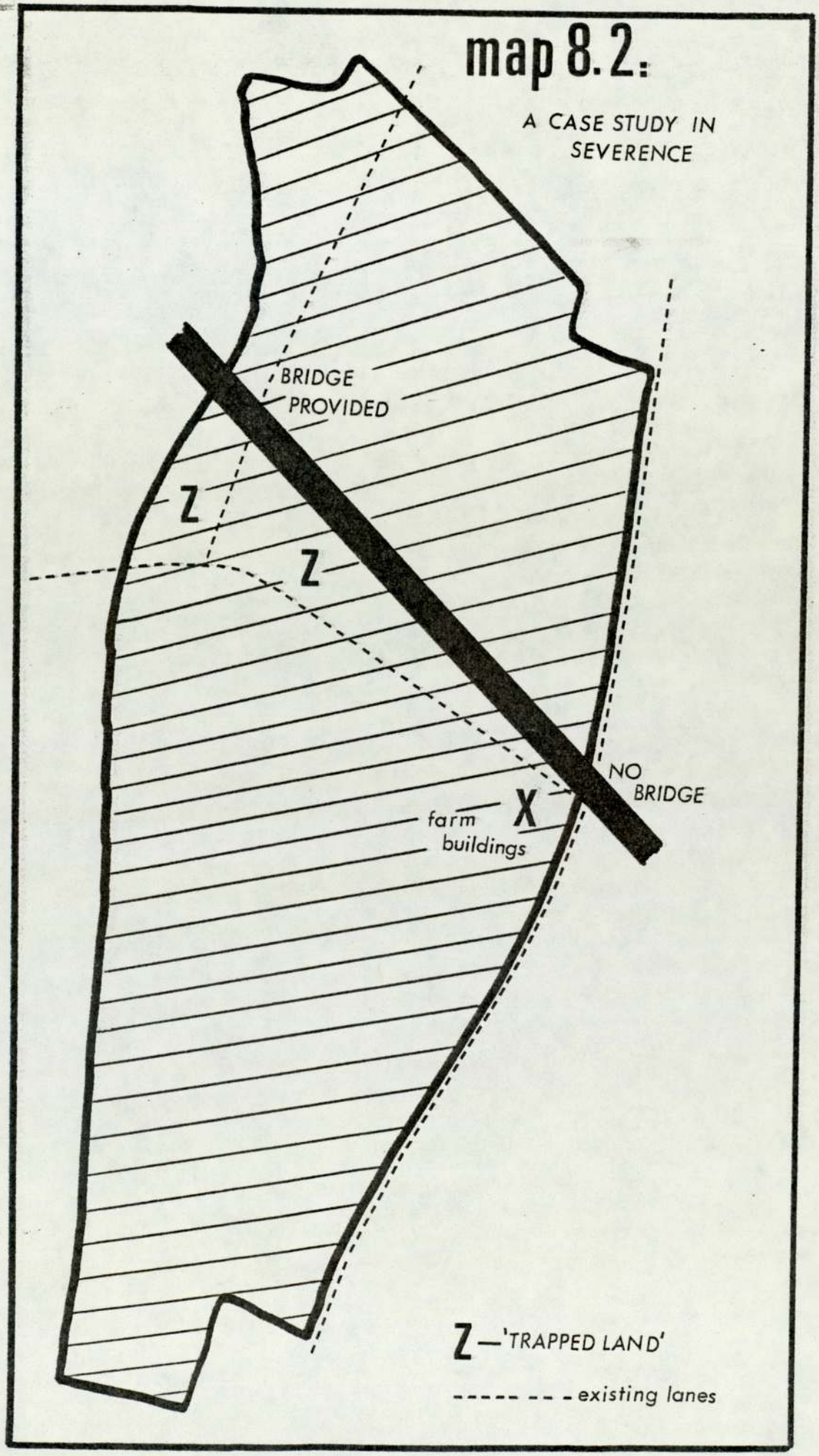
5.4 A Case Study of Severance

5.4.1 Map 8.2 shows this farm in relation to the SERCU proposed route. The two main problems are, first the extent of land severed to the north of the by-pass and, second, the area of land between the by-pass and the existing lane. This latter area will become awkwardly shaped and difficult to work. The farm at present is 404.3 acres: if Route B is constructed 13.3 acres will be lost. This comprises 3.3% of the farm. In addition 138 acres would be severed from the farm buildings to the north of the by-pass. 15.9 acres will be "trapped" between the by-pass and the existing lane. At present this is partially in grass and partially put down to wheat.

5.4.2 It was decided to investigate three possible levels of severance costs:

(a) that the present farm system be kept in operation and the local lanes be used for access;
(b) that the whole of the 15.9 "trapped" acres be put down to grass and the wheat moved to the north of the by-pass;
(c) that buildings are erected to the north of the by-pass to house the beasts which need to graze there, to obviate the need to "walk" them.

It will be noticed that none of these alternatives include the possibility of the farm having a special agricultural access bridge, for if there is economic justification for such a bridge then it will


map 8.2.
A CASE STUDY IN SEVERENCE
BRIDGE PROVIDED
Z
Z
NO BRIDGE
farm buildings
X
Z—'TRAPPED LAND'
----- -- - existing lanes

show up in the calculations performed for these three alternative shcemes. In other words the severance costs the farmer will incur will have to amount to more than the cost of the bridge (or underpass).

5.4.3 Alternative "a"

Severance costs are calculated for each crop in turn.

(a) Grassland

Area lost to by-pass: 4.76 acres.
Area "trapped" between by-pass and lane: 4.0 acres.
Maximum total area to north of by-pass at any time in the year: 32 acres (rotates with cereals).

Extra travel distance (average): 0.5 mile on the round trip. 3 trips per acre per annum required.

$\therefore$ maximum total extra annual travel distance = $\frac{32 \times 3}{2}$ = 48 miles

Assuming all trips are made walking with the animals at an average speed of 1.5 mph, then the total time involved is 32 hours per man employed. Assuming 2 men are required to walk beef cows along the public road and that the overtime rate of £ 1.14½p./hour is paid the maximum total costs involved would be £ 73.3 (per annum).

(b) Orchards

71.5 acres to north of the by-pass.

25 trips per acre per annum required.

0.5 mile average extra distance on round trip.

$\therefore$ Total extra distance = 893.7 miles.

Assuming tractor speed at 3mph, total time spent = 268 hours
Average cost of tractor + one man = £ 2 per hour.

$\therefore$ Total Cost = £ 536(per annum)

(c) Cereals

140 acres grown each year.
Area lost to by-pass 10.55 acres.
Area "trapped" 11.9 acres.
Maximum area of crop to north of by-pass: 32 acres.
Extra travel distance on round trip: 0.5 mile.

2.5 trips per acre required.

∴ Total extra distance = 40 miles.

Assuming tractor speed of 3 mph: total time = 13.3 hours.

Assuming tractor + one man cost £ 2 per hour:

Total cost = £ 26.6 per annum

(It should be noted at this point that although costs have been grossed up for both 32 acres of wheat and 32 acres of grass these two crops are rotated and only 32 acres is available in total on the severed land for them. Averaging out the two total costs indicates a figure of £ 49.9 per annum for severance of this area of 32 acres.)

(d) Hops

23.9 acres at 70 trips per acre over 0.5 miles.

Total distance = 836.5 miles.

At 3 mph total time = 279 hours.

At £ 2 per hour for tractor + man total annual costs = £ 558.

(e) Sprouts

10 acres at 20 trips over 0.5 mile = 100 miles.

At 3 mph and £ 2 per hour total annual costs = £ 66.6.

(f) Rhubarb

0.75 acre at 20 trips over 0.5 miles = 7.5 miles.

At 3 mph and £ 2 per hour total annual costs = £ 5.

∴ OVERALL COSTS (after averaging cereal/grass costs) = £ 1,215.5

It seems reasonable to add in an extra element for maintenance: at 15% of total costs this equals £ 182.2.

∴ TOTAL COSTS = £ 1,397.7

Discounted at 10% over infinity this gives a NPV of about £ 14,000. Such a level of cost would certainly not justify the construction of any agricultural access, for which the minimum cost would be at least £ 70,000.

5.4.4 Alternative "b"

(This assumes that the whole of the 15.9 acres of "trapped" land is given over to grass and the cereal is moved north, onto the severed land.)

(i) Maximum area of grass north of the by-pass would be reduced to (32 - 11.9), 20.1 acres. The severance costs on this land would be £ 46. This represents a saving of £ 27.3.

(ii) Maximum area of cereals to the north of the by-pass would be increased to (32 + 11.9), 43.9 acres. The severance costs for this area would be £ 36.5 per annum an increase of £ 9.9.

Again, bearing in mind the constraint that a maximum of 32 acres is available for both these crops on the northern side of the by-pass it is necessary to average the total costs so far derived: this gives £ 41.3, and so the level of severance costs would be reduced by nnly (£ 49.9 - 41.3), £ 8.6 per annum. Discounted at 10% over infinity this gives a capital sum of £ 86. This low level of cost saving demonstrates without doubt that it would not be worthwhile in rearranging the farm system in this way. The costs of the rearrangement operations would be far greater than the savings.

5.4.5 Alternative "c"

(This involves erecting buildings on the severed land so that the animals which grazed there would not have to walk from one side of the by-pass to the other.)

The key question here is can buildings be erected to house the appropriate number of animals for less than £ 733, which is the cost of severance of 32 acres of grassland discounted at 10% over infinity.

Present stocking density:

58 beef cows = 58 x 0.8 GLU* = 46.4 GLU
64 beef cows kept for four months = 64 x 0.8 x 0.33 = 16.9 GLU
52 beef cows kept for four months = 52 x 0.8 x 0.33 = 13.7 GLU
150 calves kept for four months -
average age 9 months = 150 x 0.4 x 0.33 = 19.8 GLU
Total = 96.8 GLU

Total number of forage acres = 141.5
∴ Stocking density 1.46 GLU per forage acre.

* GLU = Grazing Livestock Unit.

If this stocking density were to be maintained upon the 32 severed acres then it would be necessary to keep $(\frac{32}{1.46})$ GLU on the land. This represents 22.92 GLU or 15% of the total herd size; 56 beef calves are the equivalent of 22.4 GLU, therefore the grassland on the severed side of the farm would support this number of animals.

Nix gives figures of £ 30-£ 45 per head to house beef cattle in a building. Thus, to house 56 such beasts would cost at least £ (56x30), £ 1,680. This is a much higher cost than than involved in walking the beast to the severed land when required, and so such expenditure (either by Government or farmer) could not be economically justified. To put the matter another way in order to stay below the £733 limit of the discounted severance costs it would be possible to house at most $\frac{733}{30}$ 24 beef calves. To do so would be to grossly under use the available grassland.

5.4.6 Summing upon the three alternatives, it may be said that there appears to be no economic incentive either to the SERCU, to build an agricultural access, or to the farmer to rearrange the farm system. Nonetheless it should be recognised that annual severance costs of about £ 1,500 are a substantial burden to place upon the farmer and through him the nation.

5.5 Discussion of Canterbury Analysis

5.5.1 It is possible to predict the travel costs likely to be incurred by any particular individual farm providing data is available about crop types and access routes.

5.5.2 The willingness of SERCU to work with such data demonstrates that, if all the underlying assumptions are made known, the technique employed is both comprehensible to those responsible for planning highways, and compatible with other elements in the project appraisal.

5.5.3 Using travel costs as a surrogate for severance costs seems justifiable on the basis that other elements can be accounted for under other headings of disturbance. The area of farmland around Canterbury offers a chance to investigate the upper limits of possible severance costs. The land is of unusually high quality and, in consequence, is very intensively farmed. Specialist crops include hops and fruit, both of which make high demands upon a farmer's time. Table 6.15 shows that a high number of trips per acre are needed to husband both these enterprises. It is interesting then to examine both the overall and individual severance costings. Table 6.20 shows the magnitude of the severance costs as compared with income loss consequent on land loss.

Table 6.20: Summary Impact of Annual Costs (£)

	Route B	Route C
Direct land loss[1]	28,363	31,756
Field Corners[1]	4,285	7,098
Advance CPO[2]	1,755	-
Severance	18,900	14,337
TOTAL	53,303	53,191
Severance as % of total	35.5	27.0

Notes: 1. As calculated by gross margin technique.

2. Land needed for construction but will be handed back to agriculture eventually.

It would seem on the basis of these figures, to be feasible to set an upper limit of severance costs as comprising a third of the total costs.

5.5.4 Regarding individual farms and the allocation of agricultural accesses a very important conclusion emerged. Our theoretical calculations of likely severance costs indicated that for cropping farms (Table 8.17) these costs were unlikely to rise to significant levels except in extreme circumstances. The evidence of the Canterbury case-studies indicates that this hypothesis is not unfounded. The extent of physical severance on the reported Case Study was not insignificant yet the capitalised costs associated with it came nowhere near justifying access provision. In only two cases did the economic calculation of severance justify the expenditure necessary to build an agricultural overbridge. Even then in one case the justification was marginal, even though it would have been difficult to envisage a much more physically damaging case of severance. This evidence strongly supports the contention that in virtually all cases on arable, cropping units there will not be justification for such provision.

6. A DISCUSSION OF THE GROSS MARGIN TECHNIQUE OF IMPACT APPRAISAL

At this point it is appropriate to make some remarks upon the use of gross margin analysis in this context.

6.1 This type of analysis is essentially static; the calculations used refer only to a two year period spanning the time immediately before and after the taking of land for road construction. No attempt is made to predict the effect on farm units any further into the future. It is fairly certain that in the medium and long term farms will be able to adjust the level of fixed costs, thereby invalidating the gross margin approach, at least partially.

6.2 Boddington himself admits that:

> "In many circumstances losses can be assumed to be overstated. This is because:
>
> whole-farm (on a per acre basis) gross margins have been used as a measure of loss; with the loss of an area of land it may be assumed that a farmer will cut back on his least profitable enterprise first, thus reducing his net farm income by less than the average gross margin;"

6.3 Given the usual variation in net farm income (Appendix E) it is extremely unlikely that the gross margin analysis will be able to predict the actual level of farm income post-road construction. This does not, however, preclude the technique from predicting the degree of income reduction due directly to the road; that this reduction is masked by fluctuations from other sources should not deny the existence of the reduction.

6.4 By definition such gross margin analysis is applicable to only marginal changes. It is likely that degree of farm impact will increase with extent of land loss and that the greatest degree of impact will be associated with the necessity for farm system changes.

6.5 The use of average data raises a most important point. Two quotes from the RPS A55 evidence sum up the dilemma:

> "....it is not the function of this proof to say what level of performance is being achieved by a particular manager on that land."
>
> ".....5 farms will almost certainly go out of business."

The first of these statements was made in defence of the use of average data instead of actual farm statistics: the second formed part of the conclusion. They most certainly seem in conflict: it cannot be held that a farm will be made unviable when no attempt has been made to assess its actual financial position. The real justification for using standardised data must lie in the inability of Boddington due to resource constraints to obtain the actual data from individual farms. Then the second statement could be justifiably modified by the prefix "....given a fairly average performance.....".

6.6 The analysis highlights, very precisely, the major problem associated with the aggregation of individual impacts. This is that the "averaging-out" process tends to mask the real problem areas. Referring back to the A55 evidence it can be seen that in terms of land-loss (excluding land-locked areas), for Route B is higher than that for Route A, nevertheless it reaches only 5.2%. This gives rise to an income loss of 10.3% - this infers that the total impact is just shading above "marginal". It may be asked what the decision-makers can learn from this. The

conclusion that must be drawn here is that such aggregative evidence must be supported by a categorisation of the number of farms suffering different levels of impact. That Boddington did this must be one of the most notable (and useful) aspects of the work.

6.7 Finally, it may be said of this methodology that although much criticism has been levelled against it in the preceding paragraphs, it constitutes a major break-through in the assessment of the impact of major new roads upon agriculture. That there are opportunities for criticism is not surprising given, first, that time pressures were fiercesome whilst the method was being developed and the evidence being written and, second, there was no empirical evidence whatsoever upon which to assess the method.

7. DISCUSSION OF RURAL PLANNING SERVICES WORK

7.1 There is little doubt as to the value of Boddington's work at RPS; three major advances can be isolated:

(a) assessment was based upon whole farm impact rather than simply the land lost.

(b) the tools of agricultural economics were employed in the assessment.

(c) the assessment was based upon existing production patterns rather than the production potential of the affected land.

7.2 The techniques of prediction of an actual route are theoretical and logically sound, however, they are not based upon any empirical evidence gathered from farms which have lost land to motorway development. Such an empirical study was the most urgent requirement, if the prediction of agricultural impact was to progress any further.

7.3 In particular it is necessary to examine:

(a) whether land loss and severance comprise the only substantial elements of impact;

(b) whether it is possible to place a precise quantification upon the effect of severance;

(c) whether this severance cost added to a gross margin calculation of the income effect of land loss accurately predicts the reduction in income due to a motorway.

7.4 Of the cases we have presented here two have reached the stage of decision taking. Essex C.C. has decided not to go ahead with its plan to build the A120 Little Hadham By-Pass through Church End Farm, but to look instead at alternate routes. At the time of finally drafting this Chapter (October 1977) the Secretaries of State for the Environment and Transport announced that they agreed with the Canterbury Inspector who recommended that the published route (B) should be constructed. More important for our purposes, however, is the fact that the Inspector in his Report accepted both the methodology presented in the RPS agricultural evidence and the conclusions he drew. Specially, he recommended that the two farms which Boddington calculated should have access accommodation, should be so provided. The Secretaries of State concurred.

7.5 Finally, it is important to recognise that the very fact that SERCU (at Canterbury) felt obliged to call on additional agricultural expertise in the form of RPS, must be an indication that they were unhappy with the MAFF input.

part IV:

the development of a new predictive methodology.

Chapter 9:

Measurement of the Agricultural Impact of the M40 (Stokenchurch-Waterstock section): Background and Methodology.

1. INTRODUCTION

The case was made in Chapter 7 that the true agricultural cost of a proposed highway scheme should be measured in terms of an aggregation of the economic impacts on each individual farm. The technique developed by Boddington for use on the A55 North Wales Expressway indicated the type of analysis that might be used: this was developed in subsequent work undertaken by Rural Planning Services. In the previous Chapter we examined the work of RPS in order to dissect the technique being used. A number of criticisms emerged whilst handling both reports of RPS work and the procedure itself and it became obvious that the most urgent requirement for the development of a more sophisticated predictive methodology was that "post hoc" studies be carried out in order to determine the actual effect of a major highway. Until this was done any methodology would be inevitably based upon supposition rather than empirical findings. Thus, it was decided to carry out a survey of the M40 (Stokenchurch-Waterstock section).

2. OBJECTIVES OF THE STUDY

2.1 To examine the method of agricultural appraisal used by the promoting authority (Oxfordshire C.C.).

2.2 To test whether the appraisal technique used by Boddington and RPS gives a true reflection of the actual impact of a major new highway.

2.3 To collect data upon the nature and extent of types of impact which will enable a more accurate appraisal technique to be developed.

3. SELECTION OF THE HIGHWAY FOR INVESTIGATION

It was decided that the M40 (Stokenchurch-Waterstock section) would be investigated. The reasons for this were:

(a) a good initial contact existed with both the local NFU and the farmers in question;
(b) the nearby office facilities at RPS;
(c) the farms were of a mixed variety;
(d) the scheme was sufficiently recent both to reflect current practice and also to be fresh in the mind of all concerned, but construction started long enough ago for there to be sufficient "after the event" time-

series available for analysis.

4. THE ROUTING DECISION

4.1 This 9.5 mile section of M40 was opened in 1974. A more important date than this, however, is February 1972 when construction began and the farmers lost their land. The dual 3 lane road was originally promoted by Oxfordshire C.C. whose engineers were responsible for choosing the "best" route; however, after construction responsibility was handed over to the ERCU. Thus an initial problem we encountered was that the official records had been moved from Oxford to Bedford, although the mental recollections had remained at Oxford. It was necessary, therefore, to carry out an "in depth" interview with the engineers from the County Council who were involved with the route selection for this motorway section.

4.2 The engineers from the County Council were most forthright in their views about the effect of M40 on agriculture, maintaining that they knew what would happen to affected farms before construction began. They had it seems obtained this "knowledge" by interviewing all potentially affected farmers in about 1965. However, the extent of their knowledge really stretched no further than to an examination of farm boundaries. According to the Chief Engineer on the scheme they "kept to the edge of many holdings".

4.3 Additionally, he said they had employed the MAFF Agricultural Land Classification, but appeared to know little about the manner in which the gradations were constructed and nothing about either their implications or the shortcomings of the technique. The relevant sheet, number 159, it should be noted was not published until 1971, only a year before the construction began, although it is likely that the relevant information was available before this. There had been contact between the County Council and MAFF, but the engineers admitted that the Ministry input, focussing as it did only upon land type and number of farms affected, could be "greatly improved".

4.4 Two examples were cited by the County Council engineers in order to indicate that agriculture had been seriously considered. The first of these was that one of the intersections had been redesigned in order to reduce land-take slightly. This, however, meant it being

moved from one farm onto another: it was obvious that no account had been taken of the individual farm businesses involved. The attitude adopted by the engineers was that "it was too bad that the individual had to suffer, but the country lost less agricultural land as a result of the alteration". Secondly, the route had been slightly altered on one farm at the sole request of the owner involved.

4.5 There were, however, much stronger indications that agriculture had played, overall, only a small part in deliberations:

- there was no systematic assessment of the likely impact of the road on individual farms, apart from the checking of farms boundaries;
- there was no knowledge of the agricultural data sources that are available and which indicate average levels of performance;
- the engineers could not comprehend that farmers themselves might not be able to immediately envisage the impact of a particular road development;
- no contact had been made with the NFU. In fact the engineers knew nothing about its structure;
- they felt unsure about tackling a full agricultural assessment.

4.6 Discussion about access provision was also most illuminating. The engineers expressed satisfaction at there being "no severed land" on the route: they actually meant by this that there are no remaining land-locked areas. Additionally, it had proved possible to combine agricultural accesses with footpaths and bridleways in all cases. However, the engineers admitted quite freely that final location of access points was a haphazard business as they did their best to please all affected parties.

4.7 In order to assess the calibre of the MAFF input an interview was arranged with the relevant representatives at Oxford. Some important findings emerged which confirmed our pessimistic view of the MAFF operations:

- asked to comment upon the County Council preferred route and the chief objector's alternative the MAFF concluded that there was no agricultural difference between the two. The basis of the reply was quality of land;
- the only protest made was over the size of the finally chosen Lewknor intersection, but this was dropped when the engineers said that there were no further alterations that could be made;
- they knew nothing of the individual farmers affected except that one especially suffering the Lewknor intersection, and no attempt had been made to monitor any farm's progress since construction;
- no advice had been offered to farmers concerning possible system changes consequent upon the road construction;
- they were "puzzled" by the access provision on the route.

4.8 Admittedly, MAFF/CC consultations took place a decade ago, but there are no indications that the approach has changed recently. The same ADAS representatives have recently been asked to comment upon the Waterstock to Warwick section of M40 and the Swindon-Milton Keynes motorway and have replied in the same limited Land Classification terms. They did not even think it worthwhile in referring to farm size/type maps (which are produced by the MAFF) because of the homogeneity of the alternate routes.

4.9 Next we examine the role of the NFU. Evidence here was gathered from both local and national representatives. In the mid-1960's there was a fairly strong reaction from the farmers who were threatened by "the new A40". The protest was lead by Mr. R.C.Keen whose Manor Farm was eventually bisected by the M40. He was a strong NFU supporter and attempted to coalesce support under the organisation's guidance.

4.10 Keen's attitude was fairly plain: in a letter to John Davis the local NFU representative he wrote:

> "I enclose a copy of my latest letter to Mrs. Barbara Castle and company, and wonder if it would be a good idea to call together the farmers concerned with the present route and the possible alternative routes if we could steer them away from this particular one. As I see it, the people affected, if we could steer them on to the route which I think from the National point of view is the right one, would be Rowlan, Belgrove, Evans, Ridoni, Holloway, the Aston Park Stud, Joe Hill Junior, the Vansittart Estates, Col. Arthur Clerke-Brown, the National Trust and probably Frank Holmes again."

In other words the need for a new road was accepted but the best route would obviously not be across Mr. Keen's land! This is just the sort of case the NFU say they cannot support. Not surprisingly then the local NFU representative called upon Headquarters nation-wide expertise. E.W. Bebbington the NFU's "Transport Secretary" was called in to organise opposition on a more rational basis. Bebbington, at that time was the expert on motorways and agriculture, (according to John Davis) and so matters were left entirely in his hands. Unfortunately, however, before the final battle had been fought Bebbington died, taking with him much of the relevant information which was only on file in his head. His successor Wallace seemed unable or, perhaps, unwilling to take up a matter so far progressed. The burden shifted back to the local representatives at both branch and county level, but so total had been Bebbington's control of matters that these representatives really had little idea of what was going on and could do very little.

4.11 So the NFU challenge died with Bebbington, although Keen continued to battle on his own terms until he too died a short while after the M40 was opened. It is, however, surprising to find that the local NFU organisation, especially at County level, had not been more cognisant. It would, for example, have been the simplest of matters to contact the local representative at Beaconsfield, Peter Hinton, in whose area the previous section of M40 had been built in order to gain as much background information as possible. Thus it was that when construction began the NFU became deluged with complaints about the contractor's misadventures and the laggardly approach of the District Valuers Office. It is likely that early continued involvement could have minimised this.

4.12 Finally, in this section we turn to the Public Inquiry, the forum at which all is, or should be, revealed. With two main exceptions the pattern of the Inquiry appears to have been remarkably similar to that enacted at Epping over the M16. The two differences were, first, that the objectors had no right to challenge the grounds for "need", and, second, the proceedings only lasted for 7 days. The similarities were, however, striking and included, primarily, the existence of a natural feature of great beauty, the Chiltern Scarp, to which great attention was devoted throughout the proceedings. The prime alternate route was concerned only with minimising the

"damage" done to the Scarp. As regards the agricultural considerations the story was almost an exact copy of that told at Epping. The promoting authority highlighted their lack of agricultural background evidence and the farmers could only product descriptive evidence of very little value. Oxfordshire C.C., like the ERCU, found the need to rebut only those specific points raised by farmers. Only 8 of the 15 farmers we surveyed as being affected by the route, as published and built, appeared at the Inquiry. The Inspector's Report reflected this lack of agricultural evidence. Thus, it is safe to conclude that the M40 (Stokenchurch-Waterstock) was built without knowing what the real agricultural costs were likely to be and no attempt was made to examine the level of impact which has actually occurred.

5. METHODOLOGY

5.1 Although Stabler has expressed a strong lack of confidence in this particular branch of agricultural economics (1), it was necessary, in order to make progress, to have available measurement techniques which would be capable of isolating the types of impact described in previous Chapters. In particular, it was thought that guidance would be most valuable in four areas of investigation:

(a) the relationship between farm size and economic performance;
(b) the extent to which farm income measurements are useful as indicators of performance;
(c) the factors which are likely to be most decisive in influencing levels of farm productivity;
(d) decision-making and planning on the individual farm unit.

5.2 Literature surveys were carried out in order to isolate findings of use to the M40 survey. The results of these surveys, which are found in Appendix E, were in the main disappointing in that no precise tools seem to be available to assist our investigations. The major findings were:

(a) the thresholds of size between farms of different efficiency levels are too flexible to be of use, when examining the extent of land loss usually consequent upon trunk road development;

(b) income levels upon individual farms fluctuate greatly year by year, and the reason for the fluctuations are extremely difficult to discover;

(c) it is possible to isolate a number of factors associated with both high and low productivity but again there is great difficulty in defining exact thresholds;

(d) tools are available which can aid farmers to make economically rational decisions, but less progress has been made when attempting to describe and explain actual decisions where non-economic factors become decisive.

5.3 These findings were not as positive as might have been hoped for; nonetheless if the M40 survey were to be carried forward it was essential to develop some form of methodology. Despite its likely pattern of fluctuation it was decided to use farm income as the main indicator of performance, although because of the pioneering nature of the survey and the difficulty in using the income measurement because of the large fluctuations to be normally expected, other measurement techniques were explored; foremost amongst these were the output/input productivity ratio and standard man day labour requirements.

5.4 The basic approach adopted was that of case-study analysis. For each of the 16 farms affected by this section of motorway the aim was to collect as much information as possible in order that very detailed case-studies could be written, analysing in detail the effect the M40 had had upon the farm. It was not until all the case-studies had been written that any attempt was made to draw out the more generalised conclusions.

5.5 In order to compile a comprehensive case-study it was necessary to have available:

(a) a record of a good interview response with the affected farmer;

(b) a map showing how the motorway had physically impinged upon the farm;

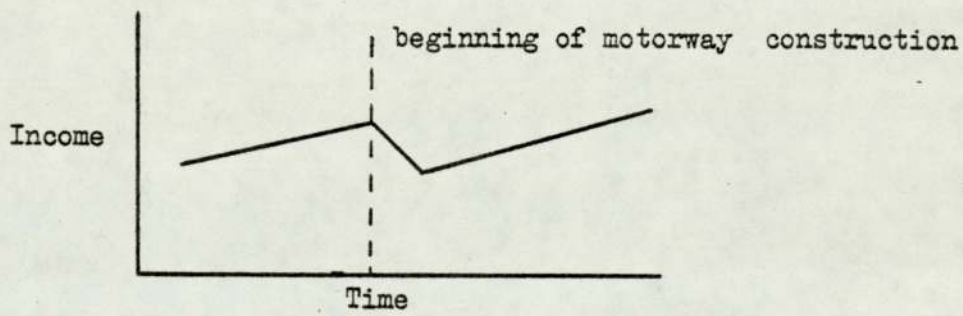
(c) the farm accounts;

(d) the farms June Returns.

The last two elements were essential in that previous farm interviews had revealed that it was unsafe to rely upon the farmers for specific information relating either to farm systems or levels of input and output. The lack of any element of the four meant that certain parts of the case-study could not be detailed and, nautrally, the more elements missing the less informative was the final case-study.

5.6 Put simply the basis of the method was to examine farm income levels in order to detect any downward fluctuations at the time M40 was constructed.

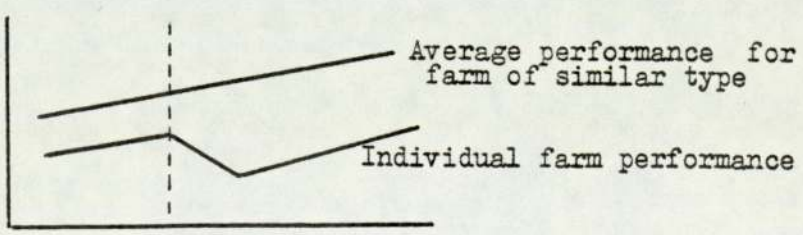
Figure 9.1: Hypothesised Income Trend for Motorway Affected Farm



Background knowledge of the farm, most importantly the picture of the farm system given by the June Returns, would be used to test the existence of a causal link between the income fluctuations and the M40.

5.7 However, given the level of fluctuation to be usually expected in individual farm incomes it was of the utmost importance to know how the farm might have performed had it not been developed upon. Standard data was used to show how trends continued for farms of a similar type not being affected by development. Such average data could be superimposed upon the individual farm's income graph:

Figure 9.2: Hypothesised Relationship Between Average Farm Performance and Performance of Farm Losing Land to M40.



Such a formulation is highly stylised and it was, obviously expected that complications would arise in such analysis, however, the scale of the complications which beset all aspects of the investigation

was quite remarkable.

5.8 Special attention was paid to the manner in which farms were able to readjust to changed circumstances and the economic effect of such readjustments. This was thought to be of particular importance as one of the main criticisms levelled against Boddington's work was its static nature. It was necessary to obtain, therefore, evidences of the dynamics of the situation.

6. DATA AVAILABILITY AND QUALITY

6.1 The Farms Affected

It was naturally important to discover initially which farms had lost land to this section of M40. By using a list supplied by the local NFU branch supplemented by the Compulsory Purchase Order Documents all land on the route was finally accounted for. In all 16 farms were deemed to be affected. Two others were surveyed, but because they were not being productively farmed they were excluded from analysis.*

Table 9.1: M40 Affected Farms by Farm Type

Farm Type (1)	No. of Farms (2)	Total Acres (3)	Average Acres (4)
Arable	2	760	380
Arable/pigs	4	986	247
Beef/sheep	3	1209	403
Dairy	3	558	186
Grass/arable	3	627	209
Pheasant	1	38	38
Total	16	4178	261

6.2 Questionnaire Design and Interview Technique

6.2.1 In order to fulfill the aim of gathering as much relevant information as possible a comprehensive questionnaire was drawn up. This is reproduced in full as Appendix D. The questionnaire was used more as a checklist which the interviewers could use both to order information received and to ensure that no major topic had been omitted, rather than to ensure precise answers were received to the same precise questions at each interview.

* The units excluded were:
1. an estate of 2,500 acres losing 15 acres of scrub, and
2. a stud farm of 1500 acres losing 6 acres of woodland.

6.2.2 Additionally, maps of the individual farms were constructed in order to ascertain farm and field boundaries, the exact position of the M40, the location of buildings, access routes and drainage flows and any other matters of pertinence. It was decided to use the 6" to 1 mile scale maps: the smaller scale (2½ to 1 mile) do not show field boundaries, whilst the larger scale (25" to 1 mile) were too bulky to carry on such fieldwork. (Interviewers were often carried out stomping across ploughed fields or jolting around in the back of fast moving land-rovers whilst irate farmers took us to the "trouble-spots" on their farms.) However, the 6" maps proved to have problems in use: most of the maps needed were last revised before 1930(!) This meant that the M40 was, obviously, not marked, whilst, it was also not uncommon to find field boundaries misplaced and farm buildings incorrectly marked.

6.2.3 The questionnaire was "piloted" on four farms and the results produced were most satisfactory, with the interview responses being very good indeed. It was decided to then use the questionnaire, with only minor amendments to survey the rest of the farms. Initial contact with most farmers was made through an introductory letter from the NFU local secretary. Arriving on the same day as the letter or shortly afterwards ensured a warm response in almost all cases. There was a markedly cooler response on the part of those who did not receive the letter or who were visited after the letter had faded from memory. In addition it is important to record that the motorway was a very live issue still with the farming community. The local NFU had called in David Hellard to chair a meeting at which the farmers could air their grievances about matters still outstanding after the road had been opened.

6.2.4 Bowbrick in a recent J.A.E. article, (2) "The Use of TapeRecorders In Agricultural Economic Research" argues strongly in favour of the use of these machines whilst upon farm interviews. The researchers in the Wolfson Group after careful consideration decided against employing them. A number of factors were instrumental in this decision:

(a) as was said before (Chapter 2) the two Wolfson researchers wanted to work together in order that their work might be both compatible and comparable even though different

areas of investigation were being undertaken. Thus both carried out surveys of the M40 and the questionnaire was designed to enable all relevant information from both surveys to be gathered at once. Thus 2 interviewers were present at each interview: this lessened the likelihood of information being misrecorded or missed entirely;

(b) an enormous amount of transcribing would be necessary in order to commit to paper over 30 hours of interviews;

(c) the use of a questionnaire divided into discreet sections enabled information to be gathered in these sections;

(d) it was felt that farmers would not mind being contacted upon the telephone in order to check uncertain details. This assumption proved correct;

(e) it was felt that farmers would talk less freely about very delicate matters such as farm income, compensation etc. if a tape machine were working. Bowbrick presented no evidence to show this would not be the case.

6.2.5 So detailed was the information required and so rambling were most interviews that it was necessary to develop two quite distinct roles to be played by the interviewers. One would take on the task of filling-in the questionnaire: he would ask the directly relevant questions and fill in all answers upon the relevant section of the questionnaire. This last task was made particularly onerous by the habit farmers have of switching swiftly from topic to topic. In order to aid the correct detailing of information the second interviewer would intervene with questions of a more general nature design/ed primarily to give his fellow a chance to catch-up on some of the recording. Such questions had to be both well-timed and relevant to the specific farm or a topic that was currently in the agricultural news. (Farmers' allegiance can undoubtedly be won over by "sympathetic" questioning.) The second interviewer also took charge of the maps and guided the farmers who, it was found, often could not read such things at all well, around them.

6.2.6 Interviews varied in length from half an hour to 3½ hours, but the mode was about 1 hour to 1¼ hours. (Even the one farmer who was unwilling to give any useful information, and has to be classified as a non-respondent spoke for over 30 minutes!) Thus, in total, about 30 hours was spent interviewing the 16 affected farmers, however, the interviewing was spread over 13 days, in a two month period in January and February 1975. Interviews were carried out at this time as this is one of the slackest periods in the agricultural calendar. Although the farmers were most willing to be engaged upon lengthy interviews it was often very difficult to arrange a time for the meeting. Many hours were spent at the telephone on this task.

6.3 June Returns

6.3.1 In order to check fluctuations in farm system over time (farmers' memories are notoriously wayward on this) it was important to obtain the annual June Returns for each farm surveyed. Before devising the questionnaire it was hypothesised, correctly as it turned out, that few farmers do actually keep the "retention copy" of the Return. However, the MAFF keep the individual farm Returns upon computer tapes and will allow access to them provided the individual farmer in question gives his written permission. Thus part of each interview focussed upon asking the farmer to sign a "release form" allowing us access to his Returns through the MAFF computer.

6.3.2 Even this data source has its problems:

- the tapes are only kept as far back as 1969: before that there is no record because MAFF have destroyed the tapes;
- no attempt is made to conserve any decomposing tapes, so that for some areas not even as far back as 1969 is available;
- for reasons which remain unexplained not all the farms which returned in June, and for which we requested Returns, were to be found on the computer tapes. Only about 65% of the expected Returns were actually available for read-out on the tapes;
- although there is a legal obligation to complete the Returns each year the obligation is not enforced and so farmers "forget" to do so occasionally. If this happens the MAFF simply reproduce the previous year's Return. It is obvious

from the print-out where this has happened because there are always at least slight year-to-year fluctuations in farm make-up; an exact duplication is thus recognisable as being a "missing" year;

- the MAFF charged nearly £ 70 for the computer printout of 62 return-years;

6.4 Farm Accounts

To obtain accurate assessments of how farms were performing financially before, during and after M40 construction, it was necessary to obtain copies of the farm accounts over a period of time. Again we hypothesised, correctly, that farmers would not themselves have very complete records and that it would be necessary to go back to the original source - the accountant. In order to gain access to the accountant a standard letter was prepared which all farmers except one signed. Ideally we wanted to go back to about 1965 in order that a good income profile could be built up. Altogether 10 sets of accounts were made available, although one of these only covered a short (but relevant) period. This, considering the confidential nature of the data and lack of financial recompense to the accountants was a particularly high level of response, with which we were most pleased. The data did, however, take a long-time to arrive (up to six months) and it was decided that it would be wise to offer payment to accountants to cover administrative costs, on the next survey of this type. Having obtained the raw accounts it was necessary to transform them out of financial terms into economic data by which farm performance could be measured. Most essentially profit had to be transferred in to net farm income so that comparison could be made with the chosen standardised data. A framework was drawn-up to make this process mechanical and standardised. This is shown in Table 9.2.

Table 9.2: A Framework for Analysing Farm Accounts

	Opening Valuation	Closing Valuation	Increase or Decrease (a)	Revenue (b)	Output (a) & (b)
Output					
1. Cereals					
2. Potatoes					
3. Other crops					
Total crops (1-3)					
4. Cattle					
5. Milk					
6. Sheep & Wool					
7. Pigs					
8. Poultry & Eggs					
Total Livestock (4-8)					
9. Sundry receipts					
10 Product to house					
Total output (1-10)					
Costs					Expenditure
11 Labour					
12 Purchased feed					
13 Seeds					
14 Fertilizers					
15 Rent and rates					
Machinery and Power					
16 Car, tractor expenses					
17 Machinery repairs & renewals					
18 Depreciation					
19 Fuel & Electricity					
20 Contract work					
Total machinery and power (16-20)					
Miscellaneous					
21 Other repairs					
22 Veterinary					
23 Insurances					
24 Sundry items					
25 Cultivations + or -					
Total miscellaneous (21-25)					
Total costs (11-25)					
Net Farm Income (Total output - total costs)					
Net Farm Income per acre					

6.5 The Standard Data

6.5.1 The prime sources of average performance data were the Farm Incomes Blue Books (5) and the Reading University Farm Management Survey. The Reading Survey gives rise to the annual publication of Farm Business Data[6]. In these annual FBD publications performance returns are given for groups of farms. The groupings used are:

Group No.	Milk Producers
1.	Predominantly Grass: farms with less than 30% tillage
	(a) Under 100 acres
	(b) Over 100 acres
2.	Mixed Grass and Arable: farms with between 30% and 50% tillage
3.	Predominantly Arable: farms with more than 50% tillage
	Non Milk Producers
4.	Mixed Grass and Arable: farms with less than 50% tillage
5.	Predominantly Arable: farms with more than 50% tillage
	(a) with little or no pigs or poultry
	(b) with substantial pigs and/or poultry, i.e. more than 20% of total output from pigs and poultry

6.5.2 It was necessary to refer to the Farm Incomes "Blue Books" published by the MAFF. These again are annual publications which in the main simply aggregate the returns from the University Agricultural Economics Departments for the different regions. The "Blue Books" were most useful in supplying average whole farm income levels, whilst the Reading University FBD gave all results on a "per acre" basis. Consideration was given to using the NFU Farm Accounts Scheme data; as the data in this source is given directly in "profits" as opposed to "net farm income" the need to adjust the accounts would be obviated. However, it was decided that the disadvantages of this data would outweigh the advantages. The biggest drawback was that the scheme was discontinued in 1973/74 and so its use would cut down the post-M40 time-span of analysis. Additionally the data was national rather than regional and the group definitions not particularly clear. In addition an NFU economist reported to us that the Accounts Scheme Data had coincided closely with the Farm Business Data and, therefore, there had been no real need to continue the survey.

6.6 Summary of Data Availability and Quality

6.6.1 Table 9.3: sums up the situation as regards data release on each of the 16 affected farms.

Table 9.3: Basic Data from Each Farm

Case Study Number*	Interview Response	June Returns	Accounts
1	Very good	1965-75	1964/5-1974/5
2	Imprecise	1969-75 (1971 & 1972 repeats of 1970)	1965/6-1974/5
3	Very Good	1969-75 (only crops no stock)	1965/6-1974/5 (1971/2 incomplete)
4	Imprecise	1969-75	1965/6-1972/3
5	Present occupant: very good Previous occupant: poor	1969-75	1970/1-1972/3
6	Imprecise	None	1965-1971
7	Good	1969-75	1966/7 and 1968/9-1972/3
8	Very good	1969-75	1966/7-1974/5
9	Very poor	None	None
10	Present occupant: no interview Previous occupant: unhelpful	None	None
11	Imprecise	1969-75	None
12	Poor	None	None
13	Imprecise	1970-75	None
14	Poor	None	1964/5-1974/5
15	Imprecise	1969-75	1965/6-1974/5
16	Good	None	None

* These numbers will be used throughout the study

6.6.2 It is at this point, perhaps, useful to remind the reader of the authoritative and revealing review article by Barnard entitled "Data in Agriculture. A Review with Special Reference to Farm Management Research Policy and Advice in Britain" (7). The main theme of this article is that in the field of agricultural economics:

> ".....although there have been recent improvements, the supply of data of the required standard of reliability has not, on the whole, kept pace with the demand." (p289)

Barnard sums up the reasons for this lack thus:

> "In short, the situation in agriculture is such that data are often difficult and costly to collect, while those that are collected are too specific in character to have general applicatinn, and take insufficient account of the many variables that bear on them. In addition, as many writers have attested, with economic conditions changing as well, it seems that an information gap is inevitable and will be a continuing problem. Existing stocks of information become obsolete very quickly, so that a "steady flow" of new data is required if the economist is simply to maintain his "current capabilities" and be in a position to "reconstruct the contemporary context", a factor which has obvious impact on administrators and the like. In contrast, the widely varying conditions in agriculture have greater impact on research workers, with the result that they seldom do "the same analysis twice on a set of data", but require fresh data for new problems." (p297)

It is against the background of this excellent review article that our M40 survey must be set. In short both the researchers and readers need to be forewarned that it cannot be expected that the data availability will enable a neat, well-defined piece of research to be enacted. At all stages there will be inadequacies and in consequence the need for improvisation. As just a preliminary example it should be noted that Upton and Casey (8) point out some of the pitfalls involved in the use of average data.

7. AGRICULTURAL BACKGROUND

7.1 Land Classification

Land classification map number 159 demonstrates that about 60% of affected land was Grade 3 and 30% Grade 2, although the uncertainty of this measurement device must not be forgotten. The high proportion of Grade 2 land compared with the national average is consequent upon the good quality soils to be found within the Oxfordshire Vale. Notably very few of the farmers interviewed knew which Grade of land their farm was comprised. This generalisation even applied to those farms which had 2 or more Grades of land, where it might be expected that, if the Classification is a true

reflection of the land's capability, the farmer would take notice of the better quality land on his unit.

7.2 Farming Alongside the A40

Prior to the construction of M40 the A40 was the only major link road between London, Oxford and South Midlands. The A40, however, was hardly capable of taking the large traffic flows expected of it. The result was a continual fast moving stream of traffic throughout the day. This made the use of the A40 for agricultural purposes highly inconvenient and often dangerous. Many of the farmers interviewed expressed great satisfaction that the A40 had become a quiet country road for local access purposes.

7.3 The Farm Economy of the Early 1970's

There is little doubt that the beginning of the 1970's was a "boom" time for all types of agriculture - all indices could be seen to be rising rapidly. Table 9.4 shows the income indices for different farm types over this period. A large part of the good fortune accruing to the farming community can be attributed to commodity price rises. The importance of the effect of this boom on our survey cannot be underestimated. M40 construction began, and so land was taken, in early 1972; thus the accounting year 1972/3 would be the first to demonstrate any "income-effect" of the M40 on individual farms. This was, however, exactly the year in which farms might have been expected to perform better than ever before, and, indeed, better than they were likely to for a long time into the future.

Table 9.4: National Trends in Net Farm Income

1968/9 - 1971/2 = 100

	All Dairy Farms	All Livestock Farms	All Cropping Farms	All Mixed Farms	Pigs & Poultry
1967/8	78	80	99	102	97
1968/9	72	73	69	81	94
1969/70	74	74	94	81	93
1970/1	91	95	103	93	84
1971/2	163	158	134	145	130
1972/3	212	240	184	195	168
1973/4	188	237	349	250	250
1974/5	155	175	360	223	206

Source: MAFF, "Farm Incomes in England and Wales, 1974-5" HMSO February 1976

Chapter 10:

The Agricultural Impact of the M40 (Stokenchurch-Waterstock Section): Results and Conclusions

1. BACKGROUND

1.1 The main objectives of this study it will be remembered are:

(a) to test the validity of the predictive methodology developed by Boddington;

(b) to analyse the impacts a motorway can have upon individual farm units, paying special attention to adjustment of farm systems carried out;

(c) to collect data which will enable an improved agricultural assessment technique to be developed.

(d) to examine the overall impact of this section of motorway.

1.2 Table 10.1 gives a summary of the effect the M40 had on the 16 units we have classified as being "affected".

2. A GROSS MARGIN PREDICTION OF THE LIKELY IMPACT OF M40

2.1 The first stage of this analysis will focus upon drawing up a prediction of the likely impact of the motorway based on the data that would have been available prior to construction and using the method developed by Boddington which utilises gross margin analysis. Table 10.2 shows the results of such analysis; the calculations are based on average data taken from Reading University's FBD. The only data that had to come from individual farms were:

(i) farm size

(ii) farm type (according to Reading University's categorisation)

(iii) land lost to motorway.

(Rolling 3 year averages of gross margins were used to prevent extraordinary results biasing the calculations to any great extent. The base year adopted was 1970/1.)

2.2 Having carried out the gross margin impact predictions using average data, the calculations were repeated using actual income and gross margin figures obtained from the farm accounts. Naturally, as the accounts were not available for all farms it was not possible to be completely comprehensive.

Table 10.1: Summary of Physical Impact of M40 (Stokenchurch-Waterstock)

Case Study	Pre M40 Farm Type	Pre M40 Farm Size (acres)	Land loss to M40 Acres	%	Land severed by M40 Acres	%	Land Grade	Special Road Features
1	Arable/beef	441	16	4	25	6	3	-
2	Arable/pigs	229	40	17	0	-	3	Maintenance Depot took 10 of the 40 acres
3	Arable/pigs	260	28	11	Farm cut into 8 sections	-	2	Complex junction
4	Arable	319 (inc 63 rough grazing)	43 (but only 22 crop land)	9	9½	4	3	Graded embankment returned to farm
5	Beef/sheep	452	26	6	49	11	3 &4	-
6	Pheasantry	37.5	11	29	12	32	2	-
7	Dairy	209	4	2	15	7	3	-
8	Arable/pigs	460	15	3	166	36	2	-
9	Arable/grass	150	13	9	c.40	c.27	3	-
10	Beef/sheep	220	14*	6	0	-	3	Simple junction
11	Dairy	93	13½*	15	14	15	3	-
12	Beef/sheep	537	11	2	14	3	2	-
13	Arable/pigs	37	3¾*	10	0	-	2	-
14	Grass/arable	272	33	12	167	61	2	-
15	Dairy	256	12	5	4	2	3	-
16	Arable/grass	205	2	1	0	0	3	-

* Includes severed field corners never farmed and bought quickly by neighbour or District Valuer.

Table 10.2: Gross Margin Prediction of M40 Impact Using Average Data*

Case Study Number	Land Loss (acres)	%	Income Loss (£)	%	Extent of Income Effect
1	16	4	368	9.2	*
2	40	17	1440	44.9	****
3	28	11	1008	27.7	***
4	32	12.5	1152	45.0	****
5	26	6	468	14.1	**
6	11	29	Specialised unit no average data available	?	**** (probable)
7	4	2	182	7.9	*
8	15	3	540	8.4	*
9	13	9	234	20.8	***
10	12	5	216	13.1	**
11	13	15	591	25.4	***
12	11	2	198	4.9	*
13	3	9	108	20.9	***
14	33	12	594	29.0	***
15	12	5	366	12.4	**
16	2	1	99	2.3	*
Total	271	7	7565	18.0	

* 1970/1 taken as base year.

Table 10.3: Gross Margin Prediction of M40 Impact Using Actual Data taken from Farm Accounts

Case Study	Income loss (£)	%	Extent of income effect
1	472	12.7	**
2	1234	Reduced below 0	***
3	1069	27.2	***
4	845	43.7	****
5	426	Income already negative	**
6	1032	48.8	****
7	168	4.3	*
8	323	5.0	*
14	646	39.6	****
15	403	23.9	***

2.3 Whether or not to use actual farm account data as opposed to the much more easily obtained average figures is an important question when developing any predictive methodology in this field. It is then of interest to compare these two sets of results a little more closely, as in Table 10.4.

Table 10.4: The Prediction of Income Loss: A Comparison of Results Obtained using actual and Average Data

Case Study	Actual Data	Average Data
1	**	*
2	***	****
3	***	**
4	****	****
5	**	**
6	****	****
7	*	*
8	*	*
14	****	***
15	***	**

This comparison demonstrates that the degree of consistency between the two sets of data is fairly high: in 6 of the cases the star-rating was the same when using both average and actual data. For the other four cases the difference was only plus or minus one star. Reverting to the income loss figures (but omitting case study 6) it can be seen that the average data resulted in an aggregate predicted income loss of £ 6118 for the nine farms whilst the actual data loss prediction totalled £ 5586. Given the techniques of project appraisal employed by the highway engineers in route selection and the difficulty of obtaining farm accounts (as demonstrated by the data gaps in this survey) it may well be argued that the use of average data is justifiable. We will, however, return to this subject.

3. THE GROSS MARGIN PREDICTION COMPARED WITH THE ACTUAL PERFORMANCE OF THE M40 AFFECTED FARMS

3.1 It is at this stage important to emphasise the point that the gross margin technique is designed to predict not actual levels of income that will occur after a new road is built, but the income loss consequent upon the construction of the road. In other words it does not and cannot purport to allow for any other fluctuations that may take place in the production or marketing fortunes of the farmer. This is demonstrated in Table 10.5 where it can be seen that because of the rising tide of agricultural fortunes during the early part of the 1970's all but two of the nine farms were able to increase their incomes in the year the motorway construction began (1972-3).

Table 10.5: Actual and Predicted Income Change 1971/2-1972/3 (£)

Case Study	Actual	Predicted	
		Using average data	Using actual data
1	+1388	- 368	- 472
2	+5218	-1440	-1234
3	-1841	-1008	-1069
4	+2196	-1152	- 845
5	+6434	- 468	- 426
7	+ 715	- 182	- 168
8	+3100	- 540	- 323
14	-1427	- 594	- 646
15	+4568	- 366	- 403

(N.B. Case Study 6 is omitted from this and subsequent income analysis for two reasons:

(a) As it was a pheasant farm there are no average performance figures with which to compare it.

(b) The farmer decided to stop farming 6 months prior to the beginning of construction because of the M40 and so no data exist to make a post M40 assessment of performance.)

3.2 This argument can, however, be taken a stage further, for even though these farms did improve their position in 1972/3 had the M40 not been constructed they might well have done much better. Thus Boddington would argue (and this author concur) that the element of income loss has to be added back into the income achieved in order to measure the true extent of loss. This is done in Table 10.6 where it is shown that the income on the nine farms might have been 23% higher.

Table 10.6: Actual Income Level (1972/3) Compared with Possible Income Level, (£)

Case Study	Actual Income (1)	Real Gross Margin/acre* (2)	Acres Lost (3)	Additional Possible Income (2 x 3) (4)	Total Possible Income (1 + 4) (5)
1	6578	44.7	16	715	7293
2	7168	69.3	40	2772	9940
3	-1945	32.4	28	908	-1037
4	2265	45.1	22	992	3257
5	4723	41.9	26	922	5645
7	7122	56.8	4	227	7349
8	7096	45.7	15	686	7782
14	1595	32.2	33	1064	2659
15	5248	59.9	12	719	5967
TOTAL	39850	-	196	9005	48855

* Actual figures taken from farm accounts.

3.3 It should, of course, be remembered that all the estimates of loss made above relate only to that due directly to land loss and that the figures in column 5 of Table 10.6 would be higher if other elements of impact were to be added in. The remainder of this Chapter is devoted to discovering the extent of these other impacts, and what consequent impact of this section of M40 both on individual

farms and overall actually was. In particular we will attempt to answer a number of questions:

(a) Is it possible to isolate farm income movements due to just the construction of the M40?

(b) Which farms were hardest hit by M40?

(c) Did the gross margin technique indicate the most vulnerable units?

(d) Can the overall impact of this section of M40 be quantified?

4. ANALYSIS OF AVAILABLE FARM ACCOUNTS

4.1 Data was presented in the previous section (Table 10.5) which demonstrated that the hypothesised dip in actual income levels was only present in two cases out of nine. (Case Study 6 ceased trading altogether). Such data does not, however, constitute a full analysis of the farm accounts available. The purpose of this section is to examine the accounts from a number of perspectives in order to discover whether it is possible to measure the real impact of the M40 on farms. It is proposed to examine, for the 9 case studies for which we have accounts, and which carried on doing business, the effect of M40.

4.2 In order that a full dossier could be built upon each farm detailed case studies were written for all of them. These ranged in length from just two or three typesheets for those with minimal information available (no accounts or June Returns) up to 25 typesheets for those with much fuller data. Naturally enough, these cannot be reproduced in full here, but they form the basis of what follows in this chapter and the most relevant sections have been extracted. (Such case-study approach is recommended to those attempting similar analysis of diverse data as it requires that the researcher becomes intimately involved with all aspects of all cases before drawing generalised conclusions.)

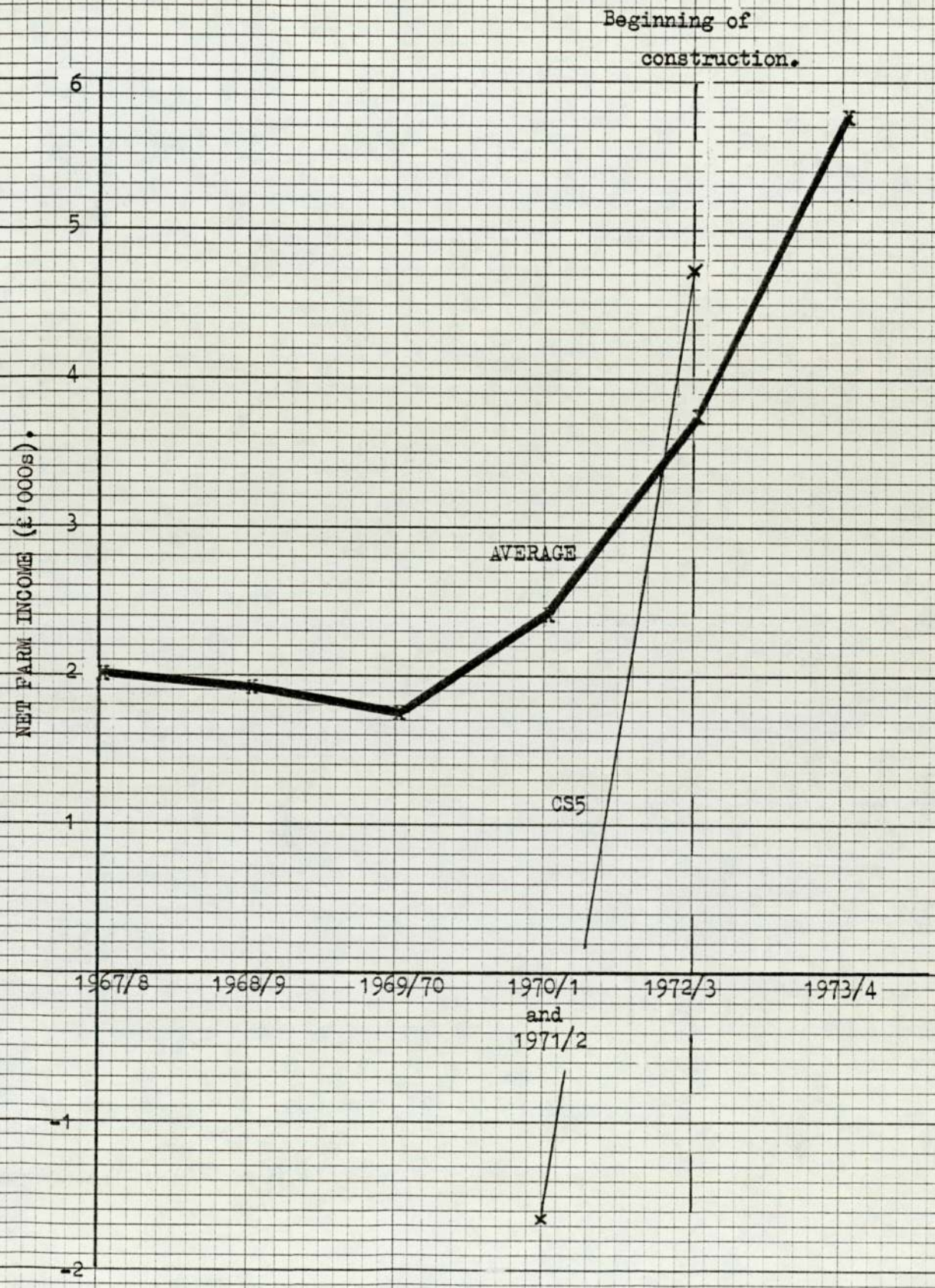
4.3 Whole Farm Income Comparisons

4.3.1 In order to compare actual whole farm income performances with some standard measurement it was necessary to use the Farm Incomes Blue Books, for only in these do whole farm income levels appear. Graphs 1-5 compare the performances of the relevant case studies with the appropriate national averages.

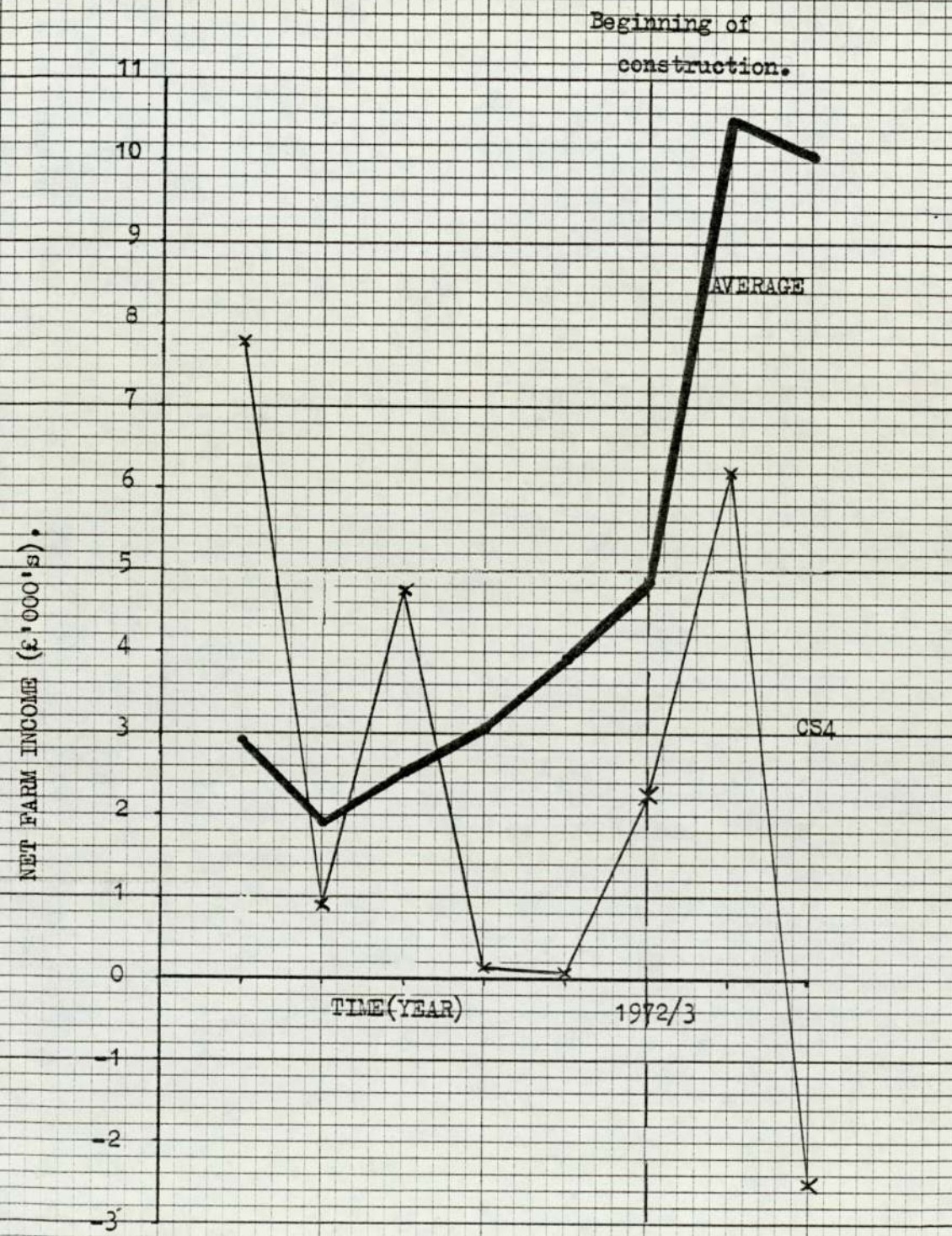
4.3.2 A number of pertinent points emerge from these graphs:

- the national average curves all follow a similar "S" shaped curve, thus supporting the contention of an early 1970's boom which has now levelled off.
- a much longer time period of analysis is used than in Boddington's A55 study. This is to enable each individual farm's relationship to the average performance prior to M40 to be established. It is supposed that a similar relationship should continue during the boom cycle provided the M40 has not effected a change. (Graph 5 shows how Case Study 8 fairly accurately reflects this pattern.)
- Case Studies 8, 1, 7 and 15 seem to follow the expected trend and we would hypothesise that M40 affected them very little.
- Case Studies 3, 2 and 14 seem to reflect a sudden turn against the average performance at the exact time any M40 effect would be expected, i.e. in 1972/3.
- Case Study 4 does not very accurately mirror the national trend; the fluctuations seem to indicate that the farm economy is not well under control. The fluctuations, however, do not seem to indicate any response to the M40 as 1972/3 was a very good year for the farm. 1974/5 was, in contrast, remarkably bad.
- Case Study 5 gives very little data for analysis, but the rise in income in 1972/3 was unmistakeable.

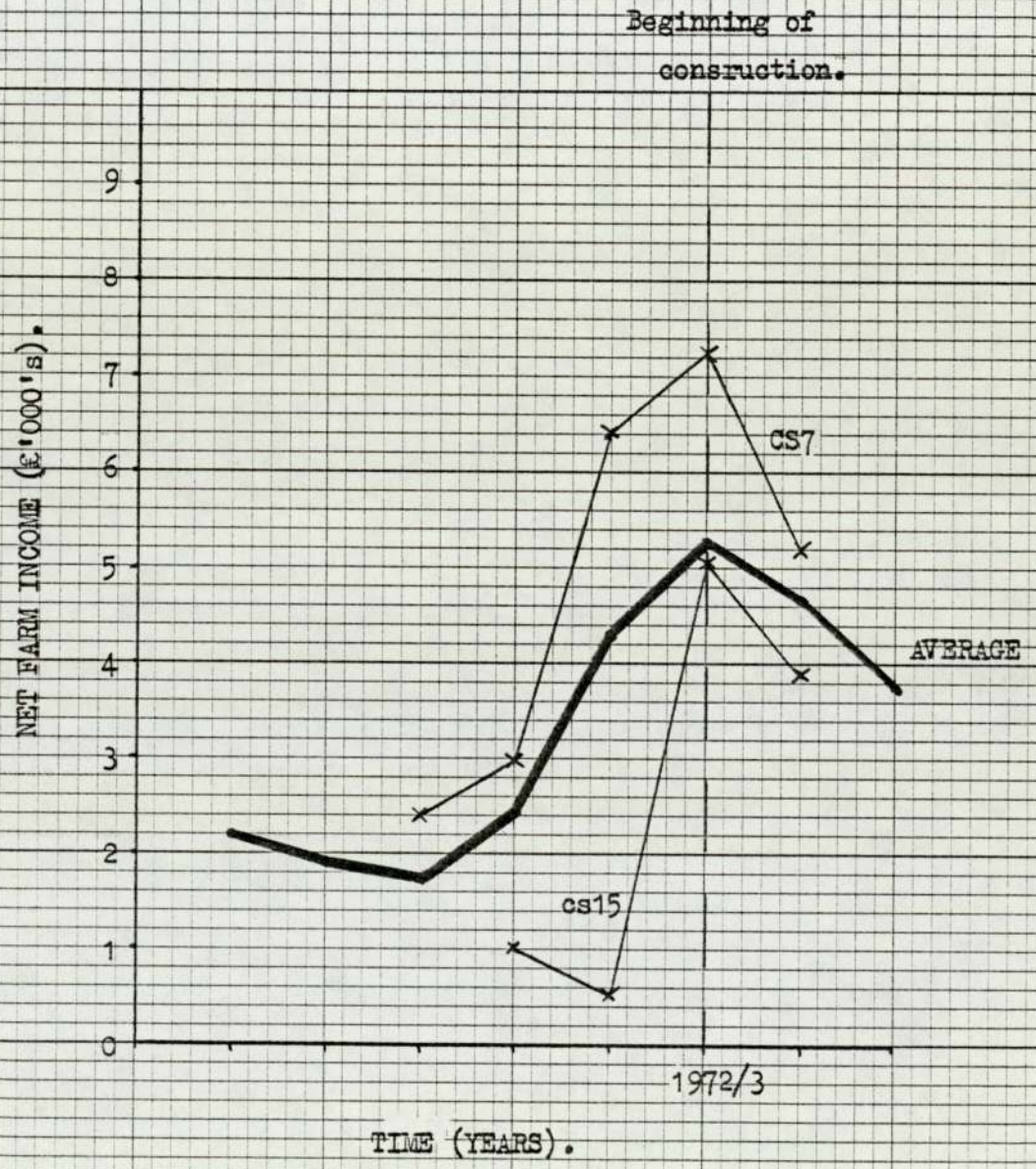
Graph 1: Net farm income for Case Study 5 compared with the national average for "All Livestock" farms (SMD 600-1199).



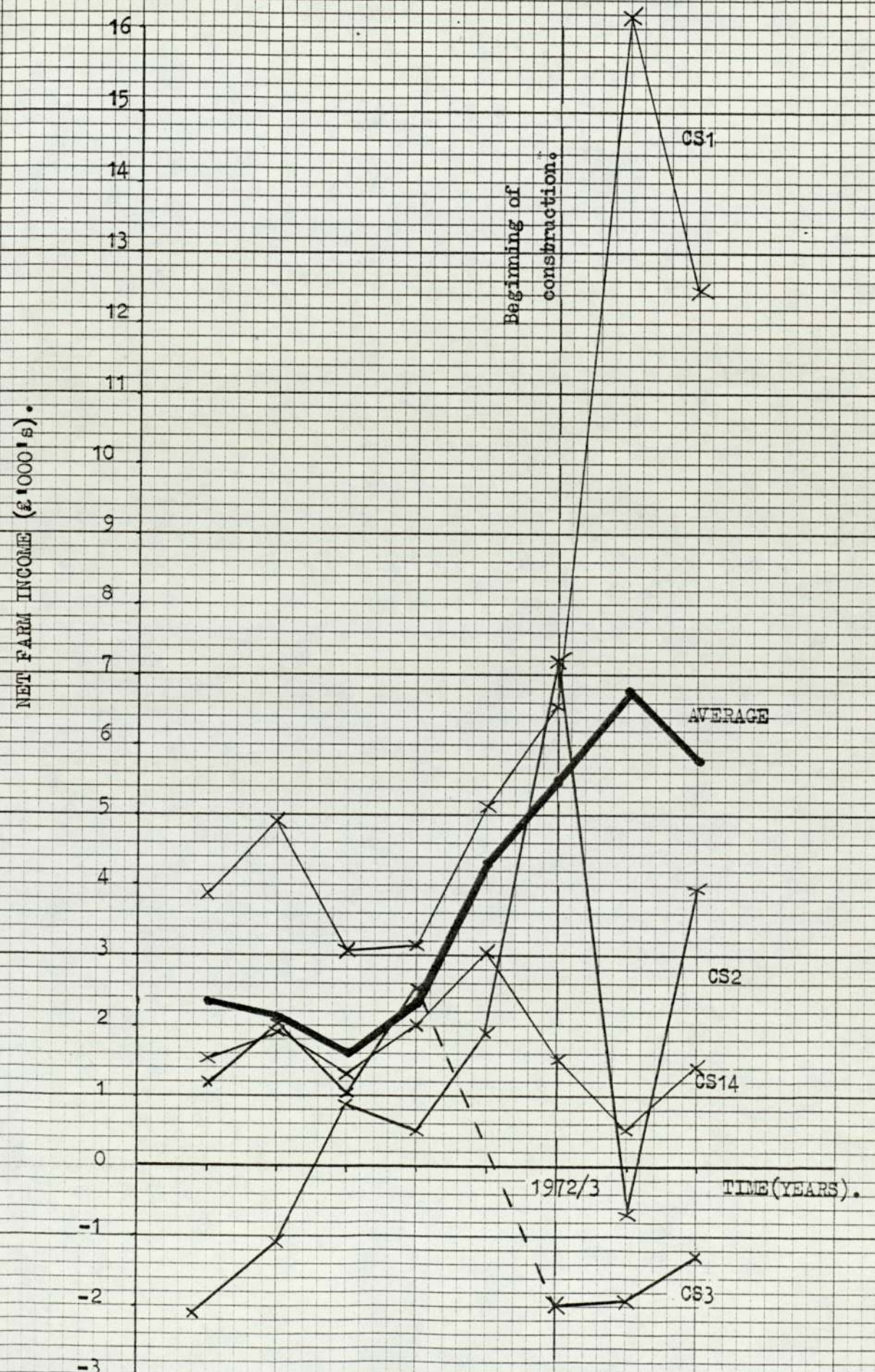
Graph 2: Net farm income for Case Study 4 compared with the national for " All Cropping " farms (SMD 600-1199).



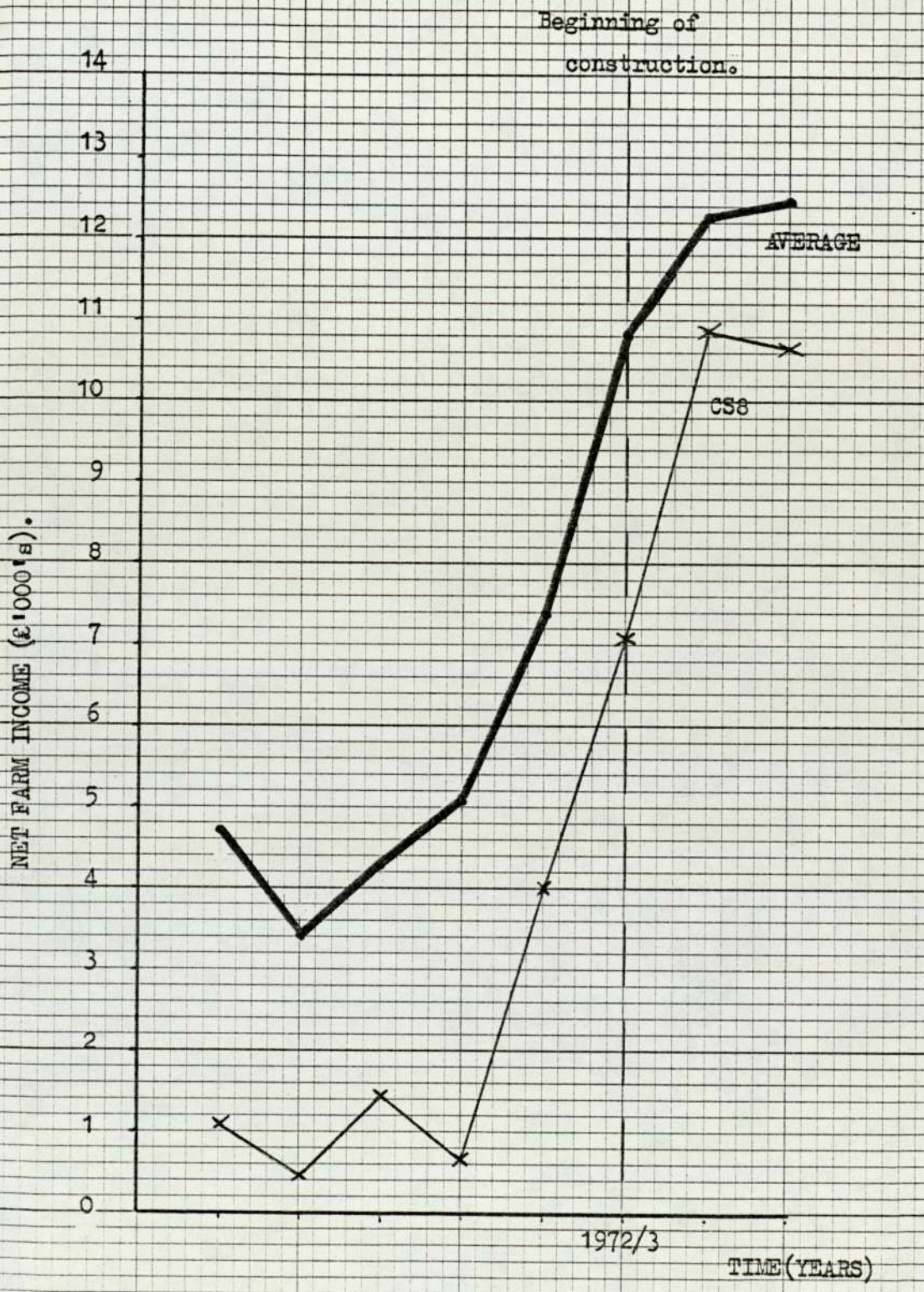
Graph 3: Net farm income for Case Studies 7 and 15 compared with the national average for " All Dairy " farms (SMD 600-1199).



Graph 4: Net farm income for case studies 1, 2, 3 and 14 compared with the national average for "Mixed" farms (SMD 600-1199).



Graph 5: Net farm income for Case Study 8 compared with the national average for "Mixed" farms (1200-1499 SMD).



4.4 Net Farm Income Per Acre

In order to examine how the M40 affected farms compared with average "per acre" income performances, it was necessary to use the Reading University FBD. Thus the M40 farms were compared with regional averages of their own type. The results of the comparisons were:

(a) Case Studies 1, 7 and 8 did not diverge from their relative position to the average performance throughout the period.

(b) Case Studies 4 and 15 did fluctuate around the average but the movements were timed so that it is unlikely that M40 was a contributing factor.

(c) Case Studies 2 and 14 experienced some decline in NFI per acre at the time M40 would have been expected to have some effect. The downturn in fortune was, however, short-lived.

(d) Case Study 3 experienced a severe downturn in fortunes which has not been rectified.

4.5 Total Enterprise Output

This measure can be most revealing. It must be remembered though, that as the output figures are taken from the accounts they will be in monetary terms; in other words the rising price trend of the early 1970's will be reflected in the overall figures.

Table 10.7: Output Variation for M40 Affected Farms

	Total Enterprise Output (£)						
Case Study	1968/9	1969/70	1970/1	1971/2	1972/3	1973/4	1974/5
1	16202	15198	16594	19215	24688	33708	36940
2	8902	12263	14459	15208	22260	15412	24009
3	25697	22926	23626	-	13370	18757	22468
4	8837	11752	12760	11032	12642	23940	21568
5	-	-	27068		19514	-	-
7	-	11710	11847	19398	20706	20080	-
8	18232	20276	21758	26888	32182	43039	47914
14	7752	7968	8662	11090	8313	10021	8959
15	-	-	17837	20692	24174	-	-

Table 10.7 indicates that Case Studies 3 and 14 were again lagging behind in that their output did not expand as fast or far as may be expected given

the trends of the time. Adopting a similar approach to that in Table 10.6 it can be shown what the likely level of Total Enterprise Output would have been had M40 not been built.

Table 10.8: Actual and Potential Total Enterprise Output, 1972/3(£)

Case Study	Actual Output	Potential Output*	% Difference
1	24688	26046	6
2	22260	26971	21
3	13370	14984	12
4	12642	14578	15
5	19514	20632	6
7	20706	21110	2
8	32182	33267	3
14	8313	9311	16
15	24174	25363	5
TOTAL	177849	192262	8

* Calculated using multiples of the actual output/acre figures given in the farm accounts.

4.6 Productivity

4.6.1 Taking the total enterprise output measure a stage further it is possible to examine farm productivity as measured by the simple ratio: Total enterprise output/Total costs. The productivity variations of the 9 farms were calculated over the period 1968/9 - 1974/5. It seems that a lagging in productivity at the time immediately after M40 construction began can be isolated in only Case Studies 3 and 14.

4.6.2 A similar test can be applied using gross margin analysis in a more usual context. A decline, or with rising prices, even slow growth, in whole farm gross margin per acre would indicate an adverse shift in the balance of output and variable costs, and that the farm was running less efficiently.

Table 10.9: Whole-Farm Gross Margin Per Acre (£)

Case Study	Before M40 (1)		After M40 (2)		Change %	
	Actual	Regional Average (3)	Actual	Regional Average	Actual	Regional Average
1	29.5	28.8	58.5	73.3	+ 98	+155
2	30.8	47.4	61.5	90.6	+100	+ 91
3	45.5	47.4	47.7	90.6	+ 5	+ 91
4	31.9	28.8	63.1	73.3	+ 98	+155
5	24.1	26.7	33.6	47.8	+ 39	+ 79
7	43.9	41.9	61.4	80.0	+ 40	+ 91
8	27.5	47.4	59.1	90.6	+115	+ 91
14	24.5	26.7	31.4	47.8	+ 28	+ 79
15	37.2	41.9	60.9	80.0	+ 64	+ 91

Notes: (1) Average of 1968/9, 1969/70, 1970/1.

(2) Average of 1972/3, 1973/4, 1974/5.

(3) Reading University's "Farm Business Data" Annual.

The figures in Table 10.9 again indicate that case studies 3 and 14 have fared less well than the rest, although perhaps 5, 7 and 15 should have cause for concern. Referring back to Table 10.7 it can be seen that the output for both 3 and 14 dropped substantially after the loss of land to M40 whilst the accounts indicate that, conversely, variable costs did not drop so far proportionately.

5. STANDARD MAN DAY REQUIREMENTS

Following on from our literature review of the "tools of agricultural economics" (Appendix E), it should also prove illuminating to examine the SMD requirements of the affected units over time.

Table 10.10: Changes in SMD Level for M40 Affected Farms

Case Study	1969	1970	1971	1972*	1973	1974	1975
1	888	923	1086	977	1051	1097	1409
2	643	784	-	-	543	508	432
3	-	-	-	-	-	-	-
4	590	667	652	584	586	582	560
5	1230	1079	1137	875	1005	1014	1084
7	984	1120	1283	1355	-	1622	1419
8	1438	1519	1556	1508	1482	1473	1448
14	-	-	-	-	-	-	-
15	1314	1399	-	1279	1306	1300	1442

(* 1972 is the first June Return after the beginning of construction.)

These figures are most indicative even if the results are not startling: only one did not show an SMD decline in 1972 over the previous year. The farms can be accurately categorised and described:

- those showing uninterrupted expansion (case study 7);
- those showing slight downturn but with recovery and expansion (case studies 1 and 15);
- those showing slight downturn but no recovery as new level is maintained (case studies 5 and 8);
- those showing decline below 600 and with no recovery (case studies 2 and 4).

Unfortunately complete June Returns were not available for case studies 3 and 14: given the downturn in both income and output trends for these farms it would have been expected that their SMD requirements would have declined quite dramatically.

6. IMPACT SUMMARY

6.1 It is perhaps helpful at this stage to summarise what we have learnt from the economic indicators used for assessment. In Table 10.11 which follows an X indicates some form of reversal in trend which because of its timing could be attributable to M40, whilst XX denotes severe downturn.

Table 10.11: Summary of Results from the Economic Indicators

Case Study	Total Farm Income	Total Output	SMD	Output/ Input	Gross Margin	Income per acre	Total
1			X				1
2			XX				2
3	XX	XX	?	XX	XX	XX	10
4			XX				2
5			X				1
7							0
8			X				1
14	XX	XX	?	XX	X	X	8
15			X				1

6.2 From this table we can draw two conclusions:

(a) farms 3 and 14 appear to have suffered an impact far more severe than any of the other farms;

(b) the SMD level does not appear to be a good indicator of impact as it produces results which do not concur with the other indicators.

In addition it may well be argued that in subsequent surveys it would be valid simply to use just total farm income as the indicator of impact. From the results obtained here it does not appear that such a procedure would distort results.

6.3 It is also appropriate to remind ourselves of case study 6 which stopped trading immediately prior to, and because of, M40. This is naturally, the greatest degree of impact possible on any farm. The next stage of our analysis will endeavour to discover explanations for the high degree of impact upon case studies 3, 14 and 6.

7. DETAILED INVESTIGATION OF CASE STUDIES 3, 6 and 14

7.1 Case Study 3

7.1.1 Despite the lack of precise information on the farm system employed (due to gaps in June Returns) it is possible because of the high level of interview response, to highlight fairly accurately the shifts in emphasis over the period with which we are concerned. Table 10.12 summarises the information we have available. From this, the farmers' answers to our questions and the accounts, it is plain that the advent of M40, which took 28 acres (11%) from the farm caused a fairly dramatic switch of resources.

7.1.2 Before M40 the farmer had spent his 10 years on the farm building up a system of open-air pigs with intensive cereals, gradually increasing the barley acreage in order to become more self-sufficient in feed. However, once he had decided that the motorway was certain to be built he made a dramatic system switch: the pig enterprise was run down, eventually terminated, and a cattle enterprise substituted.

Table 10.12: System Analysis - Case Study 3

	Wheat (Acres)	Barley (Acres)	Oats (Acres)	Mixed Corn (Acres)	Beans (Acres)	Kale (Acres)	Fallow (Acres)	Temp. Grass (Acres)	Perm. Grass (Acres)	Cattle	Pigs	Lambs/ Sheep	Total Acres
1969	180	10						60	10	None	Some	No	260
1970	90	82	10	30	8			31	9	None	Some	No	260
1971	40	110	40		15			46	9	Very small no.	Yes	No	260
1972	64	69			17	5	8	63	7	81	153	No	232
1973	45	105						78	4	Some	Some	Very small no.	232
1974	104	85						35	8	Some	None	66	232
1975	← 180 →							← 50 →		74	None	Some	232

7.1.3 Although the last sows were sold in 1972, experiments are still (1976) continuing to establish which is the best cattle system to employ. A multiple-suckling system was originally tried but was given up as being too labour intensive and difficult to operate. A successful replacement system has yet to be found and so the farm has suffered economically. Table 10.13 demonstrates the effect of the switch from pigs on both inputs and outputs.

Table 10.13: Case Study 3 - Inputs and Outputs

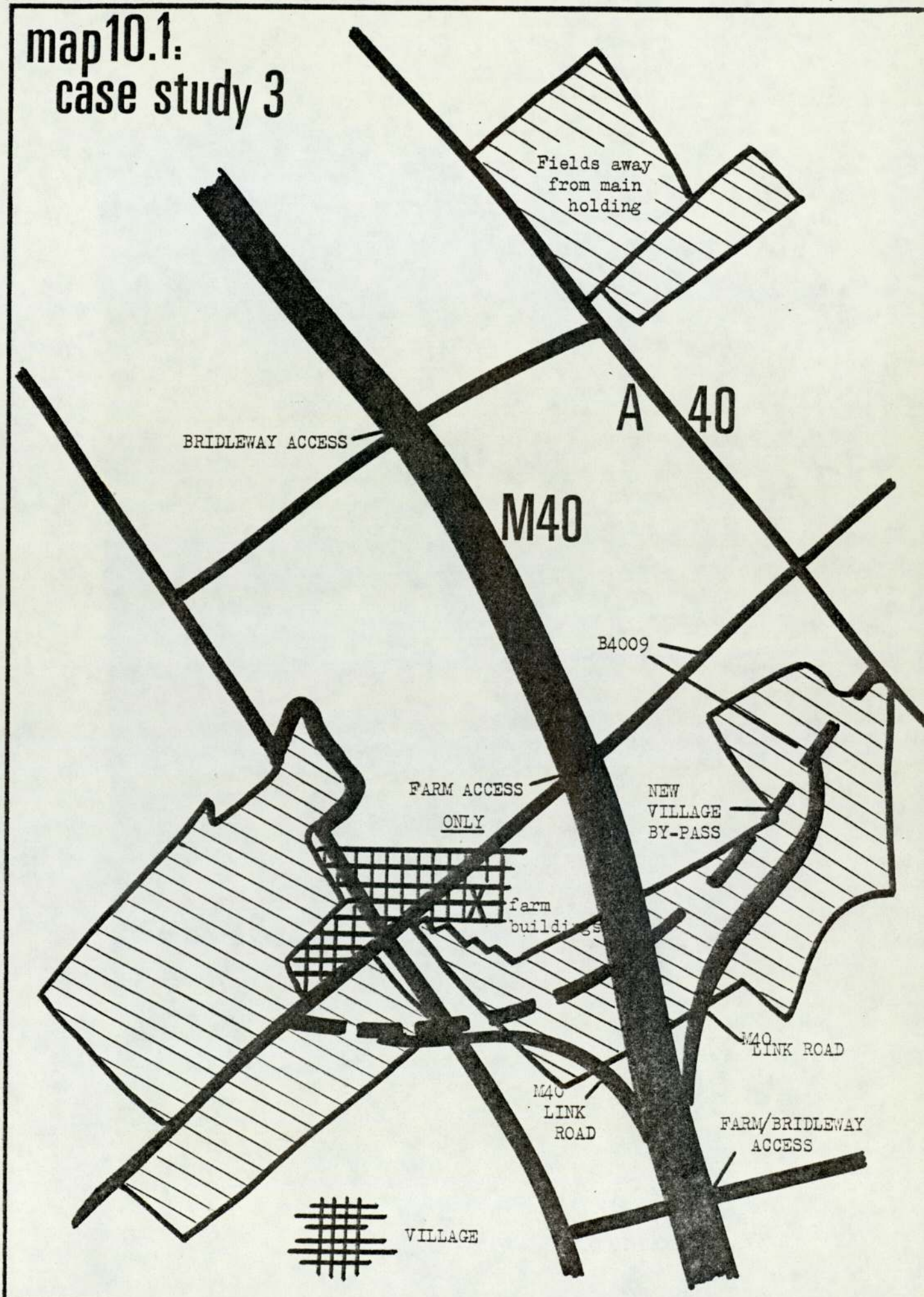
	Total Output (£'s per acre)		Total Inputs (£'s per acre)	
	Actual	Regional average*	Actual	Regional average*
1969/70	88.2	80.5	76.0	64.5
1970/1	91.0	78.9	81.2	64.0
1971/2	78.5	85.0	-	72.5
1972/3	55.4	57.8	64.8	55.6
1973/4	81.2	77.3	79.0	71.6
1974/5	95.1	104.8	95.1	88.0

* Reading University FBD Group 5A

7.1.4 System adaptation began in 1971/2 when for the first time for many years output per acre fell below average. Additionally these figures seem to indicate that in the period 1971-3 there was a noticeable downturn in overall farm activity which has yet to be fully restored.

7.1.5 The reasoning behind the decision to abandon the pig enterprise is that the farm, as can be seen from map 10.1 is located at a complex interchange. The consequence of this was that the farm has been split into 8 parts, where there were only three before and, worse still, five of these parts are small, awkwardly shaped and so very difficult to work. Additionally one major access route across the farm was "stopped-up" by M40: this was a disused railway traversing the main field of the holding

7.1.6 The farmer asserted that he could not really claim any extra travelling time was involved in moving around the farm. As map 10.1 shows, there are three access points across the motorway although only the middle one of these was provided especially for agricultural purposes. However, the much increased fragmentation of the holding seemed to the farmer to provide such severe logistics problems as to make it impossible to continue the pig enterprise, which was thus discontinued.


map10.1:
case study 3
Fields away from main holding
A 40
BRIDLEWAY ACCESS
M40
B4009
FARM ACCESS
ONLY
NEW VILLAGE BY-PASS
farm buildings
M40 LINK ROAD
M40 LINK ROAD
FARM/BRIDLEWAY ACCESS
VILLAGE

7.1.7 What has been the effect of this decision on the farm? Breaking down the total output figures into their component parts indicates that:

(a) overall output levels have been very much influenced by cereal crop output as a constant in the farm system, so that because of an expansion of cereal acreage, an increased yield per acre and rising cereal prices, output as a whole has risen after the bad patch in the early 1970's;

(b) however, this general rise has masked an important shift in the other components, for substitution of cattle and sheep for pigs has never been financially justifiable. Output levels in the two new enterprises have hardly grown and together cannot possibly be said to equal even half the gross output of pigs when that enterprise was running at full scale.

Additionally, the changes in farm system had necessitated the direct expenditure of over £ 6000 on capital equipment which would not have been required if the system changes had not been made, for the level of capitalisation had just about been steadied.

7.1.8 The alternate conclusions which can be drawn are:

either

(a) that the switch from pigs to cattle and sheep was economically rational, given the predicted effect of M40; and that the new system is working "as well as could be expected" given the situation, in which case the M40 has caused a definite deleterious effect on the financial standing of this farm;

or

(b) the system switch was not economically justifiable and it would have been more valid to stay in pigs, even perhaps at a reduced enterprise size. In this case the motorway has had an effect, but it could be classified as primarily psychological, with secondary economic consequences, rather than primarily economic;

or

(c) the system change was economically rational, but was badly executed or badly timed, resulting in a poor return. (There was a beef "boom" in 1972/3 which has since died away.)

7.1.9 Without a very detailed theoretical restructuring of the farm system over a substantial period it is impossible to be sure which of these interpretations is most accurate. A few observations do, however, allow tentative conclusions to be made:

(a) using the farm accounts and regional average pig data it is possible, as in Table 10.14, to estimate the effect on total output of continuation of the pig enterprise at only half its pre-motorway size. The conclusion here is that if it were physically possible to carry on pig farming it would have been economically desirable to do so given the likely relative returns from the different systems.

(b) the change from pigs to cattle was made because of the degree of severance the M40 had caused. It does then seem somewhat strange that an intensive animal system should be chosen to substitute for the open-air pigs, for it would not be expected that this would greatly lessen the severance problems. The farmer himself could not, on interview, convincingly rationalise the choice of a new system. That he has subsequently altered the system comprehensively is a reflection of the lack of conviction on his part about the "correct" system, for the changed circumstances of his farm.

7.1.10 It does seem from this evidence that of our alternatives, (b) is the most likely interpretation. This indicates that the farmer's response to the M40 and its effect on the farm was, in economic terms, non-optimal. It appears that a contraction in the existing pig system would have been physically possible to sustain and this would have brought far higher economic benefits. This finding raises a whole new area of investigation: economic assessments of many types are based on the assumption of economic optimality and economically rational decision-making. The existence, however of farmers who, faced with changing circumstances make non-optimal decisions will serve to upset the best worked predictive model.

7.2 Case Study 14

7.2.1 This tenanted farm comprised 272 acres from which 33 acres were taken for actual road construction. A further 27 acres was rented to the contractors by the landlord for a 2-year period. Half an

Table 10.14: Potential Gross Output of Town Farm had Pig Herd been reduced by 50% (70 Sows) rather than replaced by a Cattle Enterprise. (£'s)

	(1) Actual Total Pig Output	(2) Actual Output per sow	(3) Average output per sow*	(4) Actual Cattle Output	(5) Actual Total Output	(6) Potential Output from 70 Sow Herd*	(7) Potential Total Output (5) - (4) + (6)
1969/70	13811	98	85	388	22918	-	-
1970/1	13017	93	106	997	23625	-	-
1971/2	11008	?	115	2549	22093	-	-
1972/3	1055	?	190	4596	12854	13300	21558
1973/4	-	-	172	3683	18837	12040	27194
1974/5	-	-	260	3896	22052	18200	36356

* Source of standard data: Nix, J., "Farm Management Pocketbook" 6th ed., Wye College, 1974.
Boddington, M.A.B., "Outdoor Pig Production. Report on an Economic Investigation", Agricultural Enterprise Studies In England and Wales, Economic Report No. 4, Wye College, 1971.

acre was bought by the landlord from a neighbour; this was a land locked field corner isolated from the rest of the holding by M40. Thus for two years 22% of the farm area was lost and 12% has been permanently lost. The extent of land loss, it was argued, by the farmer, was exacerbated by its arrangement, for the M40 split the holding longitudinally (see map 10.2).

7.2.2 Unfortunately, as the June Returns for this farm have disappeared from the MAFF computer files, the farmer's Public Inquiry submission is the only evidence we have upon the pre-M40 enterprise combination on the farm:

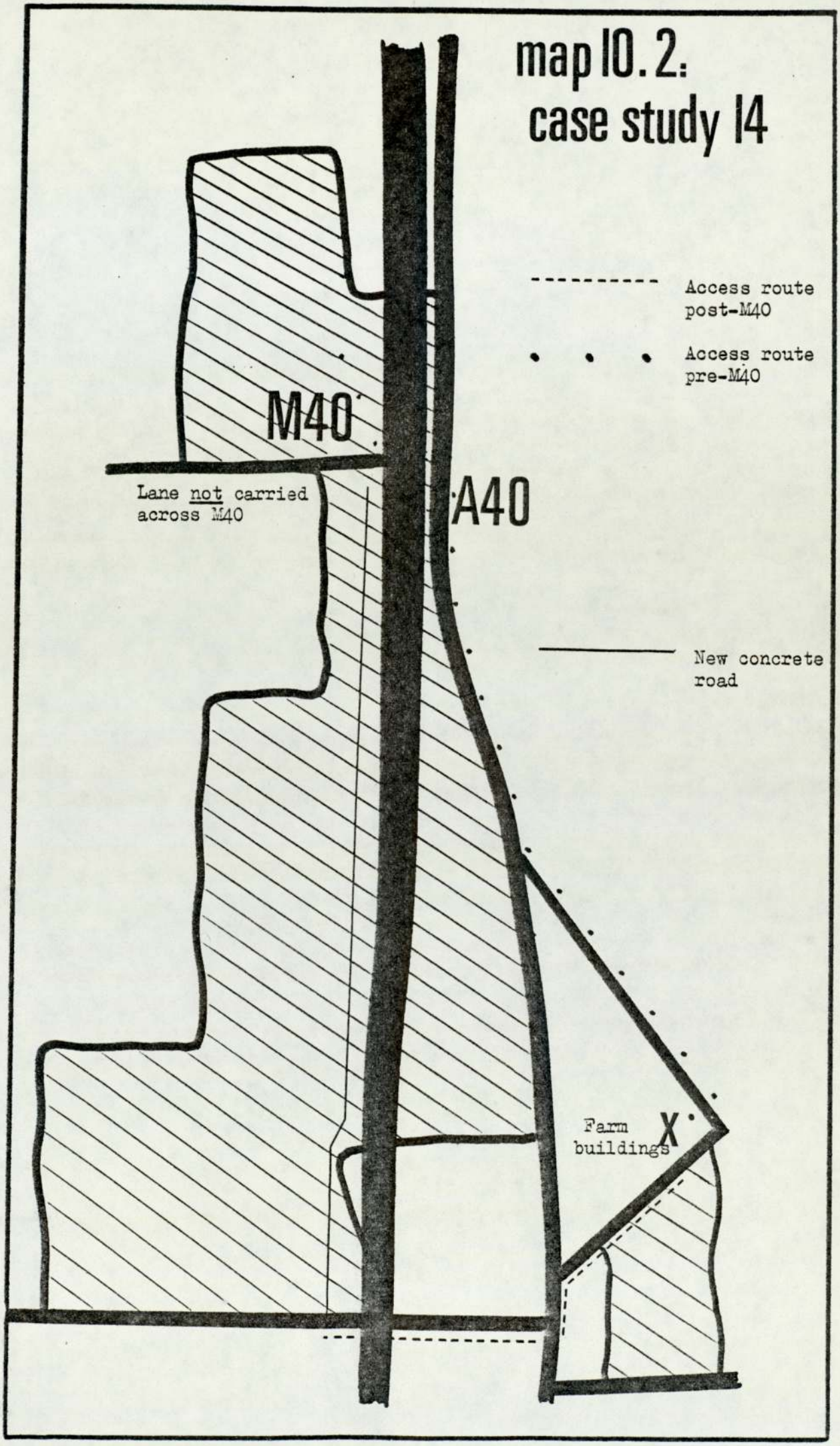
> "The present stocking of the farm comprises:
>
> 22 suckling cows rearing 32 calves, 30 store cattle are fattened each summer, 156 ewes and their lambs, which are fattened, 20 brood mares and their foals, 4 stallions, which cover 70-80 mares, which stay on the farm for a period of approximately 9 weeks each. The cropping of the farm provides for approximately 70 acres of corn which is always grown on the severed land to the south of the motorway and, in addition, 90 acres of pasture on the severed land is mown for hay."

7.2.3 This assessment incidentally, takes no account of the small pig enterprise which, according to the accounts was almost certainly in operation throughout the years prior to buildings of M40 which we have investigated. The only information which we have concerning the post M40 system is that the farmer himself felt that he had made no changes. This, logically, is impossible given the loss of land involved. What was probably meant was that the system had not been revamped merely that certain enterprises had been cut back upon. Our only source of information on this point is the accounts and it is to these that we now turn. (Table 10.15)

Table 10.15: Case Study 14 Input-Output Analysis (£)

£'s	Gross Output	Crop Output	Livestock Output	Fixed Costs	Variable Costs (seed,feed fertiliser)	Total Costs
1969/70	7968	2330	5337 (2306)+	5157	1432	6589
1970/1	8662	2920	5461 (560)+	6102	555	6657
1971/2	11090*	580	9001 (3066)+	6998	1070	8068
1972/3	8313	2054	5617 (1543)+	6738	980	6718
1973/4	10021	1031	7484 (1197)+	7034	2485	9519
1974/5	8959	1931	6820 (56)+	6205	1288	7493

* includes £ 1000 from contractors for rent of 27 acres for M40 construction.
\+ output from horses which is included in total livestock output.


map 10.2:
case study 14
Access route post-M40
Access route pre-M40
M40
A40
Lane not carried across M40
New concrete road
Farm buildings
X

A number of conclusions can be drawn from this data which are relevant to our purposes:

(a) 1972/3 saw a decline in total output; this it appears can be attributed to a decline in livestock output. Horse and cattle output reductions were responsible for roughly equal shares of the decline from 1971/2. However, it is also important to recognise that, leaving aside 1971/2 as an aberration, that crop output in 1972/3 appears to be at a lower level than in the late 1960's and early 1970's. This despite the "boom" in corn prices.

(b) the reduction in corn output continued into 1973/4, again contrary to the "boom", and still had not recovered pre-motorway levels in 1974/5.

(c) it is likely that the crop output decline was due to the loss of land to M40.

(d) after a poor year in 1972/3 livestock output grew in later years and it appears that this element, net of horses, has been maintained at a fairly constant level which is higher than that pertaining before M40.

(e) it is very noticeable that despite the output reductions which were probably, in part, at least, due to the M40 the farmer was hardly able to reduce the level of fixed costs in 1972/3 and they grew again in 1973/4.

(f) variable costs were reduced by about 8%, 1971/2 - 1972/3 but rose dramatically the next year, falling back again in 1974/5.

7.2.4 Overall it seems, on the basis of available data, fair to conclude that, first, the M40 played some part in downturn in fortune of this farm in 1972/3 and 1973/4 and second that the farm economy now seems less stable than prior to the M40 development. It must, however, be emphasised that the lack of data makes it difficult to carry this argument too far. This case then demonstrates the need to have the three components of data available (farm accounts, June Returns, and a good interview response), for without one or two of these elements the whole puzzle cannot be fitted together, so complex are the inter-relationships that exist.

7.2.5 We have also to consider the costs of severance to the farm, Map 10.2 shows:

- the available access to the 167 acres which are severed;
- the public road which was closed after construction but which could have proved useful;
- the hard road which the farmer requested at the Public Inquiry and which was obviously granted;
- the position of the farm buildings relative to M40 and the rest of the farm;
- the previous access routes on the farm.

7.2.6 The costs of severance can be more easily listed than quantified:

- the longer travel distances via the two public road underpasses;
- the awkward shape of fields left on the northern side of M40;
- the new concrete road does not run the complete length of the farm so at the western end, during wet weather, there is a distinct possibility that the machinery will badly cut up the heavy clay land;
- the cost of a new hard road which is about 1600 yards in length.

The last of these elements was carried out as part of the motorway works and so should be counted as a cost of construction. Quantification of the other costs is very difficult. Not knowing which enterprises are carried on in which parts of the farm makes the job even more complicated. For example we have no way of knowing whether the land-use pattern on the northern side of the motorway has changed because of the awkward shape of the fields. Or again, no exact estimation of the number of trips which have to be made to the various parts of the farm can be made without fairly detailed information. However, in order to put some scale to these costs a calculation of severance impact will be made using a number of assumptions:

(a) The non-severed fields to the north of M40 will be left in grass permanently in order to graze cattle and horses. The larger fields the other side of the motorway will always be selected for cereal growth.

(b) Very little grazing will be carried out upon the fields furthest from the buildings because of the distance involved in travelling to these fields. Grass would, however, play a part in the rotation.

(c) Journey lengths to most parts of the farm across the motorway were doubled. To reach, for example the farthest corner of the farm required a round trip of 4 miles instead of the two as before the M40. An informed judgement puts the modal extra journey length at about 1½ miles.

(d) Tractor speed on hard surfaces will be twice that on soft fields. This becomes important at the end of the concrete access road laid as part of the motorway contract. In such conditions it would be fairly safe to assume that average tractor speeds would not rise above 4 mph.

(e) The working paper devised by Leat and Boddington (1) shows how many trips per acre are required each year for the purposes of husbanding different enterprises. From this information it is possible to assert that, because the severed land will be a mixture of grass and cereals, the number of round trips per acre will average about 3.5.

(f) The trips will mainly be made by one man and a tractor. The costs of this combination were worked out in Chapter 8 as being £ 2.50 per hour (at present day prices).

7.2.7 Thus the average ingredients for our severance costs are:

1. 167 acres severed
2. 1½ miles extra travel on each round trip
3. 4 mph average tractor speed
4. 3.5 trips per acre
5. £ 2.50 per hour costs.

Multiplying out, it can be seen that total annual costs would equal:
585 round trips OR
877 miles OR
219 hours OR
£ 548.

This final figure cannot obviously lay claim to exact precision. It does, however, demonstrate that there would have to be far more severe effects to the farm system to cause severance costs to become substantial. Therefore we must record that although the degree of severance may be seen to be an onerous inconvenience to the farmer concerned, the economic costs involved are probably not high.

7.3 Case Study 6

7.3.1 This was a specialist unit of 37.5 acres devoted to pheasant breeding. The M40 took 10.9 acres, 29.1% of the holding, and 12.2 acres were severed. The severed land was adequately provided for by a well-placed agricultural underpass which was shared with a neighbour. Severance costs incurred because of extra travel would have been minimal, had the unit continued in business, but the farmer decided that it would not be economically possible for the farm to continue and so he stopped trading in August 1971, some 6 months before construction began. Therefore we have to examine three major issues here:

1. Was it really necessary for the operation to cease?
2. What scale of business was halted?
3. What agricultural resources were lost and what preserved because of the closure?

7.3.2 Unfortunately we have no June Returns for this farm; this, however, is of little importance because of the simplicity of the system: 20 acres of corn were grown each year in order to feed the pheasants, which were penned on the remaining land. The birds numbered anything up to 20,000 at one time, but averaged about 3,000. The yield from the corn was average at 30-40 cwt per acre. Before the M40 route was finally fixed, the farmer feeling optimistic about the future, had plans for renting extra, adjoining land and expanding his business.

7.3.3 The motorway as finally built ran straight through the pheasant pens, In order to continue in business, it would have been necessary to rearrange the physical layout of the holding to rebuild the pens. The farmer felt it would be uneconomic to do this because during the time that rebuilding was being carried out the normal outlets for the pheasants would be lost to competitors and, so competitive is the pheasant market, they were unlikely to be won back. This reasoning does not seem particularly valid - basic market economics tell us, that although there may be some institutional "friction" in the market place due to the building up of personal trading relationships, for the most part buyers will buy where the price is lowest at any given level of quality. Applying this to Case Study 6, it could be reasoned that once the pens had

been rebuilt and the farm functioning again, if the price of the pheasants was competitive, the demand for them would soon build up again.

7.3.4 Thus, although perhaps the farmer would not have admitted so, it is very likely that personal factors rather than economics caused the business to be terminated. Two factors in particular could have played important causal parts:

(a) The farmer had a very serious kidney complaint which forced him onto a dialysis machine daily. Although he was not called upon to provide physical labour for the farm, the lack of physical strength might have affected any decision about whether to increase or decrease the mental stress upon himself.

(b) The farmer also owned a garage business, which according to both him and his workers, was doing rather well, and also possessed a private "fortune". In other words, the pheasantry was not an economic necessity.

When interviewed on this matter, the farmer's land agent unreservedly agreed with this interpretation of the evidence.

7.3.5 In fact, as the table below shows, the pheasant farm was not that profitable a business:

Table 10.16: Case Study 6 - Accounts Analysis

	Gross Output	Total Costs	Net Farm Income
April-Dec. 31 (1) 1965	1663	2583	-920
1966 Jan. 1 - Dec. 31	4373	2523	1850
1967 "	5070	3048	2022
1968 "	5663	3392	2371
1969 "	5414	3447	1967
1970 - Aug. 1971 (2)	4003	3377	626

Notes

(1) Opening year of unit

(2) "Run-down" period.

7.3.6 Conversations with the farmer's valuer revealed that instructions were given to settle the M40 compensation claim as quickly as possible despite the warning that the final sum would be less than it would be possible to obtain given more discussions with the

Valuation Office. This indicates that the need to be rid of an onerous burden was more important than strictly economic considerations. The scale of income level did not, it appears, warrant the worry of continuation to a very sick man with other sources of financial support.

7.3.7 It is possible to account for most of the resources of the pheasantry after the unit had ceased to operate.

Land

1. Nearly 11 acres of land was lost to M40 leaving about 26 acres. The 12 severed acres were rented to the contractors as a soil dump. This has now been returned to the farmer and is under grass and grazed by a couple of ponies.
2. The farm yard was sold for development and now houses have been built on it.
3. The farmer himself put in for permission to develop another part of his farm but this was refused on the grounds that it was too close to the M40 (!). It is now under grass.
4. Thus most of the farm is now lying idle under grass, being grazed by nothing of any agricultural consequence.

Labour

1. The farmer himself has retired from active participation in any business.
2. His partner has moved on to an unknown activity, but is thought not to have remained in a similar field.
3. The full-time male worker who was employed has left agricultural employment entirely to work in a local factory.
4. Thus there has been a loss of labour/managerial resources to agriculture which can be attributed to M40.

Capital Goods

1. An electric generator was sold off cheaply.
2. Other agricultural equipment such as tractors, balers, combines, etc. were sold at a total of £ 140 less than the book value.
3. It was impossible to sell the equipment which comprised the pheasant pens - thus a considerable amount of netting and posts had to be scrapped.

7.3.8 The conclusions which can be drawn upon this case study are:

(a) The farmer decided at the time of construction of M40 to discontinue his farm's activities. In making this decision personal social factors seem to have been more important than economic ones.

(b) This is not to say, however, that the farm would not have suffered severe economic hardship had it been decided to continue. The loss of 30% of land area would have been a severe blow. It might well have been necessary to buy replacement land to bring the farm up to a viable size; alternatively, the only "correction" that might have been necessary was the buying-in of the equivalent of 11 acres of corn or about 15-20 tons each year. It does, however, seem to be a valid conclusion to assert that this unit could have readjusted and carried on farming. Therefore, we may argue that the decision not to carry on was economically non-optimal, in terms of national agricultural resources.

(c) Because of this decision resources, both fixed and mobile were lost to agriculture, definitely in the medium term and perhaps even forever. Thus to count the agricultural loss on this farm as 11 acres of Grade 2 land, as the DoE or MAFF would do, is to grossly underestimate the impact of the motorway. It is with an extreme case such as this that the true defects of the present method of prediction of agricultural impact can best be seen.

8. FARMS FOR WHICH ACCOUNTS WERE NOT AVAILABLE

We now turn to the five case studies for which farm accounts were not made available. The object of the investigation is to determine whether M40 has had any effects on the farms in question which might have manifested themselves in the farms' accounts, had they been available.

8.1 Case Study 9

This farmer was by far the least responsive of all those interviewed, refusing to release either June Returns or accounts, and not allowing us access to his valuer. About 13 acres were lost from a primarily grassland farm of 150 acres (nearly 9%). A further 40 acres were severed, but access was provided by means of a very fine overbridge. The real impact of M40 on this farm cannot be analysed due to lack of data.

8.2 Case Study 10

This was a case where occupation of the farm changed hands during the construction of M40. The outgoing farmer decided to retire, ostensibly because of a heart "condition"; he did, however, give the impression that the M40 speeded up a decision that would possibly have been delayed for a few more years. 11½ acres out of 220 were lost to M40 at the corner of the farm where a fairly simple junction is situated. A further two acres were severed, land-locked, and finally purchased by the DoE. Total loss to the M40 was thus 6.1% of the holding. This loss was greatly exacerbated by the outgoing farmer retaining 26 acres of his farm as "green-belt" around his newly-built retirement cottage. Thus the farm as taken over by the new owner was 39½ acres or 18% smaller than the farm pre-M40. However, as the new occupant would not grant an interview, and neither accounts nor June Returns were available it was not possible to carry out any economic analysis. It should, however, be emphasised that if it is accepted that the farmer retired prematurely because of the M40 then an extra 28 acres of land were lost before they had to be. Thus the theoretical gross margin income loss calculations carried out in section 1 of this Chapter which gave an income loss of £ 216 could be reworked on the basis that 40 acres had been lost, not 12. This would give an income loss of £ 720 or 43.7%.

8.3 Case Study 11

8.3.1 This was a small dairy unit situated in and around a medium-sized village. It was divided into three parts, all of which were easily accessible from the farmhouse by the public road network (Map 10.3). The farm and indeed, the farmer, were of the old-fashioned type and all the cows were milked by hand. 13 acres out of 93 were lost to M40, about 15% of the holding. Additionally parcels of 7, ½ and 6½ acres were severed. The District Valuer took possession of the half-acre field corner and there were fairly easy access routes to the other two parcels, (Map 10.3). However, even though easy access was available, the farmer decided that it would not be appropriate to continue his milking herd. This can be seen in the June Returns, which are reproduced below:

Table 10.17: June Returns Summary

	1969	1970	1971	1972	1973	1974	1975
SMD	395	403	302	311	344	451	347
Total acres	93	93	93	80	80	80	80
Workers (full-time)	2	2	2	2	2	2	2
Milk cows in milk	10	12	0	0	0	0	0
Beef cows in milk	11	12	26	24	9	9	9
Milk cows in calf	4	2	0	0	0	0	0
Beef cows in calf	5	6	6	0	0	0	0
Other cattle/calves	42	45	48	56	93	130	96

This data demonstrates that the dairy herd was abandoned the year before construction began. The years 1972/75 saw the farmer endeavouring to substitute a beef enterprise. Table 10.18 shows the effect this had upon the stocking density.

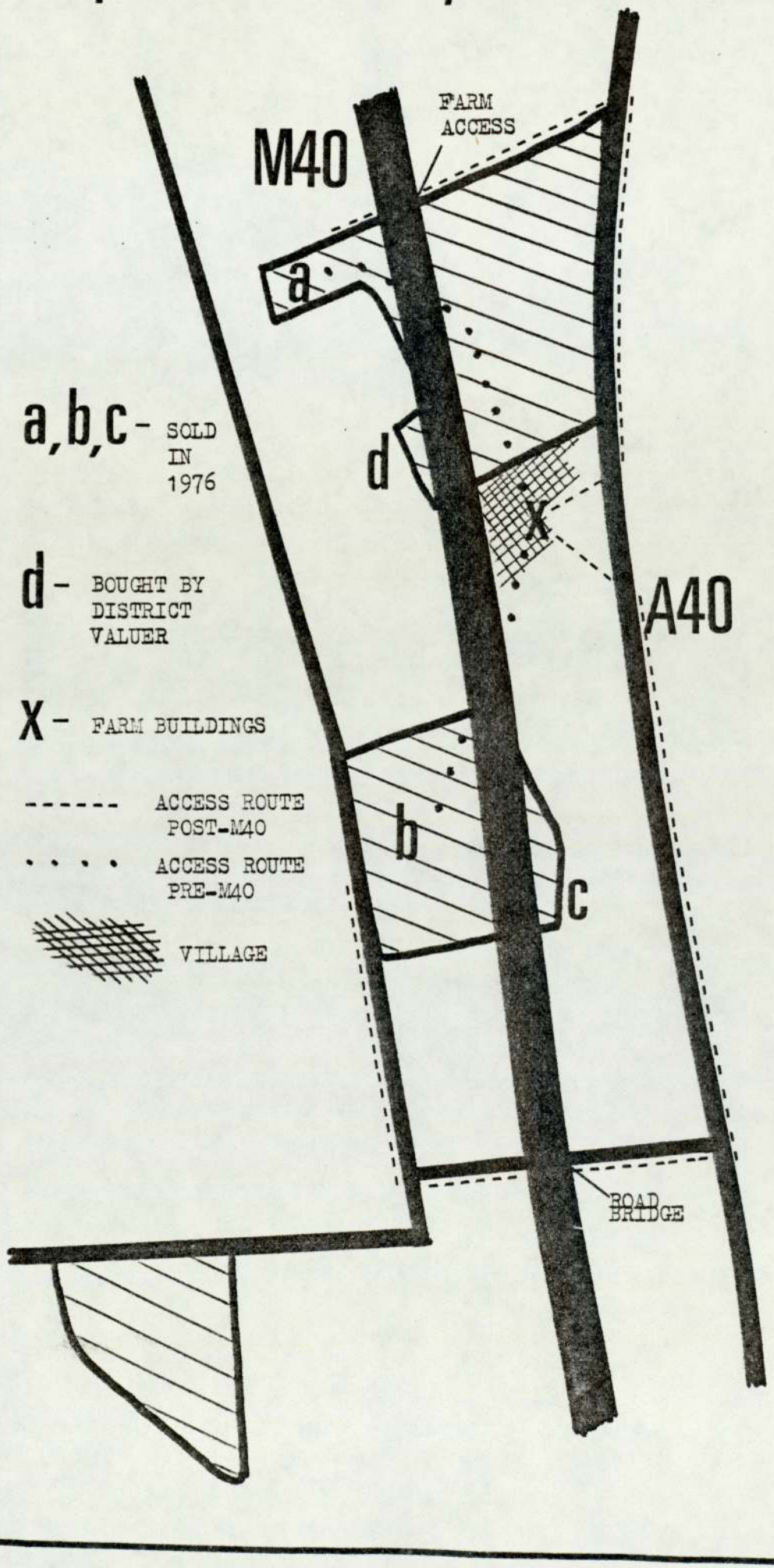
Table 10.18: Stocking Density 1969 and 1975

	*GLU per animal	1969 Number	1969 GLU	1975 Number	1975 GLU
Dairy Cows	1.0	14	14	0	0
Beef Cows	0.8	16	12.8	4	3.2
Cattle 2 yrs +	0.8	15	12	22	17.5
Cattle 1-2 yrs	0.6	14	8.4	52	31.2
Cattle/calves under 1 yr	0.4	13	5.2	22	8.8
Forage acres	Total	72	52.4	100	60.7
		93		80	
GLU per forage acre		0.56		0.76	

* Grazing livestock unit

An increase of this magnitude (35.7%) is highly significant and, perhaps, indicative of overgrazing.

map 10.3: case study II



8.3.2 Without any accounts we have no way of knowing exactly how successful this switch from dairying to beef was. It is, however, possible using Standard Output figures to examine the likely level of total output. This is done in Table 10.19 below.

Table 10.19: Standard Output 1969 and 1975 (All figures 1974 hased) (£)

	S.O. per unit	1969		1975	
		Number	S.O.	Number	S.O.
Dairy cows	250	14	3500	0	0
Beef cows	-	16	-	4	-
Cattle over 2 yrs	60	15	900	22	1320
Cattle 1-2 yrs	60	14	840	52	3120
Cattle ½-1 yr	30	10	300	15	450
Calves M.S.* to 6 months	50	3	150	7	350
			5990		5240

Thus, if this farm was performing at about average level it can be seen that over the period 1969-75 whilst the land area of the unit decreased by 15% the total standard output fell by about 13%.

8.3.3 Regarding the SMD level the fall, 1969-75, was from 395 to 347 or 23%. Notably, the farm, even before loss of land to the motorway, was functioning well below the 600 smd level and so would be classified by MAFF as being intermediate, even though two full-time men worked on it.

8.3.4 Using the technique devised for calculating the travel costs to severed land it is possible to estimate the size of severance costs accruing to this unit. Referring to the map it can be seen that the only journey which was substantially lengthened was that to area B. The round trip addition to the journey would be about 2 miles at most. For extensively grazed dairy cows Leat and Boddington assert (1) that 10 trips/acre annum are required. Area B comprises 7 acres thus 70 trips per annum would be required, and the total extra distance travelled would be 140 miles. At an average walking speed of 1.5 mph this would take 93½ hours each year. Assuming that both men on the farm made

*Multiple suckling.

all trips with the dairy herd, 187 man-hours would be involved. Costing at an overtime rate of £ 1.20 per hour, the annual cost would be £ 224. Additionally, it is necessary to make an allowance for grassland maintenance. Assuming that all such maintenance is carried out completely independently of walking cattle then about 5 trips/acre/annum would be necessary. One man with a tractor could do the work and so the cost would be £ 2.50/hour. For 70 acres the costs would be:

$$£\ 2.50 \times \frac{2 \text{ miles}}{4 \text{ mph}} \times 7 \text{ acres} \times 5 \text{ trips/acre/annum} = £\ 44.$$

Thus the total annual costs of severance would be £ 268; hardly a significant amount, compared with total variables for a year. However, it is necessary to examine the logistics of the situation. By saying that area B would require 70 round trips per annum we mean that there would be enough grass there to graze the cows for 70 days in the year. Examining an individual day it can be seen that the 2 mile trip would have to be completed by two men. Walking to the fields with the cows in the morning would take about 40 minutes, walking back on their own would take perhaps 15 minutes. Thus in total, nearly 1 hour would be added on to the working day for each man.

8.3.6 Carrying out similar calculations for a beef enterprise (extensively grazed and outwintered) the annual severance costs would amount to only about a quarter of those for the dairy herd, because less trips need be made and some can be made using vehicles rather than on foot. It is not surprising, therefore, that the farmer decided not to continue dairying on Area B. And, having once made that decision, it would seem sensible because of the total loss of land suitable for dairy cows to the motorway to discontinue dairying completely. Area E was only ever used for hay-making and grazing beef cows because of its distance, so that only A, F, and C (about 25 acres) would be available for grazing dairy cows. Thus the decision to switch from a dairy to a beef enterprise seems justified in terms of both economics and ease of working.

8.3.7 However we now have to record the most important change on this farm since M40 was built. For in 1976 (for which no June Returns are available) the farmer decided to discontinue renting 20 acres of his farm and move into semi-retirement, merely keeping a few beef cattle on the remaining 60 acres. The rationale behind the move

was that for 40 years he had milked his dairy herd, by hand, twice a day; this is what farming was to him and without the milking to do he felt that he would rather not carry on farming. Now he lives off savings and the very small return from the remaining beef herd. Thus, in effect the M40 caused 73 acres of this farm to be taken out of production almost completely, for only the 20 acres released is now being properly farmed. Without M40 there is little doubt that the farm would be in full operation today. For although the farmer is nearing retirement age, his son, who worked on the farm also, was prepared to take over the running of the unit and the dairy herd. Since M40, and because of it, the son has decided he would rather move on to another farm.

8.3.8 Thus we have discovered another case where socio-psychological factors have been more important to decision-making on the farm than the direct economic consequences of M40. These secondary factors have, as in other cases, greatly enlarged the primary economic impact of the motorway, with only 22% of the farm now fully productive.

8.4 Case Study 12

8.4.1 This was the farm owned by the farmer who led the original farming community objection to M40. This farmer himself died the year after the motorway was completed and his son has taken over the farm. This naturally complicates the analysis for any incoming farmer will have different ideas from his predecessor; indeed, the son had been engaged on phasing out his father's beef/sheep enterprises and becoming almost completely arable. Additionally we have neither accounts nor June Returns to aid our investigation.

8.4.2 11 acres out of 537 were lost to the M40 directly (2%). 14 acres more were severed in a long thin strip of land. The effect of the severance has been to stop any ploughing of that particular land: sheep and cattle have been grazed and two or three loads of hay are taken off it annually. The extra round trip journey length to the severed portion is about 1½ miles. Given that the sheep and cattle are moved by truck and the hay by tractor and trailer, the costs associated with these extra movements are unlikely to amount to more than £ 100 annually. The son contended that if anything, the farm was performing better in recent years than before M40, in his father's day. He attributed this to three main factors:

(a) the good state of farming in the early 1970's;

(b) the dry weather in which his farm thrives;

(c) the system changes he instigated.

It appears, then, that this farm has suffered little because of M40 and this is the conclusion we would expect given the 2% land loss with fairly minimal (if perhaps irritating) severance problems.

8.4.3 However, this might not be the end of the story. This farm is rented from one of the Oxford University Colleges, which in fact owns two other adjoining farms also affected by the motorway. (Case studies 3 and 8). When this farmer died the tenancy for the farm came up for renewal. Ever since then debate has been carried on between the farmers and the College about the redistribution of land in order to adjust to M40. Quite naturally, the College suggested that the severed land on this farm should be passed over to the farmer on Case Study 8 with which it now more naturally fits. More controversial, however, is the plan to transfer another, unaffected, 126 acres from this farm to Case Study 3 in order to make up for the loss and disturbance this farm suggered because of M40. It would, of course, be wrong to attribute all this potential land loss directly to the M40. However, correspondence with the bursar of All Soul's and College's agents revealed that the motorway is, at least, a causal factor in their decision-making.

8.5 Case Study 13

8.5.1 This was a small outdoor pig unit of 37 acres; the pigs were reared on barley grown on the farm, 3¼ acres were lost to the M40; part of this loss (¼ acre) was due to the widening of the local raod so that a bridge over the motorway could be constructed. An additional ½ acre was severed; this was soon sold to a neighbour for the handsome sum of £ 700. Thus the total loss was 3¾ acres or 12% of the holding.

Table 10.20: June Returns for Case Study 13

	1970	1971	1972	1973	1974	1975
SMD	463	407	423	448	555	301
Area	37	37	33	33	33	33
Wheat	10	-	-	-	-	-
Barley	20	30	26	23	23	23
Grass	7	7	7	10	10	10
Total Pigs	222	190	217	280	241	54
Sows in Pig	47	39	100	35	39	35
Gilts in Pig	3	9	6	6	4	6
Other Sows	8	12	14	24	23	10
Boars	1	1	2	2	1	1
Fattening Pigs	161	129	153	212	172	0
Barren Sows for fattening	2	0	1	1	2	2

8.5.2 From Table 10.20 and the interview response we can draw a number of important conclusions:

(a) up to 1975 the land loss was absorbed entirely on the cereal producing side of the system;

(b) pig numbers were expanded in 1973 and 1974 and additional feed bought in to feed them;

(c) the outcome of this decision was that all the compensation would be eaten away (almost literally) by the pigs within 3 or 4 years. After this the unit would run into serious cash flow and capital problems;

(d) however, it seems as though the system ran into trouble sooner than expected, for such was the situation in 1975 that the farmer, very short of liquid assets to purchase more feed, was forced to sell all his young pigs much earlier in the year than he would have liked. As a result, the SMD level in June 1975 was only 54% of that 12 months earlier. The gross margin on the young stock sold has been greatly reduced from that which would have been expected from fat hogs.

8.5.3 The question may be posed, how would the farm have fared if the pig numbers had been reduced rather than expanded post M40. No exact answer can be given on this because of the paucity of financial information available. It is, however, possible to make suppositions based on likely assumptions. Boddington (2) estimates that each breeding sow (or gilt) with farrows requires 30 cwts. of feed annually. In 1971 30 acres of barley were grown on the farm; this would have yielded about 900 cwts. The June Returns for that year reveal a total of 60 sows and gilts; the feed requirement for these would have been 1800 cwts. Thus the farm was about 50% self-sufficient in feed at this time. If this 50% level is held to be a desirable constant then the loss of four acres of cereal land would mean that the herd size should have been cut back by 8 sows after the loss of land to M40. About 52 sows and gilts plus offspring would have been a useful working number. Instead, however, the herd in 1972 was expanded to 120 sows/gilts. In subsequent years this level was reduced to 65, 62 and 51 respectively. Thus by 1975 the number of sows had fallen back to what would, theoretically, be the correct level. However, by this time the farm appears to have placed itself in the invidious position of not having the necessary cash to buy in enough feed to support the fattening stock.

8.5.4 It is then difficult to understand the decision taken in 1972 to expand the sows/gilts number so greatly. The feed requirement for 120 sows and gilts plus fattening stock would have been about 3600 cwts. whilst the farm was only capable of producing 780 cwts. (Less than 22% of total.) Even in 1973 and 1974 the farm was only about 35% and 37% self-sufficient. Thus in 1972/3/4 the farm had to buy in 4680 cwts. of feed. Had the herd size been immediately cut back to about 52 sows/gilts the buying-in requirement could have been reduced by 46% to 2520 cwts. and costs could have been reduced by about £ 5000 over these three years. We obviously cannot say that to cut back the herd to the level suggested would have been the best strategy for this unit given the land loss to M40. However, we can contend with a great deal more conviction that to dramatically increase the herd size immediately after land loss and, whilst construction was in progress, can hardly be said to be a sound decision. It seems as though this is another case where the farmer behaved in an economically non-optimal manner when faced with the problem of how to cope with the farm system adjustments necessary after land loss to M40.

8.6 Case Study 16

It was reported (Table 10.1) that this farm only lost 1% (2 acres) of its area. This was at the very edge of the unit and according to the farmer had very little effect on the farm. Even the theoretical gross margin calculation only estimated a 2.3% income loss, and we have argued elsewhere (Chapter 8) that this will tend to overestimate loss. We may, therefore, agree with the farmer's assessment.

9. THE CONFLICT BETWEEN INDIVIDUAL AND NATIONAL BENEFITS

9.1 Throughout our work we have argued that although the overall agricultural impact of a road should be measured by aggregating individual impacts. However, the most important rider to this argument is that the impacts aggregated must be those accruing to the nation as well as the individual.

9.2 The evidence gathered from M40 survey enables us to highlight the most important conflict that emerged. Case Study 4 well demonstrates the conflict and we now describe it in detail to highlight the issues.

9.3 Case Study 4

9.3.1 This farm is mainly situated at the base of the Chiltern Scarp, but also contains some hillside rough pasture. Prior to the M40 construction this farm comprised 319 acres of which 63 acres were hillside rough grazing and of little productive use. The other 256 acres were put down to cereals with barley predominant.

9.3.2 Graph 2 demonstrated that throughout the period in which we are interested the fortunes of this farm have fluctuated over a wide range of incomes. What, then, are our grounds for contending that this farm has gained from the M40 but that this gain cannot be classified as a national gain?

9.3.3 Initially we make the point that the extent of farm disturbance, other than land-take was of little consequence. Only 9½ acres of the unit (3%) was severed and this was easily accessible through a shared agricultural access. There was therefore no need for the farmer to alter his farm system in any way to cope with this.

9.3.4 The interesting factor as far as we are concerned revolves around land-take. In order to make a cutting through the adjacent Chiltern Scarp it was necessary to remove hundreds of millions of tons of material. Plans were made in advance of construction to cope with the removal of this material. However, the calculations were based on a gross underestimate of the exact amount of material that had to be moved. Therefore a short while after construction began it became obvious that the contractors would have far more excess material to dump than had been planned for. The search for dumping sites became frantic: part of the solution was a plan devised to landscape the motorway as it came out of the scarp onto the farmer's land. The landscaping involved sloping the embankment, which would be very high at this point, far more gently; this enabled a great deal of the excess material to be used to produce a fairly aesthetic result. In order to tempt the farmer to sell his land (for a CPO could not be served) he would be allowed to farm this regraded embankment.

9.3.5 The farmer agreed to this plan but only after hard bargaining on the part of his agent (from whom most of this information derives). Although we were not able to ascertain the exact amount paid by the contractors for the temporary lease of the extra land (10 acres)

the agent estimated that it had amounted to well over £ 30,000. It was this release of capital which enabled the farmer to both purchase 33 acres of replacement land at a cost of £ 27,468 (£ 832 per acre) and also a great deal of new capital equipment.

9.3.6 Table 10.21 summarises the various land transactions which took place over this period.

Table 10.21: Case Study 4 - Farm Size Acres

	Total size	Cropland	Rough Pasture	Notes
June 1971	319	256	63	Stable pre-M40 state
June 1972	266	224	42	53 acres lost to M40 (32 crop land + 21 rough pasture)
June 1973	299	257	42	33 acres of cropland bought
June 1974	299	257	42	-
June 1975	269	267	2	40 acres of rough grazing sold + 10 acres cropland returned post-landscaping

9.3.7 The sale of the rough pasture was brought about because the M40 had taken part of the Nature Conservancy's Reserve (at nearby Beacon Hill) and so they required more land.

9.3.7 Table 10.22 shows how this farmer has also been able to increase capital expenditure on the farm because of the contractor's payment.

Table 10.22: Net Capital Expenditure (including drainage works) (£)

1969/70	196
1970/1	625
1971/2	2026
1972/3	2175
1973/4	2486
1974/5	4457

9.3.8 Finally we have to report that the replacement land is 10 miles away from the main holding and because it has no buildings of its own, has to be worked from the home buildings. Using our already explained method of calculating it is possible to estimate the travel costs involved. Boddington and Leat (1) estimate that

the required number of trips to cereal bearing land is 2.5/annum/acre. Thus the total number of trips to the 33 extra acres would be 83. The costs involved therefore are for one man and a tractor over 82 round trips and one man and a combine over one round trip. The time taken for a round trip with the tractor according to the farmer, was about $1\frac{1}{2}$ hours. Therefore the total time involved would amount to 123 hours; costing this at £ 2.50/hour means that the total annual costs incurred would be £ 308. The combine movement is harder to cost for there are no standard averages with which to work. However, the farmer said that the round trip would take three hours and so, assuming 2 men are used it is fair to put an upper limit of £ 20 on the cost of the operation.

9.3.9 Therefore the total real costs of severance are unlikely to exceed £ 330/annum, and the farmer himself will not feel all the costs if work timetables can be effectively arranged. This conclusion is interesting within the context of our general discussion of severance for it seems to put a realistic upper limit upon severance costs for arable farms. A twenty mile round trip is a very large distance when compared with the more usual cases of severance encountered, yet our costs calculations indicate a low level of economic disbenefit: the £ 330 capitalised at 10% over infinity would come nowhere near to justifying the provision of an access bridge if this were appropriate. This confirms our early supposition that provided a safe right-of-way exists to severed arable land (i.e. it is not land-locked) then it does not really matter how long or tortuous the route, unless a very large piece of land indeed has been cut off, or it is very intensively farmed.

9.3.10 Finally, what of the comparison of overall benefit to this farm and the nation? A number of points should be considered:

(a) 22 acres of cropland were taken but the lease of land for landscaping created a capital release large enough for 33 acres to be purchased as replacement land. This is undoubtedly a gain for the individual despite its distance from the farm, but <u>not</u> for the nation unless the 33 acres was not being productively farmed before. This was not the case;

(b) the construction of M40 enabled the farmer to be rid of most of his unproductive rough grazing. Because this land had virtually been left to its own devices it cannot be argued that resources were available for transfer; however, more importantly, the sale did involve a capital release which would have been of use to the farmer;

(c) the contractor's generous payment for the landscaping area also provided a valuable injection of capital;

(d) in order to assert that the national farm has gained from the events on this farm it would be necessary to prove that these capital injections were able to create a larger income than that lost off the 22 acres of cropland lost between the fencelines. Table 10.6 indicated that without the land loss the income level could have been nearly £ 1,000 higher. It is, perhaps, doubtful if the capital injections could have produced income of this order, even though marginal investments can, if wisely made, be extremely profitable. We can conclude then that although this farmer has probably improved his own position (although this has yet to manifest itself in the income figures) the national farm has lost out.

9.4 Finally, then, it is important to record that when we go on, in the next section to allocate a classification of impact to each of the sixteen farms and calculate overall impact, we will have to bear in mind the difficulties surrounding the role that specifically purchased replacement land can have upon a farm's economy. If the replacement land was already productive, only the increase in productivity can be counted as a net national benefit, not the whole of the gross margin of that land.

10. THE OVERALL AGRICULTURAL IMPACT OF M40 (STOKENCHURCH-WATERSTOCK)

10.1 The full extent of the agricultural impact of this section of M40 can only be truly ascertained, so our argument runs, by aggregating the individual farm impacts. The basic loss, that of land between the fencelines, (the MAFF/DoE/RCU measure of agricultural disbenefit) is easily stated as being 271 acres of farmland. This averages nearly 28 acres a mile, a result which is not unexpected, or extraordinary, given our previous

work (Chapter 7) on this subject and the fairly flat nature of the land affected. Having said this, however, it becomes more difficult to make progress; this, it may be said, should not be surprising for we are dealing with very complex business units where numerous variables have to be taken into account.

10.2 In order to make a comparison *with* the predicted level of impact as devised earlier we will first lay out the actual impact on individual farms in a fashion employing a form of star-rating. This is contained in Table 10.23, and summarised in Table 10.24.

Table 10.23: Overall Impact of M40

Case Study	Gross Margin Impact Prediction (a)		Actual Overall Impact (b)
	With average data	With Actual data	
1	*	**	*
2	****	****	*
3	****	****	***
4	****	****	+
5	**	**	?
6	****	****	****
7	*	*	*
8	*	*	*
9	***	N/A	?
10	**	N/A	?
11	****	N/A	***
12	*	N/A	*
13	***	N/A	***
14	***	***	**
15	**	***	*
16	*	N/A	*

(a) As calculated in Tables 10.2 and 10.3 except for case study 3 for which an extra star was added because of severe severance problems.

(b) key to actual impact analysis:

?	=	Indeterminate
*	=	Minimal
**	=	Moderate
***	=	Severe
****	=	Business discontinued
+	=	Economic position improved.

Table 10.24: The Incidence of the Agricultural Impact of the M40

Degree of Impact	Predicted		Actual
	With average data	With actual data	
Economic position improved	0	0	1
Minimal	5	2	7
Moderate	3	2	1
Severe	3	2	2
Business discontinued	5	4	2
Indeterminate	0	6	3
Total	16	16	16

10.3 The most pertinent question arising from these tables is how accurate is the predictive gross margin methodology in indicating and isolating those farm units which are likely to be vulnerable to the proposed scheme? First, is it fairly plain that the technique is unlikely to miss classifying any farm which will go out of business or be severely affected - to this extent it is most cergainly accurate. The problem arises in that too many farms are predicted to fall into the upper impact range: over-estimation is the major fault of the model. In particular we need to explain the divergence in Case Studies 2, 4 and 15. This, in fact, is not difficult; for Case Study 4 we have already described in some detail that the gain came about from a "windfall" provided by the contractor's error. Case Study 2 is simple but highly instructive. There is no doubt that the extent of land loss (17%) could have led to a very high loss of income. The farmer realised this and decided to alter his farm system: both the pig and multiple suckling enterprises were dropped in favour of intensive fattening of store cattle. Graph 4 demonstrates that although the motorway and consequent system changes caused a dislocation of the farm's financial position this appears only to have been temporary. There seem to be two causes of the apparently smooth transition:

(a) the system changes were well chosen economically;

(b) the farm was operating well below the average performance prior to the building of M40. There was thus plenty of opportunity to intensify production and increase productivity.

The exceptional nature of this case is most enlightening and opens important avenues of thought. On this basis we are prompted to ask how the farms which had to reorganise, but did it in a non-optimal fashion, would have fared had they made their readjustments in a more economically justifiable manner.

10.4 For Case Study 15 the farmer showed equally good sense. Before the building of the motorway he had both dairy and beef herds. In order to cope with land loss and severance he decided not to reduce his herds at all, but to increase the stocking density instead. This has proved fairly successful according to the farmer although we do not have enough data to completely support his argument.

10.5 It does then seem valid to conclude that where the gross margin methodology has greatly over-predicted that the farmer has probably reorganised the farm system in order to lessen the impact. This will be important to bear in mind when we come on to make suggestions as to the way in which the agricultural input to the highway project appraisal might be improved.

10.6 Having made an assessment of the impact of M40 upon the individual farm units the next step is to aggregate and make an estimate of the overall impact of the motorway. This is unfortunately our most difficult task to date. The lack of data and the difficulties of analysing precisely the impact of M40 upon a farm means that we have to rely upon a more hybrid method and the final result offered can only be tentative. Although it would be quite meaningless to simply aggregate all the stars in Table 10.23 this technique of impact assessment can be of use in the attempt to place an overall monetary value upon the M40 impact.

10.7 For those farms with a one or two star rating it is proposed simply to carry out a gross margin loss calculation as done in Table 10.2 but with a 1972/3 base year (i.e. the year land was actually lost) rather than the earlier one used for predictive purposes. Due to the lack of an alternative approach this will also be done for those farms which could not be allocated a star-rating. Finally Case

Study 4 will be treated in the same fashion, but the replacement land bought with the contractors payment will be ignored because it does not constitute a benefit to the national farm. The results of these calculations using average data* are set out in Table 10.25.

Table 10.25: An Estimation of Income Loss (1972/3) for Certain Farms Affected by M40 (Stokenchurch-Waterstock).

(1) Case Study	(2) Land Loss	(3) Gross Margin/ Acre (a)	(4) Income Loss (2) x (3)	(5) Severance (b) Costs	(6) Total Costs (4) + (5)
1	16	42.7	683	100	783
2	40	68.8	2752	0	2752
4	32	41.2	1318	330	1648
5	26	30.8	801	0	801
7	4	62.5	250	0	250
8	15	68.8	1032	300	1332
9	13	30.8	400	0	400
10	40 (c)	30.8	1232	0	370
12	11	30.8	339	100	439
14	33	30.8	1016	550	1566
15	12	62.5	750	0	750
16	2	30.8	62	0	62
TOTAL	271	-	10635	1380	12015

(a) Taken from University of Reading's FBD: apprppriate group for each farm used.

(b) calculated on the basis of travel costs, using the parameters laid out in Chapter 8.

(c) includes 28 acres retained by retiring farmer.

10.8 Having made these calculations, four farms, case studies 3, 6, 11 and 13 remain to be dealt with. These are the units which either ceased operation or which dramatically changed their systems making the gross margin calculation inappropriate. Dealing first

* The results for certain case studies in this table can be compared with those in Table 10.6. It will be seen that the farms for which we have accounts were in general performing close to the average.

with those farms which ceased trading. Case Study 6, the pheasant farm it appears would by 1972/3 have been contributing about £ 2,500 to the national farm - this has been lost. So too have the buildings and pens, but we have no accurate valuations of them: to assert that all the immobile capital could be valued at no less than £ 10,000 would seem to be fair. For Case Study 13 the problem is that the farm still nominally exists although productive farming is not practiced; all the buildings and machinery has been retained but is unproductive. Thus it seems appropriate to value the 81 acres remaining to the farmer at their gross margin. This indicates a loss of about £ 4,000 per annum, although such a figure may be an overestimate.

10.9 For the other 2 farms the problems are even more complex and involve even more speculation. Graph 4 demonstrates that prior to M40 Case Study 3 was returning what might be termed an average performance. After the system changes this did not continue. Table 10.14 demonstrated how the farm could have increased its output if only half the pig herd had been retained instead of switching to beef. Had the whole pig herd been retained (the motorway not being built) it of course could have boosted total output even higher, perhaps to about £ 35,000 in 1972/3. Again this would be about average according to the Reading FBI). An average level of costs would have put the income level at something around £ 5,500 in 1972/3. Instead the income actually obtained was nearly minus £ 2,000. The loss here is £ 7,500.

10.10 Finally, Case Study 13: the question that must be answered is how would the farm have fared if the system had been undisturbed. Unfortunately we have no farm accounts upon which to base an assessment of this difficult case. In addition it appears that the true implications of the non-optional decision-making were only just being felt at the time of interview (1975) and so would not have been present in 1972/3. In such circumstances the only possible course of actinn seems to be to carry out a gross margin calculation of loss, knowing that it probably underestimates the real loss felt. Doing this a figure of £ 139 is arrived at: this may seem small but it would probably constitute 20% of the total income.

10.11 Aggregating the income loss elements given above gives a net farm income loss of about £ 26,100. If this were to be capitalised at 10% over infinity the total loss would be £ 261,000. In addition the £ 10,000 value of the pheasant farmers buildings has to be accounted for. Thus the overall loss is £ 271,000: this is the sum that should have been entered into any cost-benefit of the scheme whilst it was being planned.

10.12 A number of points need finally to be made in this section:

(a) the figures above cannot lay claim to exactness, but hopefully they give a fairly accurate indication of the size of costs involved;

(b) the costs associated with the farms ceasing operations and rearranging systems in a non-optional manner, probably outweigh those for all other farms even though they comprise only 25% of the total number of units;

(c) it is possible to compare this overall figure with the amount of compensation paid. Bell does this in his thesis.

11. BLIGHT

Finally, but nonetheless most importantly, it is necessary to outline our findings upon planning blight upon farms. The argument has often been put to members of the Wolfson Group by highway engineers that they cannot afford to consult with farmers earlier than they do at present (which in this author's opinion is far too late in the process) for fear of causing agricultural planning blight. The evidence upon this matter gathered during the M40 survey almost totally rejects this argument. After the Public Inquiry all farmers on the two alternate routes would have been aware of the possibilities for the future development, and according to the highway engineers thesis planning blight would have been in evidence. Generally this was not so. It is useful for our purposes to make a distinction between direct and indirect blight. The former can be recognised as being the actions of farmers who, with development upon their farms imminent, start to run-down the unit. Such events have been well documented by researchers at Reading University in connection with Milton Keynes (3). This appeared to happen on none of our M40 farms including those which eventually ceased operations. The latter we define in terms of the postponement of farm plans

and the suspension of current activities. This is, by nature, difficult to isolate: due to the "lumpy" nature of much agricultural capital investment, investment trends are difficult to extract from farm accounts, therefore most information has to be gleaned from the farmers themselves. It is possible to offer the tentative conclusion that finally only one farmer adopted a policy of delay; in contrast, many others decided even to grow cereals in a field they knew would be lost to the road before harvest time simply in the hope that the construction would be delayed a few months or postponed indefinitely. It would not be unfair to offer the suggestion that farmers do not believe that a development will take place until they actually see the bulldozers on their land!

12. CONCLUSIONS

12.1 This chapter opened with a statement of objectives for the M40 study: to a greater or lesser extent these have all been fulfilled. By carrying out a gross margin prediction exercise, similar to that Boddington would have produced if asked to give evidence at this particular inquiry it was possible to compare the prediction with the actual results. Two important points need to be made about the comparison:

(a) even on this section of motorway where farmers interest in the research was extremely strong there were some very sizeable gaps in the data made available. This is most important evidence when deciding whether to use actual farm returns or standardised data in whatever predictive tool is developed;

(b) in general the techniques tend to overestimate impact: this overestimation only becomes acute, however, when farm systems are significantly rearranged in an attempt to lessen impact.

12.2 All 16 farms were analysed to discover extent of impact. The impacts ranged from the clipping of two acres off the edge of the holding which the farmer, in his own words "hardly noticed" to an interchange being built upon the middle of a farm dividing it into eight different pieces. As was predicted two types of readjustment were undertaken: first, and most simply, some

farms just contracted the size of certain enterprises; second, some farmers felt it was necessary to engage in enterprise substitution. An important finding is that not all system changes were economically rational. The detailed case-studies drawn up for all farms form a valuable reservoir of information about the types of impacts and readjustments which can or might occur.

12.3 Due to the data gaps it was not possible to assess the impact of M40 upon all individual farm units. However some estimation was made for 13 of the 16 affected units. Using a combination of these assessments and estimates using Boddington's gross margin method of assessment it was possible to give an overall costing of this section of M40. It was estimated that the capitalised cost to the national farm has been about £ 271,000.

12.4 The results obtained from this study seemed to indicate that small, intensive farm units were most vulnerable to motorway development, being less able both to withstand the land loss and rearrange the farm system. It was this conclusion which shaped the course of the next major fieldwork exercise which is reported in the next chapter.

Chapter 11

The Agricultural Impact of the M5 (St. George's-Edithmead section).

1. SELECTION OF A SCHEME FOR INVESTIGATION

1.1 The results of the M40 study, as interpreted, indicate what appeared to be a number of fairly clear-cut conclusions. In order to substantiate these findings it was felt necessary to carry out a second major study. To execute a completely comprehensive survey of the economic impacts of motorways upon agriculture would require an examination of different types of roads, bui lt at different times, in areas of different agricultural characteristics. It was, however, discovered during the M40 investigation that the agricultural data available would not allow surveys of such different points in time. Additionally and just as importantly, the Wolfson resources (especially time available) would not allow more than one other study to be carried out - thus it had to be very carefully chosen. A number of factors influenced the final decision to choose a motorway running through a dairying area:

(a) It was thought that the interests of all parties could best be served if an attempt was made to locate the outer limits of possible impact. Given the M40 findings concerning the likely impact of motorways upon small, intensive farms it was hypothesised that a dairy area was more likely to suffer than other major farming activities, from the construction of a major road.

(b) The choice of a motorway as opposed to any other type of highway seemed natural, as they are usually of the greatest dimensions and, additionally, are bound by special legal restraints which serve to make them "Special Roads".

(c) Whilst the M5 survey was underway the Wolfson team was also engaged upon assisting Rural Planning Services to prepare their agricultural case for the imminent Public Inquiry into the Canterbury By-Pass. Thus the interaction of agriculture and roads smaller than motorways was not being entirely ignored - this work is reported elsewhere in the thesis. (Chapter 8.)

1.2 Having selected a motorway built through dairyland the choice of scheme for actual investigation was much narrowed, for only the M5 and M6 traverse such areas for any significant length. The relevant section of the M6 was completed much too early for any

agricultural data to be available. The M5 south of Bristol runs through the Somerset Levels dairyland. Three sections of this part of the motorway had construction dates fairly compatible with the data time constraints. These were:

(a) Clapwick - St. George's
(b) St. George's - Edithmead
(c) Edithmead - Dunball

It was decided to survey the second and third of these; the first was omitted because the construction was carried out by Laing's, and so bad had been the communications between the farmers and contractors it was felt that this might prejudice unnecessarily the responses from farmers. However, although the initial aim was to investigate two sections, it was soon discovered that resources were inadequate to tackle both, due to the very high number of farmers involved. Thus, early nn in the fieldwork it was decided to focus attention only upon the St. George's - Edithmead section.

1.3 To prevent subsidence of the motorway after construction the wet lowland had to be settled down with a vast weight of stone. This compacting process lasted for well over a year and, naturally, extended the "usual" construction time by a similar amount. Thus although the St. Georges-Edithmead section was completed in January 1973, construction had actually begun late in 1969, not early 1971 as might have been expected. Remembering the non-availability of June Returns before 1969, it might be thought that this early start would place any analysis in a difficult position. It was decided to accept the handicap for two particular reasons:

(a) It was hypothesised that the farm systems employed would be of a fairly simple nature, revolving around the extent of the grass acres available and herd size, and that, in consequence, it would not be too difficult to isolate significant changes.

(b) Taking an earlier "date of entry" than that on M40 would ensure that more compensation claims would have been closed than had been the case on the M40 study. Bell was not slow to emphasise the usefulness of this.

2. AIMS OF THE SURVEY

2.1 To refine the technique for the measurement of the impact of a major new highway upon individual farm units.

2.2 To gather data and results in order to be able, with that evidence from the M40 study, to develop a model capable of predicting the impact of any given planned major new highway.

2.3 To understand the full implications of the impact of motorway development upon individual dairy farms, and thereby test the hypothesis that such farms are likely to suffer particular hardship.

2.4 To investigate the true costs of severance to dairy farms and so to test the hypothesis that daily travel time considerations are more important to farmers than estimated economic costs.

2.5 To investigate the nature and implications of the farm readjustment carried out in order to lessen the impact of the M5.

3. BACKGROUND

3.1 General

3.1.1 This section of motorway was conceived and planned on the early wave of motorway enthusiasm, and built before the anti-motorway lobby began to operate at all strongly. The Line and Side Roads Orders were published over a period between 1966 and 1968. No objections of substance were lodged so the SWRCU (which had taken over from Somerset CC as promoting authority in 1968), had no cause to hold a public inquiry into the route. In addition, it seemed that the farming community was unaware of the agricultural implications of the development, for no farmer lodged an objection to the Compulsory Purchase Orders, and so none were present at the CPO Inquiry which was held in June 1969.

3.1.2 Contact with the relevant MAFF/ADAS officers of this region was made early on in the life of the project (1975) as part of the background survey of the existent problems. At that time the Divisional Surveyors from Gloucester, Exeter and Taunton came together for the first time to discuss motorways. The opinions expressed at this meeting differed little from those of Lofthouse and Sayce (Chapter 7), i.e. that the RCU always consult the MAFF at an early stage of development and that the "official agricultural viewpoint is usually given considerable weight". Advice was given mainly in the form of the Land Classification Maps, supplemented by reference to Farm Structure Maps. The alignment of the motorway

is considered in relation to the potential value of the farms for all future farming use, rather than for the particular farmer of the moment. It was also admitted that MHFF are given information only on the centre line of the motorway, whereas in fact they "cannot decide on the best route without all the details of service stations, intersections, cuttings, embankments, etc."

Overall, it must be said that the Divisional Surveyors from the South West Region, although very willing to assist our investigations, only succeeded in exposing the same degree of naivety about the problems involved that we found elsewhere in the Ministry.

3.2 Agricultural Background

There are a number of agricultural features of this area which need to be recorded:

(a) In common with other types of farming, dairying saw a fairly dramatic upturn in its fortunes in the early 1970's. All the farms surveyed were, unless otherwise stated, predominantly dairy units.

(b) The A38, prior to the construction of M5, was extremely heavily used, especially at holiday times. This made the use of the road for agricultural purposes at such times, if not impossible, then highly inconvenient, and often dangerous. The relief of the road has been welcomed by adjacent farmers and to this extent, at least, the M5 mirrors the situation found in Oxfordshire, where the M40 greatly relieved the A40.

(c) Farm boundaries in this area of grassland are far more fluid than those of farms in arable areas. The custom of leasing grass-keep annually seems to ensure that farm sizes fluctuate quite regularly. Each farm has its core of fields which are either owned or rented on a long-term basis; upon this core, however, many farms lease land annually simply for grazing purposes. The size and position of such land is liable to vary significantly from year to year.

(d) The whole area is in the process of changing to the bulk collection of milk. This is a gradual process taking a number of years for any region, and has been going on here since the early 1970's. This is a dramatic change for all dairy farms,

and, because of the expenditure involved, most especially for the smaller ones; it may indeed cause some farms to go out of milking entirely.

(e) There are very strong family ties within the farming community. According to the NFU representative, and various land agents, these serve to support farmers who may be faced with financial (or any other) difficulties.

(f) Due to the small size of many of the farms in this part of the county, it is not uncommon for farmers to be engaged on income-raising activities outside farming. Such activities may be completely separate from the farm, for example running a garage, or more commonly, they may utilise the farm's existing resources; the prime example of this is the provision of farm based tourist facilities, usually in the form of bed and breakfast accommodatinn, or the provision of a camping/caravan site.

4. DATA COLLECTION

4.1 Initial introductions to farmers were, as for the M40 study, made by the NFU; certain farmers that were omitted from the NFU list we discovered by referring to the Compulsory Purchase Order documents. It is important to record that, in general, it was far easier to arrange meetings with those who had received (and taken note of!) the letter from the County Secretary explaining our research than with those whom we approached with no such prior introduction. However, once across the farmer's threshold the success of the actual meeting seemed to depend far more upon the personality of the farmer involved. Again the two-man interview team was employed with as much success as previously.

4.2 The questionnaire used was basically the same as for M40. It was, however, modified in the light of experience gained in its use. The main modification was that of shortening, wherever possible, by cutting out questions where it had been found farmers could not answer or which proved irrelevant to the mainstream of analysis. Additionally there was a certain amount of ratinnalisation of the layout in order to make the task of the recorder that much easier. (Appendix D shows the final version.)

5. DATA AVAILABILITY

5.1 The CPO Schedules do not record whether affected owners/occupiers are engaged upon farming activities. They refer merely to the apparent use of the required land. Thus in order to establish which affected properties were farms it was necessary to compose a list of all possible farms and eliminate those not being farmed when telephone contact was made to fit an interview date. In this way 54 affected farm units were located on the St. George's-Edithmead section, but it must be emphasised that this was a very time consuming business.

5.2 Not all these were affected to an extent which would necessitate a full analysis, and, for this reason, some were not asked to release either June Returns or farm accounts. In particular, it proved difficult to insist upon the release of accounts when farmers held emphatically that their income had in no way been harmed by the motorway.

5.3 Table 11.1 below demonstrates the level of data release from this survey.

Table 11.1: Data Availability

	Interviews	June Returns[2]		Accounts[4]	
		No. of farms	Total No. of years	No. of farms	Total No. of years
Requested from farmer	54	34	238	31	341
Granted by farmer	47[1]	25	175	15	165
Obtained from source	47	24	130[3]	13	96[5]
Overall success rate (%)	88	71	55	42	28

Notes: (1) including those conducted on the telephone, where this was clearly all that was required.

(2) over the period 1969-1975.

(3) not including years where there is a duplication in the computer print-out, because the farmer did not submit a return for that year.

(4) Over the period 1965-76.

(5) Not including accounts for one farm (1965-75) which related to the wrong unit, but which the accountants were unable to change for the correct ones.

5.4 A number of points need to be made about the quantity and quality of data obtained.

5.4.1 Interviews

(a) A number of interviews were conducted solely upon the telephone; such cases were those where the extent of land loss was minimal, and the occupier felt strongly that the farm had not been affected. To have visited these farms would have served no useful purpose.

(b) The 7 farmers who "refused to grant interviews" mainly comprised those who were contacted by telephone, but did not want to be visited, even though it seemed that (because of the significant extent of land loss evident in the CPO document) they could have suffered more than minimal impact. One farmer, however, had recently suffered a heart-attack and it was felt humane not to disturb him or his family.

(c) The level of co-operation from farmers being interviewed was found to be less than that obtained during the M40 survey. A number of factors appeared to contribute to this:

- this section of motorway was built some time ago, most of the compensation claims are completed and it is, perhaps, likely that the new road has become accepted as part of the usual farm environment.
- farmers in this area seemed to be less outgoing and so could not be so bothered as those on the M40 to assist our investigations.
- the M5 project had been surrounded by far less controversy than the M40, which it will be remembered cut through the Chiltern Scarp, thereby raising great environmental objections.

5.4.2 June Returns

(a) Farmers appeared to take the task of completing the annual June Returns much less seriously than most of their counterparts on the M40.

(b) Genuine confusion appears to arise over the treatment that grass keep should receive. Although, June is the height of temporary grazing, and virtually all grass that is going to be sold for the season has been, farmers do not have a consistent pattern of recording such land. The result of this is that some land will be recorded twice and some not at all.

5.4.3 Accounts

(a) The level of non-co-operation from the farmers was reflected in the fairly low number who would permit access to their accounts. It would have been of use to have at least the same number of sets of accounts as there were sets of June Returns.

(b) Although accounts were received for 13 farms of these one set related to simply one enterprise on the farm and could not be gainfully employed. Two other sets contained only two years accounts and so must be classified as being of marginal value.

(c) Accountants for the farms in question did not, in general, include as much detail in the accounts as did their M40 colleagues. Thus, for example, it was not uncommon to find all output from a farm's different enterprises grouped together under the heading "Sales". Such overall grouping makes the farm's financial performance far less easy to interpret.

5.5 Overall, it would not be unfair to say that the level of availability and quality of data for the M5 survey was inferior to that of the M40 survey. However, the factors causing this appear to have been outside the control of the investigators.

6. METHODOLOGY

6.1 The basic methodological plan for this survey was the same as that for the M40 survey. In other words, a case study approach was adopted, with as much relevant information as possible being gathered for each farm. On the basis of the information so collected the degree of impact on the particular farm was estimated and the farm placed in one of six categories.

6.2 The nature of the method adopted was, however, also influenced by the characteristics of the farms being investigated:

(a) a fairly substantial proportion of farms had merely lost a small land area from their extremities and so could immediately be classified as suffering minimal hardship;

(b) the systems of most farms being investigated were of a basically simple nature, and so the degree of analysis required was reduced. There was often no need to match complex system rearrangement with income levels.

6.3 As only 10 useful sets of accounts were available rather than the 30 or so it was hoped might have been, the overall analysis was unable to lean on these completely. Thus, for a fairly large proportion of the farms the overall categorisation of impact had to be made without the aid of accounts. To an extent this means that the investigators own value judgements were brought to bear on the analysis. Again, however, the relative simplicity of most farm systems made this not an un reasonable way of approaching the problem. Also, the number of farms being classified as "indeterminate" does indicate that where doubt existed this was readily admitted. The following sections will indicate whether or not individual farms have been fairly categorised.

7. THE "MINIMAL IMPACT" GROUP

7.1 It was found at a very early stage in the Wolfson Project that farmers are reluctant, not surprisingly, to spend much time on a subject of little relevance to them. Thus, those farmers whose farms had suffered little land loss to M5 and had so been caused little inconvenience, either physical or financial, were not willing to speak long of their experience. Therefore, for a number of farms which have been classified as being minimally affected, it has often been necessary to accept the farmers own assessment of impact, which was based, primarily, upon a small loss of land. This it must be said does not contradict the M40 findings, for it was discovered that a small loss of land combined with little severance difficulty meant farms would only suffer minimal impact.

7.2 It is, however, important to understand where the level of land loss becomes important. To obtain data upon this subject Table 11.2 was drawn up.

Table 11.2: Land Loss on Minimally Affected Farms

FARM	Farm Size Pre-M5 (Acres)	Loss to M5 (Acres)	Post M5 Land Deals+ Bought (Acres)	Post M5 Land Deals+ Sold (Acres)	Net Loss Acres	Net Loss %
1	90	1	5	9	5.0	5.6
2	186	10	4	0	6.0	3.2
3	117	18	12	3.5	9.5	8.0
4	90	6	6	0	0	0
5	15	0.5	0	0	0.5	3.0
6	67	6.5	0	0	6.5	9.7
7	295	8	8	0	0	0
8	150	1	0	0	1.0	0.7
9	98	0.4	0	0	0.4	0.4
10	76	1.5	0	0	1.5	2.0
11	190	2	0	0	2.0	1.1
12	220	0.3	0	0	0.3	0.1
Total	1594	55.2	35.0	12.5	32.7	1.3

+ as a direct consequence of M5 construction.

8. THE "MODERATE" IMPACT GROUP

8.1 The main criterion against which farms were tested for membership of this group was that the degree of physical impact of the M5 made it necessary to alter the economic structure of the farm, but that the consequent changes made had little lasting overall impact on the financial standing of the unit, (for good or bad). Of the four farms, accounts were available for only one, but other sources of information were fairly comprehensive, so that a fairly complete picture of the situation is available.

8.2 Three of the four can be treated as a group and indeed indicate a most fascinating result of the M5 construction. Table 11.3 indicates that loss of land for these units was of less moment than the extent of severance.

Table 11.3: Land Loss and Severance for Farms 13, 14 and 15

Farm	Farm Size (Acres)	Loss to M5 (Acres)	Net Loss to M5		Land Severed	
			Acres	%	Acres	%
13	239	9	9	3.8	60	25.1
14	232	14	-1	-0.4	30	12.9
15	306	17	5	1.6	44	14.4
Total	777	30	13	1.7	134	17.3

8.3 Although all three farms had sizeable portions of their land severed it could not be said that any of this land was inaccessible. Farms 13 and 15 were provided with a shared access bridge as their borders were contiguous, at the appropriate point. (All 3 of these farms were situated in one village next to each other.) And whilst farm 14 had to use a public road to cross the M5, the journey involved was neither long or difficult.

8.4 Intelligent "swapping" of land could have gone a long way towards minimising the extent of this severance, but this was not a solution that appealed to any of the farmers involved. (The basic of reasoning used by all 3 was that their land was of a higher quality than that belonging to the other 2, but they thought that they would have trouble convincing them of it!) A most ingenious way round the problem was thought up, however, for the three farmers decided to form a silage cooperative, and take silage off all the severed land, where cows had once grazed. The cooperative seems to have been as successful as any of the farmers could have wished. Most of the output is used to feed the dairy herds of the 3 farms which instead of being reduced have been sustained on the smaller area available by increasing the stocking rates and zero-grazing part of the herd.

8.5 Most information is available for Farm 14, but it appears not to reflect a different pattern from the other two. The June Returns indicate a growth in the herd size:

	Milk cows/heifers in milk	Milk cows/heifers in calf but not milk	Total cattle/ calves
1969	53	24	121
1975	64	21	148

Income levels for the farm have fluctuated extensively, but the fluctuations appear to relate to factors other than those which might be connected to the M5.

Table 7: Farm 14 - Income Analysis (£'s)

	Actual		Average	
	Whole Farm	Per Acre	Whole Farm (National: 1200-4199 smd)	Per Acre (Somerset)
1965/6	1377	-	3254	15.3
1966/7	3296	-	2848	14.0
1967/8	2869	-	4079	16.9
1968/9	3943	-	3404	17.6
1969/70	3049	13.1	3531	15.3
1970/1	5334	24.5	4383	19.4
1971/2	5123	23.5	7671	27.6
1972/3	7958	36.5	10,087	37.1
1973/4	3924	18.0	9006	34.1
1974/5	16509	75.0	7876	24.1

Unfortunately, the accounts prepared are not at all comprehensive as regards the various components of Output, so there is no detail of the economics of the silage cooperative. All that is indicated is that in March 1976 the Syndicate machinery was valued at £ 1,758.

9. FARMS SUFFERING SEVERE IMPACT

9.1 As with other categories of impact those in the "severe impact" class have been so placed because of a number of diverse factors; however, it is fair to say that have all suffered to an extent which has affected, and in most cases, is still affecting the farm's performance significantly. This is in distinction to the previous group which were in the main able to quickly readjust to the new conditions caused by the motorway. In other words the impact has been lasting rather than transitory. One case-study example will serve to illustrate the type of problems which arose.

9.2 Case-Study 18

9.2.1 Prior to M5 land-take this farm was 47 acres and milked 14 cows; herd replacements being reared brought the total number of cattle to 25. As the encumbent farmer had only taken over the unit in January 1967 he was entitled to feel quite pleased with the situation reached by 1969. The farm was not entirely ring fenced as four fields were worked away from the holding: one of these was $\frac{3}{4}$ of a mile away from the farm buildings.

9.2.2 Land take associated with the M5 came in two stages. First in 1970 5 acres were taken for the motorway itself. Then in 1973 another 8 acres were taken for a maintenance depot. Thus in all 13 acres of the farm has been lost to the development. Two acres of "replacement land" have been obtained but still the net loss is 11 acres or 23.4%. In addition the farm is situated at the junction of the M5 and the A38 at Edithmead (the southern end of this section). This has meant that the accesses for the farm have been altered and are now shared with vehicles from the maintenance depot. The very busy A38/M5 roundabout has to be negotiated in order to reach part of the farm.

Table 11.4 demonstrates that the economic performance of this farm has been fairly respectable, although 1970/1 the first accounting year after land had been taken for M5 saw a downturn in fortune.

Table 11.4: Farm 18 - Income Analysis

	ACTUAL		AVERAGE	
	Whole Farm	Per Acre	National Whole Farm (275-599 SMD)	Region per Acre (66 acres)
1969/70	936	19.9	1206	21.9
1970/1	915	19.5	1352	25.9
1971/2	1297	30.9	2426	42.9
1972/3	1761	41.9	3105	51.3
1973/4	1580	35.9	2216	38.7
1974/5	1395	38.8	1602	33.6

9.2.3 The consistently fair income performance has been the result more of the farmers ability to keep the growth in costs under control rather than great output growth (Table 11.5).

Table 11.5: Farm 18 - Input/Output Analysis

	Total Output (£)	Total Input (£)
1969/70	1723	787
1970/1	2001	1086
1971/2	2816	1516
1972/3	2762	1001
1973/4	3193	1613
1974/5	3305	1910

9.2.4 The problem, as the farmer sees it, is that without acquiring more land, which now seems unlikely in this proximity, the farm will not be able to break out of the low output bracket. Therefore, it appears that because of the M5 future options for this farm have been dramatically cut-down. (This is reflected in the fact that the SMD level for the farm in 1975 was only 202, 26.5% below the full-time requirement laid down by the MAFF.) At the time of interview the farmer was seriously considering giving up his dairy herd and going into beef rearing of some kind, although was not confident that this would see any improvement in likely future performance.

9.3 This case is typical of most others in the group in that the loss of land from a fairly small holding severely cuts back options for future development. Other farmers have not been so effective in managing to maintain a positive income level because they had not managed to control their cost levels. As regards replacement land one of the farmers argued that the small farmer is in the worst position because, firstly, he needs the land most but, secondly, he cannot create the necessary capital release either from the business or the banks. (It should be noted at this point that the price of both land for sale and rent and grass-lets rose dramatically in this area at this time.) Therefore it should be remembered that not all farmers can afford replacement even if it is being offered on the market.

10. FARM BUSINESS "DISCONTINUED"

10.1 8 units stopped operations because of the construction of M5. Although not enough data is available to be certain, it seems fair to assert that two of the farms had been made completely unviable by the motorway. In other words some form of profitable farming could have been carried on on 6 of them. Why then did these farmers decide to discontinue trading?

There seem to be two main explanations:

(a) the farmers were at about the retirement age and decided that M5 constituted a big enough upheaval in their lives to persuade them to retire;

(b) the motorway, usually because of fragmentation due to severance, made it impossible to continue dairying. Alternate farm systems, such as beef fattening, were available and physically possible but the farmer decided to use his land for non-farming activities.

Three case-studies illustrate these alternatives.

10.2 Farm 24

This is a fairly simple case to describe: a 24 acre dairy farm, running 20 cows, lost 6 acres to the M5 (25%) and had a further 10 acres severed: thus an 8 acre piece of land remained attached to the farm buildings. Neither of these remaining pieces was of sufficient size to be economically stocked with either cows or beef cattle; the hilly nature of the journey between them, combined with the distance of the trip (about a mile) made it impractical for a lady of advancing years, as this farmer was, to farm them together. Thus, she sold the severed piece to her son-in-law; as it backed onto his house - this is now used as a large garden. The 8 acre piece she has left is simply stocked with a few sheep. It was not therefore an overstatement to contend that because of the M5 the totality of this farm (24 acres) has been lost to productive agriculture.

10.3 Farm 22

Prior to M5 this was a 166 acre dairy holding split between two distinct, but adjacent, farms. The farmer made it plain during the interview that he was well past the statutory retirement age. The motorway claimed only 5 acres of the holding (3%) and severed another 20 acres. Even before the beginning of construction the farmer decided to dramatically cut the size of the dairy herd, in order to forestall any disturbance difficulties. The herd size has never been renewed and one of the farms which comprised the holding has been sold to the farmer's son-in-law and he now works it as a completely separate unit. The farmer now retains 33 acres himself, upon this he keeps a few head of young stock (SMD requirement 53). Another "retired" farmer is employed to look after these. Table 11.6 demonstrates that this enterprise is really no more than a hobby, and has been shrinking to a level of virtual economic insignifance.

Table 11.6: Farm 22 - Income Analysis

	Total Net Farm Income (£)	Total Output (£)
1965/6	1,488	25,265
1966/7	10,024	25,253
1967/8	2,988	24,034
1968/9	1,550	2,647
1969/70*	-194	1,060
1970/1	1,634	2,398
1971/2	1,024	2,093
1972/3	-424	779
1973/4	-169	1,151
1974/5	-319	788

* Accounting year in which construction began.

10.4 Farm 29

10.4.1 Prior to M5 this farm was a 43 acre holding and the farmer milked about 40 Channel Island cows. In addition to the herd about 4 acres at the edge of the farm was, in the summer months, given over to a temporary camping/caravan site. This farm is situated at the southern-most point of the St. Georges-Edithmead Section and so was affected by not only the M5 itself but also by the link-road/junction connecting the motorway to the A38 at Edithmead. Additionally, because of being sited right around the junction this farm was also affected by the Edithmead-Dunball section of the motorway. It was stated earlier that a decision was made not to investigate in detail this next section south due to the high fieldwork and analysis load that would be generated. However, an exception is made for this one farm as to look at simply the effects of the St. Georges-Edithmead section would distort the true picture, especially as the construction of the two sections overlapped on this farm at least.

10.4.2 In all the farm lost 8 acres to the M5; the St. Georges-Edithmead section took the 4 acre temporary camp-site and the Edithmead-Dunball section removed 4 acres of farmland. The aggregated loss was of the order of 18.6% of the farm area. In addition about 20 acres of the remaining land (57%) was severed from the farm buildings across the motorway. No specific agricultural access was made available, so that the only access to the land was on the public

road network which involved a round trip journey of well over 3 miles, negotiating, on route, the A38/M5 junction. This land to was lost to the dairy herd. Therefore only 15 acres remained for grazing milk cows. The farmer considered that this was hardly enough to keep a viable herd.

Thus, the decision was made early on to go out of dairying. Having made this decision the farmer had the choice of turning to another farm enterprise or ceasing to farm entirely. Any other farming activity would have to be animal based due to the nature of the ground which could only grow grass effectively. Although, it would not be as difficult to graze a beef herd on the severed land as the dairy herd it would still involve a great deal of herd movement. It is not surprising then, given the farmers experience in this field, albeit limited, that he decided to give up farming entirely and open up a full time caravan park on the non-severed land. The severed land was sold and provided a release of capital to initially fund the caravan park. There is no doubt that the farmer considers this change to have been of great financial benefit. Although he would not allow access to his accounts, he did say that whilst farming his income had never exceeded £ 2,000 whilst the caravan park gives an annual profit of about £ 12,000. Thus for this farm a total of 23 acres was lost to farming because of the motorway.

10.4.3 Before leaving this section one final important observation needs to be made. Because of the retirement of certain farmers who have retained portions of their land and because others have changed the use of their land from agricultural to non-agricultural activities, there has been a great deal of what might be termed secondary land loss to agriculture. Table 11.7 demonstrates the extent of these losses.

Table 11.7: Total Land Loss (Acres) to M5 for Farms going out of Business.

Farm	Farm Size	Land Lost to M5	Land Lost to Agriculture because of discontinuation
22	166	5	33
23	198	7.5	20
24	24	6	18
25	54	4	0
26	81	21.5	15
27	160	10	0
28	86	8	52
29	43	8	15
Total	812	70	153

From this data it can be seen that land lost to agriculture because some farms stopped trading amounted to 18.8% of the total aggregated farm area. This brought the total land take up to 223 acres or 27.5% of the total area for this group. The additional 153 acre land loss increased the agricultural land take for the whole section by 39.4% from 388 to 541 acres. (Total land take for the route was increased by 35.4%.) It may well be argued that this additional loss is of only a temporary nature; we would agree with that assertion, but cite two reasons why it is important to be cognisant of it:

(a) there is no way of knowing without gathering empirical evidence how long the temporary period will be;

(b) because we are dealing with an overall project appraisal framework which discounts costs and benefits heavily it is the first few years after the construction that are of most importance for decision-making purposes.

11. FARMS WHOSE POSITION WAS IMPROVED BY M5

11.1 Farms 30, 31, 32 and 33

11.1.1 The reason for the improvement of the position of these farms was that they were able to benefit from land which came onto the market because M5 was built. As can be seen from Table 11.8 two gained fairly substantial pieces whilst the other two had smaller gains. It might be questionned whether Farm 31 really deserves this undoubtedly positive classification. However, the farmer himself asserted that because the replacement land was of a much higher value and the buying price (from the D.V.) had been nominal, he had got a very good bargain.

Table 11.8: Net Land Gain (Acres) for Farms 30-33

Farm	Farm Size	Loss to M5	Replacement Land	Net Gain Acres	Net Gain %	Source of Replacement Land
30	150	3	53	50	33	Farm 25
31	108	4.5	7	2.5	2.3	?
32	81	0.75	82	81.25	100	Farm 23
33	78	5	12	7	9	Farms 19 and 20.

11.1.2 All except Farm 33 simply expanded their farming activities onto the extra land available and although we have no accounts to confirm the suggestion, it seems from what the three farmers have told us the acquisitions did nothing but good for their profit levels. Farm 33 demonstrates a slightly different situation. It was speculated by the two farmers (sons of a father who had recently died) that there would be a demand for caravan space along the motorway for holiday-makers heading for the West Country. And, as their farm was situated at the major A370/M5 junction it was ideally placed to serve this need. Thus 2.5 acres adjacent to the farmhouse were given over to caravans. The capacity of the park is about 150 caravans. Before the motorway was built the farmer allowed up to 5 caravans to camp overnight, but the setting aside of a fairly large area, liaising with the Caravan Club and selling dairy produce to the caravaners, meant that the whole enterprise was raised onto the level of real viability.

11.1.3 Thus of the net land gain of 7 acres, 2.5 acres was devoted to the Caravan Park. This left 4.5 acres of extra land for farming, which in fact, made little difference to the farming activities. For, although the milk herd size has increased from 50 cows to 65 since before M5 construction, the farmers maintained that this had little to do with the extra land as they had, since their father died, developed a policy of increased intensification. This intensification has, however, done little to improve the financial position of the farm business.

Table 11.9: Farm 33 - Farm Income Analysis (£)

	Actual		Average	
	Whole Farm	Per Acre	National Whole Farm (275-599 s/d)	Somerset per Acre
1968/9	667	8.3	1190	22.7
1969/70	1564	19.6	1206	21.9
1970/1	1055	-13.2	1352	25.9
1971/2	1847	23.1	2426	42.9
1972/3	1860	23.3	3105	37.1
1973/4	729	9.1	2216	34.1
1974/5	1589	19.6	1602	24.1

The reason for the lack of improvement in the income level appears, from the accounts, to be due to an inability to control costs. For although output rose from £ 4605 (in 1969/70) to £ 7199 (1974/5) costs in the same period rose from £ 3041 to £ 5610.

11.1.4 It is important to recognise the nature of benefits being identified here, for we must take care to ensure that individual gains are distinguished from national gains: it is the latter in which we are most interested. Because farms have acquired extra land does not mean that the nation has benefited: it may well be merely that ownership has been transferred. In other words the land always has been in production and the transfer from one farm to another will affect the gross margin on the land very little. It is however important to consider other possibilities, for example:

(a) it may well be that had these farmers not had the capital to buy the replacement land which was in most cases severed from other units across the motorway it would have become idle for the all important (in Government project appraisal terms) first few years after the beginning of construction.

(b) given the farm structure of the region it may be that one acre in one farm will be of the same value to the nation if it were to be placed into another holding. The reason for this lies in the large number of very small farms existent in the area. Our literature review (Appendix E) dealing with the relationship between farm size and efficiency although not producing the kind of precise thresholds that would have been of the greatest use in this study indicated strongly that in the smaller size ranges efficiency does increase markedly with size. Thus the loss of 5 acres to a 40 acre farm could mean a loss in the nation's productive capacity even if the 5 acres were to be taken into the boundaries of a 250 acre unit.

Finally, it should be said that there is a great need for consistency when dealing with post-motorway land swaps, every care should be taken to avoid both miscounting and double-counting.

11.2 Farm 34

Prior to the construction of M5 this was a 306 acre dairy unit which also ran about 300 sheep. The dairy herd comprised about 90 milking cows and followers were reared as herd replacements. Thus, in all there were about 165 cattle/calves on the farm. The motorway took 16.7 acres (5.5%) and severed a further 60 acres. The round trip distance to the mid-point of the severed land was nearly 2 miles so that the farmer decided no longer to graze the dairy herd on this land. Instead he decided to build up a multiple-suckling beef herd, whilst grazing the dairy cows more intensively on the non-severed land. The dairy herd was not reduced in size, but future plans to expand it by about a third were abandoned. Building up a new beef herd is not a job which can be carried out overnight. The farmer himself estimated that it took 3 or 4 years before he had the system under control. This assertion is reflected in the accounts (Table 11.10).

Table 11.10: Farm 34 - Income Analysis (£)

	Actual		Average	
	Whole Farm	Per Acre	National: Whole Farm (1200-4199 smd)	Somerset: Per Acre
1965/6	85	-	3254	15.3
1966/7	1003	-	2848	14.0
1967/8	325	-	4079	16.9
1968/9	317	-	3404	17.6
1969/70	-244	-3.9	3531	15.3
1970/1	1766	14.8	4383	19.4
1971/2	3750	20.7	7671	27.6
1972/3	2282	11.4	10087	37.1
1973/4	6499	32.2	9006	34.1
1974/5	8674	43.4	7876	24.1

These figures and background data seem to indicate a number of things about this farm and its readjustments:

(a) Prior to M5 (i.e. up to and including 1968/9) the performance of the farm was not good. The output from the dairy herd was high (averaging £ 10,144 per annum) and, in consequence, total output was substantial at an average of £ 16,168. However, costs were also high (£ 15,607 per annum) and so little margin was left for profit.

(b) In 1969/70 the first year of accounts after the beginning of M5 construction outputs were overhauled by inputs because the latter carried on growing and the former did not. The reason for the output stagnation appears to lie in the milk output which contracted slightly. Reference to the June Returns indicates this was due to a herd reduction at the beginning of motorway construction - the farmer confirmed this.

(c) Since 1970 /1 the fortunes of the farm have improved almost continually. The early 1970's farming boom must be responsible for part of this. Indeed milk output rose from £ 10,516 in 1969/70 to £ 15,646 in 1972/3. However, when the boom was reversed (according to average trends) in 1973/4 Farm 34's income continued to grow. This appears to be due to both a further expansion in milk output, which reached £ 24,290 in 1974/5 and the "coming of age of the beef enterprise". Beef output for the period 1969/70 - 1972/3 averaged £ 4,621 per annum, whereas the output levels for 1973/4 and 1974/5 were £ 8924 and £ 8275.

It seems that both the rearing of dairy cows more intensively and the suckling herd have paid off in financial terms, at least in the short/medium term. This is one of the most interesting cases on this section, for it demonstrates that the construction of a motorway provides an opportunity for a farmer to take stock of his farm planning. And, given that the correct farm adjustment is made, it is possible that the farm may improve its financial standing. The basis of such a position is that the farm in question, immediately prior to the motorway construction, is not functioning at maximum efficiency. Either a combination of enterprises is being used which does not permit the greatest possible profit to be made, or the enterprises are being run inefficiently, or both these factors are at work. Given that the balance of profitability between various enterprises is not constant and that new techniques and materials are constantly being developed, it would not be surprising to learn that most farms, at any point in time, are not using their resources to be optimal level of efficiency. That such a possibility exists will play an important part when we are developing our "new approach" to impact assessment in the next chapter and so it will be discussed further then.

12. SEVERANCE: LOGISTICS AND ECONOMICS

12.1 It was reported, in Chapter 8, how this author in collaboration with Boddington of RPS, drew up severance sensitivity tables designed to show how severance costs could be fairly precisely quantified if it was assumed that they directly equated with travel costs. The variables used for the calculations were:

i. round trip distance to the severed land;

ii. speed of travel;

iii. extent of land severed;

iv. labour costs;

v. transport costs;

vi. activities carried out on severed land.

From such calculations it was clear that:

a. severance costs for most arable farms would befairly small in comparison with total costs in any one year;

b. the costs for dairy farmers would be higher and would often take on significant proportions.

12.2 The actual results from the M5 fieldwork indicated, however, that logistics play an important part in the decision-making processes of farmers who are in the position of having to decide how to use severed land to best advantage. In some cases the difficulty of access may be more important than the economic costs associated with the access. It is interesting to examine the sort of difficulties that deter farmers from continuing to graze dairy herds on severed land.

Table 11.11 shows how those farms with significant areas of land severed decided to rearrange the system:

Table 11.11: Farm System Response to Severance Caused by M5

Farm	Land Severed Acres	%	Extra Round-trip Distance (miles)	Annual Costs of extra travel*(£'s)	Old System on severed land	New System on severed land
13	6	25.1	0	0	Dairycows	Silage
14	30	12.9	0.75	356	Dairycows	Silage
15	44	14.4	0	0	Dairycows	Silage
17	32	45.7	1	506	Dairycows	Hay & dry cows
20	25	30.5	0.5	158	Dairycows	Beef system
21	9	8.2	1.5	213	Dairycows	Beef system
31	5	4.6	0	0	Dry cows	Dry cows
34	60	20	2	1896	Dairycows	Beef system

* calculated on the basis elucidated in Chapter 8.

12.3 It is noticeable that in two cases (13 and 15) the farmers decided to discontinue grazing dairy cows despite the fact that no extra travel distance was necessary to reach the severed land because well-sited access bridges had been provided. The reason that the farmers gave for making such a decision was that arranging for the cows to cross the bridges would have been too much of a disruption to the working day: before M5 was built it was a simple matter to let the cows wander down to the designated pastures having opened the appropriate gates. The farmers felt, however, that the cows could not be trained to cross the motorway bridges by themselves and so would always have to be accompanied. Thus although extra travel distance would not be incurred extra time, and hence costs, would be. Similar arguments can be applied to case-studies 14, 17, 20 and 21: in none of these cases are the costs based on extra travel distance significant, but it may be that before the M5 the farmers did not have to accompany the herd at all. Thus the need to do so would mean that the whole working day had to be rearranged, with perhaps the need for additional labour at certain times. Case 17, in particular, demonstrates this to excess for in order to reach the severed land the farmer and his herd had to negotiate the most complex junction on this section of M5 upon which traffic moved at speeds of up to about 50 mph. To move the herd upon this interchange would have required at least 3 men one more than actually worked upon the farm!

13. BLIGHT

13.1 We recorded in the previous chapter that it appears that farmers are not visibly affected by planning proposals until the development manifests itself physically on the land. The evidence upon this subject from the M5 survey is less detailed due both to the different time-scales involved and the shortage of detailed farm accounts. However, what evidence there is supports the "no blight" hypothesis; the best supportive data to be found is that of farms, even the smallest ones, making detailed plans for the change over to bulk-milk collection despite the imminent road development. This involves the installation of expensive equipment and would not have been undertaken if the farmers had had doubts about being able to continue in business. Bulk-milk collection in the area began just before the motorway construction. There is also evidence that farmers in the mid-60's were investing the newer types of milking parlours.

13.2 In all fairness, however, it has to be mentioned that there was a small amount of what we termed in the M40 study as indirect blight: this is best seen in the decisions by certain farmers to postpone certain actions and should be distinguished from direct blight and the tendency to "farm to quit". Perhaps the most important manifestation of this phenomenon was the delaying of decisions to increase dairy herd sizes.

14. NON-OPTIMAL RESPONSE

14.1 An important finding of the M40 study was that economically non-optimal farm system readjustments will serve to greatly magnify the initial impact of a new road. An important part of the M5 survey was therefore to examine each farm's readjustment in order to test for optimality. The results did not particularly support the M40 evidence: only one farm showed any sign of non-optimal readjustment. Farm 21 changed completely from dairy to a beef system, but unlike other farms which performed similar changes without financial loss this farmer was unable to sustain a level of output to cover his costs. There is little doubt that the system was changed because 9 acres, (from 124) were severed and it would not have been the best use of labour to walk dairy cows the required 1.5 miles. However, there is also little doubt that the farm would have returned a far larger income had the dairy herd been retained and perhaps hay or silage made on the severed land. The total system switch was far too dramatic for the extent of land loss (13.5 acres) and severance.

14.2 In general, however, it seemed that the scope for erroneous decision-making was very limited. The natural alternative to a dairy system troubled by severance is some form of beef rearing/fattening. It so happened that the early 1970's was a very good time for beef enterprises so that unless very badly executed the switch from dairying should not have brought financial hardship. That there is only one case of bad execution should not be surprising for it was at the planning stages that certain M40 farmers were found wanting.

15. OVERALL IMPACT

15.1 Analysis of the CPO Documents revealed that the SWRCU thought they would require 431.9 acres of land to construct this section of the M5. As the section is 8.8 miles long, this amounts to 49.1 acres per mile. From our experience upon other sections this appears to be an exceptionally high figure. The explanation of the high land take lies in three sources:

(a) at the southern end of the section a link road, of about half a mile, was built to connect the M5 more effectively into the minor road network;

(b) the junctions at both ends of the section are of a complex nature;

(c) for some of its length the motorway runs in a very wide cutting.

Of the total land loss 388.1 acres were lost from the 54 units we have described as the "affected farms". The remainder of the land take, 43.8 acres (10.1%) comprised gardens to private houses, paddocks used for grazing, although not forming parts of agricultural holdings, and the loss of part of an industrial estate.

15.2 From the case study analysis of all the affected farms it was possible to construct Table 11.12 which demonstrates the distribution of the actual impact of this section of M5 upon agricultural holdings.

Table 11.12: M5 (St. Georges-Edithmead) Agricultural Impact, Measured in Economic Terms

Level of Impact	Number of Farms	%
Minimal	12	22.2
Moderate	4	7.4
Severe	5	9.3
Business Discontinued	8	14.8
Position Improved	5	9.3
Indeterminate	20	37.0
Total	54	100.0

15.3 In the previous chapter, which presented the results of the M40 fieldwork an attempt was made to estimate the overall loss to agriculture directly attributable to the new motorway. Our original intention was to attempt a similar exercise for this section of M5: however, due to the far less satisfactory release of

data as indicated by the 20 farms (37%) in the indeterminate, this unfortunately did not prove to be possible.

16. CONCLUSIONS

16.1 The data availability upon this survey was less comprehensive than that on the M40 investigation. This meant that the classification of farms into the various impact categories was more difficult and the results, perhaps, less reliable. Again this is strong supportive evidence for using normalised data in any predictive methodology.

16.2 Land loss for those farms classed as minimally affected consistently stayed below the 10% level and in many cases below 5% level of loss.

16.3 The scope for readjustment for grassland farmers is more limited in scope than for those where the soils allow a wider range of enterprises to be carried on. It seems however, that such restrictions also limit the opportunity for non-optimal readjustment.

16.4 The decision of whether or not to carry on farming a motorway affected unit is often as much a social as an economic one. In particular, farmers approaching retirement may be persuaded to advance it a number of years in order not to be bothered with the problems of reorganisation.

16.5 On farms which do discontinue operations it is likely that additional land will become unproductive and other resources be lost to agriculture.

16.6 In an area where farm boundaries are usually fairly fluid it is sometimes possible to obtain a larger piece of replacement land than was lost to the motorway. It is, however, important to remember the distinction between individual and national gains.

16.7 A development such as a motorway which leaves the majority of a holding intact, offers the farmer an opportunity to revamp his whole system. If the farm was being operated at a particularly inefficient level before, a new farm plan might succeed in increasing its profitability, despite the development.

16.8 Special attention has to be paid to the problems of severance upon dairy farms. Farmers, when considering whether or not to continue grazing milk-herds upon severed land, take account of factors which relate to the logistics of movement as well as economics.

16.9 It was not possible to calculate the overall agricultural impact of this section of M5.

Chapter 12:

A New Approach to the Prediction of the Impact of Proposed Highway Schemes Upon Agriculture

1. INTRODUCTION

1.1 The main objective of this chapter is to present what is considered to be an improved method of predicting the likely agricultural impact of any proposed major highway scheme. The ideas that will be developed here are naturally based upon work reported in the previous chapters of this thesis. In particular, it should be noted that the methodology presented attempts to improve upon the work of Boddington and not the current approach to impact appraisal used by the Ministry of Agriculture. In other words no attempt has been made to convert the Agricultural Land Classification Maps into useful tools because, even if this were possible it would not, as we have argued throughout, be the correct approach to impact assessment.

1.2 The essence of our argument is that the rules of project appraisal laid down for public schemes, especially the use of the 10% discount rate, indicate that agricultural impact must be measured in terms of current usage rather than potential flexibility. The consequence of this argument is that any predictive methodology which is developed must take account of the way the proposed road will affect the individual holdings it crosses. An aggregation of the individual impacts will give the overall impact upon what we have termed the "National Farm". Great attention has been paid throughout the work to distinguishing on individual farms between losses (and gains) which simply affected the individual and those which can be counted as national losses. To reiterate, our intention is to count and predict only those losses which accrue to the national farm.

1.3 Any predictive methodology of this type, which it is hoped will be employed upon actual schemes, should have its theoretical base firmly placed in empirical evidence. Thus it is the intention here to base our suggestions mainly upon the data collected through the M40 and M5 surveys, but also from evidence gleaned from all sources throughout the period of the research. The two previous chapters presented in detail the results of the M40 and M5 studies: in order to make progress it will be of use to have a synthesis of these results. Thus in the next section we will address the problem of which factors determine the level of impact upon an individual farm.

2. FACTORS INFLUENCING THE DEGREE OF INDIVIDUAL FARM IMPACT

2.1 The first point to make is that the lack of precise measurements of extent of impact make it impossible to apply statistical techniques such as regression analysis, in order to discover the importance of supposed causal factors. Instead we will have to rely on a more descriptive approach.

2.2 Initially it appears that a distinction should be made between primary and secondary (or ultimate) impacts. Primary impact refers to the immediate effect a new road will have on a farm before the system is adjusted in order to cope with the development. This is the level of impact Boddington's technique is designed to predict. Secondary impact is a reflection of the extent of the ultimate effect of the new road after farm readjustment has been made; this then is the important level of impact when considering the national farm losses, but it must be realised that over the period of transition the difference between primary and secondary impacts will be of importance. When readjustment is not necessary or possible, primary and secondary impact will be equal, however, when readjustment is carried out it would be expected that secondary impact will be less than the level of primary impact.

2.3 We have therefore to discover what factors determine both measures of impact. The basic answer is simple and contained in the definitions of the two impact categories, but we have obviously to look deeper and discover, as far as possible, the precise causal relationships. First we can make the important point that the extent of primary impact does, as Boddington hypothesised, seem to depend almost exclusively upon the extent of land loss and access/severance problems. In addition the loss of farm buildings will be an important factor, although it has to be stated that the promoting authorities do their best to avoid all buildings and usually manage to do so with farm units. However, it has to be pointed out with equal force that the farm type and its economic standing will also have a very important bearing on the overall impact. In other words the same features of physical disturbance can have a different effect on farm units because, simply, of the characteristics of those units.

2.4 The results of the M40 and M5 surveys have enabled a number of what appear to be the most important causal factors to be isolated. The following paragraphs and tables endeavour to demonstrate these factors and their incidence.

Table 12.1: Incidence of Factors Determining the Overall Level of Primary Impact on Individual Farms Falling into the Minimal Impact Group.

Farm	Farm Type			Physical Impact			Total
	Size (1)	System(2)	Economic Condition (3)	Land Loss(4)	Access Problems (5)	Building loss (6)	
M40 Cases							
1							0
2		*	*	**			4
7		*					1
8		*					1
12							0
15		**					2
16		**					2
M5 Cases							
1	*	**		*			4
2		**					2
3		**		*			3
4	*	**					3
5	**	**					4
6	*	**		*			4
7		*					1
8		**					2
9	*	**					3
10	*	*					2
11		**					2
12		**					2

The following is a key to Table 12.1 and also all others of the same structure which follow; the numbers refer to the columns in the Tables:

1. * 50-100 acres before road development.
   ** Less than 50 acres before road development.

2. * A significant part of total output comes from an animal enterprise other than a milking herd.

** A significant part of total output comes from a milking herd or an intensive market garden.

3. * Averaging between £ 0 - 1000/annum NFI during 3 years prior to construction.

** Averaging less than £ 0/annum NFI during 3 years prior to construction.

4. * 5-10% real land loss)
** 11-20% real land loss) includes unviable field corners,
*** 21% + real land loss) but excludes all post M40 land deals.

5. * Significant extra travel costs.

** Significant fragmentation and/or logistical problems.

6. * Multi-purpose building demolished.

** Specialist building/immobile equipment demolished (includes farmhouse).

It will be seen from the key to the table that the only category to warrant a possible 3-star rating was that of land loss. The prime function of the additional star is to act as a reflection of the importance of the extent of land loss. Briefly, it will be remembered that, although we argue that land loss as measured by MAFF and RCU's at present is not the correct approach to agricultural impact assessment, we obviously do not say that land loss "per se" is irrelevant, but that any measure must reflect current usage. Thus land loss will still, in the majority of cases, be of prime importance, and deserving of additional weighting in any balance of appraisal.

2.5 The first point to make about this Table is that the system of starring employed cannot lay claim to exact precision. The reasons for this are first that naturally, it is extremely difficult to be precise about these matters and second, it must be admitted that the sample sizes dealt with do not allow all possible boundaries and thresholds to be explored. Having said this, however, we may fairly add a rider by way of explanation; it is important, given the wide range of potential impacts, that any method of measurement should be flexible enough to cope with unexpected and unusual

events. Thus the lack of exact precision is not such a handicap if a basic element of comparability is retained. At the risk of stating what should be all too obvious the reader is reminded that even a farm with all the right "farm type" preconditions will not suffer unless the "physical impact" factors are of sufficient magnitude; the important point to remember is that as more preconditions are fulfilled a smaller degree of physical impact will lead to a greater impact overall. Taking this argument to its logical ultimate we contend obviously but importantly that unless there are stars in the "physical impact" half of the table the stars in the "farm type" half are insignificant. Thus it can be seen from the second half of Table 12.1 that the only farms with any appreciable level of physical impact are number 2 from M40 and numbers 1, 3 and 6 from M5. The latter three had the lowest level of possible, recognisable impact, therefore we only really have to explain why M40 Case 2 falls into this minimally affected category when we would, perhaps, expect something more. This has already been done in Chapter 10 where we recorded that well chosen and executed system changes enabled the farmer to minimise the impact. Our framework must therefore take account of readjustment for this determines secondary impact. We will return to this but first we subject the rest of our case-studies to the same type of analysis.

Table 12.2: Incidence of Factors Determining the Overall Level of Primary Impact on Individual Farms falling into the Moderate Impact Group.

Farm	Size(1)	Farm Type		Physical Impact			Total
		System(2)	Economic Condition(3)	Land Loss (4)	Access Problems (5)	Building Loss(6)	
M40 14			*	**	*		4
M5 13		**			*		3
14		**		*	*		4
15		**		*	*		4
16	*	**			*		4

Table 12.3: Incidence of Factors Determining the Overall Level of Primary Impact on Individual Farms falling into the Severe Impact Group.

Farm	Farm Type			Physical Impact			Total
	Size(1)	System(2)	Economic Condition (3)	Land Loss (4)	Access Problems (5)	Building Loss (6)	
M40 3		*		**	**		5
13	**	*	*	**			6
M5 17	*	**		*	**		6
18	**	**	*	***	**		10
19	**	**	*	**	**		9
20	*	**	*	**	**		8
21		**		**	**		6

2.6 A number of points can be made about Tables 12.1, 12.2 and 12.3:

(a) although some of the farms in the minimal impact group have the same total scores as those in the moderate group, it is noticeable that a larger proportion of the stars are in the second half of the table indicating greater physical impact;

(b) on average, severely affected farms have far greater impact totals than the preceeding two groups. This is due both to an increase in the number of preconditions (in the first half of the table) and an increase in physical impact;

(c) it is important to realise that because the M5 was constructed through an area of dairy farms the pre-conditions in column 2 will almost always warrant a ** rating. This is a conscious decision on the part of the author to single out highly labour intensive units requiring great mobility and ease of access and which are usually quite small. Market garden units would also qualify for this 2 star rating.

Table 12.4: Incidence of Factors Determining the Overall Level of Primary Impact on Individual Farms falling into the Farm Business Discontinued Group.

Farm	Farm Type				Physical Impact			Total
	Size(1)	System (2)	Economic Condition (3)	Farmer's Age (7)	Land Loss (4)	Access Problems (5)	Building loss (6)	
M40								
6	**	*		*	***		**	9
11	*	**	**	*	**	*		9
M5								
22				**		*		3
23				**		**		4
24	**	**	**	*	***	**		12
25	*	**		**	***	**		10
26				*				1
27		*		*				2
28	*	**			**	**		7
29	**	**			**	**		8

2.7 The reader will at once realise that an extra category of precondition is included in this presentation; this is to enable the "early retirement" factor to be accounted for. The key for this, in column 7, is:

* farmer approaching usual age of retirement;

** farmer past usual age of retirement.

2.8 Apart from this the most noticeable aspect of Table 12.4 is the wide range of totals for the various individual farmers: this would appear to indicate that some factors are particularly dominant within this group, and serve to negate the importance of the presence of others. Thus it would seem that for M5 cases 22, 23, 26 and 27 the farmer's age was the most decisive factor in the decision to cease farming. Only for M5 cases 24 and 25 can it be said the decision to stop farming was without doubt economically justifiable. This leaves M40 cases 6 and 11 and M5

cases 28 and 29 to explain. For the former two (on the M40) we have already concluded (Chapter 10) that the level of impact on the two units although severe did not completely disable the unit and the decision to cease farming was primarily a social one. For M5, Case 28 and 29 the story is different: both farms would have suffered severe economic impact had the agricultural activities been continued. Both farmers decided that they would turn their energies to land-based non-farming activities - providing a caravan site. It is not too new to assert that a farm's resources could be more profitably occupied in non-farming activities, but that an "institutional attachment" to farming prevents such a transfer of resources. The point here is more specific: these two cases demonstrate that the upheaval associated with the development of a motorway can cause the "institutional attachment" to be severed. In other words non-farming activities, which in normal circumstances would not be contemplated, become attractive enough to tempt farmers away. Whether or not such resource transfer should be encouraged is a matter of policy. Although these farms lost only a total of 16 acres to M5, by going out of farming an extra 67 productive acres were lost. Thus, although the individuals improved their position, the nation lost more agricultural production than need have been the case. Had they thought of these options, other farms may have followed a similar course of action.

Table 12.5: Incidence of Factors determining the Overall Level of Primary Impact on Individual Farms falling into the Position Improved Group.

Farm	Farm Type			Physical Impact			Total
	Size (1)	System (2)	Economic Condition (3)	Land Loss (4)	Access Problems (5)	Building loss (6)	
M40 4			*	**			3
M5 30		**					2
31		**					2
32	*	**					3
33	*	**		*			4
34		**		*	*		4

2.9 The most important conclusion to arise from Table 12.5 is that even had these farmers not acquired replacement land (4, 30, 31, 32, 33) or very successfully rearranged their system (34) the overall level of impact would have only been minimal or moderate, nothing more. In other words they were able to improve their position from a basis of relative strength. These cases may fruitfully be contrasted with M40 Case Study 2, which we described (Chapter 10) as having very successfully adapted the system to cope with M40. However, because the level of primary impact was high (Table 12.1) it was not possible to gain but simply to minimise losses.

12.10 It is, perhaps, appropriate now to more systematically analyse the effects of farm system reorganisation. Again we can employ a form of tabular analysis, although this time it is less complex.

Table 12.6: Farm Readjustment and Non-optimal Response: Moderate and Severe Impact Group.

Farm	Readjustment		Non-optimal Response (3)	Secondary Impact Smaller(-) or greater (+) than Primary Impact
	Net Land loss (1)	System Change (2)		
A MODERATE IMPACT				
M40				
14	**			0
M5				
13		*		-
14		*		-
15		*		-
16		*		-
B SEVERE IMPACT				
M40				
3	**	**	**	+
13	**	**	**	+
M5				
17	***	*		+
18	***	*		-
19	***	*		+
20	***	**		+
21	**	**	**	+

KEY

1. Land loss after post M5 Land deals:

   * 5-10% net loss
   ** 11-20% net loss
   *** 21% + net loss.

2. * Contraction, relocation of major enterprise/s.
   ** Abandonment of major enterprise/s.

3. * of short term consequence.
   ** of medium term consequence.

2.11 The results in Table 12.6 have to be compared with those for the other groups which although not tabulated have been described previously. To briefly recap: of all the minimally affected farms one (M40, Case Study 2) readjusted its farm system and did so successfully. For the "position improved" group all but one of the 6 farms did so because they were able to obtain substantial quantities of replacement land, whilst the other was able to rearrange his farm system with great financial advantage. Thus for all these farms secondary impact was much less than primary impact. A number of conclusions can be drawn from these results and Table 12.6:

(a) it is necessary to distinguish between a simple contraction of certain enterprises and the need to adjust the whole farm system; contraction is likely to take place fairly naturally, but adjustments have to be carefully planned. Adjustment is only likely to be necessary on farms with a high level of primary impact.

(b) it appears that because of the alien nature of the problems thrown up by major road development some farmers find it difficult to adjust in the most economically efficient manner;

(c) the coming of a motorway seems to mark an important turning point in the minds of ageing farmers and can cause them to retire and/or give up farming, whether or not the economics of the situation demand it;

(d) readjustment can either lessen or increase primary impact: it is therefore essential that such readjustment is optimally planned;

(e) in an area where there is a tradition of fluid farm boundaries resulting mainly from short term grass lets then there is a danger that post-construction land deals will leave "losers" as well as "winners". (Column 1 in Table 12.6 has to be compared to Column 4 in Tables 12.2 and 12.3.)

2.12 Having drawn such conclusions our next task is to attempt to apply the results of this empirical evidence to the development of a more refined predictive model.

3. THE WAY FORWARD

3.1 Working Assumptions

(a) Major road construction will continue into the medium-term future.

(b) Although we have pointed out a great number of defects in the present methods of highway appraisal adopted by the RCU's, the scope of the project has not allowed an alternative to be developed. Therefore the existingframework has to be accepted.

(c) The RCU's/DTp are unlikely to develop an agricultural input themselves, but will adopt one developed elsewhere if it seems objective and is compatible with the project appraisal technique being used at present.

(d) Given that most farmers are unlikely to be faced with more than one major road development across their land, the general quality of the agricultural cases presented at Public Inquiries will not improve, although through the Information Pack they should become more aware of its significance.

(e) Only occasionally will the NFU be in a position to influence the route selection process.

(f) Any agricultural input will best be integrated into the appraisal model if it is in quantitative, ideally money, terms. Engineers will then both understand it more readily and be able to compare it with other factors in the overall benefit-cost balance.

(g) The aggregation of costs (and benefits where applicable) for individual farms on a particular route will give the overall agricultural cost of that route to the nation, provided that the appropriate elements are taken into account, and double-counting does not occur.

(h) The agricultural cost of any new road is never likely to be of sufficient magnitude to influence the decision whether or not a particular road should be built. However CoBA Advice Note 15 indicates that "environmental" considerations can hold sway over which route is finally selected and some would expect that agriculture may have the same influence.

3.2 Farm Adjustment

3.2.1 The use of gross margins to indicate the likely level of income-loss consequent upon the taking of land for road construction is a reflection of the hypothesis that farms losing the land will have their whole system unbalanced. The M40 and M5 studies indicated strongly that this hypothesis was well-founded. However, gross margins analysis as used by Boddington takes no account of the possibility that the farm system may have to be reorganised in order to cope with difficulties, both economic and physical, produced by the new road. The only difficulty the gross margin technique recognises is that because of their nature, fixed costs will not fall "pro rata" with the land loss and so fixed costs per acre will rise. The critical factors which have to be taken into account are first, the type of readjustment required and second, the time the readjustment will take. It seems important that any methoddogy should have this dynamic element. Simply to capitalise the income loss calculated for the first year after land loss could not be a theoretically justifiable approach because it takes no account of the possible costs and benefits of such readjustment.

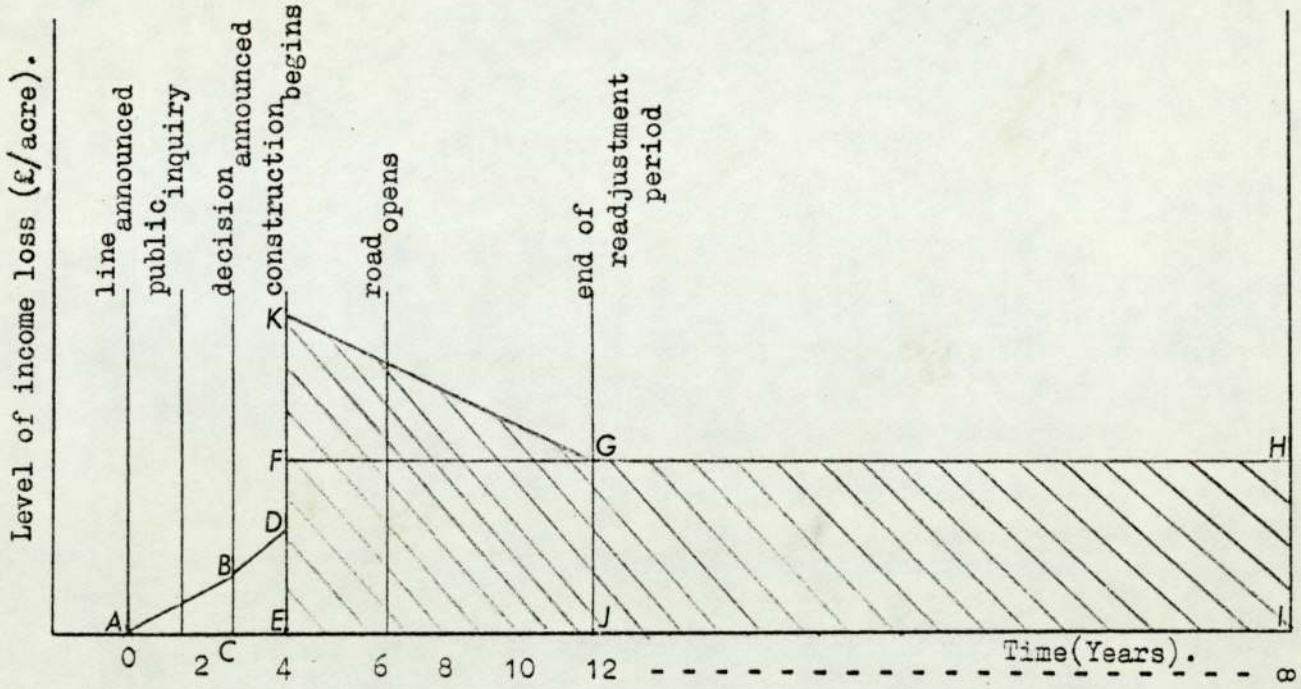
3.2.2 If the readjustment is not going to involve marked system changes, the question simply becomes one of deciding how long it will be before fixed costs per acre fall to the pre-motorway level. If, however, the farm system is to be positively changed rather than just contracted then the problem is more complex: new enterprises will mean new levels of output, investment in buildings and machinery in order to capitalise the system and a period of learning new skills for the farmer. It is necessary to draw up some form of farm-plan before it is possible to estimate the costs to individual farms forced to readjust in such a manner. Again, this is an important point: for farms which will be badly enough affected by a new road to necessitate a change of farm system, the true costs of the impact cannot be quantified until the full implications of the system change required are known. Thus, if a full-scale agricultural assessment of any particular route were to be carried out, the appropriate farm readjustments would be planned as part of the process. If expert advice was involved then this would also serve to ameliorate the impact for both the individual farm and the nation. Prediction and amelioration should form part of the same process in order that the best route can be selected and that route will eventually do the least possible damage: this is, perhaps, the most important point being made in this Chapter.

4. A NEW METHOD OF AGRICULTURAL IMPACT ASSESSMENT: THE THEORY.

4.1 Framework of Analysis

From what we have learnt thus far it is possible to erect a theoretical framework of analysis. Figure 12.1 shows this. Here level of income loss (per acre) is plotted against time up to infinity. The rectangle EFHI is a measure of the constant loss from an acre of land loss "forever" by being placed between the motorway fences. The triangle KFG is a reflection of the readjustment costs which decrease over time until readjustment is complete. These costs must, of course, be added to the land loss costs. The area ABC and the area BDEC are measurements of the possible different degrees of blight which may occur during the planning stages of the road. The basic question we have to ask is "how might all these components be valued" (preferably in money terms)?

Figure 12.1: A theoretical Framework for Predicting the Impact of Major New Road Scheme upon an Individual Farm.



4.2 Land Loss

4.2.1 What economic loss will accrue from the loss of land to the road directly (E.F.H.I.) ?

The work of Wibberley and Boddington in their assessment of the agricultural implications of the alternate sites for the Third London Airport (4) indicated that when considering the loss of agricultural land to development the most appropriate theoretical measure is that of "value added". This is a figure which attempts to measure the return of those items which are permanently located at a particular site and are not capable of being economically transferred elsewhere. Thus in practical terms we are speaking here of the land involved, its drains, fences, hedges and gates and also the permanent farm buildings placed upon it. Table 12.7 demonstrates how Wibberley and Boddington approached the difficult task of actually trying to isolate the value added of particular agricultural areas.

Table 12.7: Framework of Analysis used by Boddington and and Wibberley for Third London Airport Agricultural "Value-Added" Calculations.

1. 1. Gross proceeds per acre, in cash or kind
2. Current inputs
   (a) fuel
   (b) fertilisers
   (c) manufactured feed
   (d) seed and other agricultural inputs.
3. Interest and depreciation on capital (actual or inputed)
   (a) on mobile equipment (e.g. vehicles or removeable buildings)
   (b) on immobile assets (e.g. fixed buildings but excluding land)
   (c) rent of land (actual or imputed).
4. Farm wages, salaries and profits
   (a) employees' wages etc. (and income in kind)
   (b) farmers' management remuneration (and income in kind)
   (c) residual profit/loss.

11A. Net output
= 1 - 2 - 3(a) - 3(b)
= 3(c) + 4
= farm income and profit plus rent of land.

B. Value added attributable to land itself
= 1 - 2 - 3(a) - 3(b) - 4(a) - 4(b)
= 3(c) + 4(c)
= rent of land plus residual profit or loss.

C. Total loss when farm land goes out of production
= B(above) + 3(b)
= value added attributable to the land, plus value of immobile capital assets.

Source: Third London Airport Commission: Papers and Proceedings Appendix 9, p.204.

From this framework it can be seen that the total agricultural loss accruing from the urbanisation of farmland is taken to be the rent of the land, plus residual profit or loss, plus the value of immobile capital assets.

4.2.2 It seems theoretically appropriate to utilise this value added concept, by arguing that the economic loss accruing simply from the land lost, after all readjustment in farm system has taken place, will be equivalent to the value-added of that land. Use of this concept is naturally dependent on the assumption that all mobile resources associated with the affected land will find equally gainful agricultural employment elsewhere. It should be recognised that for a road development, which will rarely take all a farm unit, the transfer of mobile resources will mean that the problem of spare capacity will have to be dealt with. In other words labour and capital will still be required upon the farm but only in proportion to the new farm size. Therefore in practical terms it will be necessary to transfer excess labour (both manual and managerial) to agricultural occupations elsewhere and "scale down" capital equipment to a size appropriate to the new farm size. It will, then, be of use to slightly modify the value-added concept when dealing with farms losing only a part of their area and so continuing to operate: "the value of immobile assets" should be substituted by "the value of indivisible assets". This alteration is simply an expression of a special case of immobility, for if the resources are indivisible they then cannot be partially transferred.

4.2.3 Therefore, the level of loss finally associated with the loss of land to a new highway (FE on Figure 12.1) will be that of value - added. It would, however, be completely unrealistic to expect the immediate transfer of mobile resources and taking-up of excess capital resources. Hence the all important need to appraise the level of loss during the readjustment that must inevitably take place.

4.3 Losses During Readjustment

4.3.1 The underlying assumption of Figure 12.1 is that the level of loss incurred in the first year after the beginning of construction will be gradually reduced in subsequent years until the only loss remaining is the value added of the land lost and the value of the indivisible assets attached to it. Thus it is being asserted that losses incurred during the period whilst mobile assets are awaiting transfer or substitution will gradually decay as opportunities occur for such readjustment.

4.3.2 In order to value this element precisely it is necessary to know the value of KF and the shape of the curve KG. Although criticism has been levelled against Boddington's gross margin analysis for its static nature, it is valid to use it as a measure of the primary income loss before readjustment has begun, for, initially, it will only be possible to reduce the variable costs associated with production on the lost acres. Thus KF (Figure 12.1) can be taken to equal gross margin less value-added per acre. In real terms then the value of the triangle KFG is the value of the excess fixed costs, excess manual and managerial labour of the farmer and his wife and the per acre loss of return of tenants' capital, caused by the sudden loss of land as they are reduced to zero overtime. In theory then, the gross margin loss for a lost acre in the first year will decay year by year coming closer to and finally reaching the value added level where all additional costs have been eroded by the transfer and redeployment of mobile resources.

4.3.3 There are, of course, many problems associated with the use of such a framework apart from those encountered by Wibberley and Boddington in actually assessing the real level of value added. Section 5 of this Chapter deals in a little detail with the length of the readjustment period, here we will confine ourselves to the other major problem that presents itself: whether it will be possible to completely erode all losses over and above the value-added level. It maybe, for example, that the farmer cannot find a gainful agricultural

outlet for the spare working time created by the loss of a proportion of his land. This would leave him either to enjoy additional leisure time or engage in a non-agricultural economic activity. Benefit may well accrue from both options, but the agricultural loss would remain and, if the situation continued indefinitely, the ultimate level of loss would be above the value added level. The same argument would, of course hold for any non-transferable or non-divisible resource which, in theory, ought to be transferable or divisible.

4.3.4. Both the possibility that readjustment may be incomplete in some way and the array of possible readjustment patterns means that the decay curve for many farms will be unique.

4.4 Blight Loss

4.4.1 The two areas ABC and BDEC represent potential losses due to planning blight at different stages of the planning process. Three empirically founded assumptions are implicit in the way these areas are represented upon Figure 12.1

- blight will not begin until the line of a new route is officially announced;
- blight during the period after the decision is announced will be greater than before because the farmers' awareness of the impending development is much heightened;
- the overall level of blight will not be very significant when compared with the other elements of the model.

4.4.2 Although we have included blight costs in the theoretical framework, for practical purposes it seems appropriate to exclude them from overall calculations on four particular grounds:

(a) if prediction and forward farm planning are carried out together the element of uncertainty which causes blight ought to be eliminated;

(b) the field surveys have produced little evidence of positive blight as opposed to postponed capital investment delay, which itself is not likely to be of great economic moment, in most cases;

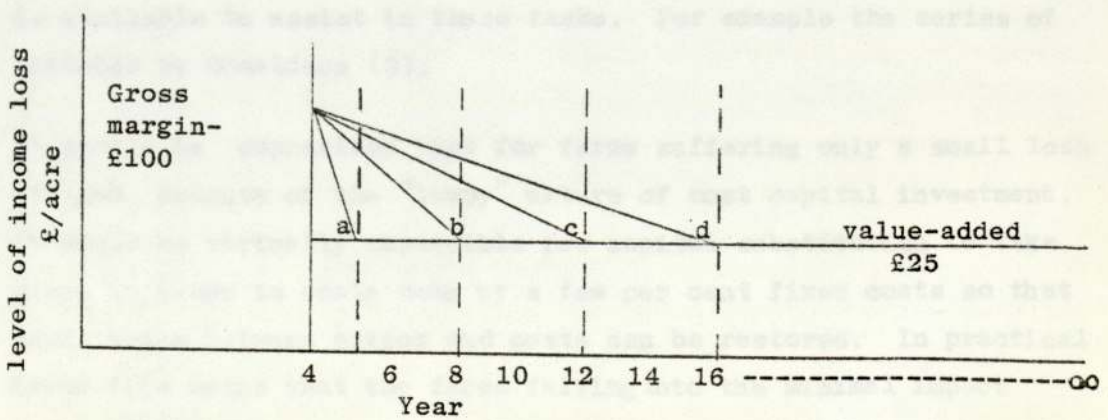
(c) it is possible (and desirable) that farms should begin the process of readjustments before construction begins: in a strict sense this would mean that costs would be incurred in the blight period. However, such costs would simply have been transferred from the readjustment period.

(d) blight costs are not likely to be large when compared with the other cost elements which will be discounted over time.

5. THE READJUSTMENT TIME PERIOD

5.1 It is, perhaps, of use to examine an hypothetical example in order to understand the nature of this problem. Assuming that one particular acre has a gross margin of £100 and a value-added of £25. It can be seen that if we assume a discount rate of 10% and an infinite capitalisation period then the losses accruing simply from the loss of immobile resources will be £250 on this acre. The readjustment costs have to be added to this; the excess costs on this land equal £(100-25), or £75. Two questions must be asked: how long will it take to reduce this level of excess costs ? and what will its capitalised loss value be by then ? Assuming the decay will occur linearly, a range of possibilities can be explored (Figure 12.2).

Figure 12.2: The Decay of Excess Costs over Different Time-Periods



5.2 If the excess costs could be decayed over just one year (point (a) on Figure 12.2) then it can be seen that the loss per acre would be:

$$£(250 + \frac{75}{2}) = £287.5$$

(The excess costs are halved in order to reflect the average level over the year.)

If however, readjustment took 4 years ((b) on Figure 12.2) the situation would be slightly more complex for it is necessary to take account of the need to discount streams of costs which occur in the future. Table 12.8 shows the effect of this.

Table 12.8: Cost Associated with a Four Year Farm Readjustment Period, Using a 10% Discount Rate

Year of Readjustment	Excess Cost at Beginning of Year (£)	Average Excess Costs in Year (£)	Discount Factor	Total Costs
1	75	65.6	1	65.6
2	56.3	46.9	0.91	46.7
3	37.5	28.1	0.85	23.9
4	18.8	9.4	0.75	7.1
5	0			
			TOTAL	£139.2

Thus the total costs over a four year readjustment would be £(250 + 139.2) = £389.2.

5.3 For 8 and 12 year linear readjustment periods ((c) and (d) on Figure 12.2) the total readjustment costs would be £247.3 and £333.0 respectively per acre. It can be seen that if it is assumed that readjustment cannot take place and the excess costs cannot be reducted then the £75 per acre loss would be incurred forever. This capitalises at £750. Table 12.2 summarises the results from this example.

Table 12.9: Total National Losses for Farms with different Readjustment Periods (Predominantly Arable 1974/75)

Readjustment period (years)	Readjustment cost per acre	Total costs per acre (£)	(2) as % of (3)
(1)	(2)	(3)	(4)
1	37.5	287.5	13.0
4	139.2	389.2	35.8
8	247.3	497.3	49.7
12	333.0	583.0	57.1
No readjustment	750	1000	75.0

(This presentation demonstrates how financially important it is to make every endeavour to readjust the farm system to the changed circumstances.)

6. OPERATING THE FRAMEWORK

6.1 It is a large step from erecting a theoretical model as above to actually implementing the procedures required to operate the model. In this particular case, a number of questions have to be confronted:

(a) what factors determine the length of the readjustment period?
(b) is the assumption of the linear decay of fixed costs a valid one?
(c) how can it be decided whether or not a particular farm is susceptible to this type of analysis? (i.e. will it contract enterprises rather than substituting them as part of a farm system reorganisation?)
(d) what techniques of analysis should be applied to those farms which are not susceptible to the analysis including those likely to be made unviable or go out of business for social reasons?

The points will be dealt with in turn.

6.2 Unfortunately the data from the M40 and M5 surveys does not really allow empirical conclusions about the time for readjustment to be drawn. There are two reasons for this: first, not enough time has elapsed for all the readjustments to have been completed and, second, the quality of the data does not allow such sensitive

analysis to be carried out. However, more generally, the fieldwork results, in conjunction with the "tools of agricultural economics", indicate which factors ought to be of significance and, therefore, need to be taken into account when attempting to estimate the length of the adjustment period; these are:

- farm size
- farm type
- type of capital employed
- age of capital
- usual replacement cycle
- ability of capital to be scaled-down.

In order to accurately assess and, indeed, plan future capital requirements, it would be necessary to discuss in detail possible developments with the farmer in question. The cost of this, however, would be small when compared with the cost of a new road and would probably cost far less than the farmer's savings.

6.3 A great deal of capital investment in agriculture is what economists are prone to call, rather clumsily, "lumpy" investment. The result of this is that replacement cycles are very important, governing as they do when large amounts of money have to be spent at once. Because of these cyclical requirements it may well be that the assumption of the linear decay of excess fixed costs is too much of an over-simplification. Indeed, if a thorough investigation of probable impact is to be combined with an assessment of how the impact can be ameliorated, as we strongly suggest, then it will be possible to work out the broad shape of the decay curve. Literature is available to assist in these tasks. For example the series of articles by Donaldson (3).

6.4 It should be emphasised that for farms suffering only a small loss of land, because of the "lumpy" nature of most capital investment, it would be virtually impossible for capital substitution to take place in order to scale down by a few per cent fixed costs so that equilibrium between output and costs can be restored. In practical terms this means that the farms falling into the minimal impact category (because of a small degree of land loss) will not be able to reduce the level of excess fixed costs caused by a new road. Thus, in these cases it does seem that it would be appropriate to value the potential loss as the gross margin on the acres lost,

as suggested by Boddington. The resultant monetary figure could then be capitalised at 10% (or whatever the chosen rate is) over infinity to give a total measure of loss.

6.5 Thus, to summarise, those farms susceptible to the decay curve technique of prediction are those which will not need to change their farm system, other than by contracting certain enterprises, but on which the level of land loss will be significant enough to allow a change in the capital structure of the farm. In order to isolate such farms it is necessary to make some estimation of the level of primary impact. This can be done by employing the indicators set out at the beginning of this Chapter in Tables 12.1 to 12.5. In addition it will be of value to carry out a gross margin prediction of loss for each farm. For even if this figure is not finally used in the aggregation of total loss it will give some indication of initial loss and allow farms likely to become unviable to be isolated. (The EEC in an effort to bring rural incomes up to the level of comparable incomes in other sectors of the economy has defined the Comparable Incomes Standard. This was set at £ 3,000 in 1976 and is now £ 3,300. Farms should be capable of returning their owners/tenants this level of income. Farm Capital Grants may be paid to farms whose income potential is above £ 2,900 per annum.)

(Viability can also be tested against Standard Man Day requirements. The Farm Amalgamation Scheme defines the following categories of farm for the purpose of grants for farm amalgamations:

(a) Over 1,200 standard man days annual labour requirement - large commercial unit.

(b) Over 600 standard man days annual labour requirement - commercial unit.

(c) 275-599 standard man days annual labour requirement - intermediate unit.

(d) Under 275 standard man days annual labour requirement - uncommercial unit.

It should, however, be remembered that the results of the M40 and M5 surveys led us to place little faith in the reliability of such thresholds.)

6.6 Having segregated the affected farms on the basis of degree of primary impact it should then be possible to decide which type of analysis to subject each farm to. It has already been argued that minimal impact farms are best quantified using the gross margin technique alone. For the moderate impact group the fieldwork results indicate that contraction rather than reorganisation is the rule so that it is to this group that the decay curve analysis best applies.

6.7 For severely affected farms, as we have said, the possibilities are far greater when considering readjustment. It may be that the whole farm system has to be remodelled in which case the techniques of linear programming could be employed to assess the best alternative system for the farm and the relative profitability of alternate systems. Our field results, however, indicate that complete system reorganisation is the exception rather than the rule and that it is more likely that on these farms there will be system substitution. There are, within the field of agricultural economics, well defined and highly practical techniques of partial budgeting, which are designed specifically to deal with problems of this type. Thus, for example, if a cereal system replaces a beef enterprise it will be necessary to compare relative profitabilities in order to assess likely income loss on the land remaining.

It will also be necessary to take account of the capital and labour implications of the new systems. Net resource expenditure will comprise part of the readjustment costs and should, therefore, be capitalised along with the reductions in NFI associated with the system changes. (Not all severely affected farms will need or be able to reorganise rather than contract; those that do not can be subjected to decay curve analysis.)

6.8 At this stage it is necessary to consider two problematic issues: first, the existence of the possibility that because of farm readjustment a farm might improve its position despite having lost land and second, the case of the farm which is already operating below the level of positive economic return, i.e. it generally has a negative NFI. The "position improved" group has to be treated with care. First, it should be recognised that

usually farms improve their position economically "because of" a new road development, if it becomes possible to rearrange the farm system favourably. The main reason for this is that extra land becomes available through being severed from another farm; remembering that we are carrying out our analysis in terms of national rather than individual cost-benefit, it is obvious that in most cases the transfer of land between farms will not be a national cost or benefit. It may be that one farm may be able to use the land to far greater effect than another, but in the main, the loss to one farm will be counter-balanced by the gain to another. It will, however, be important to be cognisant of the possibilities of farms becoming unviable because of secondary impact land losses. Here again prediction will best go hand-in-hand with amelioration. The other case we have to consider is the farmer who is prompted to reorganise his system because the road is to be built and hits upon a more financially rewarding system. (N.B. It may not be as psychologically rewarding.) The most logical recourse here seems to be to accept the increase in NFI as a benefit to the national farm, but equally assert that the capital expenditure necessary to increase the NFI is a fixed cost which the nation must bear. Thus the overall change of position on these farms will equal:

> Loss of NFI on land taken for construction (as measured by the usage current at the time of construction),
>
> LESS
>
> Increase in gross margin on remaining land caused by system changes forming part of the farm readjustment,
>
> PLUS
>
> Net Capital expenditure incurred in the readjustment.

It will be fairly obvious that only those farms working some way below optimum efficiency will have the opportunity for such a dramatic pattern of change; however, we will repeat again that a major aim of any predictive methodology of this type should be to assist the farmer to minimise the effect on his farm by highlighting the scope of impact and possibilities for readjustment well in advance of construction.

6.9 The case of the farm with a negative NFI prior to road construction poses even more complex problems. The argument has been put by both highway engineers and the MAFF alike that if the agricultural assessment is made in current usage terms then the removal of land from these farms will be a strict agricultural benefit. The point is put with the feeling that such an assessment is intrinsically wrong. We would remind the reader of two aspects of this problem:

(a) if the nation would benefit from the building of a road upon a highly inefficient farm, by giving the farmer less resources to be profligate with, then this should be reflected in the project appraisal;

(b) it is still possible to apply gross margin analysis to such farms and the results are most interesting as in Table 12.3

Table 12.3: The Possible Effect of a Road Development upon an Inefficient Farm.

	Before	After
Size (Acres)	100	80
Output (£)	5000	4000
Output/acre (£)	50	50
Fixed costs (£)	4000	4000
Fixed costs/acre (£)	40	50
Variable costs (£)	3000	2400
Variable costs/acre (£)	30	30
NFI (£)	-2000	-2400
NFI/acre (£)	- 20	- 30

Thus, it can be argued that even by taking land from unviable farms the national farm is losing NFI. This possibility has to be recognised and accommodated in the predictive framework.

6.10 The next group that we have to deal with is that of farms being made unviable. With the policy of endeavouring to emeliorate impact as far as possible it is to be hoped that the number of farms finding themselves in this position will be at an absolute minimum. There is no doubt that there are farms in Britain today which by any definition must be classified as unviable, but which continue in existence because of socio-institutional factors. The only approach that can be adopted, however, is to assume some level of economic rationality will prevail, and when a farm's income becomes negative over a period of time it will discontinue operations. What is the economic effect of this discontinuation ? The obvious approach to this valuation problem is again to have recourse to the value-added measure and make the assumption that all mobile resources will be redeployed soon after the farm ceases trading.

Purists will argue that not all the land from a farm made unviable by a highway development will lie idle forever. We would agree that some will change hands almost immediately, whilst other parts may (as the M5 evidence suggests) remain with the retiring farmer and stay idle or be used for non-agricultural purposes. It should be possible for the intentions of the farmer to be made known and, perhaps, the future utilisation of the land be planned. In any case, once the value-added for the farm has been calculated it would be possible to apportion various parts of the farm on a per acre basis to different periods of time loss.

6.11 As a rider to this use of value-added it should be recognised that there are likely to be great difficulties in valuing particularly machinery and buildings. The very short write-off periods which accountants tend to use mean that the accounts do not give a fair reflection of the worth of such items of capital. In such a situation there is little recourse except to use standardised data sources. Hill and Kempson's recent work on the value of farm buildings (5) should prove particularly useful, as of course will John Nix's "Farm Management Pocketbook"(6)

6.12 It will, perhaps, be of assistance to briefly summarise the approach to impact assessment put forward in the previous paragraphs.

(a) blight costs - ignore (both because of their small magnitude and because our method of "prediction and amelioration" should eliminate them).

(b) assess potential level of primary impact - using the indicators derived from the M40 and M5 studies + a gross margin calculation.

(c) allocate each farm to a category of primary impact - minimal, moderate, severe, unviable.

(d) assess likely level of secondary impact and quantify; technique of assessment to be used varies depending upon degree of primary impact and need and scope for system change, but generally:

Degree of Primary Impact	Technique
Minimal	Gross margin (capitalised)
Moderate	Decay curve
Severe	Partial budgeting (changes in income and capital costs should be capitalised)
Unviable	Value-added/per acre (attempt to assess likely future of all parts of farm.)

6.13 Finally in this section we must confront the question of whether to use real or average data in the prediction calculations. (By "real" data we refer to that taken directly from the accounts of individual farms.) The reworking of Boddington's gross margin method for the M40 data indicated that within certain limits the results of predictions using average and real data coincided fairly well. This seems to indicate that it does not really matter which data is employed. Such a contention is supported both by the difficulty of actually obtaining useful sets of accounts, and by the level of comparability obtained when standardised data is used. Despite all this, however, this author would argue most strongly that where accounts are available they should be analysed alongside the

standardised data. The reasoning behind this is that a great deal of the analytical technique advanced depends upon knowing fairly precisely how a particular farm is performing. For example, it is contended above that special provision should be made for farms being made unviable by a new road; the more information that can be brought to bear upon the very difficult problem of predicting how the economy of a farm will develop the better.

7. SEVERANCE

7.1 So far the new predictive model being offered here has made no mention of severance. This element of cost has been left so late for two particular reasons: first, the type of approach we advocate has already been set out in some detail in Chapter 8, because it was one of the earlier exercises undertaken in conjunction with Boddington and, indeed, employed in the Canterbury By-Pass agricultural evidence presented at the Public Inquiry. Second, and more importantly, it is essential that calculations of severance costs should be made with complete knowledge of all possible system variations.

7.2 In Chapter 8 it was argued that severance costs could be equated with extra travel costs; this contention still holds, but the results of the M5 survey indicate that care has to be taken over potential system changes. In respect of this it is important to realise that severance costings are employed for two different purposes. First, they simply form a part of the cost of a new road to an individual farm and as such part of the overall cost of the road to the national farm. Secondly, and just as important to nation and individual alike, severance costs should be used in order to assess whether or not an access bridge/underpass is economically justified. This argument is, simply, that if the extra travel incurred is costed at a sum higher than the cost of providing the bridge or underpass then the provision should be made. It may, however, be that if an access provision is not made it will be impossible to continue a particular system on the severed land. In such a case the decision of whether or not to provide an access will depend upon both the difference in profitability between the enterprise being discontinued and that replacing it and the costs of travel associated with the new system. This was shown to some extent in the Canterbury case study described in Chapter 8 (para 5.4);

however, another of the Canterbury cases prepared by Boddington and this author demonstrates more clearly both the problem and possible solution. This is to be found at Appendix F.

7.3 Finally in this section upon severance attention is drawn to something which ought to be fairly obvious to highway engineers but which seems not to affect their decision-making process to a proper degree. This is the difficult problem of junction location. It is plain from the results of the M40 and M5 studies that the farms which suffer most from severance are those which have complex intersections built upon them. Two major problems arise: fragmentation of the holding is severe and access to land has often to be taken by the public roads which form part of the busy intersection and which can be extremely dangerous. (One of the major reasons cited for building motorways is to segregate incompatible types of traffic: to mix motorway traffic with farm vehicles at junctions seems to say the least, contrary to this policy.) No general rules can be laid down regarding ways of minimising losses from junctions because of the almost infinite range of possible problems. However, highway engineers and farmers alike ought to be aware of which farms will have junctions built upon them and special steps should be taken to help individual farmers ameliorate the impact as far as this is possible.

8. AGGREGATION AND THE NATIONAL IMPACT

8.1 This is the final stage of any assessment of the agricultural implications of a proposed highway route. Having calculated the overall impact of the road upon each farm, it will be possible to estimate the national agricultural resource cost of the proposed route, because most elements of farm impact are susceptible to monetary analysis.

8.2 It is important to recognise that once a detailed data base has been accumulated it becomes possible to examine the agricultural implications of alternate horizontal alignments of the route being investigated. (Alternate alignments are distinguishable from alternate routes because they involve slight variations rather than completely separate proposals.) It may be that the moving of the route's centre line by only 100 yards will, for example, by greatly reducing the extent of severance, obviate the need for system substitution on a number of farms, thereby reducing the agricultural cost of the route.

9. THE DISCOUNTING PROCEDURE

9.1 The earlier brief reviews of the theory of discounting (p81. pp 187-9) concluded that little progress has been made towards the development of a sound framework which can correctly select the most appropriate discount rate for use in the assessment of public investment. Thus, at present, there is no sign that the Treasury will alter its instruction that 10% should be the discount rate when assessing investment in public expenditure projects. The dilemma facing the Government is simply stated, but at present apparently insoluble: if it is decided to abandon the 10% rate then what alternative(s) should (or could) be adopted ? The use of current market rates has a double disadvantage: first commercial rates of interest cannot be said to automatically reflect national social preference and, second, even if that difficulty could be overlooked, then which rate should be selected from the gamut of fluctuating possibilities ? Attempts to develop a theoretical model which will produce appropriate social discount rates on the basis of opportunity cost or time preference have created little consensus. Given this situation that the Government has had recourse to an administratively convenient, arbitrary, singular rate is not surprising.

9.2 However it is most interesting to report that the CoBA model includes standard growth rates for accident costs and time values of 2.3% to account for increases in real incomes. This has the implication that in a sense the effective discount rate is reduced to 7.7% in CoBA from the standard 10%

9.3 Given the time period over which traffic use of new roads is said to grow it should be realised that the roads programme would probably be disproportionately enhanced by a general reduction in the Test Discount Rate, both when compared with other public projects and when compared to agricultural costs and benefits as measured by the procedure laid out in this Chapter. However having said that, it seems reasonable and proper to make some preliminary remarks about how the apparently valid technique of building in growth rates to elements of the project appraisal could be applied to the agricultural input.

9.4 The appraisal methodology presented in this Chapter is based upon utilisation of the economic returns achieved on a particular piece of land at a point in time. The natural consequence of this is that agricultural land which at any time is being farmed below potential will not be able to reflect that potential in the agricultural input. Averaging out performance figures over a period of time will serve to deal with such observations which are of a short-term nature. However, we have recorded elsewhere the MAFF's more fundamental criticism that current farm activity is a function of current structure and occupation patterns and that these may change also in the short term. We dispute that these are short term factors and would prefer to place them in the medium term category. The MAFF argument leads them to the conclusion that land quality is the factor which must receive primary in the type of assessment with which we are dealing.

9.5 The use of differential discount rates would seem to make it possible to account in some logical way for these longer term factors. Again an attempt at this was made by Wibberley and Boddington in connection with the Roskill Commission. The approach adopted was that of assessing growth rates for value added for different farm types. The following results were achieved for England and Wales (1944-5 to 1970-1).

Farm Type	Growth of Value Added % Per Annum		
Dairy	-0.25	to	-0.50
Livestock	0.50	to	0.00
Mixed	2.25	to	2.50
Arable	4.00	to	4.50
Horticulture	3.50	to	4.50

It would be logically consistent they argued to temper the 10% rate by these growth rates. This would, however, mean the use of a 10.25 - 10.50 discount rate for dairy farms and, as Boddington admits himself, if inflation were also to be included in the calculations other farm groups would require a discount rate higher than the current Treasury Discount Rate. Although, there are also problems of both assessing the growth factors

initially and applying national derived factors to small specific areas, these are not as important as the fact that the measure is still based upon farming practice rather than the intrinsic quality of the land which the MAFF consider all important.

9.6 As we recorded above (Chapter 7) the MAFF have declared intentions to carry forward the Agricultural Land Classification to a second stage of analysis which will be of an economic nature. It would seem to be a sound suggestion that the MAFF could approach this second stage with the idea of producing differential discount rates for different types of land based upon the growth potential of that land. This may or may not be based upon the present Classification, if it were to be greatly improved in its ability to function as a planning tool, but would relate directly to the land and, most importantly, would be derived independently of current activities. If such figures were available then it would appear to be possible to produce a method of impact appraisal which could take account of short-term, medium-term and long-term factors. This would be done by applying the differential discount rates to the figures produced by the agricultural impact prediction procedure presented in this thesis according to the type of land involved.

10. CONCLUSIONS

10.1 It is possible, using the tools of agricultural economics and the wealth of available agricultural data, to devise a procedure (we hesitate to use the word model) which enables the least agriculturally damaging route to be chosen from a number of alternatives. Overall measurement of impact depends greatly upon the type and extent of readjustment necessary on each farm. For this reason, and in order to eliminate "non-optimal" responses, it is essential that forward farm planning should go hand-in-hand with impact prediction. Readjustment depends on the level of initial impact of the new road. This can be measured using the "indicative factors" discovered during the M40 and M5 surveys in conjunction with a gross margin analytical calculation as developed by Boddington on the A55. As the economic assessment offered is in monetary terms it is possible for it to be compared with (and against) the other economic elements of the appraisal balance, rather than being relegated to the ranks of other factors which have to be weighed mentally by the Inspector and the Secretary of State.

Chapter 13:

Summary and Conclusions

1. DEFINING THE PROBLEM AREA

1.1 An initial review of the literature specifically upon the subject of the impact of major new roads upon agriculture revealed that very little systematic thought had been given to the subject. Neither the MAFF nor the DoE could boast any reported work at all. Most references were to be found in the farming press, but no detailed analysis existed anywhere. Since the Wolfson Group began its researches some literature has been published, but it has done little to illuminate the subject matter in hand: indeed, one particular article did the area of study a grave disservice.

1.2 Thus it was left to the Wolfson Group to undertake the not insignificant task of locating, defining and ranking the particular problem areas deserving of detailed attention. This process was carried out both by interviewing farmers who had been, or were about to be, affected by major new roads, and also by gathering the views of other affected parties. Contact was made with the DoE, various RCU's, the NFU (nationally and at County level), the MAFF (both nationally and regionally), the CLA, chartered surveyors, amenity groups and highway engineers. In addition, so that an overview of the decision-making processes at work could be obtained the events at two major public inquiries were recorded in detail.

1.3 The contact with the NFU grew strongest and that organisation took on the IHD role of "problem owner". Thus it was that throughout the research programme David Hellard's Lands Use Department at NFU H.Q. supplied a touchstone against which to measure the relevance of the Group's work and also provided a fount of ideas and contacts. Hellard himself played an important part in this early task of problem definition. He argued that the farming community's most urgent requirement was to understand both the procedures involved in planning and building a new road and also be aware of the problems that might arise at the various stages of development. As initial fieldwork findings indicated Hellard's articulation of the farmers' needs to be correct, the highest priority was given to producing an explanatory Information Pack. The first edition of "Motorway, Trunk Road Development and the Farmer: an information pack for the guidance of NFU County Secretaries", was issued in May 1976. An updated second edition

was published for general sale in April 1977 and a third printing undertaken in October 1977. That by the time of writing some copies have been sold is an indication that it correctly met the needs of the farming community. The production of the I.P. was a task undertaken jointly by both research students.

1.4 The fieldwork upon which the Information Pack advice was based produced decisive conclusions. Primarily it appeared that in most cases there was an almost complete breakdown in communications between the farming community and the planners, engineers and contractors. This lack of interaction manifested itself in a number of crucial ways:

- farmers were not significantly involved in the planning of roads;
- farmers did not understand the processes involved or how to make their views known: (this was especially apparent at the Public Inquiry);
- during construction the contractors found it to their advantage to pay little heed to the needs of farmers: the results of this lack of consideration were inadequate fencing, trespass, the dumping of rubbish, inadequate drainage reinstatement, and the blocking of access to severed land, to mention just the most frequently occuring problems;
- difficulty in obtaining both compensation and third party insurance claims payments.

1.5 The problem ranking exercise placed the Information Pack first on the order of priorities; it was, however, recognised that such a publication was really only a short term solution to more fundamental problems. It is these deep rooted problems which the Wolfson Group confronted after the production of the Information Pack. Foremost amongst these were:

(a) the true agricultural implications of the construction of a new road are not understood by either the authorities responsible for the developments or the farmers they affect and, therefore, they cannot be taken account of in the overall project appraisal which is carried out on each scheme;

(b) two hypotheses were formed in relation to compensation payment after interviewing both farmers and their agents:

- procedures for the negotiation of compensation payments are unnecessarily slow;
- the final amounts paid in compensation do not fully reflect the economic losses on individual farms;

(c) preliminary surveys indicate that land trapped between new roads and existing urban areas becomes liable for development. The planning authorities seem to view strategically placed new roads as an urban fence to be developed up to, but not beyond. Potential development also appears to produce the usual form of urban fringe problems and planning blight.

1.6 Having delineated the problem areas the next task was to apportion the research between the two Wolfson research students. This author undertook to examine area (a) described in 1.5, whilst Bell, the other student, devoted his attention mainly to compensation issues, (b). The secondary "infill" effects (c) were felt to be less important and so were left to be investigated later: as it turned out no time was available to make more than a very preliminary survey of this topic.

1.7 The bulk of this thesis is then devoted to examining the present agricultural input to the highway decision-making process and devising ways in which the quality of the input can be improved. Before going on to summarise the results of this work it should be strongly emphasised that the Group's brief was to examine the national resource implications of road development on agricultural land. Therefore, at all stages of the work, the focus of attention was on the national farm and its gains or losses. However, having said that, it is only practical to realise that the national farm is comprised of all the individual farms in the country. To this extent the distinction is blurred and one of the main themes throughout the thesis is that the assessment of national impact can only be properly executed by aggregating all the relevant individual impacts. Care must of course be taken to ensure that uniquely personal losses (or gains) are isolated and omitted from assessment.

2. PRESENT QUALITY OF THE AGRICULTURAL INPUT TO THE HIGHWAY DECISION-MAKING PROCESS.

2.1 In order to assess the quality of the current agricultural input a number of different approaches were used. Foremost amongst these was the extensive coverage of the events at two major public inquiries. In addition conversation with officials from the DoE (DTp), the RCU's, and the MAFF and, of course, with farmers and their representatives served to reveal a great deal.

2.2 The Highways Act of 1959 and 1971 lay a statutory obligation upon the promoting authority of any new road to take account of the agricultural implications of the scheme. In order to do this the RCU's ask the MAFF for advice. The MAFF assert that they have an effect on routing decisions "behind the scenes", but our evidence indicates that this effect is minimal and, indeed, highway engineers complain about the lack of a useful input from the MAFF. The MAFF tool of assessment is the Agricultural Land Classification of England and Wales: land potential is reckoned to be the most important factor to be taken into account; in comparison present utilisation and economic return are regarded as insignificant, being only short-term factors. Overall we assessed (only after very careful consideration) that the MAFF has virtually "abdicated its responsibility" when it comes to the question of protecting agricultural resources faced with road development. That RCU's sometimes find it necessary to hire specialist agricultural consultants is a sad reflection on the MAFF's role as adviser to the decisinn-makers. The result of this is that in most cases agriculture is being either virtually ignored or mishandled by those responsible for planning new highways.

2.3 This, it has to be recognised, is in stark contrast to the attention that is paid to the detail of traffic forecasting and highway design. Also, notably, the "environment" (however defined) usually receives far more attention than agriculture; even though it is a more nebulous subject, attempts have been made to develop numerical assessments of environmental impact, whilst at the same time the RCU engineers argue that agricultural losses cannot be quantified.

2.4 This situation is compounded in two ways. First, individual farmers do not, in general, appear to have the capability to represent themselves adequately at the all-important Public Inquiry, or, indeed, any other stage of the planning of a major new road. Secondly, the NFU cannot often appear to wholeheartedly support one line in preference to another because the choice is usually between two agricultural routes. (Where the choice is between an urban route and a ruralroute they can appear and, if the Chelmsford By-Pass is a good case to generalise from, with good effect.)

2.5 Rural Planning Services

2.5.1 The exceptions to these general rules are to be found where Boddington of Rural Planning Services has been employed to make some form of agricultural assessment of a proposed route.

2.5.2 The most important aspects of Boddington's work are:

(a) the recognition that the agricultural impact of any road is not confined simply to the land fenced off for construction, but extends to the rest of the farm holding of which the fenced-off land forms a part.

(b) the use of the tools of agricultural economics to make impact assessments which can then, because they are in monetary terms, be entered into an overall Social Cost Benefit Analysis. In particular, the use of partial budgeting and gross margin analysis is both theoretically sound and simple to operate.

(c) the distinction is made, both implicitly and explicitly between the national interest and the individual farmer's interest. This is an important issue which needs clarification in order that the decision-makers can understand the full implication of their actions.

2.5.3 It was, however, realised that the technique developed by Boddington had important defects, foremost amongst which was its essentially static nature and the inability to take account of farm readjustment. The work subsequently undertaken by this author has attempted to build upon Boddington's theoretical framework rather than begin again from scratch.

3. MEASUREMENTS OF "POST HOC" IMPACT.

3.1 The basic requirement for the improvement of the predictive methodology was the investigation of the impact of already completed highway schemes. All farms of two sections of motorway (M40 and M5) were surveyed in order to assess the impact of the development on each of them. The sections investigated were selected for their diverse agricultural characteristics. The findings of these studies form the empirical backdrop to the new methodology of prediction, although it has to be admitted that data gaps and the problems of net farm income time-series analysis made the analysis less precise than would have been desirable.

3.2 In order to combat the analytical problems individual case-studies were drawn up for all affected farms. Having done this it was possible to allocate most farms to a particular category of impact:

Table 13.1: The M40 and M5 Impact Profiles

	M40		M5	
	No. of Farms	%	No. of Farms	%
Economic Position Improved	1	6.3	5	9.3
Minimal Impact	7	43.8	12	22.2
Moderate Impact	1	6.3	4	7.4
Severe Impact	2	12.5	5	9.3
Business Discontinued	2	12.5	8	14.8
Indeterminate	3	18.8	20	37.0
TOTAL	16	100	54	100

3.3 Bearing in mind both the dangers of generalising from just two case-studies and the high level of "indeterminates" on the M5 the opinion is ventured that the two impact profiles in Table 13.1 indicate a pronounced similarity. Thus it would not appear to be overstating the results obtained to argue that about a quarter of farms upon any stretch of major new road can expect to be severely affected or will go out of business. It has to be remembered however, that socio-psychological factors can have a large part to play in determining whether or not a farm will continue in business. The assumption of the completely rational economic man is not valid in these circumstances.

3.4 An attempt was made using an admixture of standardised and real data to give an overall costing of the two sections of motorway. Because of data gaps this was not possible for the M5; however, the 9.5 mile section of M40 between Stokenchurch/Waterstock was estimated to have cost the national farm a capitalised sum of £ 271,000, or £ 28,500 per mile. (It was one of the assumptions of the thesis that in a country with such a good network of transport links as England, additions to the network will benefit primary producers such as farmers very little through the reduction of costs, although the warehousing, wholesaling and retailing functions might be able to benefit through the redistribution of their activities.)

3.5 Special attention was paid to the way in which farm systems were readjusted in order to cope with the new road. The discoveries that some farmers are prone to reorganise their systems in a manner which is economically "non-optimal" whilst others decide to retire rather than face the development were very important and did much to shape future thinking upon the most suitable type of predictive model.

3.6 A method was developed which was capable of measuring the effect of severance. In this severance was equated directly with the travel costs accrued through having to travel extra distances to reach severed land. It proved possible by estimating the number of trips needed to husband different enterprises and allocating average costs to various activities to draw up tables demonstrating the possible range of severance costs. These tables proved most illuminating: it was plain that only in the most severe cases of severance will an arable farm qualify for an access bridge if these are allocated on an economically rational basis (i.e. a bridge will be provided only when the severance costs are greater than the cost of the bridge - about £ 70,000). It was thus possible to conclude that the allocation of bridges and underpasses on the M40 had not been done on an economic basis, but was the result rather of pressure and bargaining. The results, both theoretical and practical, were rather different for dairy farms such as the M5 affected. The calculations of severance costs using average data indicated that they were likely to be much higher for dairy than

for arable farms, given the same physical extent of severance. Nevertheless, the extent of severance would have still to be quite high for the farm to be allocated an access bridge. The results of the M5 survey indicated a surprising trend, for there was remarkable agreement amongst farmers that they would not graze dairy cows upon severed land even if fairly direct access was available. The reason for this appeared to be that the herd would require far more attention than previously and the farmers could not, or would not, rearrange their working schedules to cope with such changed circumstances.

4. THE DEVELOPMENT OF A NEW PREDICTIVE METHODOLOGY

4.1 The results of the M40 and M5 surveys indicated that the correct way to refine the agricultural input to the highway decision making model would be to attempt to make the technique Boddington developed using a form of gross margin analysis more flexible. (Implicit in this assumption is the view that the MAFF approach, using the Land Classification maps, is incorrect.) The improvement that the gross margin analysis required was that of being able to cope with farm system readjustment. Thus it became a basic postulate of the new method that if it was necessary to discover how a farm might readjust to the conditions imposed by the new road it would be possible at the same time to plan the most economically rational form of readjustment and so eliminate non-optimal responses which had been found during the course of fieldwork. The phrase "prediction and amelioration should go hand in hand" was coined to describe our intentions.

4.2 In order to cope with the problem of farm readjustment it was necessary to develop the concepts of primary and secondary impact. The former describes the initial effect a new road has upon a farm, whilst the latter indicates that once farm system readjustment has taken place the level of impact will be different. (The farmer will hope less, but as we discovered this was not always the case.)

4.3 Different types of readjustment were identified:

- the contraction of various enterprises, but no changes in the basic enterprise mix;
- a change of farm system involving enterprise substitution.

It was necessary to offer different types of impact assessment to cope with these different possibilities. For the simple contraction it was suggested that a form of Boddington's gross margin analysis could be used. Gross margin prediction is based on the assumption that the fixed costs associated with each acre of land lost cannot be cut back as with variable costs, so that proportional income loss will be greater than the proportional land loss. It was postulated that this strict fixed cost assumption would hold only where the extent of land loss was proportionately small (probably less than 10%) for it would not be possible to reduce the capital equipment by such a small proportion. For greater losses and a higher level of primary impact it was argued that fixed costs could again be brought into line with farm size, but as this will only happen over a period (because of the natural capital replacement cycle upon each farm) it was necessary to devise a form of decay curve. The shape of the curve and hence the duration of the readjustment period will be unique for each farm, but further work may well reveal useful generalised patterns.

4.4 For farms which alter their systems by some form of enterprise substitution it is necessary to adopt a more complex form of analysis using partial budgeting techniques which are well tried and tested in the field of farm planning and agricultural economics. It is necessary to calculate the loss of income consequent upon the system change and also the capital outlay required for the change.

4.5 For all these types of impact and readjustment severance costs can be calculated using the previously described travel cost model.

4.6 Finally, it was necessary to deal with those farms which would go out of business because of the new road. Here it was suggested that a form of value-added measurement (as employed by Wibberley and Boddington when assessing the agricultural implications of the proposed sites for the Third London Airport) be used to assess loss on the basis that all the transferable resources will be able to be employed elsewhere in agriculture and that only the land and buildings will be lost. Having decided upon this mechanism it is, however, important to retain flexibility; for example, some land will stay out of production longer than

other and it may well be that labour (and management) will transfer out of agriculture. However, once the value-added per acre has been calculated and the movement of various capital assets has been planned it should be possible to reach a figure which will give a fairly accurate reflection of the loss to the national farm.

5. THE DECISION MAKING FRAMEWORK AND THE PROPOSED AGRICULTURAL INPUT

5.1 Aggregation of individual farm impacts will enable the national agricultural resource cost of a proposed new road to be assessed. The next question which must be confronted is how should this revised input be inserted in the decision-making framework ? Chapter 4 highlighted a number of defects which CBA as a process may suffer from, especially in relation to transport planning. All potential projects have both costs and benefits and, therefore, any form of project appraisal should take account of them. CBA is just one form of such appraisal - in its extreme form one that attempts to reduce all factors to a monetary valuation - therefore when we are talking of costs and benefits it should not be assumed that this form of strict CBA is being advocated. Indeed, this author agrees most strongly that the exclusion of factors which cannot be reduced to monetary notation is extemely undesirable. It is necessary then to develop a framework which is more appropriate to the weighing of costs and benefits. In a general approach to supplying this need Nathaniel Lichfield has offered the Planning Balance Sheet, whilst Morris Hill has produced the Goals Achievement Matrix. The Leitch Committee was given the task of outlining the most appropriate framework in respect of inter-urban trunk road appraisal. (It is to be suspected that progress will be easier using such a sectoral approach.). To put the agricultural input proposed in this thesis in context it must be said that the aim was in one important way a limited one; no attempt was made to offer suggestions about the way in which the decision-making framework could be improved. It was instead accepted that the system in operation throughout the research programme was likely to be sustained into the future.

5.2 What contribution then will an "improved" agricultural input make to the decision-making process ? To answer this the methodology offered must be viewed in two distinct, but closely inter-related ways. First, the methodology offered will be able to produce an accurate reflection of the agricultural impact of proposed routes. Second, the assessment will be made in monetary terms. These two aspects have distinct consequences: the first will enable the decision-makers to have available an accurate agricultural input which can be place alongside other factors in any assessment framework. Having available a series of accurately appraised elements of cost and benefit does not, of course, ease the classic ("apples and pears") problem of adding up factors which relate to different aspects of human activity and are valued in different ways. Therefore the "value judgement" element of decision-making will never be excluded. It is, however, to be hoped (and logically expected) that those attempting to decide which of a number of alternate proposals will best fulfil the nation's requirements, will be better equipped for the task by having available accurate rather than inaccurate indications of the likely affect of the alternatives. The aim must be to eliminate value judgements where this is possible; where it is not possible, however, the decision-makers should have at their disposal the structured information which highlights the implications of different sets of value judgements. This it should be recognised is an altogether different approach from strictly statistical "sensitivity analysis".

5.3 The agricultural input proposed here is one which is capable of being expressed in monetary terms: this is naturally consequent upon the primarily economic nature of farming activities. Elements of a cost and benefit appraisal can be subdivided into the quantifiable and the unquantifiable.

The quantifiable elements can again be divided into two groups, those which can be valued in monetary terms and those which must be measured on some other numerical index. Finally, the monetary elements can again be subdivided into those which take their monetary valuation from current market activity and those to which "shadow prices" are imputed. It can be seen therefore, that there are degrees of "hardness" and "softness" in the data which will be available for any project. At one end of the scale

the hard data will be the valuation in money terms taken from the market-place, such as the capital construction costs, whilst at the other end of the scale soft data will only be available in qualitative terms: landscape attractiveness would often fall into this category. From this categorisation it may be concluded that the agricultural input measured in our terms will find itself amongst the hard data elements.

5.4 It is, of course, far easier to make the trade-offs required of project appraisal when dealing with monetary factors, providing of course that the elements involved can be properly expressed in this way. Thus if it is accepted that the value of time and human life are properly expressed monetarily, it is valid to consider the impact valuations derived in the agricultural assessment alongside the NPV derived from a CoBA type analysis.

Simple examples can illustrate the approach: first the case where a decision has to be made as to whether or not it is justifiable to build a proposed new road. Suppose that the CoBA analysis assessed the NPV of a scheme as £0.3 million. The agricultural appraisal indicates an agricultural cost of £400,000. Assuming (quite unrealistically) for a moment that no environmental, social or planning (i.e. non-traffic) benefits could be expected to accrue from this shceme then it would be valid to assert that the agricultural costs would negate the traffic benefits and the scheme would be economically unviable. Relaxing the constraints about non-traffic benefits it can be seen that in order to make the scheme worthwhile such benefits would have to be capable of being assessed at something more than £100,000. Although it may well be theoretically and practically impossible to make a precise monetary valuation of such benefits, it is of great use to have the problem formulated in such a manner. All parties involved know the magnitude of the problem and the decision-makers especially have clearly defined constraints to the value judgements.

5.5 The same principles can be applied to the choice between alternate routes. Suppose Route A has a CoBA NPV of £3.6 million, agricultural costs of £200,000 would reduce this to £3.4 million. Route B has a CoBA NPV of £3.8, but the agricultural costs associated with it are £600,000, which means that the NPV is reduced to £3.2 million.

Making the assumption that "all other factors are equal" then it can be seen that the inclusion of the agricultural input causes the balance of favour to switch from Route B, where it lay after the CoBA analysis alone, to Route A. If we relax the assumption the conclusion to be drawn is that for the balance of favour to switch back to Route B the other elements of the balance would have to significantly favour Route B. This formulation of the problem although offering no solution about the valuation and aggregation technique to be used for the non-monetary factors has the merit of placing definite limits upon the level of value which will cause decisions to change and this is the issue with which we, ultimately, are concerned.

5.6 It is accepted that the refinement of individual inputs will never be complete: not all elements can be given a justifiable monetary value. Indeed, the trend towards quantifying the inherently unquantifiable must be resisted. Therefore, it is essential that the framework of analysis to be used ensured non-monetary items are treated on an equal basis to monetary ones. No apology is made for not having attempted to create such an alternate framework: this task did not fall within the scope of the research programme. There are, however, groups and individuals engaged upon this problem. Thus whilst some work on the overall framework, others can examine how the individual components might be measured and others still (those with the Government's ear perhaps) can focus their attention upon how these two can be brought together to improve the overall decision-making.

5.7 Criticis are quite right in their endeavours to expose the shortcomings of current techniques of appraisal. However, the reality of the situation regarding new roads is that successive Governments have expressed a strong desire that certain roads should be built, with the proviso that individual sections can meet certain viability criteria. Thus the advocation of abandonment of present techniques (without a suitable alternative applicable, in detail, in specific circumstances) means that the balancing exercise which must be carried out will be even more exposed to the vagaries of value judgements.

5.8 Decision-makers who have to deal with large-scale public projects do not have an easy task: they have to put together many complex components with tools of appraisal which may well be inadequate. However, the chances that they will finally reach the correct decision must be improved if correct components are available. It would be naive to expect all components to be improved to the same degree of sophistication at the same time; progress will inevitably be partial, but it is progress in a useful direction nonetheless.

Chapter 14:

Future Work

1. INTRODUCTION

1.1 Towards the end of the research project it was decided that even at the end of the doctoral studies a number of questions would not be completely answered. In order to extend the research period an application was put to the Social Science Research Council for an award of a year's Fellowship in order that the work might be continued. After much delay this was awarded and so what follows is really a brief description of the type of work it is hoped to carry out in the Fellowship year.

1.2 The basic dilemma of the task of drawing up what is really quite a short research programme is that of deciding between theory and practice. The M40 and M5 investigations provided much information regarding the types of impact and readjustments that occur in certain farming regions. It would be possible to undertake a number of similar surveys in different areas again in order to construct an even wider data base and so be able to tighten the parameters of impact laid out in Chapter 12. An important, basic decision was taken not to follow such a line of approach.

2. REFINEMENT OF THE PREDICTION TECHNIQUE

2.1 It has been decided that the best way, in current circumstances, that the predictive technique put forward in Chapter 12 can be refined is by attempting to put it into operation. Only in this way will it be possible to answer a number of fundamental questions:

- will potentially affected farmers co-operate to a sufficient extent to allow a comprehensive "prediction and amelioration" exercise to be carried out?
- to what extent will the RCU's be able and willing to integrate an improved agricultural input into their decision-making processes?
- how will the MAFF react to an agricultural assessment which is not based upon their Land Classification and which, indeed, argues that it is virtually irrelevant?
- how will the District Valuer react to farmers' attempts to minimise income loss prior to construction when assessing the level of compensation? (N.B. compensation is assessed upon the land value and farm system in

operation on the day construction begins.)

- will the RCU and District Valuer be able to agree upon the allocation and positioning of access facilities using the severance costs computed through the travel cost model as described in Chapter 8?
- will the results of the comparison of two or more alternate routes give significant agricultural cost differences?
- will the refined model give significantly different results as regards chdce of route from Boddington's simpler approach or even from the MAFF's land classification assessment?

It is recognised that a negative response to one or more of these questions could mean that it is impractical to think such a technique could ever be brought into operation.

2.2 The invitation that the Wolfson Group received from the MRCU to assist its consultants upon the Newark By-Pass scheme and the subsequent withdrawal of the offer has been recorded in the Preface to this thesis. Despite this,however, the hope still remains that this author will be invited to assist an RCU on a particular scheme, for it is firmly believed that the agricultural input should be wholly integrated with the rest of the project appraisal process. Only in this way will it be possible to continually reappraise the agricultural effects of changes in alignment and design. However, should such an opportunity not present itself (and much may hinge upon the final report of the Leitch Committee) the way will still be open to introduce an agricultural input through the affected farmers themselves.

2.3 Our investigation of the M16 and Chelmsford By-Pass inquiries indicated that expert witnesses have a very important part to play in the decision-making processes, and that such witnesses with the correct credentials tend to gain preferential treatment from and access to the RCU witnesses and support team. How such agricultural expertise can have an important sway on the final decision was demonstrated both at Chelmsford and, to a lesser degree, at Canterbury. Thus the involvement with a group of farmers objecting to a proposed scheme, although obviously

second-best to being involved with an RCU directly, would allow much of the process to be dissected and also an assessment to be made of how the proposed technique operates in conjunction with other elements in the overall cost-benefit analysis.

2.4 It may be that because of the short time span of future research it would be necessary to become involved with different groups at different stages in the development of a new scheme. Thus for example one group might be confronted with a Public Consultation exercise, and another with a Public Inquiry. Different approaches and tactics will be needed in both cases.

2.5 The one area in which it will probably be necessary to carry out further "post hoc" study is that of "medium term readjustment" possibilities. It was argued in Chapter 12 that the predictive technique cannot at present be theoretically refined further because of the dearth of precise information about readjustment. The M40 and M5 studies did not provide a long enough data time-series for all possibilities to be explored. Thus a (sample) survey of a stretch of road built about 8-10 years ago should reveal much about final patterns of readjustment. (The MAFF attempted this in their survey of the use of access points on the M6, but failed to produce any useful results: Chapter 1.)

2.6 In addition to this, on a far more theoretical level, it is intended to survey the appropriate literature on the subject of capital replacement cycles and capital investment costs in order that more precise average periods of readjustment can be calculated, and incorporated into the readjustment part of the predictive technique.

3. THE DISSEMINATION OF INFORMATION

3.1 An important part of any "action research" project is the dissemination of information to the affected parties. The Information Pack was designed specifically to perform this function and by all accounts did so fairly well. However, the refined predictive technique was only developed towards the very end of the doctoral research programme and so no chance has been available to tell the farming community how they can, using such simple analytics, object far more effectively to proposed schemes.

Thus a booklet entitled "Presenting an Agricultural Objection to a Highway Proposal" is currently being prepared, and will be published through the NFU.

3.2 In addition, and in parallel to this, it is hoped to be able to prepare a manual of instruction for highway engineers laying out the problems they will encounter and some possible solutions. However, whether or not this is feasible will depend upon a positive response from the DTp in requesting that such a document be produced. An initial draft will, of course, be offered in order to test reaction.

4. OTHER WORK IN THE WOLFSON GROUP

4.1 One of the problem areas defined in Chapter 2 and ranked as being of importance was covered neither by this author, nor by Bell in his parallel thesis. This is the secondary, planning effect a new road can have by enclosing an area of land between it and existing urban development. A full scale investigation of the related matters would it was decided by the Wolfson Group require the full-time attention of another student and so a new member of the Group began work upon this subject in October 1977.

4.2 One of the early members of the Group was Dr. Christine Vick; as well as supervising the research students she carried out her own research into the effect of lead emissions from vehicles travelling on motorways on adjacent pasture land. This work has also now been taken up by a new doctoral student.

APPENDICES

APPENDIX A.

"MOTORWAY, TRUNK ROAD DEVELOPMENT AND THE FARMER."

MOTORWAY, TRUNK ROAD DEVELOPMENT, AND THE FARMER.

M. Bell, A.S. Hearne, Dr. C.M. Vick, Dr. D.J. van Rest April 1977

(Wolfson Study Group Investigating The Impact of Major New Road Schemes on Agriculture.

NOTE:

Whilst every care has been taken in the production of this information pack it is **in no way** intended to be a formal statement of government policy or statute. Expert advice should be taken before citing any of the references indicated. Neither the University of Aston nor the National Farmers Union can accept responsibility for the consequences of any use made of the information contained herein.

CORRIGENDA

This information pack was originally produced in May 1976 by the Wolfson Group in liaison with the Land Use Department of the National Farmers Union for the benefit of NFU County Secretaries. Due to the interest others have shown in the document it has now been reprinted.

The Department of Transport was reformed in October 1976 and has taken over, from the Department of the Environment, all responsibilities for transport, except where, in special circumstances, the two Secretaries of State act together. Throughout the text DTp should be read for DoE.

Additionally, since the first print, a number of factual and textual errors have been brought to our attention: these are listed below, with the appropriate corrections. We gratefully acknowledge the help fo those who have pointed these out, especially the Department of Transport. All remaining errors are ours alone.

Page	Section	
2	2.2	The DTp emphasise that they regard NFU County Secretaries as having no special position regarding consultations and prefer liaison to be done formally through RCU HQ's, not through sub-units.
6	3	''Appointment of Contractors''. Served on owners/occupiers should be deleted and the box left blank.
6	3	DTp point out that before contractors start work public meetings are ***always***, not often, held, and that they must (contractually) fence off land before they begin.
8	4.5	DTp ***prefer*** to employ statutory powers, rather than rely on agreements. (N.B. Section 254 of the Highways Act (1959) is now mainly superseded by sections 64-7 of the Highways Act (1971).)
10	4.8	DTp will normally serve notices on all those ***directly*** affected.
13	4.10 (d)	The present cost (January 1977 prices) of an agricultural underpass traversing a dual, 3-lane carriageway is £80,000. A bridge would cost £100,000. For single carriageway schemes these costs are £20,000 and £35,000 - £70,000 respectively. (Mid 1976 prices, given by NERCU.)
14	4.10 (e)	DTp say that all hedges are now planted on 'their' side of the fence.
16	5 (ii)	In ***very*** exceptional circumstances costs may be recovered.

16	5 (iv)	DTp emphasise they are ***always*** ready to discuss 'need' at line order inquiries.
18	7.1	Section 13 orders deal with side roads only. CPO.s come under Sections 214 and 215 of Highways Act (1959), Sections 44, 47 and 51 of Highways Act (1971) and Section 1 of Land (Authorisation Procedure) Act 1946.
20	8.1 (ii)	Agricultural considerations have been consolidated and expanded in recent contracts.
20	8.1 (ii) 'N.B'	'N.B' refers to accommodation works being undertaken within the scope of the contractual documents. Voluntary agreements are referred to in section 8.3(iii), page 21.
25	Appendix B	RCU's 'supervise' rather than 'administer' construction. The North East RCU has moved to: Windsor House, Cornwall Road, Harrogate. The telephone number remains the same.
26	Map	The area from Cornwall to Gloucester is the South Western Region.

CONTENTS

1. INTRODUCTION

The building of a motorway or any form of new road inevitably creates problems for the farmer - land take, severance, disruption of farm business and the problem of settling down after construction is completed. It is fortunately rare for the problem to strike the same farm more than once in a lifetime. However, this does mean that few farmers have any experience of the problems before they happen, and often have to learn them the hard way!

These notes attempt to fill a gap. They are in no way intended to replace the specific expertise of agents or advisers, nor are they a detailed textbook of all the legal and technical requirements that may have to be taken into account. They do, however, explain the various stages of planning and construction of new roads, how farms may be affected, and what can be done to minimise the possible adverse effects. They are largely based on the practical experiences of farmers who have been faced with road construction and would like others to be forewarned.

2. THE ROLE OF THE NATIONAL FARMERS' UNION

The only sure way to safeguard agricultural interests is for the farming community to be on the ball. There is no substitute for vigilance and involvement in advance of actual road construction. It is the Union's job to see that those who plan and build roads (and they are not normally agriculturalists) do understand the problems of road construction in rural areas. The following paragraphs comment upon the respective roles of NFU Headquarters, NFU field staff, and members' agents.

2.1 Headquarters:

The Land Use Department acts as a clearing house for road information. It holds the DoE trunk road map, circulars and reference works and handles all draft orders, consultation documents, etc., received from the DoE and Welsh Office. These latter documents are forwarded to the relevant County branches for local action.

The Department also maintains a close watch on current and relevant research work, and liaises with other bodies with an interest in road construction and agriculture.

As far as action is concerned, the Land Use Department occasionally becomes involved in representing members' interests at Public Inquiries, in negotiations for compensation, or in helping to establish liaison with road planners/constructors. The Department's primary function is, however, consultative. Field work is restricted to particularly stubborn problems, or matters of principle. The main function is to press for changes in central administrative procedure, particularly through liaison with DoE and MAFF. In this last context, third party claims procedures, fencing, agricultural liaison officers, and the extent of land take are all live issues.

2.2 NFU Field Staff:

At the local level, NFU County Secretaries will clearly be in close touch with County Planning Officers, and County Surveyors. This should guarantee an up-to-date picture of transport policies within the particular county. Good liaison will invariably mean that County Secretaries are involved in consultations whilst road proposals are still embryonic. These early consultations will mean, inter alia, not only the general farming considerations, eg. farm boundaries, land quality etc., are taken into account, but that such issues as farm access, fencing of lay-bys, advance notices of road-works, etc., are discussed at an early stage.

Although these particular notes are principally concerned with major road schemes, ie. trunk roads and motorways promoted by the DoE and Welsh Office, local road schemes may also have a significant impact on farmers and farming. It will therefore be important for field staff to keep a close watch on the annual Transport Policies and Programmes, (TPP's) which are now prepared by local authorities. These programmes are available from your County Surveyor's Office and are well worth scrutiny. (See Appendix A for details of the form and content of TPP's).

As far as trunk road and motorway schemes are concerned, regular liaison with the Regional Controller (Roads and Transportation) the Regional Road Construction Unit and County Sub-unit will be invaluable. (See Appendix B for addresses, and details and functions of these bodies.)

Whatever scale of road scheme, NFU local staff clearly have an important part to play during consultation, public participation, public inquiry, construction, compensation, and after care, without in any way seeming to usurp the role of the professional adviser. Indeed, in areas where significant road construction has taken place, the County Secretary has often been a most important co-ordinating factor in seeking to minimise the impact on farms.

2.3 The Member and his Agent:

Many of the problems which will arise on all road schemes (from minor road-widening to major new motorways) will be specific to the particular member. It cannot be too strongly recommended that members employ their own agents to look after their interests, and to negotiate on their behalf. **Although the member should, himself, keep an accurate record** throughout the planning, construction and eventual opening of the new road, the farmer has to continue farming and will almost invariably need the help of an experienced agent.

The Union itself has an important role to play in seeking general safeguards, in pressing matters of principle, and in co-ordinating opposition. The vital factor is, however, that if the agent is to do a good job he should be in at the beginning. Members all too often make the mistake of waiting until the problems start before realising the need for specialist advice.

3. HOW NEW ROADS ARE PLANNED AND BUILT

Stage	Bodies Involved	How the Public Find Out
General Policy & guidelines	Central Government	Green Paper, White Paper, published by HMSO, giving general plans. Hansard - especially replies to written questions.
Preparation Pool	Road Construction Unit (RCU) Department of the Environment (DoE)	DoE Annual Report 'Roads in England' (Separate reports for Wales and Scotland)*
Specific road proposals	DoE	Periodic publications of maps, press releases and as above.*
Corridor studies (on large schemes)	RCU	Announcements in Parliament reported in local press.
Drawing up alternatives	RCU consults, usually behind closed doors, with County and District Councils and with MAFF, river and navigation authorities etc.	Only by a 'leak'
Public Consultation Exercise	RCU, public and relevant interest groups. Some 50 groups are on a statutory list, including NFU.	Advertised locally, travelling exhibition, public meetings, leaflets.
Official decision on route selected	Secretary of State for the Environment	Announced in Parliament, and reported in press.
Design and assessment; preliminary report	RCU in consultation with councils.	Visits from surveyors to establish land ownership or make soil survey. Line published but details to be settled.

*In the Government's Consultative Green Paper on transport (1976) they mention the possibility of a new-style Annual Report. It is not clear if this will contain reference lists as at present.

Stage	Bodies Involved	How the Public Find Out
Publication of alignment and draft scheme, usually simultaneous with side road orders (Compulsory purchase orders may be taken simultaneously too)	RCU, NFU, agents, etc.	Written notification to owners of affected land. Published in London Gazette and official notices section of local paper. Exhibitions, plans on deposit at local Council offices.
Period for objections (six weeks minimum, though usually more)	RCU (Secretary of State can extend objection period) NFU, agents, individual objectors etc.	
Decision on whether to hold a public inquiry	Secretary of State	Announced. Letter to objectors
Public Inquiry	Inspector, RCU and expert witnesses, objectors, public interest groups, agents.	Objectors informed. Local press usually covers.
Announcement of Secretary of State's decision	Secretary of State	Press. Objectors informed and sent Inspector's report
Compulsory Purchase Orders published in draft	District Valuer (D.V.). landowners, tenants	Owners and occupiers sent compulsory purchase notices
Period of objection, three weeks minimum	RCU, NFU, agents	
CPO inquiry	RCU, Inspector, D.V., landowners and tenants	Objectors contacted individually

Stage	Bodies Involved	How the Public Find Out
Orders confirmed	Secretary of State	Press
Notice to Treat	DoE	Served on owners/occupiers
Final design and preparation of contracts	RCU/consulting engineers	
Contracts put out to tender	RCU, contractors, consultants	Adverts in national and trade papers
Appointment of contractors	DoE	Served on owners/occupiers
Notice of Entry	DoE	Served on owners/occupiers
Contractors start work	RCU, contractors, engineers	Often a public meeting
Construction period	RCU, contractors and sub-contractors, D.V. and advisers	Land should be fenced off

4. PLANNING AND DESIGN

4.1 Introduction:

It is most important that agricultural considerations are brought to the attention of the road planners throughout these early planning and design stages. It is during this initial routing procedure that informed and informal contact with RCU's and County Surveyors may prevent problems arising later, when the authorities are inevitably more committed to their proposals.

4.2 Roads in the Forward Programme:

It is stated Government policy to construct 3,100 miles of high quality inter-urban roads. As of 1975, just over 1,800 miles of this have been built. Over the last few years, the programme for this construction has become clearer as the RCU's and Counties plan ahead. HMSO publishes "Roads in England" annually - a list of all planned schemes costing over £250,000. This includes all the major roads firmly programmed.

The above information, along with the current TPP for the area concerned should give the best indication of any major road proposals.

4.3 Local Authority Consultation:

Many counties are now completing, or have recently completed their Structure Plans. These contain long term development strategy for the county. This is examined in consultation with the public, and must be approved by the Secretary of State for the Environment. Structure Plans are intended to be policy guides for a decade or more.

The NFU has the opportunity to participate in the preparation of Structure Plans. Road proposals are usually a key issue. The opportunity should clearly be taken by the farming community to put forward any agricultural considerations, e.g. placing of new roads on farm boundaries rather than out in open countryside, and guarding against the danger of a village or town by-pass severing land which then becomes eligible for future development, and may fall foul of the acquisition powers of the Community Land Scheme.

It should be noted, however, that trunk road and motorway proposals fall outside the scope of Structure Plans. The planning implications of major road schemes should nonetheless be borne in mind (eg. a motorway being used to justify urban or industrial development, thereby dictating development policy).

Although large road proposals emanate from Central Government, the first to be consulted at all stages are the local authorities. This consultation usually takes place confidentially before the public are given an opportunity to express preference on routes. **It is important that local government officers and local councillors are fully aware of the agricultural considerations in advance.** In the early stages, particularly in the formulation of routes for discussion, the local authority's support or opposition to the DoE can be all-important.

4.4 Investigation of Possible Routes - Corridor Studies:

At this stage, the RCU or consultants acting for the promoting authority, secretly investigate a possible "corridor" of land through which the new road might pass. This is the first stage at which individual farmers may become aware that a road might cross their land. Since the institution of Public Consultation the actual on-ground investigation of the routes has been put back: only occasionally will a soil survey or land ownership survey be carried out before a preferred route is chosen. Ministry of Agriculture Regional or Divisional Officers are however consulted at this stage. They may prove a useful source of information for County Secretaries. Certainly County Secretaries should inform MAFF as well as the promoting authority of any particular worries and point out any agricultural implications, so that these may be fed into the general planning decision on the road through the MAFF, as part of their concern for the national agricultural interest.

The information collected, and consultations carried out during the planning stage, allow the effects on agriculture to be judged in relation to capital cost, and cost/benefit of the various alternatives, and effects on other factors, such as developments, landscape values, recreational use, etc. Severance of farm units is examined in relation to route alignment and considerable adjustments are carried out to try to minimise its effect. It is often a sobering fact that a road alignment placed succinctly on the boundary between two farms, will, as a consequence, cut the next farm neatly in half.

4.5 Rights of Entry:

It is likely that entry for survey purposes will be required at some stage. The need is probably minimal prior to public consultation, and entry for these purposes is unlikely during the period between publication of line orders through inquiry to confirmation of line.

Although the right to enter land for survey may be claimed through statutory powers, it is usual to seek such entry initially by agreement. To do this, an engineer may visit the farmer or negotiation may be carried out by post. The boring requirements and means of entry should be clearly settled. In the case of bore-hole work, it is sometimes possible to time the work to fit in with crops. Where livestock are concerned, it is essential to insist that the bore-holes are fenced off before work begins. Although usually only 6" - 12" in diameter, bore-holes may be up to 200 metres deep. The contractor for survey work is given a schedule of ways of access as part of his contract, and the engineer responsible for the work, on behalf of the DoE or its Agents, will inform the farmer of the timing for entry, and give an indication of how long the work is likely to take. If a farmer does not choose to agree to entry, it is sometimes necessary to serve him with a notice of entry in accordance with Section 254 of the Highways Act (1971).

The landowner or occupier has a statutory right to compensation for damage and disturbance arising from surveys. Elements of claim are likely to fall under the heads of physical damage and disturbance. The former, if it cannot be made good by the contractor, may be either assessed on the grounds of depreciation, or more likely, on the basis of restoration costs. The latter is compensation for loss of growing crops and loss of profits. Farmers will often employ an agent to assess

and put forward their claims. There is sometimes criticism over delays in payment of compensation, but it is often the case that delays would be much less if the initial claim was made promptly, and was close in value to an equitable assessment of the damage and disturbance which occurred.

It will often arise that the engineer wishes to leave a survey marker or bore-hole stand-pipe behind on the land, for future use. In such cases he will arrange to make a small payment in respect of each of these. **The engineers are required to fill in the holes after use, but it is important to keep track of this, as a different gang may be employed to fill in the holes after the drillers have moved on.**

4.6 Public Consultation:

Once the corridor study is complete, one or more favoured routes will be put forward for public consultation. (This is not statutory, but is almost invariable practise, now, on large schemes.) In the case of large schemes, a number of exhibitions are organised in the main towns of the areas affected, each lasting two or three days. An additional, travelling exhibition visits the smaller towns and villages. The dates of these exhibitions are published in advance in local papers, and official notices are posted.

At these exhibitions, there will be plans, and often models of the proposed routes. Officials will be present to answer any questions. Members of the public are asked to take away a copy of the "Consultation Document" which summarises all the alternatives. This includes a questionnaire (to be filled in by a specific date), which allows for a preferred route to be indicated, and more generally offers a chance to indicate which factors, (eg. agriculture, landscape, etc.) are considered to be most relevant to the decision. Any more detailed comments not covered by the format of the questionnaire can be included in a letter.

There is naturally a built-in numerical bias against farmers at this stage; the town dwellers are usually more numerous, and want to push any new road as far from the town as possible. They will therefore tend to prefer routes which will carve through open farmland.

Thus it is important for the farming community to put in a fully representative appearance, both at the exhibitions, and in the completion of the questionnaire.

At the exhibition, it is worth asking as many questions of the officials in charge as possible, so that the agricultural implications of the various alternative routes are noted. It would not be amiss for the farmer to enclose with the questionnaire, a more detailed explanation of his position as regards choice of routes.

The more informed the farmers are, the greater their chance of having the route altered for the better. It is worth pointing out that public response is normally poor, except in sensitive conservation areas.

In a case where there is an alternative route which affects agriculture minimally, it may be in order to put in an NFU corporate reply, but even where farming is affected by all routes, an indication of the affect of any road, (especially a restricted access, large scale one) on agriculture may be worth putting in. The Ministry of Agriculture will have been consulted behind the scenes, and support may well add weight to their representations, particularly where any very productive land is threatened. The Highways Act does require that the Secretary of State for the Environment take account of agriculture in making decisions:

"Before making or confirming a scheme under this section, the Minister shall give due consideration to the requirements of local and national planning, including the requirements of agriculture." (Section II (6) Highways Act 1959 - this applies to special roads, i.e. motorways)

A unified agricultural front may have a good deal of effect. Certainly, in a recent decision on the A1 – M1 Link Road in Northampton, the least agriculturally disruptive route was selected, following representations by the local authorities and farmers concerned.

The importance of ensuring that all councils are fully briefed cannot be over-emphasised. Members of Parliament and Councillors have the most influence at this stage. The RCU's are particularly anxious to have the support of local authorities, especially the counties, as objections from them cause serious difficulties. Briefing of local councillors and local government officers should not only include the location of the best land, likely severance, and problems caused by traffic, but also possible harmful effects to agriculture from the positioning of the interchanges, service areas, and link roads to towns.

After some considerable time, there will be an official decision on a favoured route. The public participation procedure is currently under review. Greater attention is likely to be paid in future **to group representations.**

4.7 Making Contact with the Road Designers:

Most major road schemes are designed by Regional Road Construction Units, or their local sub-units, which are incorporated into County Council Highway Departments. In Wales, the equivalent is the Welsh Office.

It is of great use to make specific contact within the RCU fairly early on, so that he can liaise between you and the rest of his organisation throughout the long process. A careful balance must be kept, however, between keeping a regular contact and becoming a nuisance. Obviously there are times when the RCU must be approached by individuals, but there are occasions when a collective approach from the farmers involved, working through the NFU or an agent, might be of more value.

The approach to adopt should be considered carefully. Whatever happens, it is always vital that all concerned should be aware of any development relevant to the farming community. (Concessions won by one farmer might be a good lever for others to employ.)

Finally, an important task throughout is for members to keep a detailed record of all occurrences, and to whom they spoke, or reported them to at the time. Time spent in this way will pay dividends later.

4.8 Route Decision Announced and the Draft Scheme Published:

When the centre line of the route and amendments to side roads are announced, the only statutory requirement (except in very special cases) is that the Minister publish a Statement of General Effect, indicate a place where copies of the Draft Scheme may be inspected during the next six weeks, and state that he will receive

objections (Highways Act 1959 Sections 9 & 11 First Schedule, and Highways Act 1971, Section 14). This only need be in the London Gazette and the Public Notices section of the local papers. Regular contact with officials may guarantee notice in advance. Normally, copies of the Draft Scheme will be available for inspection in the offices of the RCU and the local authority during office hours.

There is a statutory period for lodging objections to the Scheme, usually a minimum of six weeks from publication. **It is advisable to lodge an objection, otherwise it will be assumed that there is complete satisfaction with the proposal.** All that is needed is to write to the address given in the announcement, stating name, address and grounds of objection, to the Draft Scheme. Naturally, these cannot yet be, and do not need to be, in a very detailed form. Grounds for objection could be lack of satisfaction with the attention given to the difficulties the Scheme will create, and that alternatives have been inadequately investigated. If an alternative is proposed, you can be required to identify it, at least roughly, within two weeks of the inquiry.

It is important to know whether or not a major community effort is being launched to oppose the road. Unfortunately, as these efforts are often designed to remove the road from the participant's doorstep, they may be working to move the line away from towns and further into the country-side. This may be more harmful to agriculture than a road close to the town that produces a "hard" boundary. The NFU may find allies with whom to dovetail cases at any inquiry.

4.9 Blight Notices:

This is a particularly complex matter and members should be advised to take professional advice. The process of making and confirming the scheme of a road may be a very long one, and a farmer wishing to sell up, for whatever reason, may find it difficult to obtain a reasonable price for his property. If this is the case, a blight notice may be served on the relevant authority any time from the publication of the Draft Scheme (not the public participation exercise), requiring them to purchase land at the "normal" market price, assuming there was no road planned (see Land Compensation Act 1973, Section 69; Town and Planning Act 1971, Section 192), the value will then be assessed by the District Valuer and an offer made. This is a valuable protection for people who might otherwise be trapped by the continuing uncertainty.

It has been found expedient to generally reject blight notices served during public consultation, but in case of doubt over a given investment or development it will be worth requesting a chat with the appropriate engineer to discuss the possible implications.

4.10 Prior to the Public Inquiry

(a) General action

The publication of the Draft Order allows the farm interest to examine the impact of the scheme comprehensively. It is now common practice on major schemes to supplement the formal and non-engineering format of the published Order plans with an exhibition of engineering and other relevant plans, usually held at a number of public sites in the area. Usually, engineering staff will have to make

some contact with potentially affected farmers and informal discussions often take place at this time, to explain in practical terms how the proposals will affect a farm unit.

NFU bargaining power can be at its strongest prior to the Public Enquiry.

The objection period following official publication of the route centre line is a very important one, both for the road builders and yourselves. The RCU or relevant authority have a scheme worked out in most details (usually including agriculturally important proposals for any re-routing of side roads), to which they would obviously prefer the minimum number of objections. The Inquiry is the time when the road designers will have to face the full weight of any objections there are, and justify their work. Already the scheme is detailed enough for individual effects, such as farm severance to be queried and perhaps amended.

Engineers are usually sympathetic if a good case is made. They will make every effort to meet individual needs if it is likely to lead to the withdrawal or modification of an objection, as this simplifies their task at any forthcoming Inquiry. The farmer and his agent should therefore clear as many aspects as possible with the engineers.

The detailed design of the road will not, in fact, be completed until the line Orders have been confirmed, but many important design issues, and practical agricultural implications can be dealt with at this stage.

The engineers will have designed the best road they can, within the guidelines they have been given. Challenging these guidelines is a matter for higher authority. **Hence, in discussing the effects on specific farms, it is advisable to concentrate on those aspects within their control.** The alignment of the road is usually determined by the need to avoid, wherever possible, buildings, historic sites, sites of great natural beauty or scientific importance, Ministry of Defence land, better agricultural land, etc. There are minimum curvature and sight-line standards. The height of the road may be determined by clearance required over or under other roads, railways, or navigable waterways. Between such points there are maximum allowable gradients.

After taking these factors into account, the road will be designed to be as direct as possible, between the chosen end points, subject to cost considerations, especially with respect to the amount of earthworks required. As far as possible, attempts are made to balance the amount of "cut" and "fill" to minimise the costs of earthmoving.

It is recommended that designers should be informed of all relevant farming issues at an early stage. In particular, it is important to check that the DoE have used up-to-date land-ownership maps showing any farm boundaries. The following factors should also be carefully considered.

(b) Re-alignment

Within these constraints there may be some scope for moving the alignment short distances, up or down a few metres. It must be realised that realigning the carriageway by a mere 5 feet, sometimes has repercussions on land some half a mile either side of the road. Everyone else affected must agree to the movement.

(c) Severance

Although as far as possible, new roads are routed along farm boundaries to minimise the severance, and sufficiently far from houses to keep noise levels down below the statutory compensatable level, this is difficult to achieve. Re-arrangement of holdings, although often rational, in the long-term, should not be attempted until the compensation position has been settled.

Ensure the engineers understand the problems that will be caused by severed land, including the difficulties of using public roads, accesses shared with other land-owners, and foot or bridle paths.

(d) Access

This is often the cause of acute anger and disappointment. The Department of the Environment do not provide under - or over-passes except where it is felt to be economically justified. Access via side roads (or in non-motorway cases, across the new road) is usually a poor substitute for unhindered working within a ring fence, but is normal. The cost of an underpass/bridge is put at anything up to £70,000, and there are thus very few cases where one is clearly economically justifiable. Sometimes a footpath may cross the land. Such a right of way must legally be preserved (though it may be rerouted). So it is often expanded to take farm traffic. If this is the case, do check that:

(i) It is big enough to take all vehicles owned or hired, or proposed to be used; this applies to weight and height as well as width.

(ii) Where a footpath underpass will be shared by cattle there is a raised walkway above the level which may sludge.

(iii) There is no sharing intended between brucellosis-free and non-accredited herds.

(iv) A sufficient area of hardened surface will be provided at the approaches, at a satisfactory gradient.

Where the access will be across or via a busy public road, check that:

(i) The farm gate will be repositioned so as to allow a tractor and trailer to wait without protruding onto the road whilst the gate is closed.

(ii) Where useful access is left along a verge, it is not planted so as to prohibit such use.

(iii) There is a suitable deep turning place opposite the farm gate and elsewhere, as necessary, to enter fields. These can be for tractors only (ie. with a raised kerb), if the authority wishes to prevent car turns.

(iv) There is no lay-by planned by the farm gates, as parked cars might block the gateway.

Look carefully at the provisions for re-aligning (including speeding up) side roads which may well cause equivalent access problems.

(e) Fencing and Hedging

Roads built under "special roads" (ie. motorway) provisions will be fenced in perpetuity by the authority. Roads not so built may be fenced initially by the authority, but subsequent maintenance of the fence is the responsibility of the landowner.

To take the motorways first; the farmers should state in writing to the authority their farming pattern and future plans, so that the optimal fencing can be used. In general, this will be post and rail, with sheep net where required. Few problems arise with the long-term fencing - more with the temporary fencing during construction.

In cases where the authority is not responsible for the maintenance of fences (eg. trunk roads), it is possible to call for hedge-planting as well as the erection of a fence. At the moment, the hedges are planted on the farm side of the fence, and may be considered accommodation works, and therefore offset against compensation - a point which should be watched.

If a farmer is responsible for the maintenance of a hedge along a new highway, it may be worth his checking whether the RCU consider there to be any height limit on hedges or hedgerow trees planted close to new roads.

(f) Drainage

Road contractors often say that they cannot give the full drainage details until these have been cleared by the appropriate authority, normally the Water Authority. However, by the time of the Public Inquiry, it should be possible to obtain particulars. It is normal practise to pick up all severed field and land drains, and to build petrol/rubber traps into the "french" drains at the roadside before they discharge into external water-courses.

It is important to ensure that **the level of drains along the motorway or new road should be set low enough for the future needs of the area.** To ensure the long-term implications of the road have been fully considered, members should seek the **earliest possible consultations with the Regional Water Authority and MAFF's local land-drainage officer.**

Problems can arise, because no matter how well-picked-up the drains are, if they run directly into covered drains off the farmer's land, there is no way of easily cleaning or checking them.

Sometimes, farmers may be consulted about their drainage patterns by the promoting authority, in order to allow for the planning of, and picking up of the field drainage. However, this has not always proved to be the case, so **if a member has not been consulted about his future plans for farm drainage, he should raise the matter with his agent, the NFU, and the road engineers.**

It will prove helpful for the farmer to draw up a scheme of restoration with his local drainage contractor, in conjunction with his valuer. This should be accompanied by a quotation and permission can then be sought to proceed with the work at this price. If he is left with any small fields of odd shape, the farmer should include the cost of redraining involved in making the fields a more economic size.

So the points to watch out for include:

(i) The right to inspect all relevant work before it is covered up. The contractors should be instructed to peg and record in a book, and plan all drains and pipes severed or connected, and to provide plans.

(ii) The right to have a local contractor who knows the conditions, to handle all the work off the actual construction site.

(iii) Any short term re-alignments or blockages

(iv) Pollution, particularly prior to the permanent traps being installed

(v) Dry weather may well mask future problems.

(g) Land Take

The road scheme, as proposed, and particularly the lay-out of the junctions, should be scrutinised closely for potential land savings. Sometimes, a more spread out junction would offer usable land in the centre, but in most cases the opposite is true. The engineers' design manuals can be consulted with regard to tightening junction curves, or even substituting a roundabout for a wide-spanning free-flow type of intersection. Recent DoE Technical Memos specify downgradings of many design features. Check whether these latest standards have been used.

Slopes of roads in cuttings, or on banks, are worth watching too. A shallower slope would, in fact, preserve more land in use, as the fence could be moved closer to the road itself. A recent DoE circular (Roads 38/75 para. 4.04) recommends precisely this for new single-carriageway roads.

Under the Land Compensation Act 1973 (Section 22) land may be taken by compulsory purchase for landscaping purposes. These 'environmental treatment' proposals are often cosmetic and tacked on afterwards. Whilst it is aesthetic and useful to have some completely severed land bought up and planted, a careful watch should be kept for unjustifiable attempts to take productive land.

5. THE PUBLIC INQUIRY

After the objection period, the date of the public inquiry into the section of the road in question, will be announced. If an objection has been entered, a personal notification should be received. Occasionally a late objection will be accepted by the Inspector, but this should not be relied upon.

Hopefully, the earlier approaches and contacts will mean that the agricultural effects of any road will have been minimised. However, **it is essential to go to the inquiry to formalise any unofficial agreements made with the promoting authority. Any objection sent in should not be withdrawn until it is certain that all points have been formally agreed in writing.**

NB. **The County Secretary must ask the promoting authority to keep him informed of any proposals or alternative routes put forward by other objectors which may interest members.** (Proposers of these routes have no duty to notify other objectors. Objections to such alternative routes may be lodged.)

The promoting authority try to produce good models, plans, and drawings of their route in order to sell the scheme to the public. They would probably be willing to set aside a day or evening to meet all affected farmers, with or without their agents, to present this information and to answer both general and particular queries.

(i) Whether or not to present a case in objection at the public inquiry is a serious decision. Individual members with specific grievances for which they have been unable to negotiate a remedy, should use the inquiry as a final means of seeking a solution. The Inspector might, after hearing the arguments, recommend a course of action which the promoting authority - restricted by regulations - could not accept. It should be remembered, however, that the Secretary of State, in making his decision on a road scheme, is not bound by the Inspector's recommendations.

(ii) **An effective objection takes a good deal of time and money to prepare,** whether the objection is individual or for a group of farmers. In fact, modern road designing is such a sophisticated (and sometimes confusing) statistical operation, that opposition has tended to become more a matter for large groups who can hire the necessary skill, both legal and technical. Unlike Compulsory Purchase objections, **there is no way of recovering costs,** even should the case be won.

(iii) What can, and can't be discussed at the Inquiry is in the Inspector's hands. In theory, the inquiry is about the principle of a road on the published line. The basic rule is: query anything that appears disturbing, unclear or unsettled, except blatant compensation matters. Technically, compensation is out of court. Occasionally, queries about severance (eg. under-passes/over-bridges) may be ruled out of order as being matters to be off-set against compensation, and to be dealt with later by the District Valuer. Nonetheless, these are points which should be pressed as being integral to farm planning.

(iv) The local "need" for the road can be discussed but not national transport policy. This national context has, of course, received much attention at recent inquiries (eg. Airedale) and it should be borne in mind that the Government's new thinking on an integrated transport policy has been made known to the public as recently as April, 1976. Apart from the question of need, there is also the specific question of the effect of the proposed scheme on particular farms. It is important to keep these two aspects apart.

6. THE SECRETARY OF STATE'S DECISION OR DEFERRAL

The Secretary of State will issue a decision on the road proposal, following consideration of the Inspector's report. The road scheme is then "made" in law. The decision may take a long time, depending on the size of the inquiry, but eventually each objector should receive specific notification, with reasons, of the decision. **Objections about the fairness or correctness of the decision can be made within six weeks to the High Court, but only on a point of law or against an ultra vires use of power. The Parliamentary Commissioner is available to hear objections to mal administration,** but evidence shows that, except in the most blatant case of bias, these procedures are long, expensive and unlikely to affect the actual road in question.

In special cases the Secretary of State may decide to defer a decision on a particular road proposal, or indeed to reopen the public inquiry. This clearly takes the farmer in opposition back to square one, and gives him the opportunity to have a further say, should he wish to do so.

7. LAND ACQUISITION

7.1 Draft Compulsory Purchase Order

Assuming that the decision is in favour of the road, then orders will be issued under Section 13 of the 1959 Highways Act. These will include draft orders for purchase, compulsorily if required, of necessary land. Occasionally these are left in abeyance for financial reasons, but normally the acquisition of land will follow fairly soon, and contact will be made by the District Valuer. Objections to the CPO may be entered within the 3 week time period specified. Under the Highways Act 1971 (Section 54) a CPO inquiry must be called by the Secretary of State for the Environment if objections are lodged, except where "in his opinion" the objection is one which has already been proposed, or attempts to reopen the debate on whether to have a road, or queries the position of the centre line.

The road proposals are now well advanced, the opportunity of appearing at a CPO inquiry provide a further chance to raise outstanding points of concern.

7.2 Notice to Treat, Sale Negotiations and Compensation

Once a Compulsory Purchase Order has been confirmed by the Secretary of State, a notice to treat will be served on the landowner or occupier. It will give details (including a plan) of the land and/or rights which are to be purchased and requires the owner to provide particulars of his interest, and to submit a claim within 30 days with a view to negotiating an agreed settlement. These negotiations will normally be carried out by the District Valuer on behalf of the promoting authority. They will almost certainly continue well into, if not beyond, the construction period.

It is not intended in this note to deal with the Compensation Code in detail. It is certainly strongly advised that individual members should retain agents to act on their behalf in negotiations. The professional fees so incurred may be reclaimed from the acquiring authority. **Members are strongly advised to keep an accurate daily diary of time spent on ALL matters concerning the road,** eg. letter-writing, telephoning, checking during construction. Particularly disruptive occurrences should be recorded in precise detail.

Members should be encouraged to bear in mind that they are entitled to a 90% advance payment (on the District Valuer's suggested price) in advance of the final settlement of compensation. This advance payment is entirely without prejudice to the final settlement. Members should also bear in mind that once a compensation claim has been settled it is in "full and final settlement" and cannot be reopened. Therefore, subject to the advice of agents, it is worth keeping negotiations open until all the implications of the particular road scheme can be fully assessed. Some items of damage or disturbance may only appear after the road has been completed, and indeed, been open and in use for some time.

In general, the farmer is entitled to the open market value of his interest in the land taken, disregarding any increase or decrease in its value due to the construction of the highway. Compensation is assessed by reference to the value of the land at the date of possession or the date on which compensation is agreed, whichever is the earlier. Where a tenant is concerned, he is entitled to

compensation for the loss of his interest in the holding or in the land which has been taken (see Section 48, Land Compensation Act 1973, for improved compensation provisions). The affected farmer is also able to claim compensation for severance, injurious affection and disturbance. If the amount of compensation cannot be agreed between the District Valuer and the affected farmer, then the matter can be referred by either party to the Lands Tribunal for arbitration.

Members faced with compensation claims might be encouraged to read the DoE pamphlets which give useful general guidance. These will be available from the acquiring authority or from the nearby local authority. Booklet 4 deals specifically with "The Farmer and Public Development".

As already noted, accommodation works are counted as part of the compensation payment to the farmer. This will cover overbridges, under-passes, and fencing of all roads other than new motorways, where the promoting authority erect the fences at their expense, and maintain it in perpetuity. Hopefully, negotiations on accommodation work will already have been undertaken. Assurances given at the original inquiry into the road scheme may be useful bargaining counters both in the compensation negotiations and in gaining adequate accommodation works. Each case, however, needs to be treated on its own merits.

8. CONSTRUCTION OF THE ROAD

Promoting Authority control of the contractors is what usually gives rise to most complaints; working farmers cannot afford to spend a lot of time while problems are referred from one person to another. In view of the general acceptance by the DoE of Codes of Practice, it is the NFU's ambition to persuade the Secretary of State to accept one for contractors building roads across farm lands. For contractors' working documents and appropriate standards for their materials, see Appendix D.

8.1 Responsibility and Liaison

The importance of establishing liaison before work starts cannot be over-emphasised. It has now become normal for the promoting authority or the superintending engineer to appoint one man as a specific liaison officer, whose name, address, and telephone number should be circulated before construction starts. If he had agricultural knowledge, this would make for considerably better relations. It is, however, more likely that you may have to deal with someone who has little knowledge of farming, and thus, careful explanations of problems will be essential. The NFU is currently pressing for the employment of agricultural liaison officers as standard practice - your pressure at local level will be of great help.

Once the contractors have been appointed, but before the start of construction, it should be possible for the NFU to convene a meeting of affected farmers and their agents, together with senior members of the promoting authority and the contractors.

Remembering that the Department of the Environment's road construction unit or the Welsh Office are owners in law of the land on which the road itself will stand, you will probably have contact with the following people:

(i) **Consulting Engineers** - used particularly where the promoting authority are too busy to watch over the actual construction. It is their job to oversee and manage the road-building as a whole.

(ii) **Main Contractor for each section** - big road schemes are rarely let out as a whole, but are divided up into sections let out to main contractors (eg. Douglas, French, Tarmac etc.). They actually build the road, under a contract signed with the promoting authority. This contract contains a number of scattered references to agricultural consideration, particularly British Standards for fencing and drainage, etc.

The Contractor indemnifies the RCU against third party claims for damage to external property during construction. Disputes over damage to land, machinery, etc., can be very time consuming, often insurance assessors are involved and it is not always easy to establish responsibility for damage, especially where sub-contractors have been employed.

NB. It is important that members never make arrangements with contractors without first the presence and secondly the agreement of a representative of the promoting authority. It is equally important that the promoting authority should issue the necessary instructions to the contractors/sub-contractors and the farmer should always get confirmation in writing.

(iii) **Sub-Contractors** - any number of specialist or local sub-contractors may be involved in the work at any given time. Often it is their employees with whom the farmer comes in contact most frequently. However, the sub-contractors rarely have the power to make any agreements and the golden rule (unless there is an easy immediate settlement) is to refer all problems directly to the promoting authority.

8.2 Relationships with Contractors and Sub-Contractors

Research results have shown that the best approach to contractors on site is to establish a relationship with foremen or gangers. This should be done as soon as the contract starts. Life in the construction business is hectic, especially for the foremen, who have to settle most problems in the day-to-day progression of work. This means that they have the men and equipment on the spot to put things right unless the problem is too large. They may welcome a chance to step off the site for a chat in the relative peace of the farmyard, and be willing to help. It is also important to retain good relationships with those higher in the contractors' hierarchy, and with the resident engineer. But these contacts can be kept more formal. Any request made should be in a form that will appear reasonable.

8.3 Before Construction Begins

The following points should be given careful consideration by farmers:

(i) **Keep a Diary** - Note down the time spent on anything because of the construction - the date, time, phone calls, visits, extra herd movements, dust damage, etc. Unless this is done, an agent cannot be expected to make successful claims at a later date.

(ii) **Statement of Condition** - Those with extensive and perhaps lengthy workings being carried out on their land, will obviously wish to consider drawing up a fair record of the state of the holding, its fences, drainage, and so forth, in order to meet the potential problem of "proving" any future worsening of the position due to the road works. The member may not be able to reclaim the cost of this. (The NFU is currently pressing the DoE to accept the need for records of condition, already standard practice with major pipe-laying authorities).

(iii) **Temporary Leasing of Land for Contractors Use** - No road can be built without the contractors having necessary working space for soil storage, work sites, etc. Unfortunately, most of the evidence we have shows that farmers have regretted leasing land in this way. Very great care, therefore, needs to be taken before entering into an agreement. The promoting authority does not provide any, and it is up to the contractor to negotiate his own. Usually he purchases a "Licence" to use and enter the land for a limited period, and return it when construction is finished. There are good and bad contractors, so the small print is important before members agree to deals in this competitive market. **Although the price offered is usually a good one, members should be warned that these deals often do go wrong, and they are advised to ask:**

1. Does the agreement specify adequate restoration of the land?

2. Does the agreement run until the land is restored or merely during its use?

3. Are there penalty clauses to ensure payment if the contractors run over time?

NB. The income is unearned and therefore more highly taxed. No reputable contractor or sub-contractor will object to putting everything in writing. (The whole question of arrangements for contractors' working space is being actively pursued by the Union. The current state of play is clearly unsatisfactory.)

(iv) Insist that temporary or permanent fencing is erected well in advance of construction works.

(v) **Cutting of Services** - This is where the liaison is most vital. It will often be necessary to sever services or alter drains, and what might be a small problem becomes a great inconvenience if there is no warning. The ideal would be to obtain a written promise that a week's notice be given before such interference. Naturally contractors are reluctant to give such assurances and so it is advisable to submit specific questions relating to important services such as water supply, so that a record will be available.

(vi) **Brucellosis** - In Brucellosis Eradication Areas, or where here is some individual accredited status, it will be necessary to take special precautions regarding passage between farms and arrangements of fencing. (See Appendix C for example of written Code of Conduct - Statutory Instrument 1974, No. 195.)

(vii) **Access - 1. For Contractors' Vehicles** The promoting authority should be in a position to state clearly that access to the construction site will be via a fixed number of public roads and/or private wayleaves, which should be distinct from roads important for agricultural traffic, research has shown that farm tracks are frequently misused by heavy or inappropriate vehicles if opened at all. **Vehicles seen to be transgressing should be reported.**

2. For Farmers Crossing the Construction Site

Farmers must be clear in their requirements for access in the period before permanent under- or over passes are built. The liaison officer should be told the limits (stones, slopes, etc.) which the animals or vehicles needing to cross can tolerate, and the times when the need to cross is vital.

APPENDIX A

TRANSPORT POLICIES AND PROGRAMMES (TPP's)

It would be worthwhile keeping an eye on your County's TPP and if necessary passing comment because it is at this level of planning that the farming interests are directly affected. A copy should be available free, or at a small charge from your County Surveyor's office.

A new system of local transport grants came into effect for the financial year 1975/76. It involves an entirely new form of financial aid to local authorities - the Transport Supplementary Grant (TSG), together with a new planning tool for both central and local government - Transport Policies and Programmes (TPP's). The Government's grant is no longer based on the actual cost of individual schemes but on County programmes of estimated expenditure backed by a comprehensive statement of transport policies for the area - financial support for public transport is, as far as possible, to be channelled through the local authorities and not paid direct by Central Government to the operator.

Local transport services exclude responsibility for motorways and trunk roads, which remains with the Department, but extend considerably wider than principal roads. These services include the construction, improvement and maintenance of a large number of non-principal roads, together with the management of municipal bus companies, the provision of street lighting, cycle tracks and footpaths and, in most of the metropolitan areas, responsibility for local rail services.

The preparation of TPP's and of the transport proposals of structure and local plans are supposed to be integrated as far as possible. In TPP's there is more emphasis on resource allocation, "value for money" and operational measures whereas structure and local plans are primarily concerned into wider planning interactions and the use of land. The structure and local plans which have statutory public consultation procedures should form a framework for TPP's.

The latest DoE circular 125/75 sets out the arrangements for the third year TPP submissions for the transport supplementary grant. The suggested structure for the submission is:

Part I (a) - Statement of programme adopted for 1976/77 with explanation of the reasons for the choices made.

(b) - Summary of the County's main proposals for the five years from April 1977.

(c) - Discussion of priorities within the County's programme.

Part II - An analysis of each of the different areas (e.g. major urban areas, New Towns) and of the different types of transport (e.g. inter-urban highways, rural and inter-urban public transport). As assessment of the resources for each sector would be made, projects chosen and a costed programme for a five year period worked out.

APPENDIX B

ADDRESSES

(1) DoE - DEPARTMENT OF THE ENVIRONMENT

Large complex department formed in 1971 by combining Ministeries of Transport Works, Housing and Local Government. The Secretary of State for the Environment is the Government Minister in charge. He is supported by several junior under secretaries, one of whom acts as Minister of Transport.

Head Office: 2 Marsham Street,
London SW1
Tel. 01-212-3434

Map Sales: DoE Map Library,
5th Floor,
Prince Consort House,
Albert Embankment,
London SE1 7TF
Tel. 01-628-8366

Regional Offices: There is a Regional Director for the whole Department and a Regional Controller (Roads and Transportation) specifically for transport matters. The regions and offices are as follows:

West Midlands
Five Ways House,
Islington Row,
Middleway,
Birmingham B15 1SR
Enquiries: 021-643-8191

North West
Sunley Building
Picadilly Plaza,
Manchester M1 4BE
Enquiries: 061-832-9111
Exts. 428, 491

South West
Froomsgate House
Rupert Street,
Bristol BS1 2QN
Enquiries: 0272-297201/21

Eastern
Heron House,
Goldington Road,
Bedford,
Enquiries: 0234-63161

Yorkshire and Humberside
City House,
Leeds LS1 4JD
Enquiries: 0532-38232

Northern
Wellbar House,
Gallowgate,
Newcastle-upon-Tyne
NE1 4DT
Enquiries: 0632-27575

East Midlands
Cranbrook House
Cranbrook Street,
Nottingham NG1 1EY
Enquiries: 0602-46121

South Eastern
74 Epsom Road,
Guildford,
Surrey.
Enquiries: 0234-71101

(2) RCU - ROAD CONSTRUCTION UNITS are specialised bodies, comprising a main headquarters (listed below) and a number of sub-units which design most of the major road schems and administer their construction. It is important to be in touch with the relevant people so first ring the main headquarters to find out who, at which sub-unit, is responsible for a particular scheme, and then deal direct.

NB. RCU regions are shown on the enclosed map: they do not coincide with DoE regions.

North East
Block 8
Government Buildings
St Georges Road
Harrogate, Yorks
HG2 9EL
Enquiries 0423 68903

North Western
Crystal House
Birley Street
Preston
PR1 2AQ
Enquiries 0772 54701

Midland
Brandon House
52/54 Holly Walk
Leamington Spa
Warwickshire CV32 4JE
Tel: 0926-27041

Eastern
59-63 Goldington Road
Bedford NK40 3LY
Enquiries 0234 63161

South Eastern
Federated House
London Road
Dorking
Surrey RH4 1SZ
Enquiries 0306 5992

South Western
Victoria House
Fore Street
Taunton
Somerset TA1 1JG
Enquiries 0823 85151

(3) WELSH OFFICE

Roads Division
Graham Buildings
Newport Road
Cardiff
Cardiff 499066

DoE REGIONAL CONTROLLERS (R&T) REGIONS

ROAD CONSTRUCTION UNIT AREAS

APPENDIX C

SPECIMEN REGULATIONS WHICH HAVE PROVED HELPFUL FOR BRUCELLOSIS-FREE HERDS:

Extract from "Manchester (Shap Aqueduct) Water Order" Schedule 2, Section 10, 1973 pp 14-15.

The provisions referred to in the preceeding paragraph are as follows:

(i) the accesses to the working strip shall be agreed and a prominent notice, or notices, of adequate size, shall be erected by the Corporation at the commencement of the agreed access route, and along the line of the strip, and these notices shall be erected before any other work is done on the farm. The notices shall draw attention to the Animal Health precautions required by the Code, and shall prohibit vehicles or employees of the Corporation or their contractors from going outside the proposed working strip other than by means of an agreed access route; the notice or notices shall not be removed until all work, including reinstatement and reseeding has been completed.

(ii) the Corporation shall ensure that all constructional works are completed on farms which have herds which are accredited brucellosis-free before moving onto a farm where the herd is not accredited and shall maintain an adequate double fence across the working strip to prevent access from the farm on which there is non-accredited brucellosis-free herd, to a farm on which there is accredited brucellosis-free herd.

(iii) each side of the working strip and access routes shall be fenced off with a double, stock-proof fence unless an existing stock-proof fence is available to form one boundary. The inner fence shall be suitably stock-proofed; the outer shall be an electric or other stock-proof fence situated not less that 1.8 metres from the inner fence. All such stock-proof fences shall be maintained in position and in good condition so that their effectiveness is unimpaired during constructional work, and thereafter until reinstatement of the land and reseeding is completed, or until such a period as the Divisional Veterinary Officer determines. The ends of the working strip for the time being in use shall also be adequately fenced.

(iv) during the period of construction on any farm, and until reinstatement is completed, the Corporation shall ensure that drains, ditches, streams, burns and becks shall not be diverted from their existing courses so as to flow onto farmland in other occupation.

(v) all work, (other than fence erection) shall be carried out between the lines of the inner fences. All topsoil and excavated material must be stored within the working strip on the land from which it was obtained, and no soil or other spoilage shall be transported across farm boundaries except by means of the agreed fence accesses

(vi) any servant or agent of the Corporation or any other person and equipment entering upon the working strip and access routes shall comply with such disinfection procedures, if any, as may be prescribed by the Divisional Veterinary Officer before entering, and upon leaving the said land, and shall have regard to all the relevant provisions of the Brucellosis (Area Eradication) (England and Wales) Order 1971.

(vii) the Corporation and their contractors shall not obtain access to the proposed working strip through land forming part of a farm (except aforesaid) save in exceptional circumstances or extreme emergency when the Corporation shall have obtained either the approval of the occupier or the local Divisional Veterinary Officer. The Corporation will observe any conditions imposed as a term of such approval.

(viii) no dogs belonging to employees, or contractors will be permitted on access routes or the working strip.

(ix) where the works have been completed and the land restored and until reseeding operations take place, the Corporation will at the reasonable request of the occupier provide an access across the working strip or access route to enable the farm to be worked with the minimum inconvenience in such position as may be agreed, the access to be constructed of pre-disinfected wooden railway sleepers or similar structure raised above the ground and which shall extend the full width of the working strip and be fenced on either side.

(x) all employees or contractors erecting or dismantling notices or fencing or structures across the access routes or working strips on farmland shall observe the prescribed disinfecting procedure.

(xi) all fencing material and posts, unless new, shall be disinfected in a suitable manner prior to delivery to the relevant farm.

(xii) within the working strip adequate latrine facilities shall be provided together with adequate facilities for the storage and prompt disposal of all food residues, food containers, and food wrappings. Such facilities shall have no possible contact with animals and should be bird and vermin-proof. Such waste to be removed daily. Personnel working on the strip and access routes shall use these facilities only.

(xiii) where the working strip cuts across the access to the farmhouse from the highway and there is no alternative means of access to a highway the Corporation will provide alternative access facilities in such a manner as may be agreed with the occupier or as may be required by the Divisional Veterinary Officer.

APPENDIX D

THE CONTRACTORS' WORKING DOCUMENTS

The contractor is, of course, in this line of work to make a profit. Thus he has no intention of doing any more than he quoted to do when the contract was put out to tender - unless he is paid for it. It is important therefore to know exactly what the contractor **did** promise to do. Although for no clear reason the contract itself is usually treated as confidential, much of it is codified in advance in:

"Conditions of Contract and forms of Tender, Agreement and Bond for use in Connection with Works of Civil Engineering Construction" published by the Institute of Civil Engineers, Great George St. London SW1P 3AA.

and the H.M.S.O. Handbook:

"Specification for Road and Bridge Works" and its subsequent addenda/amendments.

A guide to some possible points of contention, and their references, is given below. The actual contract document may well be a variation on these clauses, so you should also consult the RCU. Preferably the NFU should submit a list of these and other relevant matters in advance, requesting information of any divergences from the usual standard procedures.

NB. This is a GUIDE and not a comprehensive list: contractual law is complex and should be treated with care.

References are to the Institute of Civil Engineers (I.C.E.) document, to the HMSO Handbook, and to British Standards (B.S.)

Responsibility

I.C.E. clause	8	Contractors general responsibilities
	14(7)	Responsibility unaffected by (engineers') approval
	2	Engineers' representative
	20	Care of the works
	21	Insurance of works
	22	Damage to persons and property
	62	Urgent repairs

Timing and Procedure

I.C.E. clause	14	Programme to be furnished
	38	Examination of works before covering up
	4 40	Suspension of work
	41-6	Commencement time and delays

Distrubance and Disamenity

I.C.E. clause	29(1)	Interference with traffic and adjoining properties
	(2)	Noise and disturbance
	45	Night and Sunday work but see also 46 rate of progress
HMSO	103	Traffic safety and control
HMSO	104	Temporary diversion of traffic

Access to the Site for Contractors Vehicles

I.C.E. clause	30(1)	Avoidance of damage to highways etc.
	42(2)	Wayleaves etc.
	49(5)	Temporary reinstatement
HMSO	705	Transporting, laying and compacting of road pavement materials

Farmers' Access Across the Site

HMSO clause	401(1)	Provision for Access

Hedging and Fencing

HMSO clause	301	Hedges (B.S. 3963 part 1)
	401-9	Requirements for temporary and permanent fencing
	2614	Fencing wire (B.S. 1722, part 3)

Drainage

HMSO clauses	501-11	types, materials, connections etc.
	611	Earthworks to be kept free of water
	613	Watercourses
	614	Filling existing water courses
	615	Clearing existing ditches
	2621	Manholes and inspection chambers

Damage to crops, land, stock and services

I.C.E. clause	22	Damage to persons and property
HMSO	105	Privately owned services

See also 'Responsibility' above.

Blasting

HMSO clause	602	Explosives and blasting

Tidying up

I.C.E. clause	33	Clearance of site on completion
HMSO	612	Soiling, grassing and turfing
	2615	Fertiliser

APPENDIX B.

QUESTIONNAIRE EMPLOYED TO GATHER EVIDENCE ON PROCEDURAL PRACTICE AND PROBLEMS.

SECTION A - Personal and farm details.

1. Name .....

2. Name, address and telephone number of farm

.....

.....

.....

. .....

3a. Is your farm all in one holding?

Yes

No ..... If not how many? .....

b. How many acres do you farm in total?

c. What is your farm system? Predominantly milk

" arable

Milk and arable

Other .....

please specify

	Acres	Years held
4. Acres held as owner-occupier		
5. Acres held a annual tenant		Years to run
6. Acres held as long-term tenant		

7. Acres held on any other tenancy, cropping right or so forth, please give details,

.....

.....

8. Number of acres lost to, & severed by, the road in each category;

	Lost	Severed
1		
2		
3		
4		

SECTION B - The Chosen Route and Farming Pattern.

9. Was your farm ring fenced before the road came?

Yes

No

10. Have you had to make any changed in your farming pattern because of the construction?

Yes

No

11. If "Yes" please briefly specify what the changes have been and how successfully they have worked.

.....

.....

.....

12. Have you any other major changes planned for the future as a consequence of the construction?

Yes

No

13. If "Yes" please specify briefly.

.....

.....

.....

SECTION C - Contact with the Road Construction Unit (RCU) before the public inquiry

14. Did the RCU contact you personally before the general public inquiry?

Yes

If yes what was discussed?

No

Don't know

15. Were bore holes made on your land?

Yes

No

Don't know

if "Yes" a) was prior permission obtained?

Yes

No

b) were you told what they were for?

Yes

No

c) How many were there? .....

d) What dimension were they? .....

e) Were they refilled immediately after use?

Yes

No

f) Was compensation offered?

Yes

No

SECTION D - The General Public Inquiry

16. Did you make an appearance?

Yes

No

17. If "No", a) why not? .....

.....

b) given the chance again, would you present a case?

Yes

No

18. If "Yes" a) were you represented?

Yes

No

b) What was your case based on?

General transport considerations

General agricultural considerations

Personal farm details

Other (please specify) .....

c) Were any aspects of the road which later gave trouble raised?

Yes

No

If Yes, were they & how were they dealt with,

.....

.....

.....

If No, why not?

Not envisaged

An assurance received that there would be no problem — By whom .....

Told it could not be raised at the time .....

d) Were there any issued you would have liked to raise at the inquiry but did not? Please specify with reasons why not,

.....

.....

.....

e) What was the DoE's response to your case?

Unfavourable

Neutral

Favourable

f) What was the Inspector's response to your case?

Unfavourable

Neutral

Favourable

g) Did you have enough information about Inquiry procedures to be able to present your case adequately?

Yes

No

SECTION E - The compulsory purchase order (CPO) Inquiry

19. Did you make an appearance?

Yes

No

20. If "No", a) why not? .....

.....

b) given the chance again, would you present a case?

Yes

No

21. If "Yes" were you represented?

Yes

No

22. What matters concerning the problems of your farm did you raise?

.....

.....

.....

.....

23. What was the Inspector's response to your case in his report?

Unfavourable

Neutral

Favourable

24. Given your experience since the CPO Inquiry are there any issues you think you should have raised at the inquiry but did not

No

Yes please specify .....

SECTION F - Relations with the contractors, site personnel and consulting engineers.

A. BEFORE CONSTRUCTION

25. Did you meet any of the contractor's or consulting engineer's representatives before construction began?

Alone Yes With other farmers Yes

No No

26. Can you name the people who you met, and/or their positions?

.....

.....

.....

27. Were such meetings concerned with,

Specific worries of yours

Specific worries of the contractor

General matters of liaison

Broad generalities

28. How useful were such meetings in terms of preserving the farm from undue disturbance?

Very useful please explain if possible .....

Useful

Fairly useful

Useless

29a.

29a. Was any plan of the work to be done on the farm drawn up before construction began?

YES/NO

b) Was any such idea ever suggested?

Yes, by you

Yes, by someone else Whom? .....

No

c) What was the outcome of the suggestion?

.....

.....

.....

30. Was any 'statement of the condition of the farm before the road considered?

No

Considered & rejected

Seriously considered & rejected

Drawn up

Why? .....

B. DURING CONSTRUCTION

31. Did you make any private agreements with the contractors?

Yes

Approached but did not accept Why?.....

No .....

32. If an agreement was made how has it worked in practice?

.....

.....

.....

33a. How would you describe your working relations with the constractors?

Good

Workable

Unworkable

b) What factors have been instrumental in producing this state of affairs?

.....

.....

34a. How would you describe your working relations with the consulting engineers?

Good

Workable

Unworkable

b) Why was this? .....

.....

35a. How would you describe relations with the resident engineer, (or liaison office)?

Good

Workable

Unworkable

b) Why was this?.....

.....

36a. Who did you usually consult when a construction problem arose? .....

.....

b) Did he/them prove a satisfactory means of communication?

.....

37a. Do you think a qualified agriculture expert should be employed full time on site to deal with farmers' problems?

Yes

No

b. Who should employ him? .....

SECTION G - Drainage

38. Was any attempt made to find out your farm's drainage characteristics before construction commenced?

Yes

No

If yes, by whom? .....

39. Were you given the opportunity to offer suggestions on how motorway and farm drains might be married?

Yes

No

If yes, what were they and what was the result?

.....

.....

40. Have there been any incidents relating to the farm's drainage during construction?

Yes

No

If so, what were they and how were they resolved?

.....

.....

.....

.....

.....

.....

41a. Have any drainage defects on your farm, caused by the road construction, led to a loss of production

Yes

No

b) If yes on what acerage? .....
and how severely .....

Has it proved, or might it prove, necessary to redrain any part of your farm to cope with changes brought about by the road?

YES/NO

SECTION H - Access

42a. Have you negotiated a right of temporary access across the construction site

Yes

No

b. If yes i) it this formal

informal

ii) has the agreement been upheld by the contractors?

Yes

No

c. If no i) Do you move across the site anyway? Yes

No

ii) Why have you made no agreement? .....

.....

43a. Have you negotiated a permanent access across the motorway?

No

Bridge

Underpass

b. If no will you have to go off the farm to reach severed land?

Yes

No

44. If yes will it be combined with a public right-of-way?

Yes

No

Will such an arrangement cause problems ?.....

.....

SECTION J - Fencing

47. Was the complete length of road on your land fenced before construction began?

Yes

No

48. If "No" did the omission cause any problems?

Yes Please specify.....

.....

.....

.....

No

49a. Is the permanent fencing completed now?

Yes

No

b. If no could you explain how the contractors and engineers have tried to justify this omission?

.....

50a. Is the quality and type of fencing adequate for your types of farming system? Yes

No

b. If no what defects are there? .....

.....

51a. Have you had to fight for any special type of fencing? (for example sheep or pig netting)?

Yes

No

b. Please outline the situation, course of events and result .....

.....

SECTION K - Compensation

52. Did you employe your normal land agent/valuer in the compensation negotiations?

Normal

Outsider

None Used

Have No Normal Agent

53. Whoever you employed, how well did he handle your case?

very well

competently

acceptably

poorly

incompetently

54. Did you find that restrictions on his costs were an important factor in restricting work done, or were there other reasons? .....

.....

.....

55. Have you yet put in a claim for loss of land?

Yes

No

56. If yes, have you received an offer representint 90% of the D.V.'s assessment?

Yes

No

57. Have you received any <u>money</u> from the D.V.'s office?

Yes

No

58. What percentage of your assessment of the farm's value did it represent?

25%

50%

75%

90%

100%

59. Have you put in any third-party claimes for damage or ill-effects during construction?

YES

NO

60. Have you received any settlement of these claims yet?

Yes

No

61. If you have not entered such a claim is this because all is going well

not worth the effort

settled out of hand

other - please specify.....

.....

62. How much of the compensation will you be able to roll over into the business in time to avoid tax?

All

Most

Some

Little

None

63. Will the money prove a useful aid to capital investment?

Yes

No

64. Did you ever consider giving up the farm and moving elsewhere?

Considered it

Seriously considered it

Did not consider it

65a. Do you think that more than market value should be paid for land compulsory purchased?

Yes

No

b. What should the level of additional payment be?

+ 10%	+ 50%	Higher
+ 25%	+ 100%	

SECTION L - Miscellaneous

66. What problems do you foresee occurring in the future?

.....

.....

.....

67a. Faced with a similar development in the future do you think, in the light of your experience so far on this road you would proceed any differently?

Yes

No

b. If yes how? .....

.....

68. How do you think the procedures for building major roads on farmland could be improved? .....

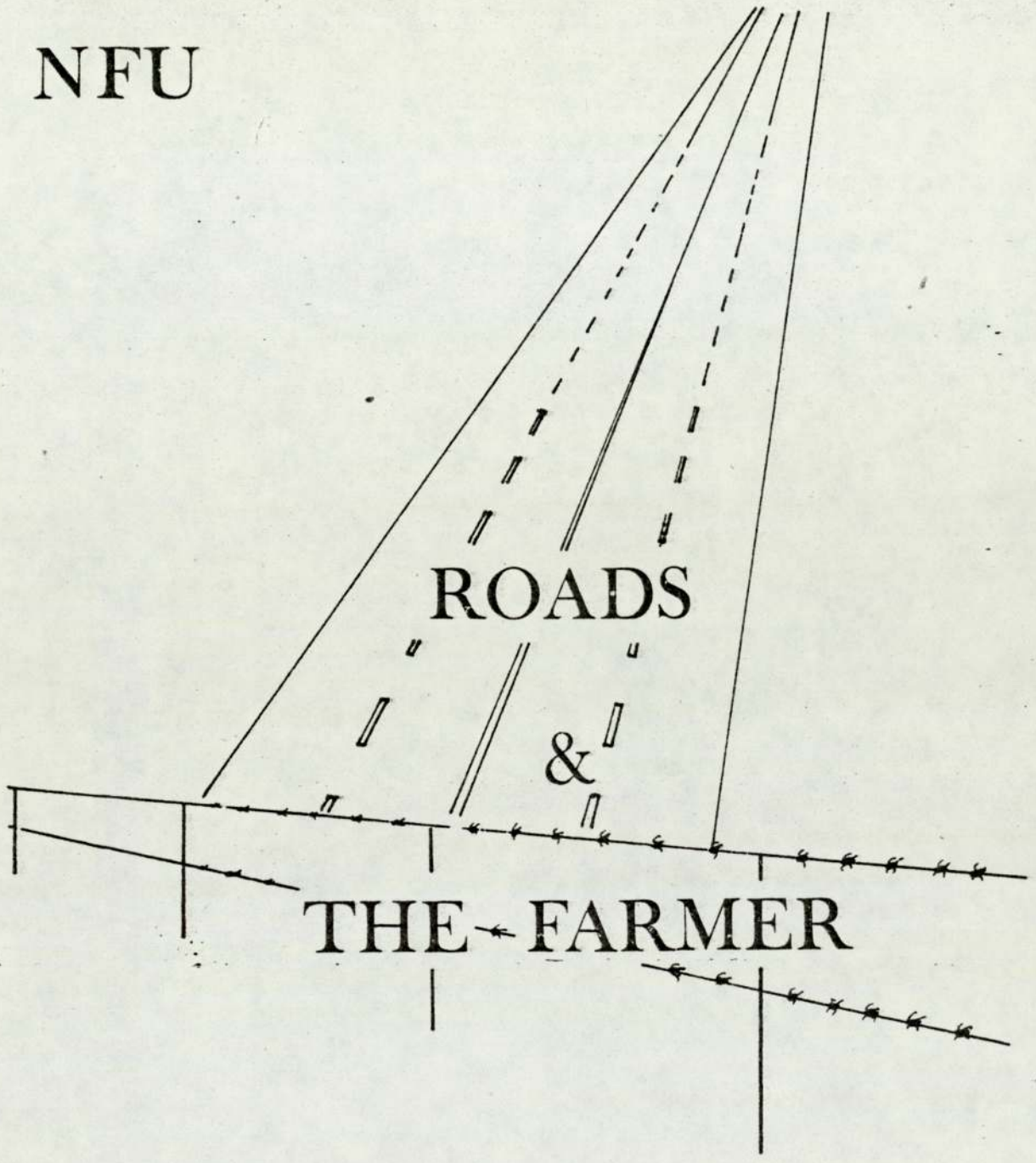
.....

.....

APPENDIX C.

ROADS AND THE FARMER: SOME PRACTICAL ADVICE.

NFU



Some Practical Advice

A MOTORWAY OR TRUNK ROAD THROUGH YOUR LAND?

ROAD CONSTRUCTION IS NO JOKE. IF YOU ARE UNLUCKY ENOUGH TO HAVE A ROAD PLANNED ACROSS YOUR FARM YOU ARE GOING TO FACE PROBLEMS. NOT ALL THE PROBLEMS ARE INSURMOUNTABLE. FOLLOW THESE ADVICE NOTES AND YOU MAY SAVE YOURSELF BOTH TIME AND MONEY.

*** *** *** *** ***

BACKGROUND :

The Government is committed to build over 4,500 miles of motorway and major new trunk road - more than 1,000 miles of motorway are yet to be completed quite apart from trunk road and by-pass schemes.

ROAD PLANNING :

After initial surveys - often involving entry onto farm land - and discussions with statutory consultees, (eg. local authorities, Ministry of Agriculture, etc.) several possible routes will be identified and a public consultation exercise held - involving pamphlets, exhibitions and meetings. Now is the chance to make your views known. Attend and make use of the questionnaire in the consultation document. Talk with the officials. If in any doubt consult your local NFU Secretary.

The Authority will eventually decide upon one route. A notice will tell you where copies of the draft Scheme for this route are on display. Any objections must then be made within six weeks.

MAKING AN OBJECTION :

The first step towards protecting your interests is to submit a written notice of objection (see example attached).

SEEK PROFESSIONAL ADVICE AT THIS STAGE - ENGAGE AN EXPERIENCED AGENT

Keep in touch with your County Secretary. Attend any meetings he may arrange, either to co-ordinate opposition or to enable detailed discussion with the promoters of the road.

The road scheme has yet to be drawn up in detail. Even if you do not intend to object in principle to the road, through careful negotiations you may be able to alter the road scheme so that it has less affect on your farm.

THE PUBLIC INQUIRY :

If objections have been made and are not withdrawn then a public inquiry will be held. If you have objected it is vital to attend. Base your case on the ways in which the proposed road, and any alternative routes suggested by other objectors,will affect your farm. It is not usually worthwhile an individual trying to challenge the general "need" for the road - you may well lose the Inspector's sympathy and remember that costs are not recoverable from this inquiry. A broader objection might however be considered in conjunction with other opponents to the road scheme.

THE DECISION :

It may be a long time before the Secretary of State finally makes his decision public but you will be personally notified of his eventual decision. If the road is to be built, you will next receive draft Compulsory Purchase Orders. Again with the help of your agent, you may object and attend the inquiry.

LAND ACQUISITION :

Following the C.P.O. Inquiry, and decision, you will be served first with a Notice to Treat meaning that the authority intend and have permission to buy your land. This is the formal start of negotiations for compensation. Next will come a Notice to Enter. Possession of the land can now be taken.

Meanwhile, the contracts will have been let ... ... soon construction will begin ... ...

IF YOU HAVE NOT ALREADY EMPLOYED AN AGENT DO SO NOW BEFORE IT IS TOO LATE

CONSTRUCTION :

(The talking now stops and the action starts. The road will be built but you can still do a lot to lessen its impact on you and your farm.)

Points to watch :-

(i) KEEP A DIARY - Record everything to do with the road and how much time it involved for you or your men - the date, time, phone calls, extra herd movements, etc. Unless this is done, you cannot expect your agent to make successful claims at a later date.

(ii) As soon as the detailed plans are available, ask for a visit from the Road Construction Unit or their consulting engineers - to walk across your farm, putting in stakes at field boundaries to show exactly where the fences will be erected. Only then will you be able to say precisely how you are affected. Your valuer can then prepare a Schedule of Accommodation Works including such things as restoration of drainage and access.

(iii) Find out the contractor's plan of works - explain your own problems of work timing to him. Ask for sufficient fore-warning when farm services, such as water and electricity, have to be cut or drains altered. Have the proposed dates in a letter for reference in later compensation negotiations.

(iv) With your agent, draw up a "Statement of Condition" for your farm - it again will help in later compensation negotiations.

(v) Make contact with the foreman on site - a good relationship with him may help to overcome local difficulties. Also ensure that you have the name and telephone number of the Resident Engineer/liaison officer.

(Insert details.)

Serious or formal complaints should always be made to the resident engineer. N.B. Not to bull-dozer drivers. Also inform your agent.

FENCING :

Insist that fencing is erected before other work starts. Whether temporary or permanent, make sure the fence is stockproof. Think ahead - demand sheep netting/cattle proof fencing where it is or maybe required.

Remember that although the promoting authority maintains motorway fences in perpetuity, on trunk roads, once the fence is completed to your satisfaction it is your responsiblity to maintain it.

LEASING LAND :

Think very carefully before leasing any land to, or making any "deals" with the contractors or sub-contractors. They may sound lucrative at first but most farmers find that they mis-fire. Any contract should be checked by your agent or your NFU Secretary and whatever happens have it in writing and have it authorised by the resident engineer and get cash in advance.

DRAINAGE :

You and neighbouring farmers affected by the road should seek the earliest possible consultations with the Regional Water Authority and the MAFF local land drainage officer. Inform the contractor of your drainage layout and ensure he plans to pick up all severed drains.

DON'T BE WISE AFTER THE EVENT

Keep a personal watch on the work while it is being done to ensure that the new drains are deep enough and flow the right way.

ACCESS TO SEVERED LAND :

Check :-

(a) Completion dates of permanent bridges or underpasses;
(b) Provision of temporary access across sites; point out the difficulties of moving animals and machinery across construction sites;
(c) Vehicles and drivers are licensed if public roads have to be used;
(d) Arrangements to isolate access points for Brucellosis Accredited herds.

COMPENSATION AND BLIGHT :

These are complicated matters - best dealt with by your agent BUT if you have kept accurate records throughout the construction period the task will be much easier.

IF IN DOUBT SEEK ADVICE. CONSULT YOUR NFU SECRETARY. CONSULT YOUR AGENT.

July 1976.

POSSIBLE DRAFT LETTER OF OBJECTION TO PROPOSALS MOR NEW MOTORWAYS OR TRUNK ROADS

(NB. If in doubt consult your NFU Secretary or agent before objecting. Don't forget that there will be a deadline for the making of objections. Do not take this draft as either being exclusive nor all embracing. Appropriate grounds of objection should be quoted according to individual circumstances.)

*** *** *** *** ***

To :
Secretary of State for the Environment, (or appropriate promoting authority)
———— Road construction Unit/ ———— County Council,
(Address)

Dear Sir,

The ———— Motorway/Trunk Road.
Reference Number ————

I wish to object to the abovementioned draft Order(s) under which you propose to construct a new motorway/new trunk road which is described as the ——— ——— to ——— ——— section of the ———— motorway/trunk road.

My interest in this matter is that of a farmer who is farming land which will be affected by your proposals. I will send you later full details of the grounds on which I wish to object but it may be helpful to you at this early stage to have some idea of the main points. I would therefore advise you that my grounds for objection will include the following :-

1. Loss of good agricultural land which the nation can ill-afford.

2. Loss of land from my own farming business.

3. Reduction in the viability of my farming business due to having a smaller area of land left to farm.

4. Problems of access due to severance.

5. Problems of drainage and possible flooding.

6. Impact on the environment including the conservation of wildlife.

I reserve the right to add to, amend or withdraw this objection prior to any public inquiry that may be held. In the meantime I would be glad for your acknowledgement that this objection has been properly made within the time allowed.

It may be that some of my objections could be resolved in discussion with Officers of your Department. It might be helpful, therefore, if someone from your Department could visit me by arrangement so that these matters could be discussed.

Yours faithfully,

APPENDIX D.

QUESTIONNAIRE EMPLOYED TO COLLECT INFORMATION ON THE ECONOMIC IMPACT OF MAJOR ROADS UPON FARMS.

Farm :

Date :

1. Background

1.1. Name -

1.2. Position -

1.3. Telephone number -

1.4. Length of time on present holding -

(If recent change, why ? _____

who had farm previously ? _____

did you know of M-5 ? _____)

1.5. Dates : notice to treat - _____

notice to enter - _____

start of construction on your land _____

end of construction _____

1.6. Nature of response/quality of information :

_____

_____

_____

_____

_____

2. Physical Impact of M-5

2.1. Map

Boundaries - tenure

Buildings

Position of M-5 (including junctions)

Effective field boundaries

Drains, watercourses etc.

Rotation

Access points/routes

2.2. Farm Size

2.2.1. Farm size now : acres

2.2.2. Area owned : acres

rented : acres

2.2.3. Land lost to M-5(owned): acres

(rented) : acres

2.2.4. Land sold to contractors : acres

2.2.5. Land leased to contractors : acres

- returned on time (penalty clauses ?) _____

- returned in good state ? _____

2.2.6. Land transactions since M-5 ? Bought ?_____ acres

Sold ? _____ acres

2.3. Farm System

2.3.1. Present system : crops -

rotation -

stock -

special features -

2.3.2. Did M-5 cause you to make any system changes ?

_____

_____

_____

_____

_____

2.3.3. Do you regret having made/not having made any system changes ?

_____

_____

2.3.4. June Returns release form.

2.3.5. MAFF reference number _____

2.4. Severance/Access

2.4.1. Acres severed : with access -

landlocked -

2.4.2. Have you been provided with an agricultural access ?

Is this shared with other farmers, or a footpath/bridleway ?

_____

_____

_____

2.4.3. If specific access points have been provided :

(i) Are they in the 'best' position, agriculturally ? - Details

_____

_____

_____

(ii) What size are they ? Do they take all the machinery you would like ? _____

_____

_____

(iii) How often (per day/per week, seasonally) do you use the accesses and for what purposes ? _____

_____

_____

_____

(iv) What is the extra journey length compared with the pre-motorway situation (time and distance) ?

_____

_____

2.4.4. If it is necessary to use public roads to gain access :

(i) How often, and for what purposes is it necessary to travel (mark route on map) ? _____

_____

_____

_____

(ii) What is the extra length of journey in time and distance compared with the pre-motorway situation ? _____

_____

_____

_____

(iii) Does this involve making any special provision (extra men, licensing men, vehicles etc.) ? _____

_____

_____

_____

2.5. Construction

2.5.1. What problems occurred during construction ?

Fencing : _____

_____

_____

_____

_____

Gates : _____

_____

_____

_____

_____

Drainage : _____

_____

_____

_____

_____

Access : _____

_____

_____

_____

_____

Liaison : _____

_____

_____

_____

_____

(Benefits : _____

_____

_____)

2.5.2. Problems remaining after contractors had left :

_____

_____

_____

_____

2.5.3. How sorted out : _____

_____

_____

_____

_____

2.5.4. Suggestions for improvement : _____

_____

_____

_____

_____

2.6. M-5 and Planning

2.6.1. Do you know of any alteration in the planning designation (i.e. possibility of development) on your land since the road ? _____

_____

2.6.2. Have there been any specific plans drawn up, or approaches made to you about development of any kind on your land ?

_____

_____

_____

3. Economic Impact of M-5

3.1. Income

3.1.1. Has the M-5 made any difference to your profit level ?

_____

3.1.2. If it has, a) to what extent (short/long term) ?

_____

b) upon what do you base your judgement ?

_____

3.1.3. If not, why not ? _____

_____

3.1.4. Has the impact been more or less severe than you anticipated ?

_____

3.2. Severance

3.2.1. What have been the overall costs of severance ?

_____

_____

3.2.2. How are these costs made up ?

- extra travel time (distance + no. of trips)

_____

_____

- landlocked areas with no access

_____

_____

- unviable field corners

_____

_____

- post-M-5 land transactions

_____

_____

- changed rotation

_____

_____

- changed system

_____

_____

- using public road

_____

_____

- using extra labour

_____

_____

- licensing or buying new machinery/laying hard surfaces

_____

_____

- other

_____

_____

3.2.3. How could the situation have been improved ?

_____

_____

_____

3.3. System change

3.3.1. How, why, and when did you decide to change your system ?

_____

_____

_____

_____

3.3.2. How profitable has the new system been ?

_____

_____

_____

3.3.3. Why did you choose these particular changes ?

_____

_____

_____

3.3.4. Do you think this was the right choice in economic terms ?

_____

_____

_____

3.4. Investment

3.4.1. What is your general policy towards capital replacement and investment ? _____

_____

_____

_____

3.4.2. Was this pattern disturbed before construction began ? Did you stop investing in order to "wait and see" what effect the road would have ? _____

_____

_____

_____

_____

3.4.3. If 'yes', then how did you cut back ? _____

_____

_____

3.4.4. If 'no', why not ? _____

_____

_____

3.4.5. Specifically, were any investment plans you had made uneconomic/impractical because of M-5 ? _____

_____

_____

3.4.6. Were any schemes that had been completed recently rendered partially or totally useless by M-5 (Details :esp. cost).

- drainage _____
- fencing _____
- field rationalisation _____
- taking on extra labour _____
- purchase of machinery _____
- purchase of livestock _____
- Laying hard surfaces _____

3.4.7. Do you think the farm is overcapitalised post-M-5 ?
What are you going to do about this ? _____

_____

_____

_____

3.5. Compensation

3.5.1. Have you received any compensation payments? _____

3.5.2. How many ?
How much ?
For what ?

3.5.3. How much do you feel is outstanding ? _____

3.5.4. Name and address of agent/valuer :

_____

_____

_____

_____

3.5.5. Release forms -agent and D.V.

3.5.6. How much were you able to "roll-over" into the farm business to avoid tax ? _____

3.5.7. How did you spend/invest the money ? _____

_____

_____

3.5.8. Would you say the money has proved adequate in restoring your farm income or will it be "exhausted" in a few years ?

_____

_____

_____

3.6. Benefits of M-5

3.6.1. Has the road enabled you to achieve cheaper or wider distribution of produce and thereby increase profits ?

_____

_____

_____

3.6.2. Has the road produced any other agricultural benefits ?

_____

_____

_____

_____

3.7. Accounts

3.7.1. Photocopy or release form.

Appendix E:

Agricultural Economics - a review of particular literature

1. FARM SIZE AND THE FARM ECONOMY

1.1 One of the main foci of the Wolfson research is, naturally, upon farms which have had a portion of their land removed and the economic consequence of such removal. Such structural adjustment raises a number of questions which it might be hoped could be answered by agricultural economics. The foremost amongst these are:

(a) Are smaller farms less efficient than larger ones and if so are there any recognisable thresholds which divide the various gradations of efficiency?

(b) Maunder (1) makes the valid point that it is unrealistic to assume that "if farms in one group alter their acreages and so join another group, they will then take on the other characteristics of the group they join." (p.58) Therefore, it must also be asked whether there is any evidence to show the extent to which farms losing land become less efficient.

1.2 The first comprehensive attempt to measure the relative efficiencies of large and small farms was made by the Zuckerman Committee (2). The report from this group, "The Scale of Enterprise in Farming" was published in 1961. Recently, however, Britton and Hill (3) have updated and improved the survey. Throughout their work Britton and Hill report on the remarkable similarity between their results and those of the Zuckerman Committee. It is then justified to use the later work as our primary source. A few brief quotations can sum up the study for despite the great diligence which has obviously been afforded the statistical working the results are fairly straightforward.

> "We may say that the acreage beyond which significant improvements in efficiency did not appear to occur was 100-150 acres for mixed farms, 200-250 acres for cropping farms and 250-300 acres for livestock farms." (p.70)
>
> "The diseconomics of small size appear to operate rather severely below 600 and, while above about 1000 smd there is no very strong evidence of any further economies being gained..... These observations suggest that there is a kind of intermediate or transitional size of 600-1000 smd at which the handicaps experienced by small farms become somewhat easier to overcome. It seems that in 1970/1, the 3 man farm stood a good chance of being just as efficient.....as the larger farms." (pp.91-2)

Comparing their results with other studies in the U.K. and abroad they concluded:

> ".....almost all studies suggest that the long-run average cost curve for farming is not U shaped....but that it is L shaped, implying economies of size up to a certain size followed by neither diseconomies nor economies as larger-sized production units are encountered." (p. 147)

1.3 Evidence is also presented upon other, more specific, issues. It seems that as size increases:

(a) Inputs per acre decline except for completely arable farms.

(b) Farm income per acre declines but total net farm income grows.

(c) The relative spread of incomes tends to increase with size of farm. This is due to the fact that the earning possibilities of small farms are usually fairly narrowly prescribed, whereas there is a greater chance of earning a high income from a large farm where the opportunities are more diverse.

(d) "Marketing economies" in the form of reduced input costs are of small or modest proportions, with factors other than size counting strongly, although these factors may often be associated with size.

(e) Regarding technical economies it seems that economies are available, but are principally manifested when comparison is made between the smallest size of business (275-599 smd) and the next (600-1199 smd).

Small businesses are associated with labour surpluses or relative underemployment in that the amount of time spent per acre of crop, or per head of livestock is generous by the standards of medium-sized businesses.

1.4 No-one would doubt the value of the Britton and Hill report as a general statement of farm behaviour. It does not, however, satisfy very well the precise requirements of the investigator looking at the impact of motorways on agriculture. The main problem is that only rarely does land loss to a new road on one farm unit exceed 20 acres. Thus a tool which indicates that the point at which efficiency stops increasing significantly lies between, for example, 100 and 150 acres, is too insensitive to record the changes required. Of more use, perhaps, are the smd

measurements, although once again the ranges given are not sensitive enough and there is the added complication that it becomes more difficult to predict change, farm system changes being completely the farmer's prerogative.

1.5 Maunder (1) has also made a valuable contribution in this field. The conception of his work is different from that of Britton and Hill in one important aspect, his analysis is dynamic. In other words they examined farms of different sizes at one point in time whilst he took farms which had increased in size over a period of time. It is this sort of analysis that we are most interested in. However the most important conclusion to emerge from Maunder's work is the implicit statement that such is the diverse nature of farms, as regards size, type, availability of inputs etc. etc., that it is impossible to make precise generalisations. Thus, it seems really that Britton and Hill found the right point at which to report the results; any less precise and the results would have been of little practical use, any more specific and charges of over-generalisation could have been levelled.

1.6 Undoubtedly up to a certain point efficiency is dependent upon and increases with farm size. The break-point is different for different farm types, but no really precise levels can be given for this from the available data. It must be admitted that this is not surprising given the complex range of variables associated with farm efficiency. Finally, it is unfortunate that Maunder's study is the only one to contain the all important dynamic element; hopefully, however, our analysis will throw further light on the subject.

2. FARM INCOME VARIABILITY

2.1 Our basic contention concerning the development of an alternate method of agricultural impact assessment is that the effect of the road proposal must be measured in terms of current usage. The most appropriate measure of this existing farm system is farm income, thus it becomes important for us to understand the normal pattern of income fluctuation.

2.2 Even during a time of utmost turmoil when part of a farm is being removed for development purposes there will be other factors at work causing income levels to fluctuate. Understanding this will aid first, analysis of individual farm trends, whilst also making possible a comparison with regional average data; if we wish to compare performances of farms which have lost land to motorways with some average control group, the possible existence of a normally large degree of variation in both average incomes and individual performances will make any analysis that much more difficult.

2.3 An important initial point is that given the high degree of competition within agricultural markets, many of the factors determining income level are completely out of the control of the individual farmer, so that even in a situation of a constant farm system and farmer, there theoretically seems to be much scope for variation in farm income levels. Additionally, some writers have come to assert that purely economic factors cannot explain all variations in farm income either over time or between farms, and that a certain element of pure chance comes into operation:

> ".....the farmer can decide and control what inputs he uses for a farm or an enterprise, but the output that he will get will partly depend on a number of chance, or random or luck factors which are, in the short run at least largely outside his control. The efficient farmer will choose more suitable inputs and combine them more effectively than the poor farmer, and on average will get a better output, but at any given level of management, chance factors will cause a considerable variation in outputs derived from given inputs." (Emphasis added) (4)

2.4 The main statistical tool that has been used to measure farm income variability is, not surprisingly, that of variance, although some authors, notably Raeburn (5) have chosen to examine certain physical components of the overall variation in order to emphasise the decision making problems which are consequent upon a high level of uncertain income fluctuation. Variance analysis seems to be fairly adequate when examining both variation overtime, and between farm types when large groupings are used, and there is a sufficiency of data, however, the technique becomes inadequate when analysis requires the comparison of one farm with a group average, of the type available in regional data. No suggestion

is given in the literature on how this might be tackled and, indeed, statistical tests are not designed to cope with the situation where the standard deviation of group average is not given.

2.5.1 It is necessary to deal with both variation between farms at any particular point in time and variations of individual farm's income over a period of time. Rasmussen (4) in the early 1950's drew the attention of agricultural economists to the importance of variance in the interpretation of averages in relation to farm incomes. Using the East Midlands Milk Costs Investigation (41 farms) 1946/8 to 1950/1, came to the conclusinn that:

> ".....the variations in the margin (per cow) of individual farms from year to year are very striking.....it means that in a given year one farmer might have a profit of £ 30 per cow, and another, equally skillful, a profit of only £ 10 per cow." (pp. 227-229)

He went on to conclude:

> "....it is necessary to be very cautious when using such data. It is dangerous to consider a difference in economic results, between two groups of farms as evidence of better or poorer farming without first testing whether it is likely to be statistically significant." (pp. 227-229)

2.6 Despite the unequivocal nature of Rasmussen's message Langley (6) still felt confident to report that, fourteen years later, there had been a relatively small amount of research into farm income instability. Endeavouring to correct the omission he reported that individual farm incomes appear to fluctuate in an unpredictable or random manner.

More specifically, he writes:

> "With an average net farm income of £ 10.6 per acre in the South-West during the period 1955/6 to 1964/5 the analysis indicated that to include seven years out of ten (68% precisely) then the range in incomes for the average farmer must be set at £ 6.2 to £ 15 per acre. To include 19 years out of 20 (95%) the range in expected incomes must be widened from £ 1.8 to £ 19.4 per acre. Thus the income on a 100 acre farm earning average profits may well range from £ 180 to £ 1940....." (p.26)

2.7 R. Bennet-Jones (7) has tackled the problem in a more detailed and systematic manner, but his conclusions, although more wide-ranging, were of a similar nature. Looking first at the "national farm" he writes:

> ".....aggregate net farm income on agricultural holdings in the United Kingdom increased, at current prices, from £ 56m in 1937/8 to £ 465½m in 1965/6. This increase was by no means continuous. Ten of the year-to-year movements in net income were downwards and eighteen upwards. The rate of increase was also very variable." (p.112)

Next he turned his attention towards the East Midlands and regional averages. It appears that in the total East Midlands sample the year-to-year movements were consistently in the same direction as on the national farm, three being downwards and six upwards. This consistency, however, did not extend to the four type-of-farming sub-groups distinguished within the East Midlands sample. Only three of the year-to-year movements were common to each of the four type groups and to the national farm, in the sense that they all moved in the same direction. (p.114)

Finally on the level of nil aggregation, the individual farm, Bennett-Jones took 72 farms and examined their incomes for the period 1955/6 to 1964/5. The average deviation from the ten-year mean for the 72 farms treated as a group was 21%, but for each farm individually the average deviation was 50%. Such results may be compared with those of Raeburn's (5) study, where it was found in the 1950's that changes in aggregate net income from year to year for groups of farms varied from 16% of net income in one area/type group to 33% in another, and suggested that variations on individual farms would be about 50 to 70% higher. Bennett-Jones generally confirms these indications though it seems possible that Raeburn may have understated the magnitude of annual variations in individual farm income.

The overall conclusion to be drawn from Bennett-Jones' work is that the greater the degree of disaggregation the higher the level of variation to be found in income levels. Given the basic nature of averages this is hardly surprising; what is perhaps more surprising is the degree of variability to be found at all levels. Answering the question "what are the chances that a farm selected at random will have about the same income next year as this year?" he concluded:

> .....it was rather more likely that a farm would move (upwards or downwards) into a different income group than that it would stay in the same income group for two successive years." (p.117).

2.8 There are a greater number of factors influencing the final income level of any farm and many of these are outside the control of the farmer, due to both the nature of agricultural market operation, and the reliance of agriculture on the vagaries of the climate. Armstrong a geographer, attempted a ranking of the importance of physical factors, using a multiple regression technique. He came to the highly unremarkable conclusinn that "soil factors have a very important influence on gross output per acre." His research led him to conclude that such statistical modelling was quite inappropriate. Indeed it seems very evident that the question of which physical factors are most important in determining final net farm income levels, does not yet lay itself open to quantification or, the factors involved, to ranking in order of importance.

2.9 On the economic side the problems are just as great, the difficulties stemming from the inability of agricultural economists to split down net farm income into its component parts with any consistency, Britton (9) attempted to extract the management income element using the formula:

> management income = 4% of gross output x 20% of wage bill + 7% of net income.

However, this has been challenged for its arbitrary nature and has found little practical use. Strauss and Williams (10) have attempted a similar operation, but Williams himself describes the effort as "crude" (11). Thus, the researchers in the income variation field have not had an overall framework in which to work and so have been forced into examining individual components in isolation. For example, Bennett-Jones concludes:

> "Changes in unit prices received do not necessarily lead to corresponding changes in income..... During the ten years 1955/6 to 1964/5 on an identical sample of 127 East Midlands farms.....(in) roughly 40% of the year-to-year changes price received and net income moved in different directions." (p.118)

2.10 Opinions differ over the effect of increased Government intervention since 1947. Raeburn (5) argues:

> "In addition to weather variations there is the fact that farmers' own decisions on acreage and livestock numbers are not simply automatic. And they seem under the new system (i.e. post-1947) to be somewhat less reliably predictable than they were under pre-war arrangements." (p.22)

His explanation of this is that whereas before farmers only had to watch one main indicator of how much of a product was wanted from them, they now tend to have their attention diverted to several other indicators and they do not always give a consistent picture. Langley and Bennett-Jones contend, however, the reduction in price uncertainty which has followed the application of the Price Review System can probably be credited with the stabilisation of farm incomes.

3. PRODUCTIVITY AT THE FARM LEVEL

3.1 Beynon and Houston (12) emphasised both the dangers associated with imprecise definition of productivity and efficiency and also the problems involved with measuring these factors. Stabler (13) is far more forthright in his criticism, but he is not alone in this. G.L. Johnson (14) writing about production function analysis accuses economists of being too simple, too descriptive, over-concerned with methodology, and neglecting the management aspects of production. He also feels that the functions only indicate what farmers ought to do under conditions of uncertainty and too little of what they actually do. Thus he concludes that economists are excluding too many variables because of an obsession with a sterile positivism which is ill-conceived in the context of agriculture. Similarly, Nix comments:

> ".....I cannot honestly feel that much of a practical usefulness is likely to emerge from this type of analysis with this type of data.....I should like to see this subject studied sociologically sometime, linking results with age, I.Q., training personal and financial commitments and so on." (15)

At this point it is intended to focus upon the one study, specifically relating to farm productivity which was devised entirely to produce practical working results. The debt for the paper, "Farm Productivity: A report on the factors affecting productivity at the farm level", is owed to the Agricultural EDC who published it in 1973 (16). The study set a precedent in this field and indeed the whole of agricultural economics.

3.2 The conclusions of the study, although not couched in precise statistical terms, nonetheless provide useful working tools. It seems that the factors most strongly associated with high productivity were:

(a) size of farm: large size allows flexibility and greater efficiency

(b) the farmer's practical and technical ability

(c) the farmer's ability to manage his labour resources.

Additionally, cost awareness and marketing ability had a fairly strong relationship with high productivity.

Factors associated with low productivity:

(a) age of farmer - the average age on low productivity farms was significantly higher than on the high productivity farms. This probably reflects a change in the farmers attitude, for the survey found a negative association between age and the importance attached to the profit motive.

(b) surplus labour - the problem is most difficult on family farms where it is often not possible to fully utilise the family labour present.

3.3 There were a number of factors with no apparent relationship with productivity. Many of the nil-relationship results are extremely interesting, such as the unimportance of region, type group, specialisation, and system index.* The lack of any perceptible effect of capital position and land tenure on productivity is also surprising. Farming background, training, health, outside business interests, marital status, the role of the wife, motivation and farming objectives, were all non-significant in the sample results.

3.4 It would, however, be facile to reject all these factors as being unimportant on this evidence alone. For example, it is possible that for some factors the methods of measurement are too imprecise to allow full statistical testing. However, a much more likely reason for a lack of some association is that the whole set of inter-relationships between the farmer and his productivity performance is extremely complex. In many ways it could be too ambitious to extract a few of the multitude of factors concerned and expect to identify a single direct link with productivity. Nevertheless, these tentative findings give no support to some preconceptions, e.g. that inter-farm differences in productivity are unquestionably affected by differences in the farmer's training, background, tenure or capital position.

* System index: a measure of the output potential of the farming system and expressed as the standard output per acre as a percentage of the average standard output per acre of a specifically defined group of farms.

4. AGRICULTURAL DECISION-MAKING AND PLANNING AT THE MICRO-LEVEL

4.1 Routing of a major new road across a farm may, where the land-take is substantial, cause farmers to at least think about changing their farm system. In some cases, they may actually do so. Thus, it is necessary to know of relevant work, in the field of decision making and planning at the farm level. The basic theoretical framework of analysis is well rehearsed and occupies the opening chapters in many general texts; the farmer has to decide:

(a) what commodities to produce;

(b) how much of each commodity to produce;

(c) what combination of factors of production to employ.

To demonstrate how such problems can be solved, analysts produce the well-worn "tools" of production-possibility graphs and indifference curves. As a conceptual framework such analysis is perfectly logical, if somewhat simplistic, but its greatest failing is that it has little practical utility. Put simply the data does not exist which could be used to construct actual production-possibility graphs or indifference curves. Thus the task is to test whether any theories have been developed which can make a real attempt to explain the crux issue of why farmers make different decisions when confronted with identical or very similar situations.

4.2 The Open University Reader on decision-making in British agriculture (17) cites a number of conditions which have to be accounted for within any decision-making model.

These are:

1. Creation of new agricultural knowledge and practices largely occurs outside farms;
2. a number of formal, institutionalised channels of communication exist to inform and advise farmers;
3. farmers are numerous and diverse and inter-farmer communication may be expected to be an important and influential channel of information;
4. any innovation will take time to spread through the system;
5. perceptions of different situations vary;
6. the possibility of rejection of change must be recognised;
7. uncertainty is involved with decision-making and must be accounted for.

The authors go on to make the point that a model which takes account of such factors will differ radically from that posited by classical economic theory which assumed complete rationality and, consequently profit maximisation. Whether or not the list as it stands is considered completely accurate, the conclusion drawn has to be accepted, to rely totally on economic theory to explain or predict human behaviour is a nonsense.

4.3 One of the aspects that most concerns us is that of uncertainty and its impact upon decision-making. It is not surprising to find that a whole field of statistical/economic modelling has been developed to assess and account for the true significance of chance or luck elements. This is Game Theory Analysis, and it has been applied to a wide range of agricultural problems (almost exclusively in Australasia and the USA.) (18) However, the practical application of this theory has found little favour. The views of Clark and Dillon are not unusual.

> Clark:
>
> "Any contribution which it (game theory) can yet make to economic reasoning is small. What it does contain is a set of ideas which may at some future date and after much further development prove to be of very great importance. It is also possible that they may not." (19)
>
> Dillon:
>
> "Game theory....has proved to be no cure-all for the conflict situations studied by agricultural economists....game theory has been applied to agricultural situations involving the market behaviour of farmers, climatic uncertainty, the adoption of innovations, bargaining, and firm-household relationships. Little success has rewarded these efforts."(20)

4.4 Maunder (21) aims his criticism at another, equally critical, issue that of individual farm analysis, where he contends that "the field of practice appears to be a pretty barren one. The study of aggregate movements has always been looked on as being much more promising."

> ".....a review of the literature seems to show that while there have been plenty of studies of the changing economy and a number of studies of national and regional agricultural adjustment and several of the two together, there have only been a few which have concentrated on individual farm adjustment....." (pp. 18-19) (Emphasis added)

Although this argument was forwarded in 1964 it seems still to retain substance. Having virtually dismissed the existent theoretical approaches as being of little value to practical analysis of

decision-making it remains to examine, albeit briefly the way writers requiring information rather than models have approached the problem. The answer can be stated baldly, for almost without exception the approach has been descriptive, with analytical content being at a very low level. This label can be attached to such work as:

(a) The Milton Keynes research carried out by Reading University (22)
(b) Gasson's study of the impact of urbanisation (23)
(c) Guither's examination of factors influencing decisions to quit farming (24)
(d) the MAFF's survey of Slough as an urban fringe agricultural area (25)

This list is naturally not exhaustive, but it is extensive enough to make the point that each survey is approached with more or less a blank sheet in order that the correct approach can be ascertained. Gasson (26) in a highly revealing paper, demonstrates that "there has been little attempt to relate psychology or sociology to agricultural economics in any systematic way." (p.30)

4.5 Far more success has been achieved in developing farm planning tools than in the field of decision analysis. However, having said this it has to be recognised that the techniques used are all based upon economic rationality and profit maximisation assumptions. No allowance can be made for the farmer who wants some intangible social benefit rather than the greatest margin of output over input. The most successful tools that have been used are those based on the theory of gross margin analysis, although some writers have been tempted to apply mathematical modelling based on production functions and game theory. (27) It is interesting to look at the raw data source before examining the use which can be made of it. The source is, of course, the end of year farm accounts basically the profit and loss statement and the balance sheet. It is from these documents that financial performance must be measured and future plans devised.

R.J. Stanbridge (ACMA) (28) admits that:

> "The management accountant does not appear to play a major role in the information appraisal and decision-making activities of the agricultural sector.....the agricultural sector may not be receiving the management accounting support which it deserves or requires." (p. 356)

The reasons for this appear to be:

1. Farm businesses are small and scattered, and usually have not the resources to carry their own management accountant.
2. Farmers have relied upon the advisory services for advice. It may be that such advisers have not been trained in management accounting.
3. Accountants are retained purely for taxation purposes.
4. Farming has tended to be technically led rather than management led. Many innovations have been based primarily on the "increasing output" concept rather than cost savings.

The results of this are twofold: first, the financial data is prepared for the wrong reasons and, second, financial advice of a highest calibre is not available, much more weight being given to technical issues.

4.6 Farm planning can be done on either an enterprise or whole farm basis; the principle is the same in both cases, if gross margin calculations are used. The essential point to this technique is to categorise the various costs incurred into the categories of variable (i.e. associated entirely with the production of a particular enterprise) and fixed (i.e. associated with the running of the farm.) Simply, if any particular enterprise is stopped the variable costs, such as feed, seed and fertiliser will not be incurred, whilst the fixed costs of labour, depreciation payments etc. will be. GROSS MARGIN IS DEFINED AS GROSS OUTPUT LESS VARIABLE COSTS. Each enterprise has a gross margin and these can be aggregated to give a whole farm gross margin. The gross margin of an enterprise represents the contribution made by that enterprise to the fixed costs. "Taking the farm as a whole, about two-thirds of the gross margin is likely to be swallowed up by fixed costs."(29) Using gross margin calculations it is thus possible to rank, in order of profitability, the various enterprises, which it is possible to physically operate on any particular unit.

4.7 O'Connor (30) points out a difficulty stemming from the absence of a good set of management accounts:

> "Gross margin planning, however, may give misleading results, particularly if average figures from other farms are used in planning a particular farm. Average gross margin figures

"are very handy to use, but unfortunately, they may not be suitable for the farm in question.....it is always safer to estimate the gross margins for the farm in question rather than to accept average figures which may not apply." (p.187)

However, if reasonable data are available, it is possible to prepare budgets using gross margins with the object of estimating the effect of possible changes in the farm system. If the change is extensive, a complete budget for the farm as a whole will be required. If the change is simple, a partial budget will suffice. Two basic questions have to be answered: firstly, is the change likely to increase the farm profit? Secondly, if the change is worthwhile, how much capital will be needed, when?

4.8 Budgeting can be described as a "trial and error" process with a solution being arrived at by iteration. There is no guarantee that this is the perfect solution, only that it is better than others worked through. On larger farms, in particular, there may be a number of feasible alternatives which are potentially more profitable than that planned. The advent of access to computers for the masses has made it possible to apply linear-programming techniques to farm planning. Both Steward (31) and (32) have shown how this is possible. The basic problem consists of fitting in the various enterprises in such a way that income is maximised whilst using up as much as possible of the available resources. Thus Casey uses ten variables or constraints apart from gross margins in order to ascertain the ideal solution; these include: labour availability throughout the year, acreage quotes, differential quality of land;

it must be recognised, however, that many feel that:

"linear programming is a rather complicated technique and is never likely to be understood or performed widely by ordinary farmers." (30)

Appendix F:

Severance Costs and System Change: A Case-Study

Assessment of need for accommodation works*

1. **Assuming that the land to the north of the by-pass will not be available to the dairy herd** (see map)

Dairy

(a) The by-pass will sever some 19 ha (46 acres) of forage land generally used by the dairy herd.

(b) The total forage area currently available to the dairy herd is 58.9 ha (145.5 acres).

(c) The intended size of the herd on this acreage is 140 cows, comprising 90 Jerseys and 30 Friesians in milk and 15 Jerseys and 5 Friesians dry at any one time. This size of herd has already been largely attained.

(d) The stocking density will thus be 0.42 forage hectares per cow (1.04 forage acres/cow).

(e) J.S. Nix, (Farm Management Pocketbook 7th Edn, 1976, Wye College) gives the following productivity performance levels.

	Gross margin per cow at 0.4 forage ha/cow	
	average	high
Friesians	£ 262	£ 319
Channel Island	£ 202	£ 258

(f) The total annual gross margin for the Dairy herd may thus be calculated as:

35 Friesians @ £ 319	£ 11,165
105 Jerseys @ £ 258	£ 27,090
Total	£ 38,255

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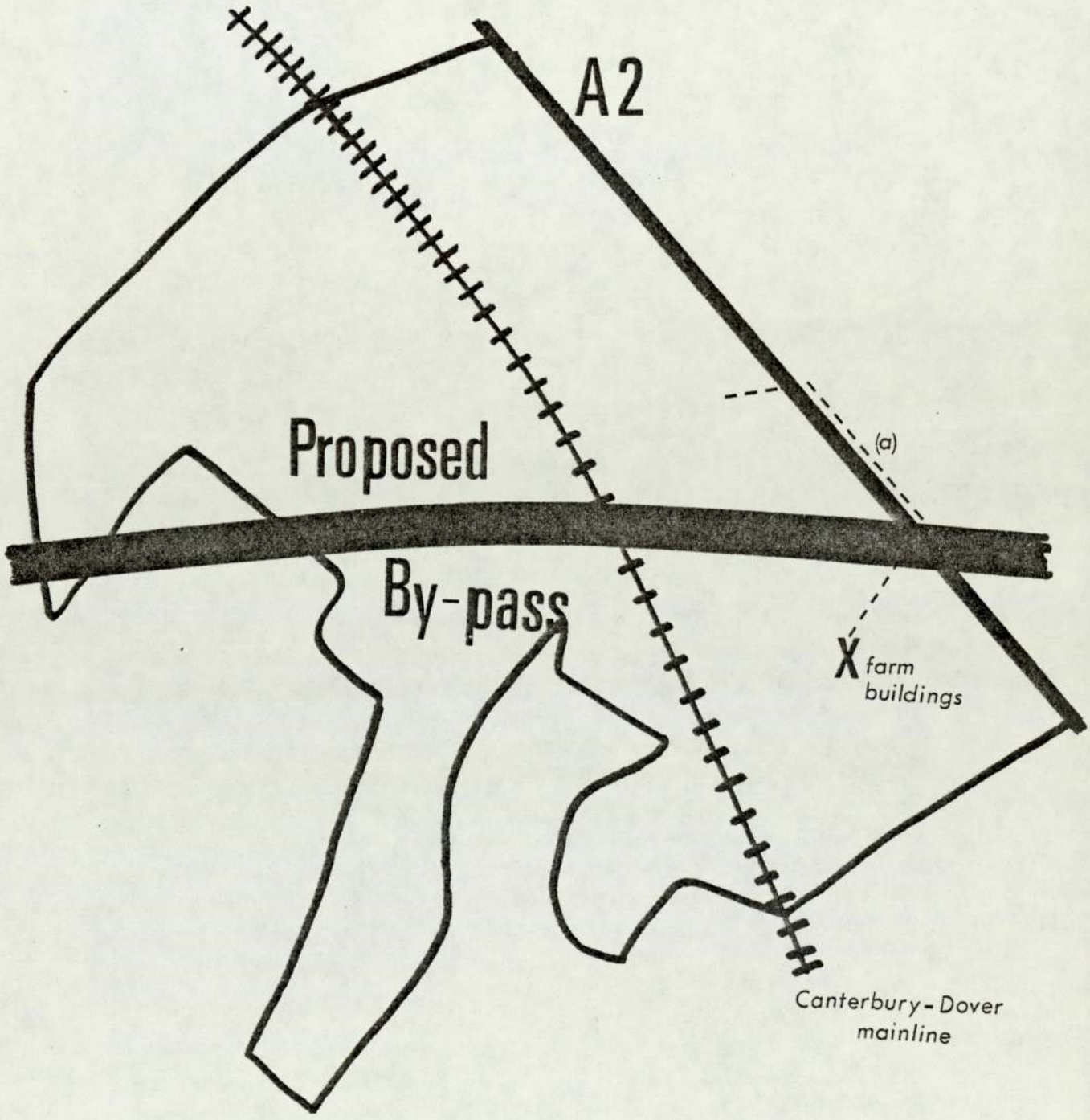
* Evidence presented by M.A.B. Boddington at the Public Inquiry, held in January 1977.

map f



Note:

a - without an agricultural access bridge the severed land can only be reached using the busy A2 - By-pass junction.

(g) The 19 ha (46 acres) to the north of the by-pass represents 31.6% of the available forage acres.

(h) If the land is not used for dairying it may be assumed that the gross margin from the dairy herd will be reduced proportionally, i.e. £ 38,255 x .361=£12,094.

(i) This represents a reduction in herd size of rather more than 40 cows, leaving approximately 100 cows, which would still require the two full-time dairy men currently employed.

Beef

(a) If the forage land to the north of the by-pass is not to be used for dairying it is assumed that it will be used for beef production.

(b) J.S. Nix (see Dairy (e) above) gives 19 different systems of beef grazing. The average gross margin per forage hectare for all 19 systems is £ 126.

(c) The 19 ha of forage land to the north of the by-pass may thus produce an overall gross margin of 19 x £126 = £ 2,394.

Net Loss

(a) The net loss resulting from the system change on 19 ha (46 acres) will be about

Loss of gross margin from dairy herd	£ 12,094
Additional gross margin from beef herd	2,394
Net annual loss	£ 9,700

2. Assuming that the dairy herd will be abandoned

Dairy

(a) The total gross margin of the dairy unit will be lost. This has been calculated at £ 38,255.

Beef

(a) It is assumed that the whole of the land currently used for the dairy herd will be turned over to beef under the same assumptions of gross margin as 1 above.

(b) Some 58.9 ha (145.5 acres) will be available giving a gross margin of £ 126 per forage acre.

(c) The total gross margin will thus be 58.9 x £ 216 = £ 7,421.

Net Loss

(a) The net loss resulting from the system change on 58.9 ha (145.5 acres) will be about

Loss of gross margin from dairy herd	£ 38,255
Additional gross margin from beef herd	7,421
Net annual loss	£ 30,834

(b) It is possible that this change of system could involve a saving of one man currently employed on the dairy unit. J.S. Nix estimates that the annual cost of a dairy cowman in 1977 at £ 3,590.

(c) The net annual loss in these circumstances comes down to £ 27,244.

3. Annual increase in travel costs, assuming no accommodation works

(a) Additional travel costs will have to accrue to enterprises on land north of the proposed by-pass.

(b) The additional journey is calculated at 790 yards for all land bordering the existing A2, together with all other existing grass/arable land to the north of the proposed by-pass.

(c) The 44 acre apple orchard (reduced to 40 acres) will involve an additional journey of 2,050 yards each way.

(d) The 37 acre pear orchard (reduced to 33 acres) will involve an additional journey of 1,550 yards each way.

(e) Tractors are assumed to travel at an average overall speed of 3 mph with an hourly cost for tractor and driver of £ 2.00.

(f) The annual additional travel cost for land to the north is thus (allowing for the fact that fruit picked will be transported direct from the orchard to Little Barton Farm at no extra cost):

Land	Acres	Additional distance	Return trips per acre/year	Cost per return trip	Annual extra cost
18 acre apples	18	790 yds	20	£ 0.60	215
44 acre apples	40	2050 yrds	20	£ 1.55	1240
37 acre pears	33	1550 yds	20	£ 1.17	775
8 acre plums	8	790 yds	15	£ 0.60	72
15 acre maize/ kale	15	790 yds	6.0	£ 0.60	48
23 acre grass	4	790 yds	6.0	£ 0.60	15
15 acre grass	7	790 yds	6.0	£ 0.60	25
Total					2390

(g) There will be additional cost involved in taking the fruit from the land to the south of the by-pass to Little Barton Farm. This will involve 5 trips per acre per annum over an additional distance of 790 yards.

(h) In total 15 ha (37 acres) are involved. The cost will thus be 37 x 5 x £ 0.6 = £ 110 per annum.

4. Summary of annual costs

(a) Dairy herd reduced

Net loss of gross margin	£ 9,700
Additional travel costs	£ 2,500
Annual costs without accommodation works	£12,200

(b) Dairy herd abandoned

Net loss of gross margin	£30,834
Additional travel costs	2,800
	33,334

(c) as (b) but with saving of one man

Net loss of gross margin	£27,244
Additional travel costs	2,500
Annual cost without accommodation works	29,744

5. Annual costs capitalised

(a) Dairy herd reduced		
Gross margin loss	£ 9,700 x 13.33*	£ 129,333
Travel costs	£ 2,500 x 10.000	25,000
Total		154,333
(b) Dairy herd abandoned		
Gross margin loss	£ 30,834 x 13.333*	411,120
Travel costs	2,500 x 10.000	25,000
Total		436,120
(c) As (b) but with saving of one man		
Gross margin loss	£ 27,244 x 13.333	363,244
Travel costs	2,500 x 10.000	25,000
Total		388,244

6. Conclusion

It is recommended that *this* farm be provided with an access bridge/underpass: the figures above indicate that this provision would be economically justifiable.

* Using a discount factor of 7.5% i.e. the Treasury Test Discount Rate less 2.5% for growth in productivity.

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