# STRATEGIES FOR AGRICULTURAL CHANGE AND THE UK BALANCE OF PAYMENTS

Colin Roy Blackman

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SUMMARY

The world food crisis, Britain's reliance on imported food and feedstuffs and balance of payments difficulties were some of the factors which lent weight to the call for increased self-sufficiency in Britain's agriculture in the 1970s. This project considers two main areas: an investigation of the impact of radical agricultural change, designed to increase self-sufficiency, on the balance of payments; and, an appraisal of the potential role of the food industry within a radically different food system. The study proceeded by: an examination of the principles of agricultural policy and its development in Britain; an overview of the mechanism and meaning of the balance of payments; a consideration of the debate on agricultural import saving; the construction of radical agricultural strategies; the estimation of effects of the strategies, particularly to the balance of payments; the role of the food industry and possible innovations within the strategies; a case study of textured vegetable proteins; and, the wider implications of implementation of radical agricultural alternatives. Two strategies were considered: a vegan system, involving no livestock; and, an intermediate system, including some livestock and dairy cattle. The study concludes that although agricultural change could in principle make a contribution to the balance of payments, implementation of agricultural change cannot be justified for this purpose alone. First, balance of payments problems can be solved by more appropriate methods. Second, the UK's balance of payments problem has disappeared for the time being owing to North Sea oil and economic recession. Third, the political and social consequences of the changes investigated would be unacceptable. Progress in UK food policy is likely to be in the form of an integrated food and health policy.

Food policy
Self-sufficiency
Economics
Food Industry
Diet

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# CHAPTER 1

## PROBLEMS WITH BRITAIN'S FOOD

'Then you should say what you mean', the March Hare went on.
'I do', Alice hastily replied; 'at least - at least I mean what I say - that's the same thing, you know'.
'Not the same thing a bit!', said the Hatter. 'You might just as well say that "I see what I eat" is the same thing as "I eat what I see"!'.

(Lewis Carroll, Alice's Adventures in Wonderland)

The Technology Policy Unit's (TPU) interest in the production and consumption of food in Britain was aroused by a number of events in the early 1970s. The world food crisis, at its most serious in 1974, focussed attention on the complexities and injustices of the production, distribution and consumption of food.[1] The World Food Conference in Rome, 1974 was a recognition of the fact that drastic action was required to prevent recurrence of the mass starvation seen earlier that year. Indeed, with concern about the scarcity of the world's resources, energy supply and ever increasing population running at its height, the desire to overcome 'the world food problem' resembled a panicked crusade.

Undoubtedly many people, including academics, in both developed and developing countries were prompted by these events to become involved in some aspect of food policy. Undoubtedly, the TPU was concerned and wanted to contribute in some way. One result of this surge of interest was a mushrooming of literature and expression of views on everything from development questions to nutrition.

One particular concept that was much discussed was self-sufficiency. Indeed, among the recommendations of the World Food Conference in 1974 was a resolution to promote national self-sufficiency in food:

> ....striving in accordance with each country's respective conditions for the maximum possible degree of self-sufficiency in basic foods is the fundamental approach to the solution of the food problem of developing countries.[2]

Although the resolution was aimed specifically at developing nations, the discussions about self-sufficiency in Rome marked the beginning of an upsurge of interest in the West and particularly in the UK. Some people would say that the world food crisis gave the concept of self-sufficiency a measure of credibility which it had not possessed before.[3]

Self-sufficiency was of great interest in Britain: there is no comparable developed country with such a low proportion of its food domestically produced. Consequently, a number of studies were published in the mid-1970s concerned with the possibility and desirability of increased British food self-sufficiency.[4] Indeed, the Ministry of Agriculture, Fisheries and Food, hardly radical in its outlook, reflected the times with its own White Paper, Food from Our Own Resources.[5]

The point that was stressed over and over again in writings about Britain and self-sufficiency was over-reliance on imported foods, particularly to support the livestock industry. Roughly speaking, the UK imports nearly half of its food requirements; in 1976 Britain's visible trade deficit was about £3.5 billion and the value of UK food imports was more than £4 billion.[6]

The answer seemed obvious. It would seem logical to increase the UK's domestic agricultural output; if Britain were to become self-sufficient in food it would wipe out the balance of payments deficit.

Increased self-sufficiency would also allow improvements to be made to the population's diet. By the mid-1970s, a consensus was emerging about links between diet and the so-called Western 'diseases of affluence'. The high consumption of saturated fats, particularly animal fats, refined carbohydrates and lack of dietary fibre were all implicated in diseases such as coronary heart disease, diabetes, some forms of cancer, etc.[7] Since the high consumption of animal products were thought to be at least partially responsible for these diseases, it would seem desirable to eat less meat and dairy produce and more vegetables and cereals. It would also be consistent to alter our agriculture by becoming more self-sufficient and to produce less animal produce and more cereals and vegetables.

Other benefits that seemed possible from increased self-sufficiency included the release of grain destined for British animals to people starving abroad, and the recapture of the social benefits of man's relationship with farming, nature, etc.

This was the background to the TPU's interest in food. The Technology Policy Unit was set up in 1974, broadly speaking, to assess the impact of technologies on society. A study of radical agricultural change was consistent with the Unit's aims and, consequently, work began in 1975. First, it was decided to limit the study to change in food and agriculture in Britain. Second, it was decided that the best approach would be to conduct a technology assessment of the impact of a shift from animal-based to plant-based agriculture.

The first project[8] investigated the possibilities for a totally plant-based agricultural system in England and Wales and assessed the effects on farming, diet, land use, etc. A crop plan was constructed assuming current technology but excluding livestock. The general conclusion of this study was that, in principle, plant-based agriculture was possible and that nutritional self-sufficiency could be achieved provided the population adopted a vegan diet (i.e. containing no animal products whatsoever).

In 1976 two associated projects were begun. One of these investigated the potential for crops which were as yet unexploited in Britain (i.e. oilseed crops such as oilseed rape, lupins and sunflowers, and leaf protein)

and industrially produced proteins (i.e. single cell proteins produced from organic wastes, or by-products from the oil and gas industry)[9]. Both of these projects were assisted by the Vegetarian Society.

This is the third part of the TPU's study of the potential and desirability for change in the UK food system. Each project stands on its own but the intention was also that, in conjunction, they would present a complete picture. This project mainly considers two areas: first an investigation of the effects of radical agricultural change to the balance of payments; and second, an appraisal of the potential role of the food industry within the strategies. The project was assisted by cooperation between the TPU and Cadbury Typhoo Limited, and their assistance was particularly valuable in connection with the role of the food industry.

## Self-sufficiency and credibility

I have described how the popularity of the concept of self-sufficiency was a big incentive for its study in the TPU. Thus, it makes sense to begin by finding out more about it. Self-sufficiency (be it in food or any other goods) is a measure of the extent to which a country's consumption is met by domestic production. The degree of self-sufficiency is expressed as a percentage. There are a number of approaches to measuring self-sufficiency

in food:[10]

1) In terms of food energy.
2) In monetary terms.
3) By assessing the contribution to food production from imported means of production.

Often, measures of self-sufficiency ignore 'hidden' inputs which may be imported. For example, on the face of it the UK is self-sufficient in poultry meat, but this does not take account of the huge amounts of imported inputs necessary (i.e. feedstuffs, energy and so on). The result of this, and the fact that there are a number of ways of measuring self-sufficiency, is a wide range of figures quoted for self-sufficiency levels.

Many arguments have been put forward in favour of increased self-sufficiency in the UK. For example, it has been said that greater self-sufficiency would:

1) Reduce Britain's import bill, make a substantial contribution to the balance of payments and alleviate the constant balance of payments deficits.
2) Ensure greater security for the nation's food supplies in times of crisis (not so much in times of war but rather when supplies are short owing to a crisis in world food production).
3) Be less wasteful of the world's scarce resources (energy, land, fertilisers, etc).

4) Allow an improvement in the nation's diet.

5) Be consistent with the desire to aid those countries with malnourished populations by diverting foods to them currently fed to UK livestock.

6) Improve the quality of life spiritually and socially by strengthening the relationship between man and the land.

7) Allow the ending of exploitation of animals.

This project was mainly concerned with an investigation of the first of the above proposals. Nevertheless, the other points have figured from time to time and in varying degrees of importance throughout the study.

Opinions about self-sufficiency since the 1960s have fallen roughly into two main camps. The first group have put forward some or all of the views described above. Their argument is usually based on the belief that it is simply quite foolish to import food into this country if it can be grown here, or other resources if they can be done without. Imports should be avoided at all costs, an increase in domestic agriculture output would 'aid the balance of payments' and be beneficial to the environment, diet and developing countries. This group consisted of conservationists, ecologists, vegetarians, scientists, writers, students and so on.[11]

The second group were made up almost entirely of economists. Generally speaking, economists were apt to dismiss the subject of self-sufficiency:[12] the mere mention of the term by an economist meant putting his credibility with his colleagues in question. It is interesting to note that it is almost entirely the first group who used the term self-sufficiency. O'Hagan remarks that 'self-sufficiency is not quite respectable in economic circles'.[13]

Why have economists ignored the concept of self-sufficiency? Ritson, quite rightly, points out that a country's self-sufficiency level should not be regarded as a potential problem in itself.[14] Varying the degree of self-sufficiency might assist in solving a particular problem but all too often this was translated to mean that the achievement of higher self-sufficiency levels was the major objective of government policy.

Ritson was also astute enough in 1975 to point out that the real question was not 'Can Britain feed itself?' but 'To what extent should Britain feed itself?'. Of course, it is possible, in principle at least, to provide a categorical answer to the former of these questions; an answer to the latter, however, is not such a straightforward matter.

Despite this, the point should be made that economists have been reluctant or have failed to understand the desire

to meet objectives other than those based on economics; they seemed to be unable or unwilling to take account of health, nutrition and dietary factors, and social and moral issues.

## Strategies for agricultural change

The main intention of the project was to examine the effects of the introduction of radical agricultural strategies to the balance of payments. This would, it was hoped, allow some conclusions to be drawn as to the possibility of increasing self-sufficiency levels as a means of solving balance of payments problems in Britain. The project proceeded by the construction of models of alternative agricultural systems. These models were then monitored to discover the implications for Britain's trade in food, feedstuffs and other agricultural imports.

Two strategies were eventually studied. The first was an extension of the vegetarian cropping plan constructed by Thompson,[15] adapted to generate figures for alterations to the import and export of agricultural goods. The model assumed current technology, did not include crops that were not already commercially grown in Britain and excluded all livestock.

The second strategy which was constructed included some livestock and a dairy industry but, again, with the emphasis on the production of cereals and vegetables. An analysis of the models allowed figures to be calculated of import saving. However, the calculation of import saving raised many questions. For example, what is the relationship between import saving and contribution to the balance of payments; and, what is the difference between agricultural expansion and agricultural change. The questions raised were addressed and are presented in chapters 2, 3 and 4.

The potential role of the food manufacturing industry is discussed in chapter 7. The development of the food industry is traced in Britain and innovation in new products are discussed. A case study of innovation in the food industry looks at the manufacture of textured vegetable proteins from soya beans. The case study includes an examination of the marketing of a new textured vegetable protein product by Cadbury-Typhoo Limited. The chapter also discusses other products that could be introduced by the food industry and the overall scope for development of the food industry within the strategies.

Finally, the study would not be complete without an assessment of the way in which implementation of the strategies would take place. Thus, chapter 8 examines the

effects of introduction with particular emphasis on the political changes implied in the plans.

Questions such as British membership of the European Community in the light of a policy of agricultural import saving are considered. Would the UK be able to pursue the goal of increased self-sufficiency whilst maintaining its membership of the EEC? Self-sufficiency may have been made respectable by the world food crisis,[16] but many people believe that self-sufficiency policies are too important to be left to individual countries or even regions.[17]

Britain's food problem, if indeed it is a problem, is certainly a product of its history and politics. If it is decided that radical change in agriculture, diet or political system is the course by which Britain's problems will be solved, it is essential that this be based on an understanding of the principles of agricultural economics and the legacy of the development of food policy in this country over the past two hundred years.

# CHAPTER 2

# THE DEVELOPMENT OF AGRICULTURAL POLICY IN THE UK ECONOMY

During the recent negotiations concerning the terms of British entry into the European Economic Community (EEC), many opponents of British membership argued that it would be detrimental for the 'agriculturally efficient' British to join forces with the 'inefficient Europeans', and that the Common Agricultural Policy (CAP) would only serve to protect the 'peasants of Europe'.[1] Leaving aside the question of efficiency for the moment, this stance appears to be extraordinarily impudent when one considers that the role of agriculture in Britain is less important than in any other country in the world.

McCrone points out that:

> One of the chief characteristics which distinguishes British agriculture from that of other nations is the small part it plays in the national economy. There is no other country in the world which produces so small a proportion of its own food supply, employs so small a part of its working population in agriculture, or earns from the production of food so small a part of its national income.[2]

Green goes further:

> The average Briton happens to be a particularly well-fed member of one of the least agrarian societies the world has ever known ..... In spite of that he confidently expects to enjoy large, uninterrupted and varied supplies of high quality food at lower prices than anywhere else in the civilised world.[3]

In the United Kingdom, less than 3 per cent of the working population is now employed in agriculture, producing the comparatively high figure of nearly 3 per cent of the gross domestic product. Thus, Britain produces about fifty per cent of its total food requirements and about two thirds of indigenous-type food supplies.[4] However, it should be noted that about 10% of the whole workforce is involved in the production of food in one way or another (see Table 2.1).[5]

The reasons for the relatively unimportant part played by agriculture in the UK economy can be discovered by an examination of agricultural policy during the last two hundred years, because the present position has largely been determined by both Britain's domestic and foreign economic policy, and agricultural policy during this period.

Table 2.1: Employment in food, agriculture and allied industries (1979).

| Sector | Number employed |
|---|---|
| Food, drink and tobacco | 679400 |
| Fertilizers | 11300 |
| Agricultural machinery | 28200 |
| Tractors | 33600 |
| Retail and distributive trades | 1257082 |
| Agriculture and fisheries | 370000 |
| Total | 2379582 |
| Total employed in UK | 22400000 |

Source: Department of Employment Gazette, June 1979, HMSO, London

Agricultural policy is a topic which is little understood. Thus, before considering its development in this country, it would be useful to outline the social, economic and political principles on which it is based. To most people in this country, being a member of the EEC simply means that they have to buy more expensive food. Few people understand, or are even remotely aware of, the economic problems which food producers face, and the consequent measures that governments take to control the supply of food. In this next section, the major problems of agriculture are pinpointed and the objectives of agricultural policies are considered.

Aims of agricultural policies

Josling interprets agricultural policy to mean:

> ..... that set of measures taken by central governments which are aimed at influencing, directly or indirectly, agricultural factor and product markets.[6]

Perhaps it can best be described as the role of state involvement in agriculture concerning the formulation and administration of programmes of support, advice, protection and control.

The reasons for government support and intervention in agriculture are, ultimately, dependent on certain political objectives, concerning employment, income distribution, and the price and nature of the food produced. However, some objectives for certain policies seem to gain favour simply because they may be popular with one particular interested group.[7]

One often cited objective is the maintenance of a large agricultural population. The belief that this was desirable used to be based on the fact that farmers and farm-workers could provide a useful source of manpower in time of war. However, more recently the arguments in favour of high numbers of people working on the land have rested on the socially stabilising effects that they have on the community. There is little evidence to suggest that farmers or farm-workers are happier than the urban dweller, but this line of thought is popular.[8]

A second reason that is often put forward is that the maintenance of a high level of self-sufficiency in agriculture is essential during

periods of war, and that Britain should not allow the poor agricultural position before both world wars to develop again. The merits of these strategic reasons are questionable in the light of the changing nature of war, but still deserve consideration.

Another objective, which has gained great favour, and is of great importance to this thesis, concerns the balance of payments. Briefly, the argument rests on the belief that the support of domestic agriculture or, more specifically, the development and expansion of agriculture, may relieve balance of payments difficulties.[9] This is basically an application of the theory of tariffs, turning the terms of trade in favour of the country concerned and, thereby, assisting the balance of payments.[10] This argument has, at times, gained great currency in Britain, and is perhaps a manifestation of the fact that Britain is the largest importer of foodstuffs in the world.[11] The importance of this argument to this project demands that it be discussed at greater length in Chapters 3 and 4.

Undoubtedly, the major objective of agricultural policies in recent years, in developed countries at least, has been to maintain the incomes of the farming community, and to improve the efficiency of agricultural production and marketing.[12] As Hallett suggests, this objective arises because of the inability of the market economy to work efficiently in agriculture, particularly with respect to income distribution.[13] There are two main problems here for the agricultural sector: low and fluctuating incomes. These are largely a result of the peculiar

nature of both the supply of, and to a lesser extent, the demand for agricultural products. Low incomes are a consequence of the demand inelasticity for food, and fluctuating incomes are mainly due to the uncertainty and nature of agricultural production.[14]

Demand inelasticity for food

Engel first showed the relationship between income and expenditure in 1857, and formulated an empirical law, which states that the proportion of income spent on food declines as income rises (see Figure 2.1).[15]

Since 'Engel's Law' was formulated, many empirical studies in almost all countries have confirmed, in principle, this simple relationship.[16] Individual foodstuffs, of course, may not be inelastic, such as fillet steak or caviar, and an increase in income may not necessarily cause more food to be consumed. Nevertheless, it would be untrue to suggest that the pattern of food consumption remains unchanged whilst incomes vary.[17] As incomes rise there are substitution effects from cheap, starchy foods to more expensive foods such as meat and fruit. However, there is a characteristically low increase in consumption resulting from either increases in consumers' real incomes, or falls in the price of food. That is to say, there is both a low income and price inelasticity for food.[18]

These features of demand have one major consequence. As societies become more wealthy, the proportion of the national

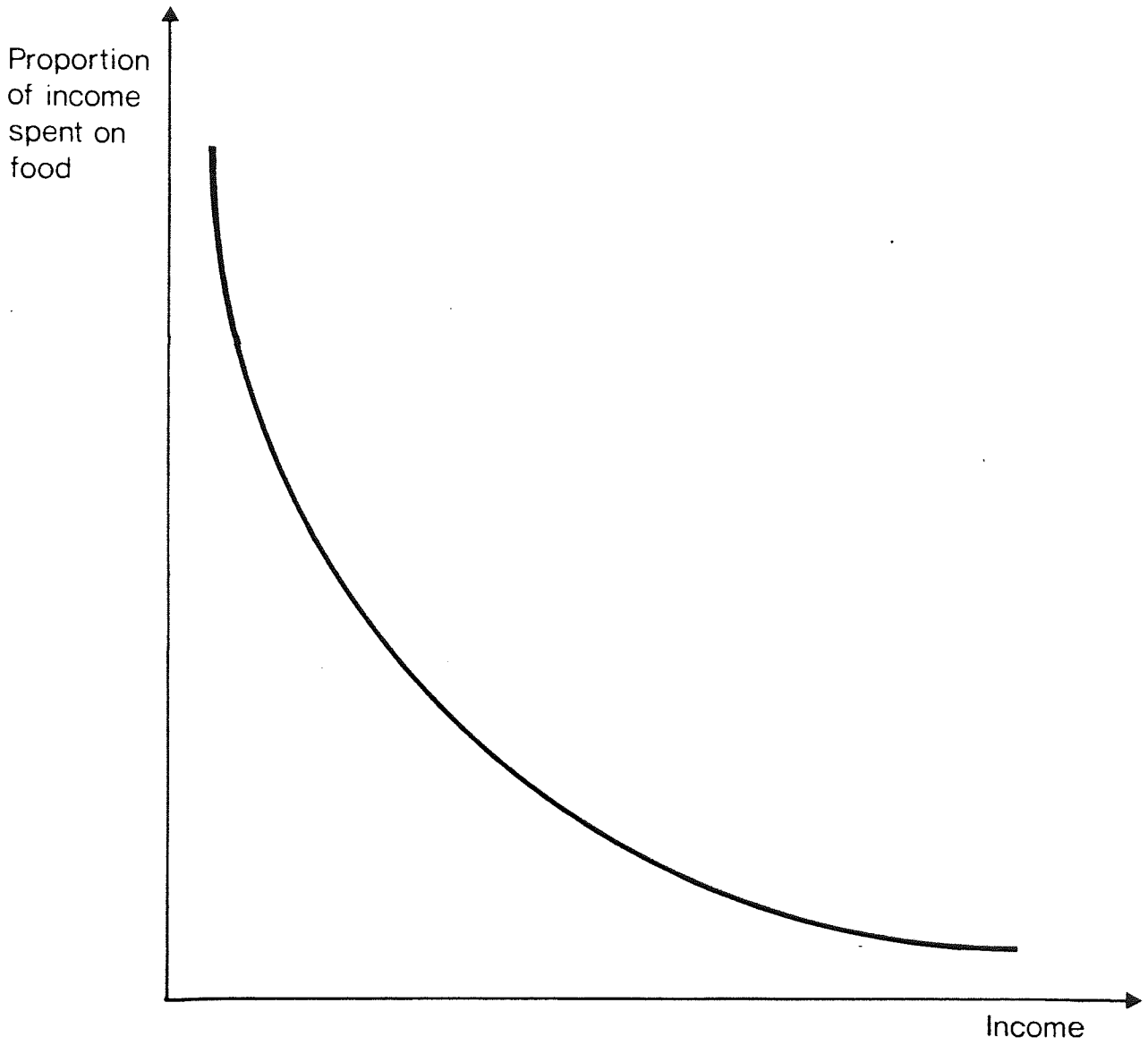


**Fig. 2.1**

**Relationship between income and food expenditure**

Source: Engel, op cit, Ref 15

income spent on food decreases, and thus, farmers' incomes will increase less rapidly than the rest of the society, producing relatively poor farmers.[19]

Cochrane was impressed by the inelasticity of demand for food and hypothesized that farmers were on a 'technological treadmill', on which farmers had to run merely to stay in the same place.[20] The treadmill hypothesis states that, in a competitive agricultural sector, the adoption of new technology by the progressive farmers, to lower their costs, turns the terms oftrade against agriculture, necessitating the rest of the sector to adopt, adapt or move out. But, since total revenue decreases in conditions of inelastic demand, there must be some net exodus, further technology, or a new agricultural system, to maintain per capita incomes.

Although price supports may be used to bolster farm incomes, it can only be a short term measure, and the solution has traditionally been sought through the improvement of farm structure. This structural reform, basically a process of increasing the size and improving the layout and equipment of farms, has the following effects, according to Green.[21]

a) Decreases the number of farmers and increases the remainders' share of a decreasing amount spent on food.
b) The people removed from farming would be more happily and gainfully employed in industry, and would, at the same time, add to the general prosperity of the nation.
c) Their removal would allow farms to become larger, and so, ex hypothesi, more efficient.

d) Being more efficient would enable them to produce even cheaper food.

e) In this way, an entirely beneficial spiral would be created, and would continue for as long as it was possible to keep moving people from the land.

However, the validity of such a process is questionable.[22] Firstly, the fact that there is so much intervention, in terms of subsidies, production grants, structural aids, levies, tariffs and quotas, makes it difficult to determine the price at which agricultural produce is sold, and to be sure that it truly reflects the economic price of production. Similarly, consumers demands are distorted by subsidies, taxes, education and advertising. In short, it is simply untrue to say that the supply and demand of agricultural produce takes place within a free market; so, this simple theory of farm structure may not be the most appropriate in this highly interventionist system.

Furthermore, it has long been thought by many agricultural economists that the law of diminishing returns operates more quickly in farming than in other industries and that economies of scale eventually become outweighed by the problems of managing large enterprises.[23] Therefore, farm structure theories, although important, do not reflect the complexities of agricultural production and must, for the time being, be considered as insufficient.[24]

## Inelasticity of food supply

Fluctuating incomes are a consequence of the large fluctuations that occur in the price of agricultural goods. Agriculture is rendered extremely sensitive to price changes, especially when falling, because of the inflexibility of supply.[25] Supply is inelastic for several reasons. First, the length and uncertainty of the productive process must be considered. Unforeseen variations in yield are common, due to climate, disease and other natural factors. Second, there is an economic lag between expenditure and receipts, and an immobility of capital.[26]

The eventual consequence is that prices drop sharply when the demand for agricultural products fall. Thus, the tendency for incomes to be low and to fluctuate goes hand in hand with surplus production.[27]

The solution lies, apparently, in price policies which, by the use of taxes, subsidies, quotas, tariffs, intervention buying, production control and marketing, try to alleviate the discrepancy between supply and demand.[28] Therein lies the basic aim of any food policy. It is, quite simply:

1) to keep food production and consumption in balance, allowing neither, if possible, to become permanently and heavily in surplus; and,
2) to keep food producers and consumers in economic, if not political, balance, allowing neither group to exploit the other immoderately.[29]

However, the economic effects of farm support policies are difficult to ascertain. Gale Johnson remarked recently that he knew of no government that could answer even the most simple questions about the economic effects of its policies.[30] This, combined with the apparent failure of farm supports to solve rural poverty, and the seemingly insatiable demand for government finance, suggests to many people that the solution may be elsewhere. Josling explains the pressure that builds up:

> Most governments faced with such demands, convincingly backed up by statistics on farm incomes and costs, cannot resist the temptation to limit imports.[31]

## The development of state interventionism in British agriculture

There are three reasons for the inclusion of an historical examination of British agriculture policy in this thesis. The intention is,

a) firstly, to demonstrate how the principles of agricultural economies, outlined above, have been put into practice, in general terms, over the last few hundred years;

b) secondly, to trace the level of state involvement in agriculture; and,

c) thirdly, to discover the extent, and the causes, of the decline of the small farmer in Britain.

### The Acts of Enclosure

The general decline of British agriculture has been particularly characterised by the disappearance of the peasantry, the small farm owner-occupants, which has survived to a much greater extent in many parts of Europe.[32] The loss of this group is often attributed to the Acts of Enclosure.[33] Enclosure involved the re-arrangement of formerly common land or open fields into self-contained private land-units, or the division of formerly common, but uncultivated land (woodlands, rough grazing, waste-land, etc.) into private property.[34]

Far from being one solitary act, there were over four thousand Acts of Enclosure affecting well over six million acres;

i.e. about one quarter of cultivated acreage. It has become common to imagine the era of enclosure to be between the period 1760-1780 and, between the Napoleonic Wars, 1793-1815; although it is true that the majority of the parliamentary Acts were concentrated in these periods, evidence suggests that enclosure was taking place as far back as the early sixteenth century, and continued until well after the end of the French Wars.[35]

However, the view that enclosure took place at the end of the eighteenth century, combined with an imagined agricultural revolution of farming methods, has led to the belief that the small farmer was almost eradicated overnight, creating a new itinerant group of hungry and landless people. Certainly there was extreme poverty and suffering, but it did not occur in this manner. This misconception was used by many early socialist writers to popularise the idea that enclosures were designed to produce a suitable workforce for the industrial revolution. Marx indicted enclosure as the instrument by which the landlords, following up their earlier 'thefts of state lands', carried out a 'systematic robbery of the communal lands' of the people with the objective of creating large capitalist farms and setting free 'the agricultural population as proletarians for manufacturing industry'.[36]

Mingay suggests that the period of decline of the small farmer was much earlier, probably during the period from 1660 to 1750.[37] Land tax evidence shows that the numbers of small farmers actually increased between 1760 and 1830.[38] The reason

for this earlier decline has been attributed to the effects of generally low prices, and heavy taxation between 1688 and 1715. Small farmers failed and their small units were amalgamated into larger areas.[39]

This hypothesis is more realistic and also suggests that there was no sudden agricultural revolution. The modern interpretation indicates that a continual process of improvement operated within agriculture.[40] The agricultural revolution was a more protracted affair, stretching back over centuries rather than decades.

Enclosure could be said to represent the final recognition of a process of reorganisation that was a constant feature of the improvement in farming methods and farm structure; that people undoubtedly suffered was more a manifestation of the injustices of the existing political system. Enclosure facilitated the improvement of farm methods through experiment and innovation, new crops and methods of rotation and better fertilisation. Economies of scale were generated which the 'open-field' system did not allow, and, as a result, agricultural productivity roughly doubled during the sixteenth century.[41]

The decline of the small farmer has been almost complete in Britain, and this is important to note in the context of this thesis, because it would be necessary to reverse this process, to reintroduce the small farm owner-occupier, for the successful implementation of the strategies suggested in Chapter 5.

## Corn Laws, repeal and laissez-faire

The Corn Laws were an example of government attempts to establish a balance, as described earlier in this chapter, between consumers and producers.[42] Like enclosure, the Corn Laws were not the result of a single act, but stretched back to the early Middle Ages.[43] Simply speaking, their original purpose was to establish a guaranteed food supply to a largely agrarian community by preventing speculation and monopolitistic practices, by the regulation of internal trade and the restriction of imports.[44]

From 1660 onwards, imports were regulated by a sliding scale of duties, but as long as Britain was a net exporter of grain, the Laws were of minor importance as a measure of import restriction.[45] It must be remembered that in 1750, Britain still exported half a million tons of grain.[46] Grain has always played a disproportionately large role in policies of agricultural protection, again due to the inelasticity of supply and demand. Chambers encapsulates the problem for grain producers:

> Unlike the fatstock and dairy farmers, the corn producers had to face no foreign competition and the more intractable consequences of an expanding but inelastic demand. (The population of Britain was increasing rapidly during this period, doubling between 1750 and 1830). A fall in the price of meat would be partially cushioned by an increase in the amount consumed; the relatively fixed demand for bread corn caused prices to fluctuate disproportionately to the changes in the size of the harvest .....[47]

But, by the end of the Napoleonic Wars, conditions were different. By the year 1800, Britain was importing three-quarters of a million tons of grain and, as a consequence, the Bill of 1815 raised

domestic prices and effectively prohibited imports. The aims of the Corn Laws had become perverted by those who benefitted most from them - the land-owners.[48] It was an easy matter for the landed aristocracy to push these Bills through Parliament, due to their enormous political power. Of the five thousand or more members who sat in the House of Commons between 1734 and 1832, about three quarters had their principal economic interest in land.[49] Thus, the landed gentry, who had benefitted by the construction of an essentially aristocratic farming structure through the Acts of Enclosure and high food prices and rents during the war time period, sought to make further gains by the prevention of imported grains.

All of these factors, the Poor Laws and a rapidly increasing population contributed to some of the worst food poverty ever seen in Britain; but, the effect of expensive bread was to galvanize the common protest against the Corn Laws through the formation of the Anti-Corn Law League and similar bodies.[50] Eventually, the pressure to remove the oppressive Corn Laws became too great, and resulted in the reformation of Parliament under the Reform Act of 1832.[51] The Repeal of the Corn Laws was completed in 1846 and had such far reaching consequences that it is justly remembered as a landmark in British political history.

Green has suggested that here was Britain's 'revolution', encapsulated between the years 1832, when the first Reform Bill was passed, and 1846, when the Corn Laws were repealed.[52]

It was a revolution fought in terms of food, and has determined that, ever since, Britain would be ruled democratically rather than aristocratically, that society would be dominated by commercial and industrial rather than landed interest, and that the British would be, largely, a nation of consumers rather than producers of food.

The consequences of Repeal were widespread and, ultimately, devastating for British agriculture. Some of its effects were not realised for thirty years, and could not have been foreseen by Sir Robert Peel, who was instrumental in the adoption of a policy of free trade.[53] There were three major effects.

Firstly, the landowning oligarchy, that had ruled Britain for a century and a half, lost its political, and then its economic, power.[54]

Secondly, and perhaps of more importance to agriculture, the farmers lost their economic power too, since the farm structure left by enclosure blurred the distinction between the working peasantry and the landowners. Evidence suggests that the small farmers that had survived the process of enclosure could not survive the effects of Repeal.[55]

The third effect, and probably the cause of the first two effects, was obscured for thirty years. Although the level of imports had risen, the price of wheat remained fairly constant for about thirty years, whilst other agricultural prices had

risen sharply. A succession of poor domestic harvests in the late 1870s, coupled with the cessation of the wars on the Continent and the USA, and the advance of transport, brought British farmers face to face with the harsh realities of free trade.[56] Poor harvests could no longer be offset by a rise in prices, due to the competition of cheap foreign grain. The import of wheat, which had been about forty eight per cent of total consumption in 1868-1878, rose to between sixty and seventy per cent.[57] When 'cheap food' arrived, rents and prices were driven down, destroying the economic base of both landowners and farmers.[58]

The Repeal of the Corn Laws opened the way for free trade and eventually brought 'cheap food' to Britain. With it came an unstoppable decline in British agriculture. The Golden Harvest, which had reached its peak in 1870, was over.[59] The decline was meteoric. Of the three million acres of wheat being grown in 1870, only one million remained in 1931, and the arable acreage, including that cultivated during enclosure, shrank from 18 to 12 million acres.[60] The proportion of the working population in agriculture dwindled from 19.1 per cent in 1871 to 6.8 per cent in 1931; and the ratio of agricultural to non-agricultural incomes is estimated to have fallen to sixty three per cent in 1900 and to sixty one per cent by 1930.[61]

Despite the disastrous effects on domestic agriculture, the policies of laissez-faire worked well for Britain for a considerable period. Britain was able to take advantage of its Empire, which

included large food producing areas, and of the progress in transport, to feed her people to a higher standard than almost anywhere in the world. When it came to a choice between cheap food and British farmers, it was political suicide to favour more expensive food; and it is still a sensitive political issue.[62]

Free Trade came and went, and with it cheap food. The myth remained, and still does to some extent, for an even longer period, but eventually the disorganised farming community, combined with the need for increased domestic production during the first and second world wars, forced the government to re-introduce some measure of protection.[63]

The end of free trade

A price had to be paid for the benefits of cheap food, and it was the bankruptcy of British agriculture. The price was felt during the first world war, when the British began the slow and expensive rehabilitation of agriculture.[64] At the outbreak of war, Britain had no plan for raising food production, but by 1918 extensive control had been established which guaranteed prices to farmers, compelled the ploughing of grassland, and allowed all essential foodstuffs, whether home-grown or imported, to be bought or requisitioned by a central body, known as the Food Controller.[65] The war had thus necessitated a return to protectionism and a reversal of laissez-faire policies toward agriculture. The change of attitude was short-lived, however, for the Agriculture Act of 1920, which gave some guarantee of

prices to farms, was repealed the following year, and agriculture was abandoned during the post-war depression.[66] Domestic food supplies dropped as low as one quarter of domestic demand, as the general price trend was downwards.[67]

However, a drastic change was to occur in agricultural policy due to the great economic depression which began in 1929.[68] With the new coalition National Government came a comprehensive tariff system, enacted by the Agricultural Marketing Acts of 1931 and 1933, and the Imported Duties Act of 1932.[69] Britain retained the benefit of its Empire by the concessions of the Ottawa Agreements Act of 1932, which gave preference to the import of Empire goods, and a reciprocal arrangement for British export manufactures; this did little to assist British farmers.[70]

So, although there were attempts to support agriculture in the 1930s, the traditional policy of cheap food was still an important factor. The legislation of this period was influenced by the all pervading depression, and the restrictionist devices employed reflected the times.[71]

The second world war had a greater effect on agriculture than the first, and Britain entered the war with a prepared plan of action. In September 1939, the Ministry of Food was formed, and became the sole buyer and importer of all major foodstuffs; existing food stocks were requisitioned; price controls were imposed and rationing was introduced.[72] Compulsory cropping, the reclamation of derelict land and the eviction of inefficient farmers combined to bring the arable acreage back to its record

peak of the 1870s, although output only increased by about 20 per cent due to the slaughter of livestock.[73]

British farmers had to make considerable effort and sacrifice during the war but the system of guaranteed prices greatly increased their prosperity, and farmers did not want to see their position eroded again, as it had been at the end of the first world war.[74]

Post-war policy

Prior to the accession to the Treaty of Rome and the previous debate on the European Economic Community, British post-war agricultural policy had developed in three phases.[75] In the immediate post-war period, both Labour and Conservative governments pursued a policy of expansion with little regard for the cost.[76]

By the mid-1950s, greater emphasis was placed on the control of Exchequer expenditure and economic efficiency; domestic farm-support policy reflected the easing of the world supply situation.[77]

During the early 1960's, efforts were made to control external access to the U.K. market.[78] With the trend from shortages to surpluses on world markets came the increasing problem of imports. Farmers complained frequently of dumping and the argument of the import saving role of agriculture was invoked. The lengthy discussion which ensued, reviewed in

Chapter 3, did not result in great restriction, but some quotas were introduced to prevent dumping of some goods, notably butter.[79]

The basic policy of government intervention within a framework of economic and social forces, laid down in the Agriculture Act 1947, was:

1) to ensure food supplies at reasonable prices, whilst the parties involved in agriculture received equitable treatment; and
2) to ensure that British agriculture made an appropriate contribution to the development of the British economy as a whole.[80]

The Act declared that the objective of policy was that of:

> .....promoting and maintaining, by the provision of guaranteed markets and assured prices ..... such part of the nation's food and other agricultural produce as in the national interest it is desirable to produce in the United Kingdom, and of producing it at minimum prices consistent with proper remuneration and living conditions for farmers and workers in agriculture and an adequate return on capital invested in the industry.[81]

The main instrument of farm support during this period was the system of guaranteed prices implemented through the Annual Review procedure, and commonly known as the deficiency payments scheme. Farmers sold their output for the best market price they could obtain, but any difference between the average market price thus realised and the guaranteed price determined at the

Annual Review, was made good in the form of a government bonus paid retrospectively on each unit of output sold.[82]

Britain's use of this method of support was unique, although its adoption had been recommended in the report of the Haberler panel, appointed by GATT.[83] The advantages of a system of direct income support, rather than price support were two fold. Firstly, the price of food was lower for consumers and, consequently, consumption was stimulated. Secondly, the cost of direct income payments was included in the national budget, and the public scrutiny of the costs would act as a control on protectionism.[84] Although deficiency payments aided farmers with most to sell, low income farmers could benefit from production grants and subsidies on milk, sheep and cattle.[85]

Later in the 1960s, a combination of several factors, including international agreements, the costs of the deficiency payments scheme, the intention to enter the E.E.C. and the view that agriculture could assist the balance of payments, led to a modification in policy toward an expansion programme aimed at import saving.[86] The effects were a shift towards greater protection through the regulation of imports, transferring the burden of support from the treasury to the consumer. In effect, the transition period to the EEC's system of farm support began long before the Heath government accepted the terms of entry to the Community in 1971.[87]

## The Common Agricultural Policy and Britain

Food and agriculture in this country have been dominated by the Common Agricultural Policy (CAP) since Britain became a member of the European Community on 1st January 1973. This required Britain to adopt the CAP, which had been formulated in 1957 under the Treaty of Rome. The creation of an agricultural community was an important aspect of the essentially Franco/German alliance which the European Community undoubtedly was in 1957. Agriculture was, and still is, the most powerful instrument of European integration and the Treaty of Rome can be seen as a bargain struck between German industry and French agriculture.

The agricultural objectives of the Treaty of Rome were five in all:

a) to increase agricultural productivity;
b) to ensure thereby a fair standard of living for the agricultural population;
c) to stabilise markets;
d) to guarantee regular supplies; and
e) to ensure reasonable prices in supplies to consumers.

The Treaty of Rome provided little indication of how these objectives were to be achieved, and it took about ten years for detailed proposals to be presented by the European Commission to the Council of Ministers. Primarily responsible for the four principles which eventually emerged was Sicco

Mansholt. These were:

a) common organisation of the market with common prices for the main products;

b) free trade between the member countries;

c) a single-trading system with non-member countries;

d) joint financing of the cost market support for farm produce, and the subsidising of exports of agricultural products to non-member countries and the contribution by the Community to the cost of modernising the agricultural economy.[88]

The price support system

The policy operates in two main ways. It protects the Community market against both low and high prices in world markets through threshold prices or export restrictions, and it guarantees a minimum price for the basic agricultural products through intervention prices or direct payments to producers. The basic premise underlying the price support system is that farmers' returns should be received directly through the market. For all products, except potatoes, wool, mutton, lamb and some horticultural products, there is a support system, although the arrangements for all commodities differ slightly. The system for cereals was the first to be introduced, and the method adopted has been applied to other products.

There are three types of support prices for cereals; the 'target price', the 'intervention price' and the 'threshold

price'. The target price is the desirable market price, and represents the average price the system is designed to maintain. The target price is fixed at the level which it is hoped producers will achieve on the open market in that area of the Community where grain is in shortest supply.[89]

The intervention price is set at between 12 and 20 per cent below the target price, and is the price at which the Intervention Authorities are ready to buy cereals to maintain prices; it is, therefore, the price that the farmer is guaranteed to receive.

The threshold price is calculated such that, when grain is imported at any port around the Community, it will sell at about the target price, or a little more, in the Duisburg area. Each day variable levies are calculated in Brussels, making up the difference between the lowest cif offers on world markets and the threshold price. These levies are payable on each consignment shipped into the Community from non-member countries, to prevent farmers of member states being undercut by cheap imports. Similarly, export subsidies or restitution payments may be paid enabling EC produce to be sold on world markets where prices are lower.

Thus, the prices of cereals are maintained at a high level by the use of the threshold price and variable levy, which prevent imports of cheap grain, and the intervention price, which prevents the home market being flooded through over-production.[90]

## The green pound and Monetary Compensatory Amounts

When the U.K. joined the E.E.C. in January 1973 her agricultural industry entered a negotiated transitional period which ended at the end of 1977. During this period the support prices of U.K. farm products were raised by a series of transitional steps to those of her other community partners. From the 1st January 1978 the U.K. farmer has received exactly the same institutional price, measured in units of account, as any other community farmer. As their name implies, units of account (u a) are simply an accounting convention by which the Commission sets support prices. These prices are translated into each country's currency by means of special exchange rules, fixed by the Council of Ministers, known as representative or green rates.

The provision of a single system of price support was conceived during a period of fixed exchange rates. Within this context it was theoretically possible to implement a policy of common support prices which would be effective throughout the Community.

However, the abandonment of the fixed currency system in the early 1970s, and the adoption of a floating system of exchange rates, has caused great problems to the application of common prices. As currencies have been allowed to fluctuate against one another, these green exchange rates have produced price levels for agricultural products different from those which would apply if fixed parities or market values were used to calculate prices.

For example, the green mark maintains agricultural prices higher in FR Germany than is justified by the market value of the mark. Conversely, the green pound was worth more than the market rate for sterling, although recently the disparity has not been so great due to successive devaluations of the green pound and the strength of sterling.

Clearly, a fixed agricultural exchange rate is an anomaly in a period of fluctuating exchange rates, but moves to eliminate the disparities have been hampered for political and economic reasons; the undervalued green mark benefitted German farmers, whereas the overvalued green pound benefitted British consumers.

Thus, agricultural imports into the UK attracted an import subsidy which allowed the trader to sell goods on the British market at a lower price than he actually paid for them. Similarly, the British exporter had to pay a levy which nullified any competitive advantage resulting from the strength of the green pound. The taxes and subsidies charged to remedy this situation are known as Monetary Compensatory Amounts (MCA), and in 1977, these payments cost the EEC about £500 million.

More recently, with a steadily increasing rate of exchange for sterling caused by high interest rates and North Sea oil revenues, the position has been reversed. The green pound has become artificially under valued effectively subsidising UK exports of agricultural goods and making food more expensive to UK consumers.[91]

## Problems of the Common Agricultural Policy and British agriculture

Firstly, it is pertinent to ask if the CAP has met its objectives, broadly stated in the Treaty of Rome. It would appear that the CAP has met its first objective, the increase of agricultural productivity, since, between 1958 and 1974, the average amount produced for each person working in agriculture increased annually by about 6.5 per cent.[92] This was due to a combination of the total amount produced, and a decrease in the number of people working on the land. However, it is unlikely that the CAP was directly responsible since little effort has been placed on the structural improvement of European farms. Productivity may actually have been held back by the price policy, enabling low productivity farmers to stay in business; it is likely that other factors contributed to the increase in productivity.

It is difficult to assess the effect of the CAP on farmers' incomes, because they are largely self-employed and do not usually receive a wage. However, it would appear that farmers' incomes have risen, although not as fast as the incomes of the people working in other industries. Furthermore, the CAP has accentuated the gap between the rich and poor farmers, since the farmers who produce most receive the highest returns.[93] It is for this reason that some critics have dubbed the CAP 'the Kulak's charter'.[94]

Has the CAP achieved market stability? Between 1968 and 1974, prices for farm produce fluctuated much less within the EEC than in the rest of the world. For example, wheat prices

varied by an average of three per cent in the EEC compared to an average of eleven per cent on world markets.[95] But stability of prices has been achieved at a high level; food prices in the EEC can be up to 320 per cent higher than on world markets.[96]

The CAP has probably come closest to achieving the objective of security of supplies. The EEC is self-sufficient in a large number of different types of food. However, in many products there have been large surpluses, notably in dairy products, wine and olive oil. Surpluses are estimated to have cost the EEC about £2000 million in 1976.[97]

The final objective of the CAP concerns the production of food at reasonable prices. Reasonable prices are difficult to define, but considering the high cost of food within the EEC compared with prices on world markets, the majority of people would say that the CAP does not ensure production of food at reasonable prices. The CAP tries to protect farmers' incomes through high prices and it is the consumer who, to a large extent, pays for this protection.

In this brief review, several consequences have emerged:

a) the CAP has failed to improve the incomes of many poor farmers;

b) the CAP has caused expensive over production in some products; and,

c) the cost of the CAP has been expensive to both consumer and tax payer.

Major criticism of the policy has been aimed at the ineffectual price policy. Many critics argue that it is impossible to use the price mechanism to both balance supply and demand, and to give farmers a reasonable income.[98]

Common sense would indicate that any policy which guaranteed a market at high prices to farmers would produce surpluses, and be expensive to operate. The cost of the CAP is of particular concern to the UK since the CAP accounts for about 70 per cent of the Community budget and, in 1980, the UK was expected to be the largest contributor.[99]

Critics of the CAP suggest that there is now no longer free trade in agricultural goods in Europe.[100] The existence of MCAs, which are in effect border taxes, would support this. Their existence is further evidence of the strain that monetary instability has imposed on farm policy, and is undoubtedly a major factor in the failure of the CAP.

There is now a widespread belief that the CAP has become doctrinaire, over protectionist and, ultimately, unrealistic.[101] The need for reform has never been greater but change appears to be extremely difficult in the face of the differing interests of farmers, consumers and the individual member states of the EEC. Of course, it is now nigh impossible for Britain to implement policies which are solely to the benefit of British farmers or consumers, but even so, agricultural policy in the EEC is not controlled by a 'Supra-national' body. The Council

of Ministers, which is made up of ministers who represent national interests, effectively makes the decisions; Britain, with the smallest agricultural interests of any of the member states, would seem to have the least power in effecting reform of the CAP.

## Conclusions

This review has traced the involvement of the state in British agriculture, and shown the general trend for increasing intervention. One cannot ignore the apparent failure of government to effectively regulate the production of food in most developed countries, and in particular to overcome the problems of farm incomes. It appears that there is an inability of the market economy to cope with the problems of agriculture.

Combined with the rise in state intervention in agriculture, we have seen, in this country, an almost complete loss of the small farmer, together with a general decline in the agricultural sector. McCrone summarises the reasons for the minor role of agriculture in Britain today:

> There is little doubt that the small part played by agriculture in the British economy, compared with the economies of any of the Continental neighbours, is largely due to the United Kingdom's long adherence to free trade and laissez-faire. Both France and Germany embarked on policies of protection in the 1870s, while Britain waited till the 1930s; and undoubtedly this saved them from the overseas competition which forced British agriculture to contract. This contraction affected not only output but the amount of labour employed, the area of land cultivated, and even the total agricultural area.[102]

Thus, the legacy left by the last two hundred years of agricultural policy, combined with EEC membership, and its restrictions on individual policy, create enormous problems that would have to be overcome for the successful implementation of any radical changes in British agriculture.

# CHAPTER 3

## THE BALANCE OF PAYMENTS AS NEMESIS

> There still prevails, even in nations well acquainted with commerce, a strong jealousy with regard to the balance of trade, and a fear that all their gold and silver may be leaving them.
>
> (David Hume, Of the Balance of Trade, 1742)

The term 'the balance of payments' has a ring of familiarity to most people. It is only necessary to listen to the evening news on the television occasionally to have heard it being used, usually in severe tones. But, it is apparent that few people really understand what it is really all about.

To tackle the concept of agricultural import saving, one of the main concerns of this thesis, an understanding of the rudiments of the balance of payments, possible adjustment policies and measures taken by UK governments in the past is essential. A consideration of plans to increase domestic agricultural production combined with policies of import substitution makes two assumptions: first, that the meaning of balance of payments is understood; and, second, that the UK does indeed have a balance of payments problem. The purpose of this chapter, then, is to clarify the meaning of the balance of payments and to put the proposition of import saving into perspective.

## The principles of the balance of payments

The balance of payments is not, as many people imagine, a precisely defined term; rather it is a loose unifying concept which is applied to the international accounts of any country. As such, its meaning is easily misinterpreted and its application often confused.[1] Broadly speaking, the balance of payments can be described as a systematic record of all economic transactions between residents of the reporting country and residents of all other countries.[2] The transactions may involve a flow of real resources, such as goods or services, a movement of foreign assets or liabilities or transfer payments.[3]

It is now common practice to divide the external accounts of the UK into three sets of items:

1. Current account items consist of exports and imports of goods (known as 'visibles'), and services, investment income and various transfer payments (known as 'invisibles'). The difference between the import and export of visible goods is often known as the 'trade gap', and the sum of the visible and invisible accounts is known as the 'balance on current account'. All of these items are collected together because the majority are directly related to flows of national income and expenditure, whether public or private, and are closely related to movements in foreign and domestic incomes. The current account shows, broadly whether the UK has added to, or reduced, its net external assets in any period. It is,

therefore, an important indicator of the current economic health of the nation, which is why the state of this balance attracts considerable attention.

2. Investment and other capital transactions are gathered together because all capital flows correspond to changes in the stocks of foreign assets and liabilities of the UK and, as such, are made up of the inward and outward flow of money for investment and international grants and loans. The addition of the current and capital accounts is sometimes called the basic balance; the total of investment and other capital flows, together with the balancing item (see below) is known as the Total Currency Flow (TCF) and can be treated as the net balance of autonomous transactions.

3. Official financing can be described as the measurement of cash movements between the U.K. and overseas. Thus, changes in the official reserves, which are mainly the sterling equivalent of gold and convertible currencies held in the government's account by the Bank of England, are shown in this account. Official financing also includes net transactions with overseas monetary authorities, such as the International Monetary Fund (IMF).[4]

The presentation of the accounts is analagous to a double-entry accounting system, in which each transaction involves both a credit and debit and, so, appears twice. In this type of recording, the total of all entries should be equal to zero, and hence the use of the term the balance of

payments. In practice, however, errors and omissions arise because of the many different sources from which the accounts are compiled, and the time-lag between the recording of transactions and the corresponding payments. The balancing item is therefore introduced so that the sum of the identified transactions plus the balancing item add to zero in true accounting fashion.

The way the accounts are presented is shown in summary form in Table 3.1. Two main balances are shown: firstly, the current balance, which shows if the U.K. has had a surplus over expenditure; and, secondly, a line is drawn to show the total sum (current balance plus net investment and capital transactions plus balancing item) that has to be met by, or contributes to, official financing.

A further distinction is made between 'autonomous' and 'compensatory' items. Those transactions which appear above line 21 (in Table 3.1), within the 'balance for official financing', are autonomous. This balance is financed by the accommodating or compensatory items which are 'below the line'. The distinction is based on whether the transactions involved have arisen from commercial or political reasons (autonomous), or from financial considerations by U.K. monetary authorities (compensatory)[5]. The structure of the accounts is summarised in Table 3.2. Thus, it may be misleading to say that the U.K. balance of payments is in deficit, since

Table 3.1: The presentation of the balance of payments

| | Item No. | 1970 | 1972 | 1974 | 1976 |
|---|---|---|---|---|---|
| Current account | | | | | |
| Visible trade: | | | | | |
| Exports (f.o.b.) | | 8 121 | 9 449 | 16 538 | 25 416 |
| Imports (f.o.b.) | | 8 146 | 10 151 | 21 732 | 28 987 |
| Visible balance | | -25 | -702 | -5 194 | -3 571 |
| Invisibles: | | | | | |
| Services and transfers (net): | | | | | |
| General government | | -486 | -561 | -858 | -1 546 |
| Private sector (and public corporations) | | +650 | +834 | +1 181 | +2 533 |
| Interest, profits and dividends (net): | | | | | |
| General government | | -269 | -143 | -355 | -652 |
| Private sector (and public corporations) | | +825 | +677 | +1 661 | +1 831 |
| Invisible balance | | +720 | +807 | +1 629 | +2 166 |
| CURRENT BALANCE | 1 | +695 | +105 | -3 565 | -1 405 |
| Capital transfers | 2 | - | - | -75 | - |
| Investment and other capital transactions | | | | | |
| Official long-term capital | 3 | -205 | -255 | -276 | -158 |
| Overseas investment in UK public sector | 4 | -10 | +120 | +252 | +203 |
| Overseas investment in UK private sector | 5 | +838 | +773 | +2 278 | +2 051 |
| UK private investment overseas | 6 | -789 | -1 383 | -1 149 | -2 100 |
| Overseas currency borrowing or lending (net) by UK banks: | | | | | |
| Borrowing to finance UK investment overseas | 7 | +180 | +725 | +270 | +165 |
| Other borrowing or lending (net) | 8 | +292 | -254 | -564 | -271 |
| Exchange reserves in sterling: | | | | | |
| British government stocks | 9 | +63 | +65 | -124 | +14 |
| Banking and money market liabilities | 10 | +130 | +222 | +1 534 | -1 421 |
| Other external banking and money market liabilities in sterling | 11 | +266 | -91 | +148 | +255 |
| Import credit | 12 | +14 | +196 | +159 | +169 |
| Export credit | 13 | -395 | -409 | -809 | -1 178 |
| Other short-term transactions | 14 | +188 | -399 | -48 | -543 |
| Total investment and other capital transactions (items 3 to 15) | 15 | +572 | -690 | +1 671 | -2 814 |
| Balancing item | 16 | +20 | -680 | +323 | +591 |
| EEA loss on forward commitments | 17 | - | - | - | - |
| Balance for official financing (items 1, 2 and 15 to 17) | 18 | +1 287 | -1 265 | -1 646 | -3 628 |
| Allocation of Special Drawing Rights | 19 | +171 | +124 | - | - |
| Gold subscription to IMF | 20 | -38 | - | - | - |
| Total (items 18 to 20) | 21 | +1 420 | -1 141 | -1 646 | -3 628 |
| Official financing | | | | | |
| Net transactions with overseas monetary authorities | | | | | |
| IMF | 22 | -134 | -415 | - | +1 018 |
| Other monetary authorities | 23 | -1 161 | +864 | - | -34 |
| Foreign currency borrowing: | | | | | |
| by HM governments | 24 | - | - | +644 | - |
| by public sector under exchange cover scheme | 25 | - | - | +1 107 | +1 791 |
| Transfer from dollar portfolio to reserves | 26 | - | - | - | - |
| Drawings on (+)/additions to (-) official reserves | 27 | -125 | +692 | -105 | +853 |
| TOTAL OFFICIAL FINANCING | 28 | =1 420 | +1 141 | +1 646 | +3 628 |

Source: CSO, Annual Abstract of Statistics 1977, HMSO, London, 1977, p325.

Table 3.2: The structure of the accounts

| | Net credit or debit |
|---|---|
| Current account | A |
| Investment and other capital transactions | B |
| Balancing item | C |
| Balance for official financing | (A+B+C) |
| Official financing | -(A+B+C) |

Source: Central Statistical Office, The UK Balance of Payments, 1967-77, HMSO, London, p.67.

by definition the balance of payments must always balance. When more is spent on imported goods and services than is earned through selling goods and services to the rest of the world, then the result is a deficit on current account. The fact that external assets have been consumed will also show up in the other accounts. If the deficit has been financed by borrowing, then it should show up in the capital account, whereas if currency reserves have been utilised to finance the deficit, it will be recorded under official financing.

Deficits may be financed by borrowing or reducing currency reserves for a considerable time depending on the size, frequency and reasons for the deficit. However, the capacity to borrow money, often with attached conditions (e.g. the recent loans from the International Monetary Fund), or liquidate reserves is obviously limited, and if the deficits are large and continuous then a more permanent adjustment may be necessary.

Balance of payments adjustment

Given that a country needs to restore balance to its external accounts, there are a number of measures theoretically possible: Ritson identifies three broad kinds of policy option:[6]

1. to allow a currency depreciation;
2. to apply domestic monetary or fiscal measures designed

to reduce the general level of prices in the domestic market relative to prices in other countries, when these prices are converted at the prevailing rate of exchange; and,

3. to introduce measures designed to restrict certain categories of imported products or to increase the quantity of certain categories of exported products.

Currency depreciation or devaluation lowers the price of exports in terms of foreign currencies and raises the price of imports on the home market. Economists have traditionally favoured this method because of the welfare merits of the free trade solution.[7] But the cost of such action is similar to an unfavourable change in the terms of trade (the ratio of prices of home and foreign produce). For the same resources, used in the production of exports, less foreign exchange is earned with which to pay for imports. In order to maintain the status quo more resources have to be diverted to the production of exports, and to the dissuasion of home consumption. Devaluation may cause a loss of real income rather than any benefit to the balance of payments, and has a detrimental effect on unemployment. The fact that it may also stimulate inflation is another matter. The general hope is that the benefits of increased foreign and domestic demand for home produced goods may offset any loss due to an unfavourable movement in the terms of trade.

The second measure, deflation, reduces the aggregate demand in the economy as a result of domestic monetary or

fiscal policies. This results in lower levels of national income, employment and imports. Examples of monetary policies include increases in interest rates and contraction of the money supply; fiscal policy includes increases in taxation or reductions in government expenditure.

The British government adopted a 'stop-go' or stabilisation policy, especially during the mid-1960s, to try to restore balance.[8] Fiscal and monetary controls were used to preserve the exchange rate. These controls, together with the trade cycle, produced subsequent periods of stagnation and rising unemployment which, in turn, encouraged successive governments to stimulate the economy.

The third option can be described as 'expenditure-switching' policies, as opposed to the 'expenditure-reducing' measures of deflation.[9] These measures attempt to switch expenditure from foreign-produced to home-produced goods. Although there are two possible aspects - the stimulation of exports and the restriction of imports - the response of exports to stimulation is slow. The effect of import restrictions, on the other hand, can be felt almost immediately, and the measures available are easy to implement.

Imports may be restricted by the use of commercial controls (i.e. quantitative restrictions and embargoes, tariffs, quotas etc.) or fiscal controls (devices of exchange control, multiple currency practices, capital transfer restrictions etc.).

Switching has the effect of adding directly to the demand for home-produced goods, thereby creating employment or excess demand and inflation, should full-employment exist; it would also tend to improve the balance of payments, if excess demand and inflation were prevented.[10]

The case for import restriction, with particular reference to agriculture, is analysed in greater depth in Chapter 4. Although the measures outlined above act in different ways, it should be remembered that all balance of payments adjustment policies must involve some cost, or welfare loss, to the community because of their implications for the pursuit of general economic objectives (such as employment, income distribution, regional disparities and economic growth).[11] An improvement in the balance of payments does not come free of charge.

## The U.K. balance of payments in practice

The balance of payments has been high on the agenda of all post-war British governments and appears, to most people, to have prevented the achievement of major economic objectives.[12] Politicians, economists and the media have combined to convince us that the UK suffers from a semi-permanent balance of payments 'problem'; to many people it appears that Britain is constantly on the verge of international bankruptcy. Much political currency has been made of the suggestion that Britain is 'living beyond her means', and by common agreement

the problem is that we import more goods than we export. Mr. Callaghan, then Chancellor of the Exchequer, said in the 1967 devaluation debate:

> I am not seeking to ascribe any responsibility to anybody for failing to try to export, I am merely pointing out the fact that it is industry which does the exporting, and industry which imports, and if the two do not balance, eventually we get into disequilibrium.[13]

He was not the first to state the problem in these terms; Dr. Dalton, Chancellor in 1947 argued that:

> Our trouble is this yawning gap between exports and imports. Therefore all our measures must be aimed at narrowing this gap at both ends.[14]

By the end of 1947 the slogan 'export or die' had been coined and is still being used today.[15] A cursory glance at Britain's visible trade figures will confirm that, with two exceptions, since the second world war (in 1956 and 1958) Britain has consistently had a visible trade deficit.[16]

However, a more thorough examination of the visible trade figures reveals that there has been a continuous visible trade gap since annual trade statistics were first compiled in 1697.[17] Yet, the period between 1697 and the present has been extremely prosperous for Britain, and, indeed, one of the most prosperous of any nation in the history of the world. Thus, the first assumption - that Britain has in the past been a net exporter of goods - is false; and furthermore, it is also untrue that, in order

to be a wealthy nation, it is necessary to export more goods than is imported.

The reason, of course, is that generally speaking, Britain's invisible earnings have been large enough to compensate for any deficit on visible trade. In 1977, invisible exports were about 50% of visible exports, and accounted for about one third of all Britain's exports.[18] Britain is now the second largest exporter of invisible trade after the USA and, on a per capita basis, Britain is the largest invisible exporter in the world.[19]

An examination of the current account shows that, from 1697 until 1931, the UK's balance on current account was always in surplus except for the first world war period. There were minor deficits between the wars but the second world war had an enormous effect on the balance of payments. In the 1940s the UK was forced to liquidate many of its overseas assets and to borrow substantial sums to pay for the war with the result that, although on average the current balance continued in surplus, the immediate post-war period saw considerable change. After 1958 the current balance tended downwards into deficit until 1967, when sterling was devalued. This caused the current balance to recover temporarily until the rise in the price of oil by the Organisation of Petroleum Exporting Countries (OPEC) in 1973. The consequence of the oil crisis was that record visible deficits were registered in 1973 and 1974 and also a record deficit on current account

of about £3500 million in 1974.[20]

The current balance has recovered since 1974 and in 1978 there was a surplus of about £1000 million.[21] Without doubt, the major factor in the recent recovery of the current balance has been the growing importance of North Sea oil. North Sea oil contributed about £1000 million to the current account in 1977 and, including the contribution to the capital account, the benefit to the basic balance was about £2300 million.[22] Furthermore, foreign exchange receipts accrued from North Sea oil were forecast to increase annually until 1980 by £1000 million, with subsequently smaller increases until 1990.[23]

In the Brookings Report[24], Cooper suggested that the UK balance of payments position, at least until 1966, could be summarised in terms of four propositions:

1. The UK is normally a net exporter of long-term capital, with a surplus on the current account.
2. The visible trade balance is normally in deficit, but the invisible balance normally offsets this.
3. The role of the UK as banker to the Overseas Sterling Area (OSA) gives volatile short-term capital flows an important position in the balance of payments.
4. The trading, investing and international financial activities of the UK are carried out with an inadequate underpinning of foreign exchange reserves.

Metcalfe, summarising the experience of the period from 1955 to 1975 suggests that:

> .....the one crucial factor appears to be the persistent weakness of the visible trade account which more than offset the steady improvement in the invisible surplus. The resulting current account deficits combined with the propensity to export long term capital progressively undermined the ability of the UK to act as an international financial centre by borrowing short and lending long. The principal result of this has been the termination of the UK's role as a banker to the OSA and the persistence of disruptive changes of international confidence in the external value of sterling. The advent of North Sea oil, of course, raises the possibility of eliminating, at least temporarily, the state of fundamental disequilibrium as the improvement in the current account for 1977 illustrates. However, this still leaves the longer term question of how the decline in international competitiveness can be reversed before the benefits of North Sea oil are exhausted.[25]

The UK balance of payments has obviously been affected by a number of economic factors since the second world war, not least of which are the adjustment policies which successive governments have implemented in attempts to alleviate disequilibrium in the accounts. Again, it must be stressed that any measures taken to improve the balance of payments must result in a cost to the community in some way or other. This applies whether devaluation, deflation or import restriction measures are used. Although theoretical economists advocate the former, both Labour and Conservative governments, since the second world war, have only resorted to devaluation when their 'stop-go' policies of deflation and reflation have failed. Import controls have been resisted, in general, although some tariffs have been levied on particularly vulnerable products, (e.g. cotton). The reasons for the general lack of enthusiasm for import restriction by many economists and governments is discussed in Chapter 4.

The UK problem

Given that the UK has tended to suffer from balance of payments disequilibrium, many explanations are given for the causes. The argument that is most often heard is that the UK has failed to export sufficient manufactured goods. Metcalfe[26] indicates that the UK share in world exports of manufacturers has declined dramatically from 20.4% in 1954 to 8.3% in 1976. This, considered with the expansion in world trade at the historically unprecedented rate of between 7 and 10% per year between 1959 and 1973, supports the claim that the decline in UK industrial competitiveness is, in part, responsible for the weakness of the international accounts. Furthermore, the UK was the only major industrial nation to experience a substantial decline in export share.

The evidence from the growth of manufactured imports again indicates that Britain's manufacturing industry is not able to compete with their US, European and Japanese counterparts. However, the growth in invisible earnings must not be forgotten. As mentioned, on a per capita basis, the UK is the largest exporter of invisibles in the world.

The enormous increase in the price of oil initiated by OPEC is often blamed for recent troubles. Although the huge deficits on current account, which occurred in the early 1970s, may be due to the effects of oil increases, this cannot be a fundamental cause for imbalance. Furthermore, the UK now earns considerable foreign exchange through oil

exports; it is ironic that increases in the price of oil in the future will benefit the UK balance of payments.

A similar reason given for balance of payments problems in the 1970s is UK membership of the European Community. The effects on the balance of payments on UK accession to the Community were complex. But, it can be said that the removal of all trade barriers between the UK and other members, the cost of supporting the CAP and contribution to the Community budget must all be detrimental to the accounts. Concern is also expressed over the possible deterioration in the long-term capital account.

Manser[27] suggests that the UK does not run a commercial deficit but rather a political and military deficit. If government expenditure on arms, the maintenance of military forces abroad and aid to developing countries were removed from the accounts, a commercial surplus would result.

There are many other factors which are often cited as having contributed to UK international payments difficulties, including inflation, confidence in sterling and the adoption of a system of floating exchange rates. However, the possible reason for imbalance with which this thesis is primarily concerned is the heavy dependence on imported food and feedstuffs. Of course this is not unrelated to many of the above mentioned factors. In 1976, Britain imported food and feedstuffs at a cost of more than £4000 million, which was considerably more than the deficit on current account in any year, except 1974.

It is a fundamental aspect of this thesis to ascertain whether dependence on agricultural imports contributes to balance of payments disequilibrium and whether the expansion of, or radical change in, domestic agriculture could improve the balance of payments by import substitution.

## The bogus problem

Most discussion of the balance of payments implicitly assumes that a 'strong' or 'satisfactory' balance of payments is an economic necessity of life. But what exactly constitutes a satisfactory balance of payments? It is usually assumed that a 'trade-gap' is unsatisfactory but, as already shown, the UK has consistently had a trade gap during its predominantly prosperous development. Similarly, a deficit on current account may not necessarily give rise to problems. The balance of payments only becomes a problem when total receipts of foreign exchange are insufficient, or not consistent enough, to allow a country to sustain its way of life or implement the policies it desires.[28]

Foreign exchange is required by the UK:

1. to enable its residents to purchase desired goods and services from abroad;
2. to finance overseas development for the construction of factories and the purchase of foreign securities;
3. to allow the support of less developed countries by official aid;
4. to repay accumulated foreign debts;
5. to add to official reserves of gold and foreign exchange, and
6. to finance the maintenance of a British diplomatic and military presence in strategic parts of the world.

The sources of foreign exchange to meet these requirements are earnings from exports, short and long-term capital inflows, and drawing from reserves. This implies that the pursuit of a satisfactory balance of payments must firstly allow the pursuit of desired economic and political goals.[29] Furthermore, a satisfactory balance of payments must also allow the achievement of other domestic policies. If the international accounts balance at the expense of other goals, such as employment levels, stable and reasonable prices, or even consumer choice, then does this qualify as 'satisfactory'?

In short, in the words of Samuel Brittan, the balance of payments is a 'pseudo-problem' and is largely self created:[30]

> Examples of real problems include the pressure of population on limited land in the South-East, bad industrial relations, or an unsatisfactory productivity performance. Those cannot be tackled by a uniform alteration in any set of numbers. If wages and prices were half or twice of what they are, or it the pound were devalued to £1.40 or revalued to £4.80, there would still be no more land in the South-East, industrial troubles would not change their nature, and the underlying level of productivity would be no different. The balance of payments is on the other hand a pseudo-problem because its nature and size is an arbitrary one depending on artificial ratios of this kind. A change in international exchange rates or in the ratio of money wages at home and abroad, unconnected with any fundamental change in performance, can transform a vast surplus into a tremendous deficit, or vice versa.

To concoct a problem through concentration on the earning of foreign exchange, and then to invoke guilt in people by suggesting that it is due to their laziness or bad management is 'bogus patriotism'.[31]

It is my view that concentration on the UK balance of payments is misplaced. There may be no fundamental cause for the seemingly depressed economic state of the UK and its international accounts other than an obsession that a problem exists. Indeed, recent improvements in the current account resulting from a strong pound, high oil prices and ever increasing flows of oil from the North Sea has meant that concern over the balance of payments has waned. Nevertheless, with 2.5 million unemployed, industrial stagnation and persistence with monetarist policies, the UK economy has not been in such a bad state since the 1930s.

# CHAPTER 4

## AGRICULTURAL EXPANSION AND THE BALANCE OF PAYMENTS

The case for agricultural expansion has traditionally gone hand in hand with the more general argument for the imposition of import controls. Such ideas usually stem from concern for the balance of payments, or more specifically, for the accumulation of deficits on the current account.

The basic assertion is quite simple. Firstly, economists have noted that the UK has had persistent balance of payments deficits. The implication is that levels of imports are too high or exports too low or both. Since it is difficult to influence exports in the short term, it is easier to concentrate

on cutting imports. So, why not let all goods which can be produced at home be protected and limit imports on these goods? Thus, the balance of payments problem can be solved without cutting national expenditure through higher taxes or lower government spending, etc.[1]

More specifically, economists, and later agriculturalists, have witnessed the steady increase of imports of food and feedstuffs such that now the UK is heavily dependent on imports for about half its food supply. It is taken for granted, by many, that should UK agriculture be expanded and be accompanied by a policy of import restriction and substitution, then this would cause a vast improvement in the balance of payments. In reality, this proposition is far more complex.

The purpose of this Chapter is to examine this simple description of the case for agricultural import saving in greater detail. By analysing the literature which has accumulated on this matter it is hoped that it may throw light on the specific strategies described in Chapter 5.

## The debate

Since the possibility of agricultural expansion has been seen, in the main, as a means of solving balance of payments difficulties, it is not surprising that much of the work parallels concern about the balance of payments. Consequently, nearly all of the work is post- second world war, with the debate climaxing in the early 1970s.

The debate could be said to have begun with the publication in 1950 of an article by Blagburn.[2] Blagburn calculated that it took £123 of the nation's resources to produce about £100 of food, valued at import prices. Robinson and Marris[3] replied by arguing that although the value of exports produced by £123 of resources might be as high as £200, 'The extra output must not only be produced, but also sold, and sold almost certainly at worse terms'. They went on to estimate that the elasticity of demand for UK exports would have to be as high as 2.5 to make the transfer of resources from agriculture to export industries worthwhile. So began a long and heated debate. MacDougall,[4] realising that Robinson and Marris were, in fact, advocating an application of the theory of tariffs, pointed out that the possibility of 'retaliation' had been ignored. The assumption that a country has the ability to turn its terms of trade* in its favour by a policy of domestic expansion and import restriction had ignored the possibility of retaliatory measures

*The terms of trade is the ratio of the import prices index to the export prices index. The 'terms of trade effect' refers to a situation in which a reduction in the demand for an agricultural country's products may force prices down; whereas, a reduction in the sales of UK manufactured goods may result in the price of its remaining exports being raised.

from countries who import UK goods. An improvement in the terms of trade results if export prices rise more quickly than import prices.

Marris[5] continued by attempting to find a relationship between the quantity of UK exports and the nation's terms of trade, and concluded that an increase in UK exports would result in a deterioration of this ratio.

Morgan and Paish[6] disagreed. They argued that because the UK was a large importer of agricultural produce and exported mainly manufactured goods, its terms of trade would change with world terms of trade for agricultural produce. Furthermore, since the majority of UK exports went to countries dependent on agricultural exports, their capacity to import industrially manufactured items would also be related to the world's changes in agriculture's terms of trade. Therefore, an improvement in the world terms of trade for agriculture would be associated with a deterioration in the UK terms of trade, but would also increase UK exports of finished goods to primary producing nations. Marris did not accept this, but it was later shown that UK exports did increase in the 1950s and 1960s under these conditions.[7]

Robinson[8] tried to measure the cost in terms of home resources, of saving foreign currencies by import substitution. Using data for the period 1938-1954,[9] he estimated that about £100 of extra agricultural output had been obtained at a cost of about £150 of resources.

McCrone[10] made his contribution by presenting a formal treatment of the theory of tariffs to agricultural protection. He later emphasised that the nature of the cause of the balance of payments influences whether or not a particular measure represents an appropriate solution to balance of payments disequilibrium.[11] For example, if the balance of payments deficit was due to a gold and dollar shortage, then a decrease in imports of food from agricultural countries would not increase gold or dollar supplies, since most of UK trade with these countries was conducted in sterling.

The criterion of net contribution to the balance of payments was introduced by Moore and Peters.[12] This they defined as the import value of a marginal increase in agricultural production when adjusted for its import content, the impact upon the terms of trade, the reciprocal loss of exports and the opportunity cost of the resources used. Their analysis turned the calculation on its head by estimating what would be the effect on the balance of payments of a marginal decrease in agricultural imports. Then, assuming that agricultural output has an import content of about 25%, a reduction in agricultural output of £125 million would require an increase in food imports of about £100 million. The effect of increasing purchases on the world market would be to push up import prices. They estimated that this would increase the import bill by about £10 million to £110 million.

If agricultural output was reduced by £125 million resources employed in agriculture would be released to other industries, including labour and industrial capacity in agriculture's allied industries. The calculation assumes that labour productivity is higher in export industries than in agriculture, and that the labour released would produce 39% more in other industries. Using two cases, one in which resources would shift easily into other sectors, and the other with low resource mobility, production of exportable products was estimated to increase by between £116 million and £154 million. Such increases in the production of exports would increase imports of industrial raw materials, and an increase of exports of this order would necessitate some reduction in export prices.

The extra import content of additional industrial production was estimated at between £14 million and £20 million. Added to the extra import bill of £110 million, this makes the additional imports required between £124 and £130 million. The reduction in export prices needed to sell a larger volume of goods abroad would reduce the increased revenue from £154 million and £116 million to £111 and £88 million respectively.

The net effect on the balance of payments would be the difference between the total increase in imports of between £130 and £124 million, and the increase in exports of between £111 and 88 million, i.e. £19 and £36 million.

Thus, a reduction in agricultural output of £125 million valued at import prices would reduce the balance on current account by between £19 and 36 million, representing between 15 and 29% of the change in the output. Moore and Peters concluded that although the positive net contribution of agriculture was comparatively small, 'Support of the industry clearly appears to be worthwhile from the balance of payments point of view.....' Phillips and Ritson[13] argued that this did not follow from their calculations. A comparison of the balance of payments contribution of a certain value of resources in agriculture with export industries' contribution by assuming that the resources start in agriculture and have to be shifted towards manufacturing industries biases the calculation in agriculture's favour. They also pointed to the limitations of a calculation concerned with a contraction of the agricultural industry.

Furthermore, according to Moore and Peters, if the net contribution is positive then the extra agricultural output plus the beneficial effects of the decrease in import prices exceeds the cost of expansion. In terms of marginal analysis this means that the net marginal product of resources in agriculture is greater than elsewhere. In effect, the net contribution to the balance of payments as defined, measures the extent to which a redistribution of resources contributes to economic growth, and only coincides with the contribution to the balance of payments under conditions of full employment and no policy of internal deflation.

This illustrates some of the confusion which often arises in calculations like this. Firstly, it is all too easy to define a concept which does not truly represent the effect on the balance of payments. Secondly, it shows that the theoretical case for agricultural expansion must be considered separately from a policy of import substitution. Only if it is accepted that there is a case for import substitution as an effective means of correcting a balance of payments deficit can it then be argued that the agricultural industry offers better scope than manufacturing industry for investment of resources.

Houston[14] has defined three criteria which may be useful in an evaluation of the potential contribution of an expansion in domestic agricultural production to the balance of payments:

1) Gross import saving.

2) Net import saving.

3) Real contribution to the balance of payments.

The gross import saving or displacement measures the value of a marginal increase in domestic production, and the second measures the net change in the cost of imports when no adjustment has been made for the impact upon import prices. The third measures the difference between the net changes in the import bill and export earnings, adjusted for the impact upon import and export prices.

The gross import saving represents the simplest and most incomplete measure of the contribution to the balance of payments, being nothing more than the decreased volume of imports required, valued at import prices. No account is taken of the direct or indirect costs attributable to the implementation of a marginal expansion of agriculture.

The direct costs involved refer to the increased imports required arising through expansion. In other words, they are the imported inputs (e.g. fuel, fertilisers, machinery etc) needed to produce the increased output. When these direct costs are deducted from the gross import saving, the remainder represents the net import saving or displacement.

These two criteria were employed by the Economic Development Committee for Agriculture when they reported on Agriculture's Import Saving Role in 1968.[15] Summarizing their approach to the relationship between agricultural expansion and the balance of payments, the report said:

> Our calculations have necessarily been confined to assessing the gross and net import saving consequences of the proposals for expansion, after taking account of any additional imports that such an expansion would call for. But the import saving is not synonymous with the contribution to the balance of payments. The latter depends not only on the volume of imports replaced, but on any changes in the terms of trade which policy might produce and on the extent to which reduced imports lead, via a cut in the incomes of foreign countries, to a reciprocal fall in British exports compared with the level they might otherwise attain. Generally speaking the 'terms of trade effect' of agricultural expansion is likely to be favourable, but it may be partly offset or even exceeded by the 'reciprocal effect'. The net result cannot be predicted, but it is likely that the reciprocal effect would be greater for a country whose imports from Britain account for a high proportion of its total imports or which is in a weak balance of payments position.

> We have not been able to explore these complicated matters in detail or to assess their quantitative significance. Such work as has been done on this question, however, indicates that agricultural expansion does make a positive contribution to the balance of payments, although not necessarily to the full extent of import saving. It is clear that more research is badly needed on the net contribution made by agriculture and by other industries to the balance of payments, either in the form of import saving or export earnings. A more effective appraisal of these problems will not be obtained until this research is carried out.
>
> The United Kingdom has had a substantial balance of payments deficit for a number of years. Imports of temperate zone agricultural products in this period have averaged just under £1000 M a year. Against this background, and whilst appreciating the difficulties of assessing the quantitative significance, we consider that if the agricultural expansion envisaged could, in fact, contribute to a net import saving of over £200 M a year, this would represent a major contribution to strengthening the national economy.

The calculations of the Economic Development Committee were based on several assumptions. Firstly, that the correction of the balance of payments is the first prerequisite of economic growth. Secondly, they omitted from their calculations any estimate of the opportunity costs of the resources to be used in the expansion of domestic agriculture. Resources used in agriculture implies an opportunity lost to use them elsewhere.

However, it would seem probable that there would be a correlation between net import saving and the real contribution to the balance of payments.

The Agriculture's Import Saving Role report prompted a number of studies to investigate the missing areas - reciprocal trade effects, price effects, opportunity cost of resources, etc.

Notably, Phillips and Ritson[16] investigated the possibility of reciprocity in trade with particular reference to how a reduction in UK agricultural imports might affect demand for UK exports. They defined reciprocity as a situation whereby a change in imports in one year causes a change in that country's exports in the same or subsequent year. They pointed to three ways in which a change in the value of UK imports could affect demand:[17]

1) By direct retaliation.
2) Balance of payments effects.
3) Income effects.

Direct retaliation might occur, for example, where bilateral trade agreements exist. When trade is controlled or influenced by central governments, the opportunity to sell goods to a country may be dependent on the purchase of imports from that country. The restriction of imports from that country may bring about retaliation by the cancellation of orders from UK exporters.

With fixed exchange rates, a reduction in the value of a country's exports will, all other things being equal, reduce the balance of trade. In many countries, liquid reserves are inadequate to bridge the gap until new outlets can be developed. Consequently, they are forced to place restrictions on imports to balance trade.

Any country which exports goods to the UK obtains some of its national income from this trade. Thus, any decrease in the amount of UK imports will reduce the national income of that country, part of which would have been spent on UK exports. A multiplier process will cause the national income of the UK's trading partner to fall by more than the value of its loss of exports: national income falls reducing imports and encouraging exports.

By examining data from nine exporters of primary products to the UK, Phillips and Ritson tried to see what had happened to UK exports to these countries following changes in UK imports from them. Using correlation and regression analysis they produced a series of 'reciprocity coefficients' for each of the nine countries. These coefficients represented the changes in exports associated with given changes in imports.

Then, applying these 'reciprocity coefficients' to the level of import saving projected by the NEDC's report, Agriculture's Import Saving Role, an attempt was made to calculate the net contribution to the balance of payments. Using the NEDC projected value of net import saving of £218 million, they estimated that the balance of payments

net contribution would be reduced to about £115 million.*

Since the reciprocal effect was defined as the change in the value of exports resulting from a change in imports, and value is defined as price times the quantity, then this incoporates the terms of trade effect mentioned above.

Houston[18] attempted to estimate the extent to which past periods of agricultural expansion could have contributed to an improvement in the balance of payments through import substitution. He concluded that there was scope for improvement in the balance of payments through a policy of agricultural expansion coupled with domestic expenditure reduction, within strict conditions. However, he again emphasised that the extent of this improvement would be substantially less than the estimates of gross and net import saving. Despite the enormous fluctuations from year to year, Houston showed the real contribution to the balance of payments to be about 50% of the gross import saving and about 70% of the net import saving.

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*There is a discrepancy in the Phillips and Ritson article 'Reciprocity in International Trade', Journal of Agricultural Economics, Vol. 20, No. 3, September 1969, pp 303-316. On page 313 they state that, 'If we allow for reciprocity on the remaining £71.3 million at only 15 per cent of net import saving then the net Balance of Trade contribution would be approximately £103 million or about one half of the NEDC projected value of net import saving.'

I presume from their calculations that this figure of £103 million refers to the amount of exports lost through reciprocity, and not the net contribution to the balance of payments. Thus:

Net import saving - export loss = net contribution to balance of payments

£218 m - £103 m = £115 m

Houston also compared the effectiveness of general deflation policies with import substitution. Although there are difficulties in quantifying the effectiveness, he surmised that the reduction in total expenditure necessary to bring about an improvement would be greater with general deflation than with agricultural import substitution. However, this would depend largely on the opportunity cost per pound real contribution by the agricultural industry and also to the extent to which deflation policies are accompanied by the associated changes in both the import bill and export earnings, over and above the initial contraction in import expenditure.

Houston stresses the importance of the opportunity cost of resources. It is difficult to evaluate the relative merits of import substitution in alternative sectors. This could not be achieved in a single calculation but would involve an estimation of the opportunity cost and the real contribution for all import competing industries. The scope for import substitution in manufacturing industry, however, would appear to be greater for two reasons:

1) Firstly, there is a limit to the potential for agricultural import substitution because of climatic constraints. Only the import of temperate foods could be realistically replaced - an obstacle that manufacturing industry does not have to overcome. Furthermore, imports of manufactures are greater, and look like growing faster than agricultural imports.

2) Secondly, productivity in manufacturing industry is greater than in agriculture. However, this statement needs considerable qualification. In the first place, there is difficulty in comparing the factor productivity within competing industries. Table 4.1. shows the total factor productivity in agriculture as a percentage of that in other industries. Also, although average productivity levels may be higher in industry, it does not follow that resources currently employed in agriculture would have a higher level of productivity if transferred to an industrial sector.

A better indicator of which industry would be most suitable for a policy of import substitution is the opportunity cost. The opportunity cost is simply the alternative production foregone as a result of transferring resources into one particular industry, thereby depriving another of the benefit of those resources. Thus, the opportunity cost includes some measure of the mobility of resources between differing industries. Agriculture has a high immobility of resources and, consequently, a high opportunity cost of resources. However, many economists have pointed to the difficulties and complexities in these calculations and suggest that extreme caution should be applied in any interpretation of productivity, resource allocation and opportunity cost.[19]

Ritson,[20] returning to the theory of tariffs, pointed out that the argument that the UK could turn its terms of trade in its

Table 4.1: Total factor productivity in agriculture as a percentage of that in manufacturing, distributive trades and all industries.

| | 1948 | 1952 | 1961 | 1965 |
|---|---|---|---|---|
| Manufacturing | 70 | 68 | 67 | 62 |
| Distributive trades | 89 | 91 | 62 | 63 |
| All industries | 63 | 70 | 83 | 81 |

Notes: Marginal productivity of capital was measured exclusive of changes in stocks.

Source: A. M. Houston, Import Substitution and the Balance of Payments, PhD Thesis, Department of Economics, University of Exeter, 1970, p.184.

favour by restricting agricultural imports might only be valid in the context of a balance of payments deficit. With free exchange rates, a country would not exploit a position of monopoly selling power by the imposition of measures which reduced its quantity of imports. Thus, the presence of a balance of payments deficit is critical in the application of the theory of tariffs to agricultural protection:

1) not only because this makes retaliation less likely;
2) but also because it is only under these conditions that an inverse relationship between quantity of exports and level of domestic agricultural output can be assumed.

Ritson[21] has summarised the factors relevant to a calculation of agriculture's balance of payments contribution, and this is shown in Table 4.2.

The characteristics of the debate about agriculture and the case for import saving was epitomised by the contribution of Josling and Winegarten.[22] In this publication, Winegarten put the case for import saving in agriculture and this was answered by Josling. Winegarten, at the time chief economist for the National Farmers' Union argued that:

1) Britain has to run a surplus on the balance of payments of some £300 million a year, for several years, in order to pay off the accumulation of short term international indebtedness in recent years.

Table 4.2: Factors influencing the net contribution of agricultural support to the balance of payments

| Credit | | Debit | |
|---|---|---|---|
| A | Import saving of domestic agriculture | E | Increase in supply of UK exports facilitated by release of sources |
| B | UK monopsony power | F | Increase in demand for UK exports facilitated by income and reciprocity in foreign countries |
| C | UK monopoly power | G | Effects of retaliation against support of UK agriculture |
| D | Import content of exports foregone | H | Import content of agricultural output |
| | | I | Import saving foregone resulting from release of resources from agriculture |
| | | J | Import saving to be valued at import prices |

Source: Ritson, op cit, Ref 7.

2) This would place an 'enormous additional burden' on our export industries and so, as a 'necessary underpinning measure' we need to give much more attention to import saving.

3) Many industries are candidates for import saving, but calculations are complex.

4) The case for agriculture is the most straightforward. Agriculture could, given the right incentives and confidence, contribute about £220 million a year in net import displacement at the end of a five year expansion programme.

5) A policy to expand agriculture would mean that we could 'look forward to the end of constraints on general economic growth' stemming from persistent balance of payments problems.

6) Agricultural expansion is justified in terms of the economic use of the nation's resources apart from the balance of payments position.

According to Josling, Winegarten's argument is based on false assumptions and misinterpretation:

1) The outstanding debts need to be kept in their true perspective.

2) Costs are involved, which Winegarten does not consider, in the achievement of a target surplus.

3) The attainment of a large balance of payments surplus is not especially desirable.

4) Selective import substitution is not necessarily the most appropriate policy for balance of payments stabilisation.

As I have discussed in Chapter 3, the balance of payments accounts are often misinterpreted. Josling, replying to Winegarten has this to say:

> To conjure up images of imminent bankruptcy with such phrases as Britain is 'living far beyond her means, accumulating large debts which one day will have to be repaid' is to misrepresent the true position of one of the richest countries in the world. The 'burden' of our short-term debts is political and not economic.

However, Josling concludes that agriculture can make substantial contributions to national objectives through increases in productivity and the consequent release of labour to other sectors. But, 'artificial' expansion, through higher price supports, distorts the value of resources, is a clumsy method of dealing with secular international monetary adjustments, and the true costs of such policies are always likely to outweigh the benefits.

## The end of the debate?

The successful application of the UK for membership of the EEC brought to an end, at least for the time being, the application of the theory of tariffs to UK agricultural trade. This was due to the importance assumed by administered prices in the CAP.[23] However, the debate has found a new companion with the reawakening of interests in agricultural self-sufficiency.[24]

Perhaps at this point, it would be useful to draw together some conclusions arising from the plethora of work generated in the 1960s and 1970s. If there is any general conclusion then it must certainly be to emphasise the complex nature of the subject and the calculations attempted, and to indicate that large errors can occur when the problem is over simplified. Secondly, the source of the deficit of the balance of payments is important in considering measures to alleviate the disequilibrium. Thirdly, it is important to realise the differences between import saving and contribution to the balance of payments. Although there is likely to be some correlation, they most certainly are not synonymous. Fourthly, that before agriculture is established as a sector offering a high potential for import saving, the whole question of whether import saving is the most appropriate instrument for affecting the balance of payments must be resolved.

Finally, after considering evidence of agriculture's past contribution to the balance of payments, one must conclude that

there is little reason to believe that a policy of agricultural expansion would aid the balance of payments. Ritson[25] concludes that:

> The balance of evidence, therefore, suggests that the contribution of agricultural support to the balance of payments, if any, has been small. The cost of such contribution may be viewed either in terms of exchequer subsidies, or reduction in the total volume of goods and services in the country because of a mal-distribution of resources. Whichever way it is viewed, the implication is that if the government of the UK has maintained agricultural support at its present level on the grounds that it was necessary to assist the balance of payments, then this has been an ill-chosen policy.

# CHAPTER 5

## STRATEGIES FOR AGRICULTURAL CHANGE

This chapter describes the formulation, and the problems incurred in their construction, of alternative strategies for agriculture in the UK. These strategies were designed to test the hypothesis that if the UK were to reduce its levels of imports by a policy of agricultural change, then there would be a positive contribution to the balance of payments.

Thus, these alternatives were constructed such that they did not rely so heavily on imported food and feedstuffs, as the UK currently does. Implicit, therefore, is the fact

that the UK becomes more self-sufficient in food, and hence expands its agriculture. However, agricultural expansion and agricultural change are not one and the same.

By describing the characteristics of the alternatives suggested in this chapter, and by comparison with the work discussed in Chapter 4, the differences between change and expansion, and the way in which they affect the balance of payments, will be brought out.

## The strategies

The study compares two alternative strategies for agricultural production with the system currently used in the UK and examines their effects on the levels of UK food imports and exports, and consequently their effects on the balance of payments. This chapter briefly describes the current system of agriculture and then shows how the alternatives were constructed.

The alternatives consist of a Vegan system, i.e. a system in which no meat or animal products are produced, imported or consumed in the UK, and an Intermediate system, which includes meat and dairy production and consumption.

The suggested strategies can be imagined to lie on a continuum, as shown in Figure 5.1.

These two systems were chosen for a number of reasons. First, it is assumed that it is undesirable to shift towards a more meat oriented production and consumption pattern. In

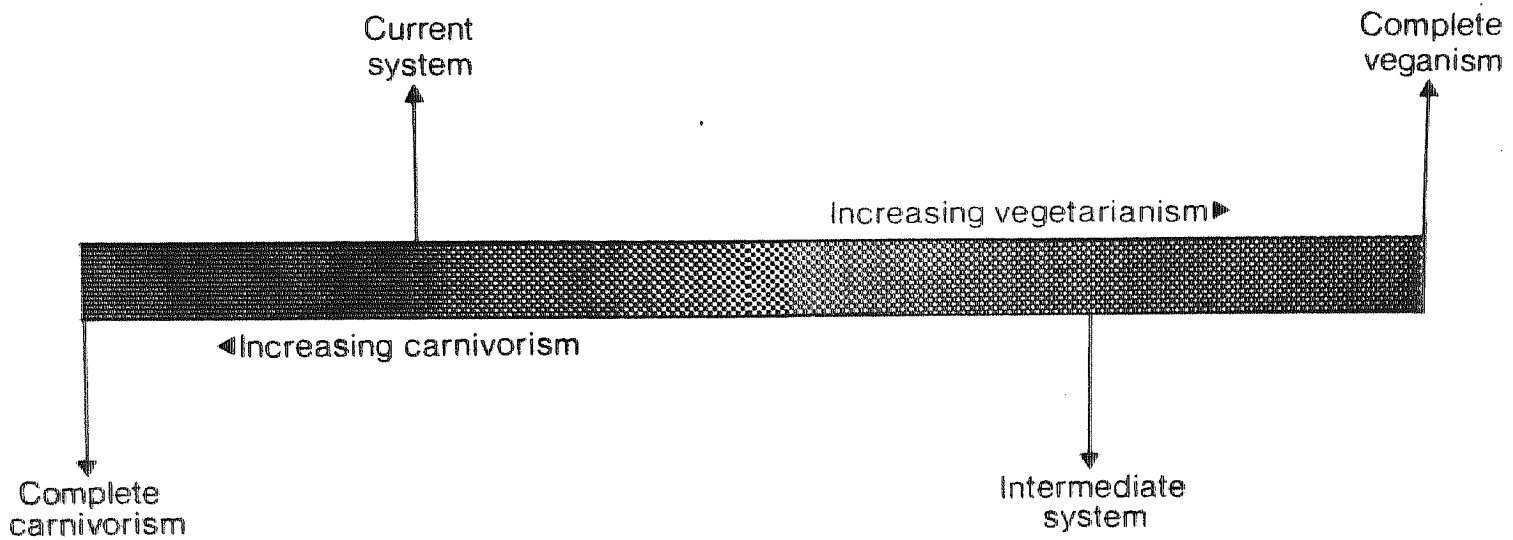



**Fig. 5.I**

**The vegetarian–carnivorism continuum**

dietary terms there is mounting evidence that the UK population consumes too much animal produce, but perhaps of more importance in the context of this study, the consumption of more meat would require increased imports of animals, meat and feed and other imports.

The Vegan system was chosen because it offers a number of advantages. Primarily, it can be easily defined, is simple to work with and acts as a boundary or limiting case. Furthermore, this study has been able to utilise the work of Susan Thompson[1] on a vegetarian cropping plan for England and Wales, undertaken in the Technology Policy Unit.

The second, Intermediate system was chosen because it was felt that although it was valid to examine the effects of an extreme vegetarian agriculture, it was too far from reality. The intention of the second alternative was to consider a strategy which bears some resemblance to the current system without relying too heavily on imports and could, possibly, be implemented.

## The current system of agriculture

This section is intended to give a brief sketch of the system of agriculture currently employed in the UK, and will serve as a control to which the alternatives can be compared. Time and space limit the extent of this description and little would be gained by a detailed analysis. There is a great deal of literature on the subject should more information be required.[2]

The United Kingdom of Great Britain and Northern Ireland has a total land area of about 24 million hectares, of which about 79% is used in agriculture. However, Table 5.1. shows that much of this is rough grazing land and has little potential for crop production.

Agricultural land is also categorised according to its quality. Land is graded as 1 or 2, which includes land suitable for the widest range of crops with the greatest productive potential; grade 3, which is valuable for cereals, roots and grass to moderately good for oats, barley, roots and grass; and grades 4 and 5, which are described as of 'limited potential'.[3]

In England and Wales, only 12% of the farmland falls into the top two categories; furthermore, Scotland possesses about two-thirds of the total rough grazing in the whole of Britain. Although Scotland has yet to be included in the Agricultural Land Survey, a rough approximation of the areas under the five grades in Britain can be estimated, as in Table 5.2.

Table 5.1: UK agricultural land use (1976)

| | Hectares ('000) | Acres ('000) | % of total |
|---|---|---|---|
| Crops and fallow | 4802 | 11866 | 19.9 |
| Temporary grass | 2314 | 5717 | 9.6 |
| Permanent grass | 4950 | 122232 | 20.5 |
| Rough grazing | 6768 | 16725 | 28.1 |
| Other | 312 | 770 | 3.0 |
| Total agricultural land | 19146 | 47310 | 79.4 |
| Total UK land | 24100 | 59600 | 100.0 |

Source: Economic Development Committee for Agriculture, Agriculture Into the 1980s: Land Use, NEDO, HMSO, London, 1977.

Table 5.2: Estimated land classification areas in Britain

| Grade | Area (million acres) |
|---|---|
| 1 | 1 |
| 2 | 15 |
| 3 | 16 |
| 4 | 7 |
| 5 | 17 |

Source: K. Mellanby, Can Britain Feed Itself?, Merlin Press, London, 1975, p 11.

A comparison of Tables 5.1. and 5.2. suggests that arable crops and temporary grass cover all the land of grades 1 and 2 and most of that in grade 3. Permanent grass would seem to be grown on grades 3 and 4, and grade 5 coincides with rough grazing areas.

Furthermore, the quality of land is distributed geographically throughout the UK and, hence, the type of agriculture practiced varies from region to region. There are other factors, such as climate, altitude, tradition, etc, which also help to determine agricultural practices.

The demand for land in the UK for industrial, urban, road, forestry and other uses is high. The Ministry of Agriculture, Fisheries and Food give a figure of 32000 hectares annual loss of agricultural land, with an additional 30000 hectares being afforested each year; many are becoming concerned by these excessive losses of agricultural land.[4]

It is now estimated that about 550000 people are employed in agriculture, representing about 2.6% of the total labour force, producing about 2.7% of the total UK Gross Domestic Product.[5]

By now it is well established that the UK is heavily dependent on imports for the continuation of its food supply. In broad terms, the UK produces about one-half of all its food

requirements, or about two-thirds of temperate foods, although many imported inputs are required to achieve this.[6] Table 5.3 summarises UK self-sufficiency levels for some commodities.

The pattern of food imports can be described briefly. Firstly, large quantities of animal feedstuffs are imported to support the intensive livestock industry. There are substantial imports of hard wheats from North America for the production of the characteristic 'British loaf'; U.K. wheat is used for animal feed, biscuits, cakes with a small amount used for bread making.

Vegetable oils, used for margarine, cooking oils, etc have been imported in large quantities, although oilseed rape will almost certainly be grown in increasing amounts.[7] However, there will be continued imports of oilseeds and beans, particularly soya, for which the defatted meal is a major constituent of animal feeds. The UK is also dependent on large imports of sugar cane to support its large refining industry, although this industry is currently in a state of great flux. It is almost certain that, with the present overcapacity and competition with sugar beet, cane imports will have to shrink.[8]

For animal products, again the situation varies. The UK is self-sufficient in milk, eggs, poultry meat and pork, but imports a considerable proportion of its butter, cheese, ham, bacon and lamb requirements.

Table 5.3: Quantities of home-produced as a percentage of new supplies, 1975-76

| Commodity | Percentage |
|---|---|
| Wheat | 58 |
| Barley | 90 |
| Oats | 92 |
| Oilseed rape | 49 |
| Sugar | 29 |
| Potatoes | 75 |
| Apples (not cider) | 46 |
| Pears (not perry) | 63 |
| Cauliflower | 86 |
| Tomatoes | 41 |
| Beef and veal | 89 |
| Mutton and lamb | 57 |
| Pork | 100 |
| Bacon and ham | 47 |
| Poultry meat | 102 |
| Eggs | 100 |
| Liquid milk | 100 |
| Condensed milk (full cream) | 112 |
| Milk powder (full cream) | 147 |
| Milk powder (skim milk) | 216 |
| Cream | 95 |
| Butter | 19 |
| Cheese | 60 |

Source: Ministry of Agriculture, Fisheries and Food, UK Food and Farming in Figures, HMSO, London, 1978.

The gross output of British agriculture was estimated at about £6000 million in 1976. Table 5.4 summarises the inputs and outputs for British agriculture. In terms of output value, livestock is by far the biggest contributor, followed by farm crops, milk and milk products and horticulture. The table also shows inputs and the calculated farming net income, which has been falling in recent years.[9]

Table 5.4: Output, input and net income of British agriculture, 1976 (£ million)

| Output | | Input | |
|---|---|---|---|
| Total crops | 1469 | Total expenditure | 3269 |
| Total horticulture | 596 | Gross input | 3240 |
| Total livestock | 2158 | Gross product | 2760 |
| Milk and milk products | 1295 | Depreciation | 600 |
| Eggs | 342 | Net product | 2160 |
| Other livestock products | 34 | Labour, rent and interest | 1002 |
| Sundry output and receipts | 76 | Farming net income (including stock appreciation) | 1835 |
| Produce grants | 114 | | |
| Work in progress | -19 | | |
| Output stock exchange | -16 | | |
| Gross output | 5999 | | |
| Final output | 5545 | | |

Source: Cmnd 7058, Annual Review of Agriculture 1978, HMSO, London, 1978.

## The vegan system

A vegan system was chosen as a suitable case for study for a number of reasons. Firstly, it can be easily and precisely defined. Veganism, as defined by the Vegan Society, is 'the practice of living on the products of the plant kingdom to the exclusion of all food and other commodities derived wholly or in part from animals'.[10] More specifically, Barkas defines a vegan diet as one 'which omits all animal foods but includes a mixture of unrefined cereal products, legumes, nuts, vegetables, and fruit supplemented with vitamin $B_{12}$'.[11]

Secondly, there was the availability of a recent study by Susan Thompson within the TPU.[12] This project was intended, in part, to complement Thompson's work; thus, it seemed both logical and convenient to study the effects of a vegan system on the UK's food trade and the balance of payments.

Thirdly, the exclusion of meat and animal products from the agricultural system reduces the number of variables involved, and simplifies its investigation. Finally, the study of the effects of a vegan system enables some conclusion to be reached on the effect of meat consumption on the balance of payments.

Thompson[13] constructed an alternative cropping plan for agriculture in England and Wales, which would yield food and nutrients capable of supporting the basal nutritional needs of the population of England and Wales entirely from plant sources. Table 5.5 shows the Initial Crop Plan constructed, compared

Table 5.5: Initial crop plan for England and Wales

| Crops | Hectares | % of Arable Area | % of Arable in 1973 | % of Arable in 1944 |
|---|---|---|---|---|
| Wheat | 1,378,270 | 24 | 19.8 | 21 |
| Barley | 1,585,130 | 27.7 | 33.2 | 12 |
| Oats | 305,573 | 5.4 | 3.4 | 15.3 |
| Rye | 41,549 | 0.7 | 0.1 | |
| Maize | 3,586 | 0.06 | 0.02 | |
| Early potatoes | 24,597 | 0.4 | 0.4 ) | 6.7 |
| Main crop potatoes | 175,669 | 3.1 | 2.7 ) | |
| Field beans | 62,978 | 1.5 | 1.1 | |
| Turnips and swedes | 24,510 | 0.4 | 0.8 | 3.3 |
| Cabbage | 22,407 | 0.4 | 0.04 | |
| Oilseed Rape | 47,559 | 0.6 | 0.2 | |
| Sugarbeet | 202,012 | 3.6 | 3.4 | 2.8 |
| Hops | 6,399 | 0.1 | 0.1 | 0.1 |
| Orchards | 57,446 | 1.0 | 1.0 | 1.8 |
| Small fruit | 13,317 | 0.2 | 0.2 | 0.2 |
| Open Air Vegetables | 254,357 | 4.7 | 3.2 | 2.7 |
| Glass house crops | 1,928 | 0.03 | 0.03 | |
| Flowers, bulbs, etc | 15,116 | 0.3 | 0.3 | |
| Other crops | 18,203 | 0.3 | 0.2 | 11.6 |
| Lucerne | 29,355 | 0.5 | 0.2 | |
| Grass (temp) | 1,301,552 | 23.0 | 26.0 | 20.4 |
| Fallow | 57,853 | 1.0 | 1.0 | |

Source: S. E. Thompson, The Potential For and Limitations Of a Shift From Animal-based to Plant-based Agriculture and Food Production in England and Wales, PhD Thesis, Technology Policy Unit, The University of Aston in Birmingham, 1979.

with the reality of 1973 and 1944, and Table 5.6 shows the potential output and the level of nutritional self-sufficiency from the plan.

The vegan system that is to be studied here is essentially that constructed by Thompson, with a few minor modifications. However, the study of the system requires certain assumptions to be made, and these are listed below.

1) Production and consumption of meat and animal produce excluded.
2) Trade in meat, animal produce and animal feed requirements excluded.
3) Trade in selected crops, vegetables and fruit permitted.
4) Only crops currently commercially cultivated in the UK considered.
5) Working area taken to be the 1973 arable acreage for England and Wales.

In keeping with the definition of a vegan diet, meat and animal products would not be produced or consumed under this regime. Consequently, imports and exports of animals, meat and animal products and the feedstuffs necessary to sustain the current livestock industry are excluded.

Although the cropping plan provides nutritional self-sufficiency, the inclusion of some imports of vegetables, cereals, other crops and fruit would be permitted. This would not only make the diet more palatable, but would also

Table 5.6: Potential output of energy and protein from plan and nutritional self-sufficiency

| Crops | Energy (MGJ = $10^{15}$J) | Protein (tonnes) |
|---|---|---|
| Wheat | 75.6 | 738642 |
| Barley | 86.0 | 442650 |
| Oats | 19.41 | 141712.5 |
| Rye | 1.7 | 9744 |
| Maize | 0.4 | 1615 |
| Early potatoes | 1.47 | 7241.4 |
| Main crop potatoes | 18.73 | 105736.4 |
| Field beans | 0.47 | 53352 |
| Turnips and swedes | 0.7 | 8692 |
| Cabbage | 0.6 | 15115 |
| Oilseed Rape (as oil) | 1.5 | - |
| Sugarbeet (as sugar) | 20.02 | - |
| Brussels sprouts | 0.4 | 9075 |
| Cauliflower | 0.2 | 5832 |
| Carrots | 0.8 | 5688 |
| Beetroot | 0.3 | 3092 |
| Broad Beans | 0.2 | 3957 |
| French and runner beans | 0.1 | 2445 |
| Green peas | 1.02 | 20857 |
| Dried peas | 1.29 | 22970 |
| Parsnips | 0.3 | 2535 |
| Onions | 0.4 | 3899 |
| Lettuce | 0.1 | 1874 |
| Watercress | 0.01 | 543 |
| Total (rounded) | 232 | 1607257 |
| with 30% wastage factor removed | 162 | 1125087 |
| Self-sufficiency (with waste removed) | 125% (87%) | 230% (161%) |

Source: S. E. Thompson, The Potential For and Limitations of a Shift From Animal-based to Plant-based Agriculture and Food Production in England and Wales, PhD thesis, Technology Policy Unit, The University of Aston in Birmingham, 1979.

allow some conclusion to be drawn on the value of imports saved by the elimination of the production and trade in animals, meat and animal products. Effectively, this system excludes the livestock industry.

However, this does raise another complication. Presumably, the continued imports of non-animal foods would be surplus to requirements - nutritional self-sufficiency has already been achieved. The effect would be surplus domestic production. To take account of this surplus production, one of two assumptions must be made:

1) The surplus could be exported.
2) Domestic production could be reduced.

For ease of calculation, it is simplest to assume that less would be grown at home. In effect this allows more margin for error but also underestimates the potential savings in imports.

Only crops currently cultivated on a commercial scale are considered. Although exotic crops such as sunflowers, lupins and soya beans are being tested, their potential in the UK is uncertain. However, oilseed rape is included. It has now become accepted by many farmers, particularly as a break crop and because of its value in the vegetable oil industry.

Although the working area of this system is taken to be the 1973 arable acreage of England and Wales, the trade figures used are for the United Kingdom of Great Britain and Northern Ireland. However, this does not present any serious

problems. The majority of the UK's arable acreage is to be found in England and Wales, as is most of the population. Furthermore, land is not the constraint that one would imagine. Thompson showed that England and Wales could become nutritionally self-sufficient by using only about 50% of the available agricultural land.[14]

## The intermediate system

The construction of the model for an intermediate strategy posed some of the most difficult problems encountered in the project. The desire to investigate another strategy was, in part, a result of dissatisfaction with the vegan strategy. Although a vegan system allows certain broad conclusions to be drawn, and is valuable in defining boundary conditions, it does not seem to be the most appropriate or practical system for the UK.

Firstly, the vegan system was studied because it offered a way in which the UK could overcome its reliance on imported food and feedstuffs. However, it is not necessary to stop meat production and consumption to achieve this goal.

It is right to question current practices of livestock production but the emotional rejection of the use of animals in agriculture is unscientific. There are ecological niches which only animals can fill. Firstly, many upland areas are only suitable for rough grazing. In the vegan system suggested above, about 50% of the agricultural land would not be used. Sheep and cattle could graze these areas without competing with humans for food. Furthermore, pigs and chickens could be fed on waste and household scraps.

Mixed techniques of farming are more efficient than monocultural farming methods because animal wastes could be

used as manures for crops, and surplus or waste crops can be fed to livestock. There are logical and ecological reasons for the inclusion of livestock in an agricultural system, and thus, the purpose of the intermediate system was to construct a model which recognised this but also did not rely on intensive rearing methods.

Another cause of dissatisfaction with the vegan alternative was its unrealism. The original cropping plan was designed to find out if it was physically possible to achieve nutritional self-sufficiency for the population from plant foods. However, the changes required to implement such a scheme would be enormous. Even the drastic position during the second world war was not sufficient to evoke a system as radical. But, the most critical factor, leaving aside the merits or disadvantages of a vegan diet, is that the population of the UK would never voluntarily accept the dietary, political and social upheaval involved, under normal social, economic and political conditions. The desirability and effects of the implementation of both the vegan scheme and the intermediate alternative are discussed in detail in Chapter 8. For now, it is enough to note that the intention of the intermediate system was to take account of these factors and attempt to present a more realistic, yet still radical, alternative.

## A rational agriculture

The desire for an agriculture which would produce a nutritionally healthy diet and use resources more conservatively prompted several writers, agriculturalists and ecologists to broach the subject. A spate of articles appearing in the mid-1970s with titles such as Can, Should or Must Britain Feed Itself, reflected the times.

Blaxter[15] proposed a reduction in the beef herd to a third of its current size and an increase of 30% in the dairy herd for milk production. He suggested that most dairy bred beef calves should be killed at or shortly after birth for low quality veal. The cereal and legume acreages should be increased and there should be widespread introduction of oilseed rape. Potato and sugar beet acreages would be increased by 70%. This would produce a diet with substantially less meat, fat, sugar and fruit but more dairy produce, vegetables, cereals and potatoes. The diet would perhaps be low in fat, despite the increased production of oilseed rape, but this would affect the palatability rather than the nutritional status of the diet.

Mellanby[16] argued that Britain currently produces about 15 million tonnes of cereals from 9 million acres, which alone would give the population 90 grams of protein and 3000 Kcal each per day, i.e. enough to support Britain on an uninspired diet. He suggested that the dairy herd should be maintained at around its current level, or even slightly increased,

providing butter, milk and some meat (about 1lb per person per week). The sheep flock would be maintained in upland areas but pigs, poultry and the pure-beef herd would be severely reduced. Wheat would have to be used as a direct human food, requiring bread to be baked with home grown wheat, and sugar consumption would fall to about 0.5 lb per person per week.

Watkin Williams[17] suggested a trade-off between livestock production and milk and egg production. The short-fall in protein, as a result of the drastic reduction in the beef herd, lowland sheep flock, pigs and poultry could be made up by doubling egg production and increasing milk production by 60%. He suggested an alternative for increasing protein supplies; protein rich grain crops such as peas, beans and home-grown oilseed residues could either complement or eventually replace the increased milk and egg production.

Tudge[18] describes a system which he calls a rational agriculture. A rational agriculture is defined simply as, 'one designed to make the best use of the country's own land, while meeting the nutritional needs and gastronomic aspirations of its people'.

Rational agriculture is founded on three principles:

1) It is designed to use energy conservatively and yet to produce as much human food as possible from the available land.

2) It reflects nutritional theory and is designed to produce food that nourishes people.

3) It is designed to meet gastronomic aspirations.

Tudge, constructing his rational agriculture along these lines, first outlined the nutritional and gastronomic requirements that must be met:

1) Energy - carbohydrate is the most convenient source.

2) Vitamins and minerals.

3) Protein and essential fat.

4) Meat, eggs and milk - not vital but desirable.

5) Green vegetables, fruit and salads - again desirable.

Tudge argues that, although human protein needs have been over-emphasised, it makes sense to ensure that the agricultural system is geared to protein production. The most productive protein source, i.e. the highest protein yield per hectare that can be used by humans and grown in the UK is the potato. About half a tonne of protein per hectare would be a reasonable yield. Furthermore, the protein/energy ratio is roughly what humans require. Thus, Tudge considers the potato as the outstanding staple crop.

Cereals and legumes would also be given high priority as staple foods because of their high protein yields per hectare. If a country based its food production around these three classes of food, Tudge believes the problem would be practically solved. The only other requirements would be for some micronutrients - vitamins, minerals and essential fats - and for

some exciting flavours.

Tudge imagines non-competitive livestock (cattle and sheep mainly, but possibly antelope, deer and horses) grazing on upland areas to produce small but significant amounts of lean meat, a small dairy herd supplemented by surplus crop production, and scavenging pigs and poultry fed on the waste from the system. Vegetables and fruit would be produced for vitamins and minerals, but also for their flavour.

The results predicted for this conceptually simple idea are extraordinary: an agriculture which would employ more people in interesting jobs, use less energy and resources, produce a soundly-based nutritional diet and enable an exciting cuisine to develop. Tudge has since followed his work on rational agriculture with a cookery book demonstrating the culinary possibilities.[19]

Tudge's reasoning seems logical and almost compelling but, attractive though his proposal for a rational agriculture may be, it is largely founded on common sense, supposition and speculation, and has little substantial evidence for support. Similar criticisms could be levelled at the other studies mentioned above.

However, the similarity of many of the ideas proposed in these studies suggests that this would be a reasonable starting point for the construction of an intermediate system. Sifting through the ideas, the intermediate system might:

1) Be largely crop-based.

2) Retain or increase sheep on uplands.

3) Have a smaller pure beef herd.

4) Have a smaller dairy industry.

5) Have a much smaller pig and poultry production capacity.

However, an analysis of this scheme is much more complex and would immediately introduce a variety of new variables and unknowns. For example, at what level should each type of livestock be set? And once the levels have been chosen, there would be immense problems in calculating the amounts of feed they would require. This would be an important part of calculating how much could be supplied from the vegetarian cropping plan and how much would need to be imported.

A system along the lines mentioned above was seriously considered but appeared to present too many analytical problems, and could not have been realistically tackled in the time available. However, it did indicate that the construction of the intermediate system would have to be less ambitious, and lend itself to analysis more easily.

This suggested that the intermediate system should utilise as much information as possible, accumulated from the vegan system, and that any other information necessary should be easy to obtain, manipulate or calculate.

In the light of this reappraisal, it was decided that the intermediate system would:

1) be an extension of the vegan system, retaining the previously devised vegetarian cropping plan;
2) not include pigs or poultry, but would retain sheep at 1976 levels;
3) have a dairy industry of the same magnitude as the 1976 levels;
4) not have a pure beef herd - meat would be obtained as a by-product of the dairy industry; and,
5) would assume current livestock husbandry practices.

Thus, the livestock numbers for the intermediate system were set as shown in Table 5.7. Some livestock, such as sheep and dairy cattle, have been included at the same level as 1976, so that data on their feed requirements were easily obtainable. Similarly, pigs, poultry and pure beef cattle have been excluded so that the amount of feedstuffs that they would not require can be simply calculated.

The retention of the vegetarian cropping plan means that the question of which crops and how much should be grown is already answered. Again, however, given that nutritional self-sufficiency has already been achieved, additional production of meat and dairy produce, and possibly imports of animal feedstuffs, might cause surplus domestic crop production. As before, it is assumed that some land would be taken out of food production if necessary; alternatively, food could be exported or the land could be used for timber.

Table 5.7: UK livestock numbers for the intermediate system (thousands)

| | 1976 | Intermediate |
|---|---|---|
| Total cattle and calves | 14069 | 4167 |
| Of which: dairy cows | 3228 | 3228 |
| beef cows | 1764 | - |
| heiffers in calf | 939 | 939 |
| Total pigs | 7736 | - |
| Total poultry | 134286 | - |
| Sheep and lambs | 28104 | 28104 |
| Ewes | 11215 | 11215 |
| Yearlings | 2487 | 2487 |

Source: Ministry of Agriculture, Fisheries and Food, UK Food and Farming in Figures, HMSO, London, 1977.

Current husbandry practices were assumed so that animal feed requirements per head would remain unchanged, allowing the calculation of new feeding requirements for the new levels of livestock.

Effectively, this intermediate system is a modified version of the vegan system. This affects the method of analysis since certain study areas do not need to be duplicated. The technique employed was to assess in what way the imports required by the vegan system would be altered by the inclusion of a dairy industry, and sheep on upland areas.

In what ways would the inclusion of sheep and dairy cattle alter the scheme? As previously mentioned, land would not be a constraint, since the vegetarian cropping plan would use only about 50% of the available agricultural land; the rest, suitable only for grass, would be ideal for sheep and dairy cows. The only other disruption would arise from the feedstuffs this livestock would require. Thus, after calculating the feedstuffs needed, it is necessary to calculate how much of this, if any, could be produced from surplus home production and what would need to be imported.

## Agricultural change and agricultural expansion

At this point it is appropriate to consider the vegan and intermediate systems against the background of literature discussed in Chapter 4. How do the systems I have constructed relate to the findings of Moore and Peters, Houston, Ritson and Phillips and others?

Although there are certain aspects of previous work that can be utilised, such as the concepts of gross and net import displacement, and real contribution to the balance of payments, there are some fundamental differences between the work of the 1950s and 1960s and this study. The important variations can be understood by describing the difference between agricultural expansion and agricultural change.

The work described in Chapter 4 was based on agricultural expansion. Past studies usually considered the effects on the balance of payments of a marginal expansion of domestic agriculture, along its present lines. Using conventional macroeconomic marginal analysis, most of this work examined the costs of producing a marginal increase in product. For example, in Figure 5.2, the additional output ($q_2 - q_1$) at an additional cost of $p_2 - p_1$, would displace a certain amount of imports. Then, depending on the assumptions made, some calculation would be made of the effect on the balance of payments, taking into account import saving, additional costs, etc.

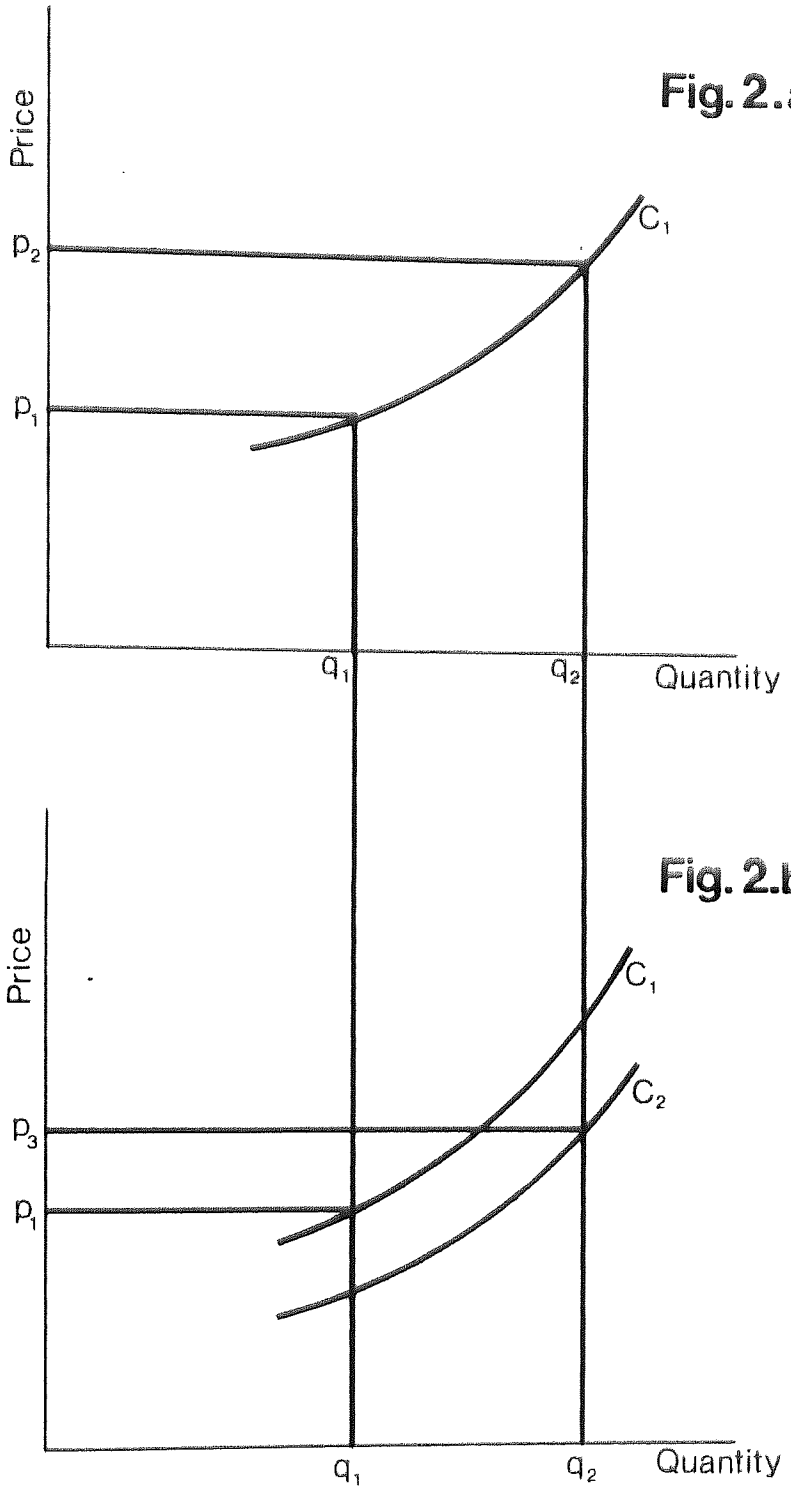



**Fig. 5.2**

**Improvement in productivity**

Source: C. Ritson, Agricultural Economics: Principles and Policy, Granada, London, 1977

However, the study being attempted here is based on agricultural change. Agricultural change differs from expansion in that an improvement in agricultural efficiency is involved. Ritson defines a technological (or productivity) improvement as:[20]

> ..... a change in the state of human knowledge which allows more of a product to be produced from a given combination of inputs, or alternatively, allows the same level of output to be produced using less of at least one input, with no increase in the use of other inputs.

A productivity improvement can be represented by a shift in the isoproduct curve away from the origin, i.e. $C_1 - C_2$, so that following the improvement, any given combination of inputs would lie on a higher isoproduct curve (see Figure 5.2). Thus, the same increased domestic consumption would be achieved at a cost of $p_3 - p_1$; it is possible that $p_3$ could even be less than $p_1$.

Care should be taken before assuming that because costs are reduced the quantity supplied will increase, because the fall in total cost associated with the productivity improvement may not necessarily increase with output, although it is certainly likely.

In what ways would the systems I have proposed offer an improvement in productivity? Firstly, by removing the livestock industry completely in the vegan plan, the population could be fed without the need for resources used in intensive feeding of livestock. By Ritson's definition, the same output

for reduced input equals increased efficiency. Similarly, the intermediate system includes less animals than the current system, requiring less resources. The importance of the way in which moves towards self-sufficiency are achieved when considering any effect on the balance of payments, is stressed by Ritson:

> It is often regarded as self-evident that an increase in agricultural self-sufficiency will 'aid the balance of payments', but whether or not a particular measure will improve our external balance depends on the reason for the deficit. At present we appear simply to be attempting to consume a greater value of goods and services than we produce, (following the rise in the price of oil). This means that an improvement in the balance of payments can only come about if we are prepared to cut our consumption or if we are able to increase production. For this reason, an increase in agricultural self-sufficiency which is brought about by an improvement in agricultural productivity or a change in food consumption habits would probably improve the balance of payments. An increase in agricultural self-sufficiency brought about by a diversion of resources to agricultural production or an attempt to force a change in food consumption habits, very probably would not.[21]

Now, referring to Table 4.2, further reasons why agricultural change rather than agricultural expansion may make a positive contribution to the balance of payments become evident. On the credit side, the vegan and intermediate systems have all the characteristics listed. The import savings accrued by the schemes are calculated in Chapter 6. UK monopsony power refers to the imposition of tariffs and the price of food imports, and UK monopoly power refers to the taxation of exports. Both B and C would be possible measures of enforcing an import saving policy and it is through such measures that the UK would improve its terms of

trade. Also, some exports would be foregone as a result of import saving and the import content of those lost exports would also be credited.

On the debit side, there are several differences. Since an increase in resource inputs into the plans is not necessary, resources would not need to be transferred from other sectors, i.e. there would be no opportunity cost in this case. Thus, E is not a debit of the vegan or intermediate systems.

However, the reciprocal and income effects (F), and the retaliatory measures (G) would still apply. The import content of the additional agricultural output should not apply, or be almost negligible.

Again, since resources do not need to be transferred, other sectors are not prevented from making import savings, and consequently,(I)does not apply. Finally, as a part of the calculation of import savings in Chapter 6, prices are automatically valued at 1976 import prices.

Thus, the contention is that the vegan and intermediate systems described in this chapter, being examples of strategies for agricultural change, facilitate import and other savings, but do not involve such great costs as the plans of agricultural expansion described in Chapter 4. It is, therefore, possible that the vegan or intermediate strategy could make a positive contribution to the balance of payments, when policies of agricultural expansion might not seem to be worthwhile.

# CHAPTER 6

## CONTRIBUTION OF THE STRATEGIES TO THE UK BALANCE OF PAYMENTS

This chapter is concerned with the effects of the implementation of the vegan and intermediate strategies, described in Chapter 5, on the UK balance of payments. The assessment of the strategies' contribution to the balance of payments is considered after calculation of the gross and net import savings of each strategy. Gross import saving is calculated by estimating the potential import substitution capability of the strategies and comparing this with the current levels of imports required for the present system of agriculture in the UK. The potential for import substitution of the vegan system takes account of the level

of domestic production facilitated by a modified version of the cropping plan, Thompson's cropping plan[1] and the composition of the planned diet for the vegan and intermediate regimes.

The calculation for the intermediate system is slightly different. By using the common elements, duplication of large sections of the calculation are avoided. By pinpointing the differences in imports required for the intermediate system, then an amendment to the gross import savings of the vegan system, rather than a complete recalculation, is all that is necessary.

When gross import savings have been calculated, net import saving can be estimated by calculating the value of exports foregone in each system and by a qualitative consideration of additional imports required for the systems. Finally, a consideration of the real contribution of the vegan and intermediate systems to the balance of payments is presented, taking into account gross and net import saving, exports foregone, additional import requirements, price and income effects, and retaliatory and reciprocal effects.

## Sources of information

The main sources of information for the calculations presented in this chapter were Thompson's plant-based cropping plan and the Overseas Trade Statistics[2]. Statistics for 1976 were chosen for two reasons: firstly, when the study was begun,

1976 statistics were the most recently available; and secondly, in that year, the trade statistics were presented in annual, cumulative volume for the first time.

The tables of imported savings that follow (6.1, 6.3, and 6.4) have been set out in a similar format to the Overseas Trade Statistics. Thus, the first column gives the item section number, referring to the commodity under consideration; the classification used is laid out in the Guide to the Overseas Trade Statistics.[3] Each major group of commodities is further subdivided as necessary. Thus, section 001 refers to live animals, and subsection 001.1 refers to bovine cattle (including buffaloes).

The second column gives a brief description of the commodity, or commodities, including any treatment or preparation received. The third column lists the quantity, usually in metric tonnes, of imports saved of each commodity. The fourth column evaluates the imports saved of each commodity in thousands of pounds sterling, at 1976 import prices.

## Import saving of the vegan strategy

Table 6.1 shows the gross import savings of the vegan strategy. Essentially, this table shows the decreased volume of imports required, valued at 1976 prices, for the vegan system. Table 6.3 gives the additional imports required, and Table 6.4 shows the exports foregone as a result of the implementation of the vegan system.

## Explanation of tables

Items in sections 001-013.8 represent automatic import savings since the vegan system completely excludes the production, consumption and trade of meat. Live animals (001-001.9), although not imported exclusively for the purpose of human consumption, are included for consistency; the non-food imports of live animals are most likely to be included in section 001.5 (horses, asses, mules and hinnies). However, since the UK is a net exporter of live animals, including animals in section 001.5, the involvement of live animals in the calculation is likely to depress potential import savings.

Items in sections 011-013.8 include all imports of meat and meat preparations; thus the exclusion of meat production, as shown in Table 6.1, represents a gross import saving of almost £1000 million.

The exclusion of dairy products from the vegan system (022, 023) allows gross import savings of more than £23 million

on milk and cream, and nearly £350 million on butter, as a result of the UK's heavy dependence on European and New Zealand butter, and about £127 million on cheese and curd imports.

The curtailment of egg consumption would mean a gross import saving of £5 million; however, the UK is a net exporter of eggs and, consequently, net import savings on this item would be negative.

The vegan system would not require any fish imports. Thus, exclusion fish and fish preparations allow a gross import saving of more than £191 million in sections 031 and 032.

The items considered so far have been fairly straightforward. It is apparent from its definition that a vegan system has no need for imports of meat, fish or dairy products; hence, gross import savings of these items can be easily calculated. However, the consumption of other foods are likely to be affected in more subtle ways. For example, wheat requirements will be affected in two ways. Firstly, the amount required for animal feed would be reduced to zero. Secondly, a vegan diet is almost certainly likely to contain a higher proportion of wheat, through increased consumption of bread and cereal products. Wheat import levels also need to take account of the amount that can be met by domestic production in the crop plan.

What would the UK's wheat requirements be in the vegan system? It can be seen from Table 6.2 that currently, on average, the UK utilises about 8.5 million tonnes of wheat per year. However, about 3 million tonnes of this goes solely to animals as feed. So, only about 5.5 million tonnes of wheat per year would be required if the livestock industry did not exist.

Under the crop plan for a vegan agriculture, the production of 5.5 million tonnes of home grown wheat would be easily attainable; in fact, the UK produced more than this in 1974/75 as shown in Table 6.2. But, the figure of 5.5 million tonnes assumes that there would not be an increase in the consumption of wheat as a result of the adoption of a vegan diet. Table 6.2 however, shows that the vegan cropping plan would allow the production of 8.7 million tonnes quite realistically, from 2000000 hectares at the modest yield of 4.35 tonnes per hectare. This would allow a 50% increase in wheat consumption.

In other words, the vegan system would allow the UK to become self-sufficient in wheat, even allowing for a 50% increase in wheat consumption. This does assume, of course, that much of the UK's home grown wheat that is currently used for animal feed would be used for human consumption. British wheat cannot be used to manufacture the typically British white loaf, which requires North American hard wheats. The British would have to get used to eating wholemeal bread.

Thus, the UK would not have to import any wheat. In 1976 the UK imported nearly 4 million tonnes; this would mean a gross import saving of almost £328 million. Currently, the UK produces about 7 million tonnes of barley per year, nearly all of which is fed to animals. Under the vegan system, much of the land used for barley production would be switched to wheat, but there would still be ample to cover human needs, mainly for the brewing industry. Thus imports would not be necessary enabling a further gross import saving of £48.85 million.

Maize is also imported mainly as an animal feed, but also for distilling. The UK's production of maize has been very small at about two or three thousand tonnes per year; in the vegetarian crop plan, only a small increase is planned. Thus, the amount produced in the vegan system would be almost negligible. The requirements of the distilling industry are about 1.7 million tonnes, and therefore gross import saving on maize would be nearly £145 million.

The position for rye and oats is similar to that of barley. Three-quarters of the UK's present oat production of 750 000 tonnes is fed to animals. Without the need to support a live-stock industry, oat requirements could easily be met by home production, allowing a gross import saving of £31 million.

The next important savings would come from potatoes. Potato production would be increased in the vegan system

allowing the UK to become self-sufficient. Thus, about £123 million would be saved. Fairly obviously, the next item animal feedstuffs would not be imported, saving a further £172 million.

The remaining sections of Tables 6.1 and 6.3 are concerned with the amount of vegetable oils and fats the UK would require in the vegan system. Firstly, the UK would not produce or import any animal fats of any description. Thus, our present consumption of margarine, butter and cooking fats would be replaced by the consumption of margarine and cooking oils produced entirely from vegetable oils.

It is important to note that, technically speaking, it is possible to produce margarine or cooking oils from almost any source of oil, be they animal or vegetable in origin. Currently, fish, palm, soya bean, sunflower, safflower, corn and other oils are used in either margarine or cooking oils. The most important factor governing the choice of which oil to use is price. The low quality margarines which claim no special nutritional status are produced from the cheapest oils - fish, palm and soya bean oil. Margarines high in polyunsaturated fatty acids (PUFA), thought to be nutritionally superior, include greater quantities of sunflower or safflower oil. Taste must be taken into account as well, but it is assumed here that there would be only minor organoleptic difficulties in switching from one source of oil to another.[4]

To simplify the analysis, current imports of margarine, shortening, oilseeds and animal and vegetable oils have been included in Table 6.1 as import savings, to be replaced by a new pattern of vegetable oil imports shown in Table 6.3. Thus, import savings in Table 6.1 amount to £2 958 632 000.

To calculate the amount of oil imports required under the vegan regime, it is necessary to look at household consumption statistics. From this source, it is discovered that the average Briton consumes about 300 g of fats per week.[5] Thus, the annual consumption of all fats is equivalent to about 800 000 tonnes.

In the vegan system, it is proposed that this amount of oil would be supplied in part by domestically produced rape seed oil, and imported soya bean and sunflower oil. In Thompson's original cropping plan, it was proposed that the UK would grow about 120 000 acres of oilseed rape. This acreage has actually now been achieved. Recent studies by Stanley[6] have indicated that the UK could easily grow 500 000 acres of oilseed rape, yielding about 500 000 tonnes of rape and 175 000 tonnes of rape oil.

This leaves 625 000 tonnes of oil to be supplied from abroad. Currently, the UK produces its oil and margarine mainly from imported beans or seeds, the extraction process taking place in the UK; the protein-rich residue is almost entirely used as a protein supplement in livestock feeding.

If the UK did not have a livestock industry it would probably be impractical to import soya beans to produce the 625 000 tonnes of oil required - unless a use could be found for about 2 million tonnes of defatted meat that would remain after the extraction process.

One suggestion is to increased production of textured vegetable protein (TVP) from this source of meal. But, two million tonnes of meal would produce nearly 6 million tonnes of rehydrated TVP, requiring every inhabitant of the UK to consume almost 4 lbs of TVP every day. Certainly a small increase in consumption could be expected, but since current UK consumption of TVP in human foods is of the order of 10 000 tonnes per year, the suggestion is unfeasible.

A simpler alternative would be to import the oil direct. Without a livestock industry it would make sense to import oil without the needless or unnecessary meal. However, this would have a major affect on the currently large UK capacity as an oil refiner.

There is one other aspect of vegetable oils to be considered before a decision can be made on imports. Of our present margarine consumption, about 8% contains oils high in polyunsaturated fatty acids. Soya bean oil, although of a higher quality than fish or palm oil, does not contain linoleic or linolenic acids in sufficient quantities necessary to produce margarines high in polyunsaturated fats. The best available supply of oil able to meet these

requirements is sunflowers. Margarines high in PUFA usually contain about 80% sunflower oil, giving them a PUFA content of about 54%.[7]

Therefore, to enable this trend to be continued in the vegan plan, it is proposed that the UK imports about 80 000 tonnes of sunflower oil per year, allowing the production of about 100 000 tonnes of high-PUFA margarine. This would represent about 12.5% of all oil consumption.

Thus, the remaining 550 000 tonnes of oil would be made up of imported soya bean oil. At 1976 prices, this would add £166 462 000 to the import bill shown in Table 3 - £133 650 000 for the soya bean oil and £26 812 000 for the sunflower seed oil.

From Tables 6.1 and 6.3, the total gross savings of the vegan scheme would be £2 958 632 000 - £166 462 000 = £2798 170 000.

Exports foregone

The restrictions imposed by the vegan system on consumption and production of animal goods and feeds would mean the loss of some exports. These are shown in Table 6.4. Many of the items which appear in import trading figures may actually not be destined for consumption in the UK, but may be intended for re-exportation.

In section 001, the UK exported about £62 million of live animals. Since the UK imported about £84 million of live animals the net import saving is reduced to about £22 million.

The loss of meat exports modifies gross import savings by a further £180 million. Therefore, the net saving from the restriction of meat consumption would be about £680 million.

The UK would also lose some revenue through the loss of milk, cream and egg exports, but this would be negligible in comparison with savings from butter and cheese.

Fish exports foregone amount to about £81 million reducing gross import savings on fish to about £110 million. There would also be small losses in the export of some cereals categorised in sections 041, 043, 044, 046, 047 and 048. It is possible that the vegan system would produce more barley than could be used in the UK, but any estimate of likely barley exports would be difficult. Again, with potatoes, a small export may be possible.

Under section 081, losses of animal feed exports are shown. However, it is possible that exports of wastes and residues from cereals could be exported as animal feeds.

Finally, margarine, oilseeds and oils are also included as exports foregone. The UK is almost certainly not the country of origin of these items, but their export would be

lost unless the UK were to import more than its needs, which I have calculated, and export any surplus.

Thus, from Table 6.4, exports foregone amount to about £680 million. Therefore:

Net Import Savings = Gross Import Savings - Exports Foregone

= £2 798 170 000 - £680 112 000

= £2 118 058 000

$$\% \text{ saving on food imports} = \frac{\text{Net import savings on food}}{\text{1976 food import bill}} \times 100$$

$$= \frac{2\ 118\ 058\ 000}{4\ 229\ 040\ 000} \times 100$$

= 50%

Import saving of the intermediate system

As outlined in the introduction, the calculation of import saving for the intermediate system is somewhat different. Having calculated the import saving for the vegan system, it is only necessary to pinpoint the different import requirements of the intermediate system to work out the import saving of the second plan.

The most likely changes to import requirements for the intermediate system would be as a result of the need for animal feeds. UK livestock consumed a total of about 18.7 million tonnes of concentrated feeding stuffs in 1976.[8] Of

this, 3.6 million tonnes was grown and retained on the farm of origin, representing about 20% of total needs. A further 11.35 million tonnes was manufactured in this country.

Feed requirements for the number of livestock proposed in the intermediate system would obviously be less than 18.7 million tonnes. Firstly, pig and poultry feed accounted for 52.3% of all compound feed production in 1976. Consequently, the loss of pig and poultry production would reduce the amount of compound feed needed to 8.8 million tonnes.

Of this amount, sheep would probably require only a relatively minor proportion. Current production of feeds for sheep represent about 2.6% of the total, i.e. about 500 000 tonnes. The requirement for the current level of cattle is about 8.3 million tonnes. But, in the intermediate system cattle would require less than this. Overall, it is proposed that numbers of cattle be reduced from 14 069 000 to 4 167 000. Of these, only the 3 228 000 dairy cattle would require any intensive feeding. A typical level of feeding would be about 1 tonne of concentrate per head per year, i.e. about 3 228 000 tonnes.[9]

Heiffers in calf would mainly eat hay and silage but, to allow for some feeding of concentrates, total requirements for cattle would be about 3.5 million tonnes. This, with the requirements for sheep would give a total of about 4 million tonnes.

Currently, compound animal feeds consist mainly of cereals and cereal by-products, with about 10-15% animal or vegetable protein products, molasses, and small amounts of fat, limestone, salt, minerals and vitamins (see Table 6.5).

What scope is there for the production of 4 million tonnes of compound animal feeds in the intermediate system? Firstly, there would be a supply of cereals. It is planned that about 6 million tonnes of barley would be produced. Only a small proportion of this would be required for human consumption, mainly in the brewing industry. Consequently, there would probably be enough barley alone to fulfil the cereal requirements of compound feeding for livestock.

In addition, the intermediate system would grow between 5.5 and 8.7 million tonnes of wheat. Although this would be mainly for human consumption, there would almost certainly be some feed wheat available. Furthermore, there would be a small amount of oats grown for which there would be little human demand. Thus, there would be an ample supply of cereals to meet animal feeding requirements in the intermediate system.

The second major component of compound animal feeding stuffs is protein, in the form of oilseed cake and meal or animal substances and protein concentrates. In the intermediate system, all protein would come from vegetable sources. Currently, the major source of vegetable protein is soya bean meal, a by-product of the vegetable oil and margarine industry.

Again, before an assessment of any import needs, an appraisal of domestic protein sources is necessary. In the vegan system it is planned that about 500 000 tonnes of oilseed rape would be produced. As already stated, this would produce about 175 000 tonnes of rape oil, and also about 325 000 tonnes of meal, with a fairly high protein content.

The protein meal requirement for the livestock levels proposed would be about 600 000 tonnes, leaving about 275 000 tonnes to be found from other sources.

In the vegan system the lack of a livestock industry, and a ready outlet for soya bean meal, determine that soya bean oil, rather than soya beans, be imported. However, the need for some additional protein meal in the intermediate system would require some soya beans to be imported. To produce 275 000 tonnes of meal, about 350 000 tonnes of soya beans would be required.

The oil produced from this amount of beans, about 70 000 tonnes, would also be more than adequate to cover the oil and fat needs of the livestock industry, and any remaining could go to human consumption.

Thus, the major components of compound animal feedstuffs could be produced from domestic sources, with the addition of about 350 000 tonnes of imported soya beans. This would add a further £42 million to the import bill, at 1976 prices,

and is shown in Table 6.6.

Thus, net import savings of the intermediate system would be £2 075 431 000. At first it seems surprising that the intermediate system has only a marginally smaller net import saving. However, it is quite logical. Firstly, there is land available for livestock included in the intermediate system, and secondly, there are large amounts of cereals, notably barley, available to feed them.

Perhaps it is best to consider that the livestock proposed in this intermediate system are simply filling an ecological niche. There would almost certainly be other complementary effects of a system involving livestock; these can be witnessed on any efficiently run mixed farm today. Waste from animals can be used for manure, and surplus or crops unsuitable for people can be fed to animals, for example. The major point is that livestock need not necessarily be a drain on resources as they most often are in the present UK system of agriculture.

Net import savings

As indicated in Chapter 4, the temptation to equate the concepts of import saving and real contribution to the balance of payments must be resisted. In terms of Houston's[10] definitions of gross import saving, net import saving and real contribution to the balance of payments, the calculations so far probably represent something between gross and net import saving. Although I have taken into account exports foregone and additional food imports, an estimation of imports of other items (e.g. fertilisers, seed, machinery, energy) is necessary for a true reflection of net import saving.

It was decided that only a qualitative impression of these factors was possible. The first point to stress in relation to this question is that both the vegan and intermediate systems assume that current technology would be used. This simplifies an assessment of any change in resource requirements.

Energy, because of its fundamental importance to the balance of payments, demands first consideration. One of the prime motives for studying the alternative systems of agriculture suggested in this thesis was that current Western agriculture was wasteful of resources, and no resource more so than energy. Examples to illustrate the wastefulness of our agriculture abound, but perhaps another, from Leach, will aid this discussion. Whilst primitive farmers, fertilising by manure and cultivating by hand produce between 5 and 50 calories of food for every calorie they expend, industrialised systems put

in 5 to 10 calories, primarily of fossil fuel, to obtain one calorie of food in return.[11] It is more sensible, energetically speaking, to produce crops rather than livestock, since livestock in Western countries consume food that could be eaten by humans, and merely convert it into a rather similar product (see Table 6.7). Thus, the vegan system, and the intermediate system without the intensive feeding of livestock would certainly require less energy inputs. However, estimation of potential energy savings is beyond the scope of this study. That savings could be made is certain, but at what level is difficult to say.

The use of fertilisers would be affected by the adoption of either plan. In the vegan system the use of fertilisers on permanent pasture would be stopped as they became agriculturally redundant; furthermore, as temporary grass would not be used to produce maximum output, little or no fertiliser would be required.[12] Similarly, the need for fertiliser for permanent and temporary grass in the intermediate system would also be reduced. It should also be noted that, should any additional fertiliser be required for arable land, there would be considerable amounts of plant waste produced in both systems. Less fertiliser would also reduce energy requirements.

There is nothing to suggest that seed requirements could not be met from domestic sources, since only crops currently cultivated in the UK have been considered.

Finally, there would probably be some change in the requirements for machinery. Current needs for sophisticated equipment in the livestock industry would disappear from the vegan system, and be severely reduced in the intermediate system. This would be offset, perhaps, by the need for more tractors, harvesters, etc for the increased production of crops. However, it would be impossible to quantify these changes and their effect on the import of machinery or parts. In principle, there would be no reason to prevent all additional machinery being made in the UK.

Thus, in terms of other resources, neither system would require any additional inputs, and so the calculations do give a reasonable estimate of net import savings.

Real contribution to the balance of payments

Houston[13] has defined the real contribution to the balance of payments as the difference between the net changes in the import bill and export earnings, adjusted for the impact upon import and export prices. The study of the literature discussed in Chapter 4 showed the complexity of trying to quantify the effects of a policy of agricultural expansion on import and export prices, affected by reciprocal trading effects, monopoly and monopsony power, and so on.

However, the discussion in Chapter 5 of the differences between agricultural expansion and agricultural change, does allow some conclusion to be drawn on the real effects of the vegan and intermediate systems to the UK balance of payments. Of those factors affecting real contribution, both the vegan and intermediate systems have the ability to allow an improvement in the terms of trade, through monopoly and monopsony power. Furthermore, both systems allow savings to be made on the import content of exports foregone to their credit. In debit however, both would affect the balance of payments through reciprocal and income effects, and retaliatory measures.

At best, the crediting factors would completely offset the debiting factors, equating real contribution to the balance of payments with net import saving. At worst, net import saving would probably be reduced by about 30%; according to Houston,[14] a policy of agricultural expansion

would produce a real contribution to the balance of payments roughly equivalent to 70% of the net import saving.

Thus, the most accurate estimations, considering all the factors, of the real contribution to the UK balance of payments of the systems studied are:

Vegan system: between £ 1 482 640 000 and £ 2 118 058 000

Intermediate system: between £ 1 452 801 000 and £ 2 075 431 000

Table 6.1: Gross import savings of vegan system

| Section | Description | Quantity (tonnes) | Value (x £1000) |
|---|---|---|---|
| 001 | Live animals | 146 584 | 83 974 |
| 001.1 | Bovine cattle (including buffaloes) | 103 214 | 49 628 |
| 001.2 | Sheep, lambs and goats | 2 776 | 1 159 |
| 001.3 | Swine | 37 683 | 18 149 |
| 001.4 | Poultry, live | 111 | 620 |
| 001.5 | Horses, asses, mules and hinnies | 2 799 | 14 333 |
| 001.9 | Live animals (chiefly for food) not elsewhere specified (NES) | 2 | 84 |
| 011 | Meat, fresh, chilled or frozen | 572 481 | 389 198 |
| 011.1 | Meat of bovine animals (fresh, chilled or frozen) (F, C or R) | 210 399 | 182 541 |
| 011.2 | Meat of sheep, goats (F, C or R) | 222 133 | 133 225 |
| 011.3 | Meat of swine (C or F) | 12 027 | 9 250 |
| 011.4 | Poultry, killed or dressed (including offals other than liver) (F, C or R) | 6 003 | 3 314 |
| 011.5 | Meat of horses, asses, mules and hinnies (F, C or R) | 36 | 24 |
| 011.6 | Edible offals or animals above (F, C.or R) | 113 248 | 58 840 |
| 011.8 | Fresh, chilled or frozen meat and edible offals not elsewhere specified | 8 635 | 5 004 |
| 011.81 | Poultry liver, (F, C or R, salted or in brine) | 80 | 40 |
| 011.89 | Meat and edible offals (NES, F, C or R) | 8 555 | 4 964 |
| 012 | Meat, dried, salted or smoked, whether or not in airtight containers | 265 009 | 227 808 |
| 012.1 | Bacon, ham and other dried, salted or smoked pig meat | 264 990 | 227 776 |
| 012.9 | Meat and edible offals, NES, dried, salted or smoked | 20 | 32 |

| Section | Description | Quantity (tonnes) | Value (x £1000) |
|---|---|---|---|
| 013 | Meat in airtight containers, NES and meat preparations whether or not in airtight containers | 214 636 | 221 492 |
| 013.3 | Meat extracts and meat juices | 2 159 | 2 992 |
| 013.4 | Sausages, whether or not in airtight containers | 11 856 | 12 389 |
| 013.8 | Other prepared or preserved meat whether or not in airtight containers | 200 621 | 206 111 |
| 022 | Milk and cream | 57 067 | 23 311 |
| 022.1 | Milk and cream (including buttermilk, skimmed milk and whey) Evap, condensed (in liquid or semi-solid form) | 11 564 | 4 682 |
| 022.2 | Milk and cream (including buttermilk, skimmed milk and whey) dry (in solid form) | 34 147 | 16 894 |
| 022.3 | Milk and cream, fresh (including buttermilk, skimmed milk, sour milk, sour cream and whey) | 11 356 | 1 735 |
| 023 | Butter | 397 897 | 349 201 |
| 024 | Cheese and curd | 147 230 | 126 880 |
| 025 | Eggs | 8 435 | 5 193 |
| 025.01 | Eggs, in shell | 4 732 | 1 895 |
| 025.02 | Eggs, not in shell and yolks | 4 063 | 3 298 |
| 031 | Fish, fresh and simply preserved | 126 240 | 94 707 |
| 031.1 | Fish, fresh, chilled or frozen | 114 471 | 78 459 |
| 031.2 | Fish, salted, dried or smoked but not further prepared | 2 274 | 1 346 |
| 031.3 | Crustacea and Mollusc, fresh, chilled, frozen, salted or dried | 9 495 | 14 902 |
| 032 | Fish in airtight containers (NES) and fish preparations whether or not in airtight containers (including crustacea) | 75 304 | 96 453 |

| Section | Description | Quantity (tonnes) | Value (x £1000) |
|---|---|---|---|
| 032.01 | Prepared or preserved fish, NES (including caviar and caviar substitutes) | 63 910 | 75 650 |
| 032.02 | Crustacea and molluscs, NES, prepared or preserved | 11 394 | 20 803 |
| 041 | Wheat | 3 802 333 | 327 923 |
| 043 | Barley, unmilled | 646 445 | 48 850 |
| 044 | Maize (corn) unmilled | 2 000 000 | 144 871 |
| 045 | Cereals, unmilled (other than wheat, rice, barley and maize) i.e. oats, rye | 414 876 | 31 789 |
| 046 | Meal and flour of wheat or meslin | 3 549 | 353 |
| 047 | Meal and flour of cereals other than wheat, etc | 11 089 | 875 |
| 048.1 | Cereal grains, flaked, pearled (breakfast foods) | 38 957 | 3 298 |
| 048.11 | Cereal grains, rolled, flaked, polished, pearled or kibbled: germs of cereals, whole, rolled, flaked or ground | 38 013 | 2 891 |
| 048.12 | PRD foods obtained by the swelling or roasting of cereal grains (e.g. puffed rice, corn flakes) | 944 | 407 |
| 048.2 | Malt (including malt flour) | 33 933 | 4 554 |
| 048.4 | Bread, biscuits, cakes (bakery products | 17 242 | 12 025 |
| 048.8 | Preparations of cereals, flour and starch for food (NES) | 20 609 | 8 519 |
| 054.1 | Potatoes, fresh (not including sweet potatoes) | 630 999 | 122 890 |
| 081 | Feeding stuff for animals (not including unmilled cereals) | 1 619 243 | 172 770 |

| Section | Description | Quantity (tonnes) | Value (x £1000) |
|---|---|---|---|
| 091 | Margarine and shortening | 194 840 | 55 290 |
| 221 | Oil seeds, oil nuts and kernels | 1 499 172 | 205 618 |
| 411 | Animal oils and fats | 323 131 | 69 010 |
| 421 | Fixed vegetable oils, soft | 53 803 | 19 157 |
| 422 | Other fixed vegetable oils | 432 477 | 98 080 |
| 431 | Animal and vegetable oils and fats, processed, and waxes of animal or vegetable origin | 45 909 | 14 543 |

TOTAL = 2 958 632

Table 6.2: Estimated total wheat supplies

| | | | | Vegan Plan | |
|---|---|---|---|---|---|
| | 1973/74 | 1974/75 | 1975/76 | Low | High |
| Production area (thousand hectares) | 1146 | 1233 | 1035 | 1500 | 2000 |
| Yield (tonnes per hectare) | 4.36 | 4.97 | 4.34 | 4.12 | 4.35 |
| Production (thousand tonnes) | 5002 | 6130 | 4488 | 6180 | 8700 |
| Imports (thousand tonnes) | 3080 | 3176 | 3984 | 0 | 0 |
| Exports (thousand tonnes) | 56 | 52 | 310 | 0 | 0 |
| Total supplies (thousand tonnes) | 8026 | 9254 | 8162 | 6180 | 8700 |

Source: MAFF, Output and Utilisation of Farm Produce in the UK (1968/69-1975/76), HMSO, London, 1977, p8.

Table 6.3: Additional imports required for vegan system

| Section | Description | Quantity (tonnes) | Value (£1000) |
|---|---|---|---|
| 421.2 | Soya bean oil | 550 000 | 133 650 |
| 421.6 | Sunflower seed oil | 80 000 | 26 812 |
| | | TOTAL = | 160 462 |

Table 6.4: Exports foregone in the vegan system

| Section | Description | Quantity (tonnes) | Value (x£1000) |
|---|---|---|---|
| 001 | Live animals | 53 826 | 62 392 |
| 011 | Meat, fresh, chilled or frozen | 171 203 | 171 261 |
| 012 | Meat, dried, salted or smoked, whether or not in airtight containers | 2 298 | 2 231 |
| 013 | Meat in airtight containers, NES and meat preparations, whether or not in airtight containers | 9 703 | 8 547 |
| 022 | Milk and cream | 229 054 | 79 112 |
| 023 | Butter | 16 029 | 18 071 |
| 024 | Cheese and curd | 10 732 | 9 158 |
| 025 | Eggs | 11 836 | 8 654 |
| 031 | Fish, fresh and simply preserved | 138 852 | 70 283 |
| 032 | Fish, in airtight containers, NES and fish preparations, whether or not in airtight containers (including crustacea and molluscs) | 12 038 | 10 877 |
| 041 | Wheat (including spelt) and meslin, unmilled | 85 659 | 6 636 |
| 043 | Barley, unmilled | 198 035 | 15 861 |
| 044 | Maize (corn), unmilled | 44 082 | 3 229 |
| 045 | Cereals, unmilled, other than wheat, rice, barley and maize | 10 898 | 929 |
| 046 | Meal and flour of wheat or meslin | 30 769 | 3 924 |
| 047 | Meal and flour of cereals, except wheat and meslin | 3 974 | 519 |
| 048 | Cereal preparations and preparations of flour and starch of fruits and vegetables | 313 717 | 102 228 |

| Section | Description | Quantity (tonnes) | Value (x £1000) |
|---|---|---|---|
| 054.1 | Potatoes, fresh (not including sweet potatoes) | 67 709 | 13 428 |
| 081 | Feeding stuff for animals (not including unmilled cereals) | 316 765 | 45 151 |
| 091 | Margarine and shortening | 15 090 | 7 873 |
| 221 | Oil seeds, oil nuts and oil kernels | 14 924 | 3 582 |
| 411 | Animal oils and fats | 17 571 | 7 339 |
| 421 | Fixed vegetable oils, soft | 19 275 | 5 990 |
| 422 | Other fixed vegetable oils | 8 889 | 3 450 |
| 431 | Animal and vegetable oils and fats, processed, and waxes of animal or vegetable origin | 60 166 | 19 387 |
| | | TOTAL = | 680 112 |

Table 6.5: Estimated quantities of raw materials used in the manufacture of compound animal feeding stuffs in the UK (thousand tonnes)

| | 1975 | 1976 | 1977 |
|---|---|---|---|
| Wheat | 2383.3 | 2206.5 | 1932.1 |
| Barley | 1841.2 | 2125.6 | 2176.5 |
| Maize | 1226.1 | 1715.4 | 1819.0 |
| Oats | 95.8 | 106.9 | 98.8 |
| Sorghum | 259.8 | 271.8 | 132.5 |
| Wheat by-products | 1035.3 | 1042.4 | 1000.6 |
| Oilseed cake and meal: | | | |
| High and medium protein | 935.5 | 1147.7 | 1090.9 |
| Low protein | 92.9 | 160.1 | 161.2 |
| Animal substances and protein concentrates | 636.7 | 594.0 | 558.1 |
| Oil and fat | 83.2 | 89.7 | 94.2 |
| Molasses | 417.5 | 479.0 | 443.3 |
| Other (including minerals, vitamins, limestone, salt) | 1584.8 | 1805.5 | 1436.3 |
| Total | 10592.2 | 11744.6 | 10943.5 |

Source: UKASTA Information Service, Do You Know?: Facts and Figures about the UK Compound Animal Feeding Stuffs Industry, United Kingdom Agricultural Supply Trade Association Ltd, 3 Whitehall Court, London SW1A 2EQ, November 1978, p 9.

Table 6.6: Additional imports required for intermediate system

| Section | Description | Quantity (tonnes) | Value (x£1000) |
|---|---|---|---|
| 221.4 | Soya beans (excluding flour and meal) | 350 000 | 42 627 |

Table 6.7: Energy ratios for a range of outputs from UK farms

| Crops | Energy ratio |
|---|---|
| Average wheat | 3.35 |
| Average potatoes | 1.57 |
| Fresh peas | 0.94 |
| Milk (from friesians) | 0.374 |
| Poultry meat | 0.10 |

Source: Gerald Leach, Energy and Food Production, IPC Science and Technology Press, Guildford, 1976, p 97.

# CHAPTER 7

## THE ROLE OF THE FOOD INDUSTRY

This chapter looks at the nature and development of the UK food industry and its role within the strategies discussed in the thesis. The chapter begins by looking at the state of the industry and discusses the controversy surrounding current products and methods of promotion. A case study of an example of innovation in the food industry is then presented in two parts: a general view of the technical innovation in textured vegetable proteins, nutritional aspects, etc; and, a specific example of marketing a novel product -Cadbury-Typhoo's Soya Choice. The chapter concludes with a view of the potential for the food industry within the strategies.

## The nature of the UK food industry

The average British consumer is more dependent on processed foods than anybody in the rest of Europe.[1] This is most certainly a result of the comparatively low level of agricultural self-sufficiency in the UK. Consequently, the food manufacturing industry has assumed a prominent role in the economy, and affects consumers' food choice to a degree unprecedented in the rest of Europe. Consumers' expenditure on food and beverages was estimated to be about £16000 million in 1977, with expenditure on manufactured foods about £6000 million.[2]

Thus, the market for the food industry is large, but it is not without its problems. As described in Chapter 2, a number of factors conspire to make the overall market for food fairly inelastic. Furthermore, changes in dietary habits and population have recently caused the market to shrink. Evidence suggests that the market is probably shrinking by about 2% per year.[3]

The food industry is constantly adapting itself to trends in consumption habits. These consumption changes occur as a result of changes in lifestyle, wealth, aspirations, experiences in different foods, and nutritional awareness.[4] The increase in the number of working women, for example, has greatly influenced eating habits. Fewer cooked breakfasts are eaten and evening meals have become lighter. There is a trend away

from formal lunch-time meals towards lighter pub meals and sandwiches. These eating and working habits imply that people need to eat a far greater number of snacks and convenience foods - a habit not overlooked by the food industry.

Foreign holidays also have their effect. Holiday makers who experience foreign foods can recapture the spirit of far-away places by eating in foreign restaurants in the UK. Consequently, the number of Italian, Greek, Indian, Chinese restaurants and 'take-aways' has risen rapidly, mainly run by immigrants who have settled here. This trend also allows food manufacturers to market more exotic foods, often in a convenient form, e.g. curries, Italian-style sauces, etc.

The food industry is not slow to capitalise on opportunities presented to it by such trends. For one thing, their survival depends on it; an inelastic and shrinking market guarantees fierce competition.

Food manufacturers compete for sales by two main methods. First, by looking for opportunities presented by changes like those mentioned above or in new technology, they saturate the market with new product lines, usually by adding as much value to their raw materials as possible. In 1950 there were about 1500 new products launched; by 1974, that figure was about 10000.[5]

It is difficult to assess how many serious product ideas food manufacturers have. Cummings[6] estimates that 'only a little over 1% of the research projects ever result in a product being launched onto the consumer market'. Also, launching a product does not guarantee success; probably only one in ten launches is considered to be commercially successful.

The second technique of the food industry is to back their proliferation of new lines with heavy advertising. Of the estimated £362 million spent on advertising in the UK in 1973, £88 million was spent on food products - the largest amount on any single product group. In 1979, advertising on food products was estimated to be about £120 million. About 40% of this was devoted to 'between-meal snacks', reflecting the industry's increasing desire to capitalise on changing social habits.[7]

Advertising and the food industry is a controversial subject, arousing accusation from consumerists, journalists, writers, the occasional academic and the health lobby; the sensitive food industry's spokesmen defend themselves with immovable reason.

A common complaint is that processed foods are low in nutritional value, contain too many additives and that advertising is used to make the public familiar with products that the food industry wants the public to eat.

The food industry often takes the stance that the consumer simply does not understand what is good for them. One representative of the food industry believes that:

> The work of the food scientist is probably as misunderstood today as Galileo's revelation to his contemporaries that the world was indeed not flat.... tell (the public) that any part of (their food) has been touched by science and you will probably confirm their worst suspicions about the unspeakable chemicals the food industry is putting into their steak and kidney pie and peas.... we have indeed a communication gap of gargantuan proportions between the food scientists and the public.[8]

Tudge[9] argues that, although criticism is heard from dispersed groups, it is not surprising that a communications gap exists since the only consistent voice heard is that of the food industry through the media. The food industry argue that the gap should be bridged by 'public education', but Tudge thinks that their advocacy of their products smacks more of indoctrination. The food industry feels justified in heavily advertising their products claiming that consumers are conservative by nature and will not buy their new products unless they are made aware of their benefits. But, history demonstrates that the public have been quick to take up many new products: cornflakes almost replaced porridge for breakfast in less than 50 years; tea, coffee and chocolates became established in a few decades; canned foods were only invented in the 19th century; and convenience and frozen foods have rapidly become established.[10]

The food industry plays down the issue as much as possible, arguing that in such a large industry the odd complaint is to be expected. In general, the food industry argues that consumers are traditionally conservative, need educating about their products and that the food industry acts in the consumers' best interests.[11]

While even the most vehement of the industry's critics would not doubt the sincerity of most working in the food industry, it must be said that this immovable position of the food industry is shortsighted. In the next few years, the food industry may be compelled to take more notice of its critics by the implementation of new regulations on food additives, labelling of products and health issues.

## Influences on the food industry

The food industry in Britain has had to take account of many influences in recent years. Although it can be argued that the food industry is the primary cause of a trend towards the increasing consumption of convenience foods, nevertheless, the food industry has had to move with the times.

It could be that many changes are in store for the food manufacturers. One criticism, already mentioned, is that the industry fails to take account of nutritional factors in their products. Indeed, Ulbricht believes that 'the separation of palatability from nutritional value has been

brought to a fine art by the food industry'[12]. But, at least in the UK, there are indications that consumers are now more nutritionally aware and demand foods of greater nutritional value. For example, increases in the consumption of wholemeal bread, muesli, margarines high in polyunsaturated fatty acids (PUFA), and the decrease in sales of soft drinks, chocolates and confectionary may be signs of unrest.

Furthermore, this growing unrest is almost certain to be backed by increasing legislation. Stricter regulation of food additives and the labelling of products to include nutritional information loom large on the horizon for the food industry.[13] And, as understanding of dietary-related diseases increase (e.g. the relationship between saturated fat intake and coronary heart disease) food manufacturers may be compelled to rethink many of these products either by public or legislative pressure.

But, the food industry is usually quick to respond and adapt to new conditions, and although the appearance of a Mother's Pride wholemeal loaf may not be the answer, it does show that the food industry is aware of this trend.

The food industry in the UK is also showing greater perception of longer term policy issues. The industry has recognised that it was not prepared for the effects of the accession of the UK to the EEC.[14] It seems to have become less competitive than its European competitors and some sectors have fared particularly badly in the 1970s (e.g. processed meat, processed fish, dairy

produce, cane sugar and margarine). Some would argue that this was as much a result of UK government policy as the effect of the CAP.[15] However, with the accession of Greece, Portugal and Spain at different stages, the UK food industry has shown its willingness to consider the possible pitfalls and potential opportunities available in the second enlargement of the EEC.[16]

This open-minded attitude would be essential if the food industry were to develop its role to its full potential within the context of either the intermediate or vegan strategies described in this thesis. A case study of innovation in the British food manufacturing industry is now presented, as an example of the way in which technological and economic opportunities may be grasped. The study is in two stages: first, a review of the manufacture, nutritional aspects and legal requirements in respect of textured vegetable proteins; and second, an examination of the marketing of a novel product - Cadbury-Typhoo's Soya Choice.

Textured vegetable proteins: a case study of innovation in the food industry

Soya beans have been used as a source of food for centuries in south-east Asia, but the development of textured vegetable proteins is comparatively recent. What were the reasons for the innovation? Was it in response to a demand for a cheap and nutritious food?

In the late 1940s Robert Boyer stumbled upon the texturing properties of soya beans. Boyer had no connection with the food industry at the time. He was actually working to discover new raw materials for fibres for use in the manufacture of motor car tyres for the Ford Motor Company.[17] Boyer examined the gelatenous properties of wheat gluten, casein and egg albumen before his work with soya protein.

First, he isolated the soya protein from the beans by extracting the oil, dispersing the remaining meal in alkali and removing the insolubles in a centrifuge. The residue was treated with mineral acid to bring the protein to its isoelectric point, precipitating the protein. After centrifugation and washing the protein was about 95% pure. Boyer dispersed this isolate in an aqueous alkali solution to produce a dope suitable for texturing. The texturing process used is similar to the technique of spinning man-made fibres.[18]

Thus, the incentive to develop textured vegetable proteins was generated by a technological opportunity, following a serendipitous discovery. However, once the food industry realised the potential that TVPs might have as food products, the nature of the innovation altered. There was now a potential market that demanded the availability of a cheap, easily manipulable, nutritionally adequate and profitable product.

Soya beans

The soya bean plant, Glycine maximus, is a legume and has been a traditional source of food in many parts of the world, particularly south-east Asia, for centuries. It has long been used by the Chinese, the first mention being in The Heavenly Farmer by Emperor Sheng-Nung in 2038 BC.[19] There are a whole range of products of oriental origin still in use. The beans can be mixed with cereal and fermented to make soy sauce, or shoyu. They can be made into a milk, and then into a form of yoghurt, cheese and a soya bean curd known as tofu. Finally, miso is produced from soya beans and cereal grains fermented with salt and water and is used in soups and sauces.

News of the soya bean was first brought to Europe by the German botanist Engelbert Kaenfer, after a visit to Japan in 1692. They were not introduced to the USA until Commodore N. C. Perry returned from Japan in 1854.[20] However, they were not particularly popular in the West at that time.

Although the Soya bean's statistics look impressive (see Table 7.1), the simple fact of the matter is that it does not taste very good. It was not until this century that scientific research indicated the nutritive value and variety of uses of the bean. With the growth in the cooking oil and margarine industry the soya bean has become established as the most important source of vegetable oil.[21] It has also been used increasingly in the baking industry as a dough improver, because of its high-protein, low-carbohydrate properties.[22]

Soya beans have a high yield per acre and are relatively easy to produce. Consequently, their production statistics are also spectacular. Production in earnest did not begin in the USA until the beginning of the 20th century, yet by 1930 about 380 000 tonnes were being produced.[23] More recent figures of the enormous increase in world and US production are shown in Table 7.2.

More recently, countries like Brazil and Argentina have joined the ranks of soya bean producers and exporters. Brazil's production in 1978/79 was about nine million tonnes.[24] Imports to the UK of soya beans and products have also increased as shown in Table 7.3.

When the oil is extracted from the bean, for use in the manufacture of cooking oils and margarines, a protein rich

Table 7.1: Analysis of soya bean (%)

| | |
|---|---|
| Oil | 19.63 |
| Crude protein | 42.78 |
| Carbohydrate | 7.96 |
| Ash | 4.99 |
| Crude fibre | 5.52 |

Source: A. M. Altschul, Processed Plant Protein Foodstuffs, Academic Press, New York, 1958.

Table 7.2: World and US production of soya beans (million tonnes)

| | US production | World production |
|---|---|---|
| 1960 | 14.5 | 25.9 |
| 1961 | 15.1 | 25.1 |
| 1962 | 18.0 | 28.4 |
| 1963 | 18.2 | 28.2 |
| 1964 | 19.0 | 28.3 |
| 1965 | 19.1 | 28.1 |
| 1966 | 23.0 | 32.2 |
| 1967 | 25.3 | 34.8 |
| 1968 | 26.6 | 36.5 |
| 1969 | 30.0 | 39.8 |
| 1970 | 30.4 | 40.6 |
| 1971 | 32.7 | 43.6 |
| 1972 | 34.6 | 52.3 |
| 1973 | 42.1 | 62.3 |
| 1974 | 33.6 | 56.8 |
| 1978 | 50.9 | 82.5 |
| 1979[a] | 61.7 | 98.4 |
| 1980[b] | 48.3 | 85.8 |

Note: [a]estimate; [b]forecast.

Source: USDA Economics Research Service, Fats and Oils Situation, various issues; FAO, Food Outlook, No 11/12, 1980; Correspondence with Dr. D. A. Jonas, Food Science Division, Ministry of Agriculture, Fisheries and Food, 13 April 1977.

Table 7.3: UK imports of soya products (million tonnes)

| | Cracked dehulled beans | Oilcake and meal |
|---|---|---|
| 1965 | 0.282 | 0.248 |
| 1966 | 0.282 | 0.216 |
| 1967 | 0.249 | 0.164 |
| 1968 | 0.237 | 0.193 |
| 1969 | 0.319 | 0.147 |
| 1970 | 0.360 | 0.248 |
| 1971 | 0.302 | 0.317 |
| 1972 | 0.530 | 0.217 |
| 1973 | 0.767 | 0.176 |
| 1974 | 0.791 | 0.290 |
| 1975 | 0.742 | 0.250 |
| 1976 | 1.116 | 0.208 |

Note: 1 tonne soya beans gives about 0.9 tonnes cracked dehulled beans and 0.73 tonnes oilcake/meal.

meal remains. The main use of this meal is as a high protein supplement for animal feed.[25] Alternatively, this residue may be upgraded by concentrating the protein, and then given texture by a number of techniques such that it resembles foods already consumed by people; this is usually in the form of meat but can also be made to resemble pieces of fruit or dessicated coconut, for example. These products are generally known as textured vegetable proteins.[26]

Drawbacks of soya beans

The development of textured vegetable proteins has tried to capitalise on the positive aspects of the soya bean and sought to overcome those negative characteristics that have restricted its use to south-east Asia. The major drawbacks of the soya bean are associated with:

- Antinutritional factors
- Organoleptic qualities
- Flatulence

Soya beans exhibit a number of antinutritional characteristics, the most important being protease inhibition (i.e. the inhibition of digestion of dietary protein by enzymes in the small intestine) and agglutination of red blood cells.[27] Soya beans also contain a group of substances called glycosides which, although harmless in themselves can be altered to goitre-inducing agents (goitrogens) or can release toxic levels of cyanide (cyanogens).[28]

It had been long known that it was necessary to cook soya beans; the discovery of a heat-unstable trypsin inhibiter in 1945 seemed to explain the reason why.[29] But, later research has shown that protease inhibition is vastly more complex than realised; it is still not fully understood. However, the process can be summarised thus: trypsin, secreted by the pancreas aids the breakdown of proteins in the gut. Pancreatic secretion is regulated by an inhibition-feedback mechanism which depends on the level of trypsin in the small intestine. Negative feedback inhibition can be suppressed if the trypsin is complexed with the inhibitor or even with the dietary protein itself.[30]

The food industry is acutely aware of the flavour problems of soya beans, since it is a property that they must overcome in textured vegetable proteins. Representatives of the industry point out that flavour is the most important factor limiting the use of soya protein in foods.[31] Terms used to describe off-flavours present in soya protein products include 'beany', 'grassy', 'green-pea', 'bitter', 'nutty', 'sweet', 'astringent', etc.[32] Most people find these flavours unpleasant, to say the least, and consequently considerable food industry research has taken place on ways of improving the flavours of soya products.

The other major drawback of soya beans, like many other legumes, is that they have a tendency to cause excess flatulence in humans. Since the food industry's interest in textured vegetable proteins they have also studied flatulence. An example of their studies is given below:[33]

..... the subjects consistently reported a higher incidence of intestinal gas production during the soya diet period. We wanted to express these findings in an objective way, and made standardised sound recordings on 20 men in sound-proof rooms after test meals. The ear clearly discriminates the different characteristics of the sound tracks, and the recordings on paper are visibly different, but efforts to express these differences in numbers for further evaluation failed.

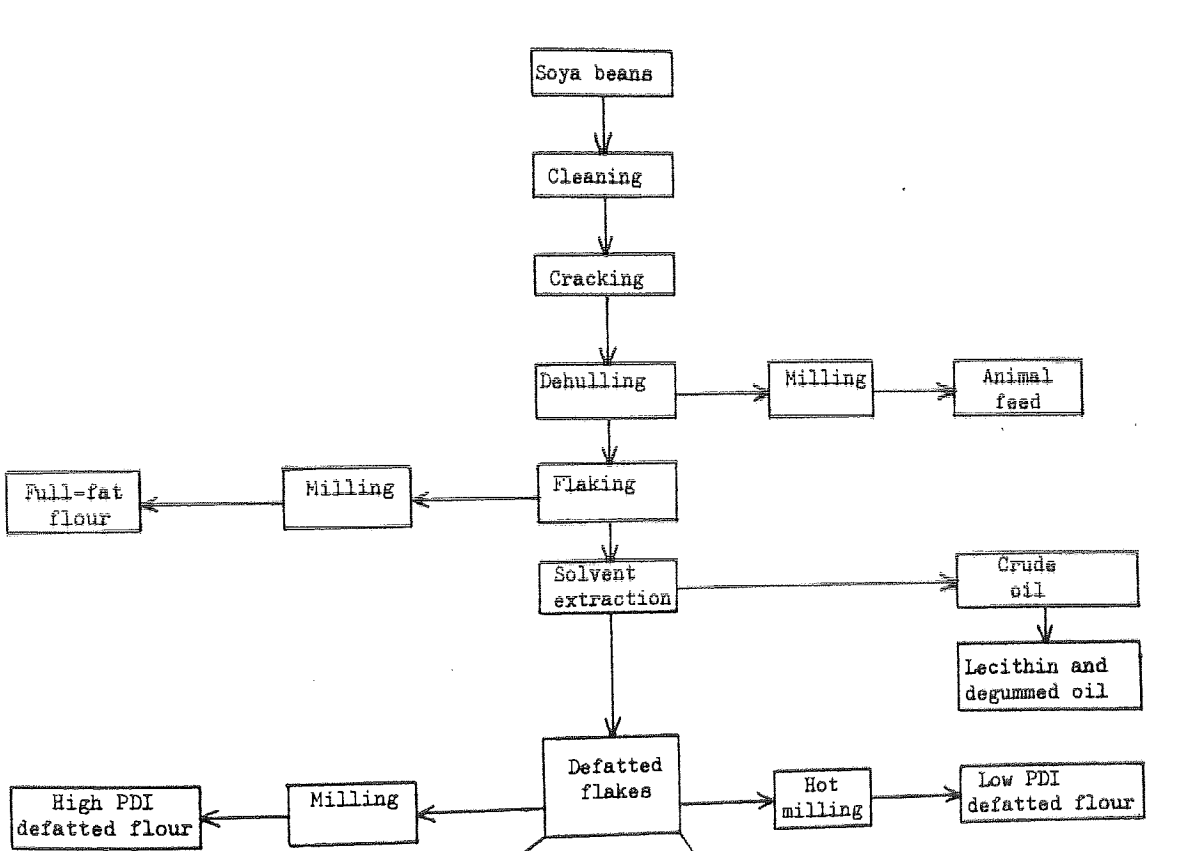
## The manufacture of textured vegetable proteins[34]

There are a number of methods of generating texture in vegetable proteins but the two most important techniques are thermoplastic extrusion and spinning. Figure 7.1 shows the different stages in the processing of soya beans and illustrates that the two processes use different raw materials.

## The spinning process

Figure 7.2 depicts a typical process for the spinning of protein fibres. The raw material for the spinning process is a concentrated form of the vegetable protein. Thus, the first stage is the production of a protein isolate, which usually consists of between 85 and 95% protein.

The technique of extracting vegetable protein from the defatted meal is well known. The meal is first treated with dilute alkali. Insoluble residues are removed by centrifugation or filtration, and the protein is precipitated at the isoelectric point. The protein can then



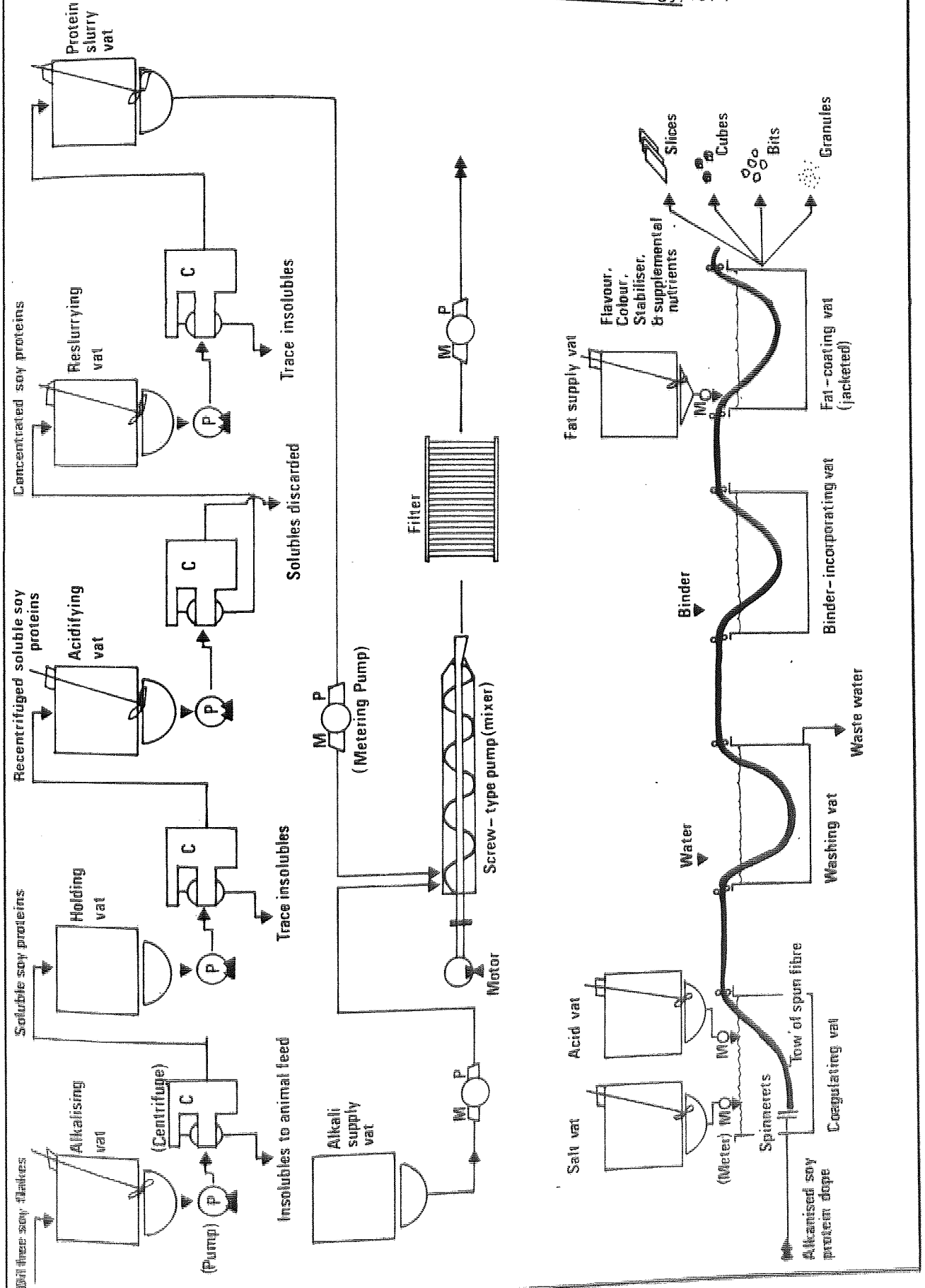

# Fig.7.1

**Soya bean processing**

Source: Pagington, op cit, Ref 17

# Fig. 7.2
## Protein fibre spinning

Source: A.M. Altschul, New Protein Foods, Vol 1a, Technology, 1974



be collected by further centrifugation. This preparation by solvent extraction is now the most popular although it is possible to press the meal hydraulically; however, this tends to denature the protein.

The first spinning process, applied to foodstuffs, was used by Boyer in the late 1940s and early 1950s. The process he adapted from the spinning of man-made textiles remains largely unchanged.

To produce a satisfactory fibre, the protein must be modified by treatment with an alkali of pH 10-11. This maintains the strength of the precipitated protein so that the fibres do not break when formed. However, prolonged exposure to alkali causes the nutritive value of the proteins to decrease, and also produces more off-flavours. When the protein has been dissolved in alkali, additives such as vegetable oil, flavourings or colourings can be incorporated. It has been found that it is better to include some additives before spinning.

After mixing and filtering, this alkalised soya protein dope is ready for spinning. The dope is forced through a porous membrane, known as a spinnaret, borrowed from the rayon spinning process. The spinnaret is simply a small die made from platinum which has between 5 000 and 15 000 holes punctured in it, rather like a sieve; each hole is about 0.075 mm in diameter.

The expressed fibres pass directly into an acid-salt bath. Although the acid coagulates the fibres, at this stage they are still extremely weak. Salts present in the bath assist the stabilisation of the fibres. The acid is usually lactic, acetic or citric, and the salt is usually sodium chloride.

The coagulated fibres are stretched by means of rollers rotating at a variety of speeds; the amount of stretching can vary from between 50 to 400%. This stretching orientates the fibres such that elasticity and strength are added to the threads, known at this stage as a tow. The tow passes through several other baths which wash the fibres, incorporate a binder (such as casein, wheat gluten or albumen, to hold the filaments together) and coat the fibres in a vegetable fat, mainly for aesthetic purposes. At this stage, further additives can be incorporated into the fibres, such as stabilisers, supplementary nutrients such as vitamins, minerals, amino acids and again, flavourings and colouring.

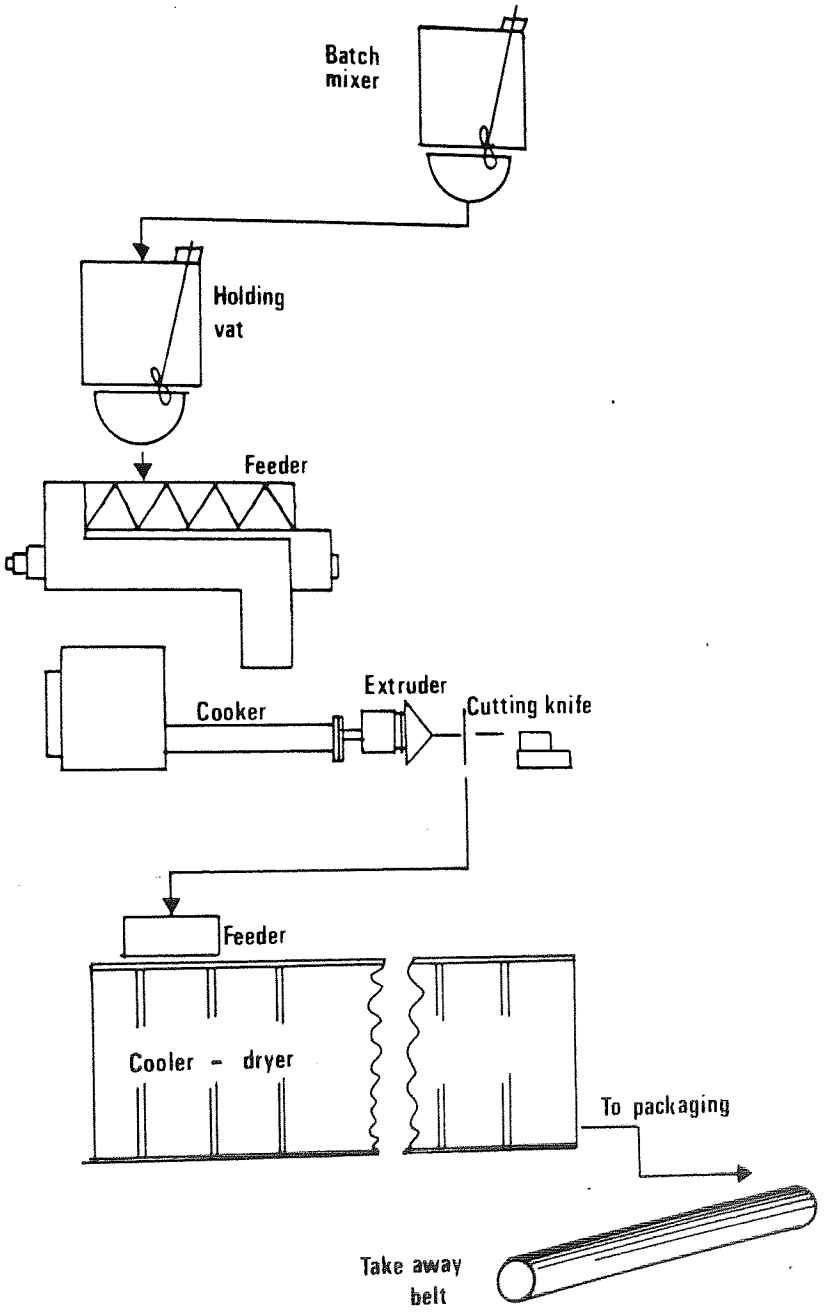
The tow is then cut into the required form (slices, chunks, granules or fines). The size of the final product can also be determined by the size of the spinnaret holes. Finally the product must be preserved and this is usually done by freeze-drying.

## The extrusion process

As Figure 7.3 shows, the extrusion process is more simple than the spinning process. The basis of the process is a thermoplastic extrusion technique. The feedback for the extruder is based on a plasticised mixture containing defatted soya flour, with a protein concentration of about 50%.

The process begins by the preparation of the dough, which usually consists of a mixture of the defatted soya flour, water and any flavouring or colouring required. The dough passes to the thermoplastic extruder where it is subjected to a pressure of between 70 and 700 kg per $cm^2$, and temperature of between 115 and 180°C. A high pressure is preferred since it gives better cohesion and structure retention in the final product.

When this temperature and pressure are reduced suddenly, the superheated moisture trapped inside the dough vaporises. As the vegetable protein emerges from the hole in the end of the extruder, the vaporising moisture causes a rapid expansion. The result is an expanded textured product containing about 8% water. As it emerges from the die it is cut with rotating knives to the required size. Unlike the spun vegetable protein, the extruded product is simply cooled and packaged.




# Fig.7.3

**Extrusion cooking of protein**

Source: A.M Altschul, New Protein Foods, Vol 1a, Technology, 1974

## Other texturing methods

There are several other techniques for texturing vegetable proteins, but none have found such widespread use as the two methods described above.

Proteins are capable of forming gels when they undergo a treatment of protein dispersion by the adjustment of pH and solids content. A gel precursor is formed which can become a heat-stable gel on heating. Shaping of the chewy gel is achieved by moulding, pressing or extruding followed by cutting. A binder usually holds the particles together and this can be skimmed milk powder, casein, albumen, soya flour, wheat flour or starch.[35]

Texture may also be produced by beating. A textured simulated meat can be produced by rapid orientation and coagulation of the vegetable protein under certain conditions.[36] Another technique, known as film drying, produces dried sheets from an aqueous slurry of oilseed protein. The sheets can then be flaked and mixed with an aqueous emulsion of fat. The protein flakes become hydrated by the water in the fat, producing the texture.[37]

## Comparing spun and extruded textured vegetable protein

A number of factors contribute to the differences between the spun and extruded vegetable proteins. These differences affect the production costs of the products and, consequently, the uses of the products.

First, spun vegetable protein uses the protein isolate as its feedstock whereas extruded vegetable protein uses defatted soya flour. The isolate, being more concentrated, is obviously more expensive to produce than the defatted soya flour.

Second, the preparation of the dope for the spinning process requires great care and attention, and is far more sensitive than the dough used for extrusion. The whole spinning process requires higher levels of capital, energy and skilled personnel than the comparatively simple extrusion procedure.

Third, the finished spun vegetable protein must be preserved by drying or, more usually, freeze-drying. In the extruded form, excess water is flashed-off such that a preservation stage is not needed.

Extensive figures of energy use and costs of manufacture do not seem to be widely available, except in relation to the costs in producing fresh meat. However, one estimate of the total energy required for the production of 1 lb of textured vegetable protein, presumably by extrusion, is shown in Table 7.4. The energy for growing soya beans is included and also packaging and cooking.

Henig and Schoen estimate that the energy input into producing fresh meat is higher than that of a meat analogue by a factor of 4. Although costs vary, it is usual for the spun

Table 7.4: Total energy required for 1lb of textured vegetable protein

| | Energy (Btu/lb) |
|---|---|
| Soya flour | 330 |
| Soya oil | 520 |
| Egg albumen | 1 200 |
| Other ingredients | 250 |
| Processing | 3 000 |
| Packaging | 2 000 |
| Distribution and cooking | 5 000 |
| Total | 12 300 |

Source: Y. S. Henig and H. M. Schoen, 'Meat analogs vs fresh meat', Food Engineering International, Vol 48, September 1976, p49.

protein to cost between two and three times as much as the extruded form.[38]

The two products also perform differently. In terms of flavour, the spun protein is considered to be superior since more of the beany off-flavours are removed during processing. Furthermore, the spun protein seems to take up and retain any additional flavouring or nutrients more effectively than extruded products. Structurally, the spun form resembles the fibrous nature of meat more so than extruded vegetable protein, which is said to have a spongey characteristic.[39]

For these reasons, the textured vegetable protein manufacturers and users usually classify the two forms separately; they maintain that they fulfil two different roles, thus:

- Spun textured vegetable protein is designed for use in meals as a complete meat replacement; i.e. as a meat analogue.
- Extruded textured vegetable protein is designed to replace only part of the meat in a meal; i.e. as a meat extender.

Nutritional aspects of textured vegetable proteins

The intention of this section was to provide a complete appraisal of the nutritional quality and value of all the

textured vegetable protein products available on the UK market. It was hoped that, in the light of the information on nutritional content, the assessment of textured vegetable proteins on nutritional grounds would be straightforward. However, research led me to conclude that this was neither possible nor would it be particularly enlightening. Problems were encountered in obtaining information on some products. Often, when data were available, they were incomplete, incompatible with other data, conflicting or unsound.

Thus, a decision was taken to limit the analysis of nutritional content to something less ambitious: the analysis now highlights the problems inherent in the information available, takes account of current awareness of human nutrition and pinpoints the main issues of the nutritional aspects of textured vegetable proteins.

## Analysis of nutritional content

From the beginning of the analysis of nutritional information of textured vegetable proteins, problems were encountered. The study, of course, had to be based on secondary information sources - the collection of my own experimental data was quite impractical. Information gathered from the manufacturers[40] and other sources proved disappointing on a number of grounds, which will be brought out below.

During this fairly lengthy initial period, it was discovered that three independent sets of data existed for one product. British Arkady's product, TVP, had been analysed, apparently, on three occasions: by British Arkady;[41] by the British Food Manufacturing Industries Research Association (BFMIRA);[42] and, by Rank Hovis MacDougall, who distributed the product through their subsidiary, McDougall's, under the name Protena.[43]

A comparison of those three sets of data with data for other traditional foods could bring out the main areas of concern for textured vegetable proteins and illustrate the information problems.

Table 7.5 gives a chemical analysis of TVP from British Arkady, BFMIRA and Rank Hovis MacDougall's Protena with milk, egg and beef. Raw beef steak is shown because it is a direct competitor to textured vegetable proteins and a comparison on nutritional grounds has been a large part of the manufacturer's evidence in support of the value of their protein products. Milk and egg are included because they have been considered to have an appropriate nutrient content for a healthy human diet. The British Arkady and Protena data have both been adjusted for comparison on a moisture-free basis.

Table 7.5: Chemical analysis on moisture free basis (g/100g).

| | Whole milk | Whole egg | Raw beef steak | TVP (BFMIRA) | TVP (British Arkady) | Protena |
|---|---|---|---|---|---|---|
| Protein | 26.1 | 48.5 | 60.3 | 54.3 | 55.3 | 56.5 |
| Carbohydrate | 37.0 | 3.3 | 0 | 34.7 | 33.5 | 32.6 |
| Fat | 28.4 | 43.2 | 32.5 | 1.0 | 1.1 | 1.1 |
| Ash | 5.3 | 3.7 | 3.1 | 6.5 | 6.9 | 6.5 |
| Fibre | - | - | 0 | 3.3 | 3.2 | 3.3 |
| Calories (per 100 g) | 506 | 511 | 553 | 298 | 280 | - |

Source: B. K. Watt and A. D. Merrill, Composition of Foods, Raw, Processed, Prepared, USDA Agriculture Handbook No 8, 1963; R. A. McCance and E. M. Widdowson, The Composition of Foods, HMSO, London, 1967; M. R. Ashton, C. S. Burke and A. W. Holmes, Textured Vegetable Proteins, Scientific and Technical Surveys No 62, BFMIRA, Leatherhead, 1970; TVP Analytical Data, British Arkady Col Ltd; Protena Analytical Data, Rank Hovis MacDougall.

The first point to note about Table 7.5 is the difference in the figures for the textured vegetable proteins. These are not three different products, but one product with three different sets of data. Although the figures do not conflict heavily, their reliability must be questioned. The table shows that the textured vegetable protein has a protein content of about 55%, comparing favourably with beef; about one-third carbohydrate, similar to milk; and about 1% fat. It is worth noting that other textured vegetable protein products claim protein contents of between 50 and 70%, 20-35% carbohydrate, 1-2% fat, 5-7.5% ash, and 0-4% fibre.

The energy value of the products is considerably lower than the traditional foods, although other textured vegetable proteins claim calorific values of up to 470 calories per 100 g. The products are usually marketed in a dehydrated form (about 6-8% moisture) and are rehydrated to about three times their original weight.

Tables 7.6 and 7.7 show the mineral and vitamin content of the textured vegetable protein, again compared with milk, eggs and beef. The difference in the data for the vegetable protein products is again illustrated. Little can be concluded from these tables. However, in general terms the products seem to be adequate in mineral content apart from phosphorus and iron. The textured vegetable proteins lack any vitamin A and are lower in thiamine and riboflavin than the traditional foods.

Table 7.6: Mineral content mg/100g of product on dry basis

| | Whole milk[a] | Whole egg[a] | Raw beef[a] | TVP (BFMIRA)[a] | TVP (BA)[b] | Protena[c] |
|---|---|---|---|---|---|---|
| Calcium | 923 | 210 | 17 | 212 | 220 | 200 |
| Copper | 0.15 | 0.11 | - | 2 | 1.3 | 1.95 |
| Iron | 0.61 | 9.5 | 13.4 | 6.3 | 10 | 6 |
| Magnesium | 107 | 46.2 | 76.5 | 2659 | 260[d] | 2500 |
| Phosphorous | 730 | 819 | 862 | 680 | 570 | 640 |
| Potassium | 1230 | 518 | 1043 | 2606 | 2200 | 2450 |
| Sodium | 384 | 507 | 215 | 1595 | 700 | 1500 |

Source: [a]Ashton et al, op cit, Ref 34; [b]British Arkady, op cit, Ref 40; [c]McDougall's Catering Foods, op cit, Ref 40.
Note: [d] This figure would appear to be incorrect and should almost certainly read 2600.

Table 7.7: Vitamin content mg/100g of product on dry basis

| | Whole milk | Whole egg | Raw beef | TVP (BFMIRA) | TVP (BA) | Protena |
|---|---|---|---|---|---|---|
| Vitamin A[a] | 961 | 7692 | Trace | None | None | None |
| Thiamine | 0.3 | 0.7 | 0.15 | 0.22 | 0.62 | 0.21 |
| Riboflavin | 1.1 | 2.6 | 0.68 | 0.44 | 0.6 | 0.42 |
| Nicotinic Acid | 0.6 | 0.25 | 15.6 | 2.57 | 16.0 | 2.42 |

Source: see Table 7.6.

Note: [a]Quantities in international units.

The significance of these points is open to question. Although they do not conform exactly to the vitamin and mineral content pattern of either egg, milk or beef, this would only become significant if the products were substituted entirely for, say, meat. This would require, some say, the products or the diet to be fortified with either minerals, vitamins or other nutrients.

Amino acid content

This part of the study attempts to show the amino acid profiles of a number of textured vegetable products, compared with that of milk, egg, beef and a profile considered by the Food and Agriculture Organisation (FAO) and the World Health Organization (WHO) to be the optimum for humans.[44]

Considerable difficulty was encountered in trying to manipulate these data on amino acid contents. First, results were published in different units.[45] Second, often no indication was given of whether the products were fortified, flavoured, etc, which would affect the figures. Table 7.8 shows the essential amino acid content, expressed in mg/gN, of a range of products. These figures have, where necessary, been arithmetically converted to these units.

Interpretation of these figures should proceed with caution. As mentioned previously, doubt has been cast on the reliability of the data due to many factors. These include arithmetic conversion, uncertainty about what data actually

Table 7.8: Essential amino acid content (mg/g total N)

| Amino acid | FAO[a] | Whole milk[b] | Whole egg[b] | Beef[b] | TVP (BFMIRA)[b] | TVP (BA)[c] | Protena[d] | Ultra Soy[e] | County Farm[f] | Maxten[g] | Temptein[h] | Kesp[i] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cystine | 126 | 57 | 149 | 80 | 92 | 49 | 92 | - | 120 | - | - | 46 |
| Methionine | 144 | 154 | 197 | 150 | 68 | 72 | 68 | 80 | 90 | 87 | 91 | 173 |
| Cystine + methionine | 270 | 211 | 346 | 230 | 160 | 121 | 160 | - | 210 | - | - | 219 |
| Leucine | 306 | 630 | 553 | 490 | 471 | 489 | 471 | 463 | 460 | 528 | 575 | 512 |
| isoLeucine | 270 | 407 | 415 | 320 | 328 | 296 | 328 | 278 | 290 | 297 | 318 | 275 |
| Lysine | 270 | 496 | 403 | 510 | 368 | 380 | 368 | 371 | 290 | 381 | 366 | 424 |
| Phenylalanine | 180 | 311 | 365 | 260 | 334 | 312 | 334 | 311 | 310 | 322 | 336 | 381 |
| Tyrosine | 180 | 323 | 262 | 210 | 243 | 183 | 243 | - | 220 | 165 | 188 | 237 |
| Phenylalanine + Tyrosine | 360 | 634 | 627 | 370[j] | 577 | 495 | 577 | - | 530 | 487 | 524 | 618 |
| Threonine | 180 | 292 | 317 | 280 | 236 | 261 | 236 | 247 | 220 | 261 | 256 | 215 |
| Tryptophane | 90 | 90 | 100 | 80 | 85 | 41 | 85 | 82 | 80 | - | - | 56 |
| Valine | 270 | 440 | 454 | 330 | 359 | 314 | 314 | 287 | 310 | 294 | 296 | 357 |

Source: [a]FAO/WHO, op cit, Ref 44; [b]Ashton et al, op cit, Ref 34; [c]British Arkady, op cit, Ref 40; [d]MacDougall's Catering Foods, op cit, Ref 40; [e]Europroteins, op cit, Ref 40; [f]Craigmillar, op cit, Ref 40; [g,h]Miles Foods, op cit, Ref 40, [i]Courtaulds, op cit, Ref 40.
Note: [j]Obviously this figure should be 470.

refers to and the standardisation problems involved in analysing a protein for its amino acid content. There appear to be a number of methods of analysis which do not always produce results in agreement. Furthermore, it is often difficult to duplicate the results.

However, it is apparent from Table 7.8 that all of the products, except Kesp, are low in methionine when compared with any of the traditional foods or the FAO/WHO profile. Methionine and cystine, the sulphur-containing amino acids, are grouped together because they are, to some extent, complementary. Kesp has a fairly high methionine content because it has been fortified.

The decision to fortify Kesp is based on the fact that methionine is the limiting amino acid. This is best understood by means of an analogy. Figure 7.4 represents a bucket made up with staves of differing height. The staves represent the individual amino acids, and the contents of the bucket the amount of protein the body will absorb from a particular food. It is impossible to fill the bucket beyond the level of the shortest stave. In the same way, the relatively low level of methionine in soya beans prevents the body from fully utilising the other amino acids. The theory is then extrapolated: if the textured vegetable protein is fortified with methionine, then much more protein can be absorbed.[46]

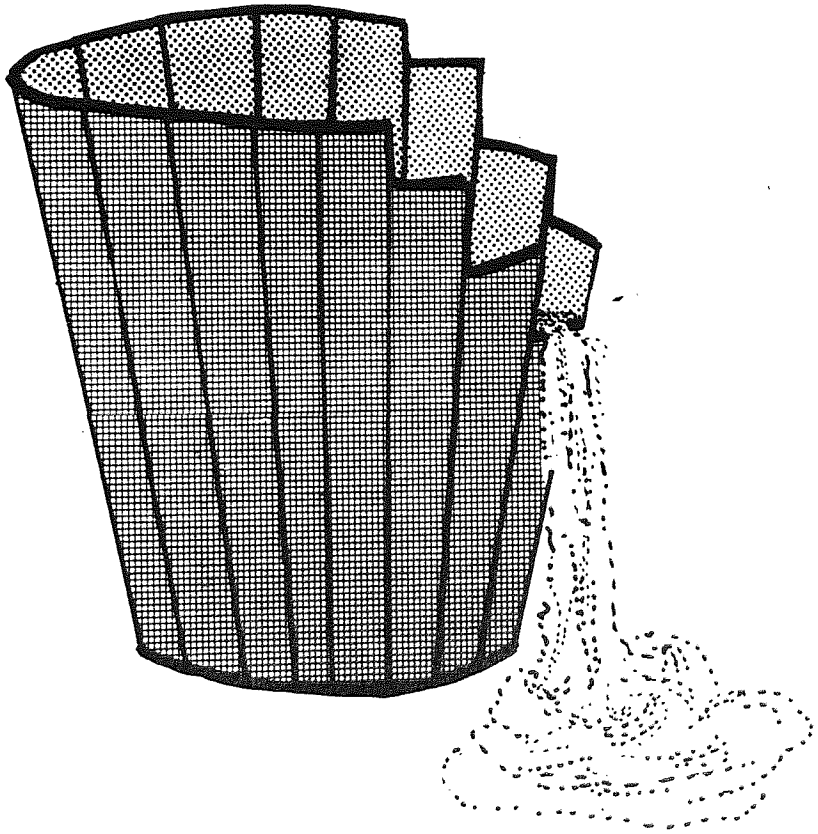


**Fig. 7.4**

**Concept of limiting amino acid**

Source: G. Borgstrom, World Food Resources, Intertext Books, 1973

## Legal requirements and fortification

The question of fortification is, again, a matter which provokes discussion and, very often, disagreement. The question can be considered in reference to a number of factors: technical, nutritional, organoleptic, aesthetic and legal. From the manufacturers' point of view, they are quite willing to comply with the current nutritional consensus providing it is technically feasible and does not affect their products' appearance or taste detrimentally.

However, many food and drug authorities believe that the general provisions of the Food and Drugs Act do not allow sufficient control over the use of novel foods.[47] In the UK the principle adopted by the food and drugs authorities is that any manufactured food which simulates a natural food should in all important respects have the same nutritional value as the natural food it simulates.[48]

The Food and Drugs Act does cover textured vegetable proteins in that it is an offence to sell food 'which is injurious to health or which is not of the nature, substance or quality demanded, or which is falsely or misleadingly described on the label or by advertisement'.[49] However, it is an 'enabling' act, much like the Health and Safety at Work Act, which relies upon many separate regulations prescribing minimum standards of composition for individual

foods, and controlling the use of additives or contaminants. Further protection to the consumer is granted under the Labelling of Food Regulations 1970,[50] particularly the requirement in Regulation 5 to state on the label of prepacked foods the common or usual name or an 'appropriate designation' of the food.

The Food Standards Committee, reviewing the use of unconventional sources of protein as food in 1974 recommended that there should be measures to control the use and labelling of novel proteins.[51] They pointed to the existing legislation and made it clear that in order to comply, manufacturers would have to state the substance from which the protein was derived (e.g. soya beans) with an indication of the physical treatment it had received (e.g. spun, extruded or, possibly, textured).

Recognising that these novel foods were likely to find their greatest use in the substitution of meat, the committee pointed to the specific provisions relating to the description and minimum meat contents of various meat products that would affect the use of textured vegetable protein products. These regulations include The Canned Meat Product Regulations 1967, the Meat Pie and Sausage Roll Regulations, the Sausage and Other Meat Products Regulations 1967, and the Fish and Meat Spreadable Products Regulations 1968. The report states that:[52]

> Unless and until these regulations are amended, if any novel protein food is used as a component of a defined meat product, it would be an offence for the product not to contain the specified minimum meat content.

The committee recommended that the replacement of meat by hydrated novel protein food be limited to a maximum of 30% of the statutory meat content. The report, recognising the increasing use of textured vegetable proteins in school meals, suggested that their use as substitutes should be limited to 10% in school meals.

In response to the view that textured vegetable proteins should be fortified with methionine, the FSC said:

> We recognise that a case could be made that, in view of the probably very limited replacement of meat by some form of novel protein food or food component in the next five to ten years, there is little immediate need to require reinforcement of the substitute material with added nutrients. This case would be especially strong in relation to the need to add methionine, in view of the very satisfactory protein intake of the UK.[53]

This recommendation undoubtedly pleased the food industry who were aware of the deleterious effect of methionine on the taste of their product. One manufacturer had a poor response from its initial launch in the Channel Islands using methionine-fortified textured vegetable protein.[54] However, the committee did recommend that:[55]

1. Textured vegetable proteins which simulate meat shall contain, on a dry weight basis, not less than 50% protein.
2. Textured vegetable protein foods shall contain not less than 2.6 g methionine per 100 g protein.
3. Textured vegetable protein foods shall contain per 100 g

dry matter, not less than:

10.0 mg iron

2.0 mg thiamine

0.8 mg riboflavin

5.0 mg vitamin $B_{12}$

These recommendations were updated by the Committee on Medical Aspects of Food Policy in 1980.[56] They reaffirmed that methionine fortification was unnecessary, that the levels listed above should be 20 mg, 2.0 mg, 1.6 mg and 10 mg respectively. They also recommended that there should be a minimum zinc level of 20 mg per 100 g protein. The recommended maximum level in institutional catering was increased to 30%.

During my discussions with manufacturers and users it seemed to me that the spun protein and extruded protein advocates were not totally in agreement over fortification. Spun protein manufacturers sought to exploit the advantages of their techniques (in taking up added nutrients more readily) by tacitly supporting legislation for minimum levels of nutrients. This, hopefully, would offset some of their higher manufacturing costs in the trade-off between price and a product which met legal criteria more easily and tasted better than the extruded opposition.

## Nutritional evidence

Initially I thought that it would be possible to decide whether textured vegetable protein products were acceptable as foods and should form a major part of the diet of this country purely on nutritional grounds: if they were nutritionally sound, they could replace large amounts of meat and, if not, then they should not be eaten at all. However, not surprisingly, the evidence does not allow such a categorical decision to be made.

Given our current knowledge of human nutrition and, in general, the tolerance of the human body, the average diet in this country is sufficiently high in protein and other nutrients for textured vegetable proteins to be eaten in substantial quantities - even if they are not nutritionally adequate in themselves.

Even if they are nutritionally sound, which they probably are, this alone does not allow a decision to be made on whether textured vegetable proteins should be eaten because this also involves ecological, economical, political, agricultural, sociological and cultural factors.

## Innovating and marketing a novel food product: Cadbury's Soya Choice

As described in Chapter 1, this research project was financed by a CASE award with the cooperation of Cadbury-Typhoo Ltd. This cooperation enabled me to study the progress of one of their food products as it was launched and to piece together how the decision to produce the product was made. This was achieved mainly through discussion with Dr. W. A. W. Cummings (Technical Director) and Mr. D. Gwyther (New Products Development Marketing Manager). Discussion also took place with many others involved in marketing, research and development, the library and information service, consumer research, forecasting, and the foods advisory service. Other information was obtained from internal working documents.[57]

Cadbury-Typhoo Ltd became interested in the production of soya-based foods in late 1973. However, this was not the first time that the use of textured vegetable proteins had been considered. Before Cadbury's and Schweppes merged in March 1969, both were involved through subsidiaries in manufacturing tinned meat products. Culrose, a subsidiary of Cadbury's, was largely involved in manufacturing cold meat products, and Harvey's, owned by Schweppes, are remembered mainly for the inventive, but expensive 'duo-can'.[58]

These products were entirely of animal origin but, around 1968, both companies were simultaneously trying to reduce their manufacturing costs, and one of the ideas was to incorporate some TVP into the meat product. These tinned meats were competing against the successful dried products produced by Batchelor's under the name Vesta. However, the plan to use TVP made little progress simply because legislation on minimum meat contents were too strict. It would only have been possible to introduce TVP into the recipe in addition to the existing meat, and could not be used to substitute for any of the meat. This, quite obviously, would not allow any reduction in manufacturing costs.

One member of the company interviewed hinted that one reason why the TVP products did not receive much attention in 1968, was because of the lack of interest of the marketing department. Apparently, the research and development on TVPs was quite advanced even in 1968.

Culrose and Harvey's are no longer part of the Cadbury-Schweppes conglomerate: Culrose was sold before the merger in 1968 and Harvey's was sold after the merger in 1970-71.[59] It is puzzling, at first, to understand why Cadbury-Schweppes sold these meat interests when they quite clearly wanted to diversify from producing chocolates and confectionery into the meat market. It is worth pointing out that the confectionery market is shrinking slowly, and that trend is expected to continue.[60]

So, Cadbury-Schweppes were looking for the right vehicle to move into the meat-market, and neither Culrose or Harvey's offered the right opportunity. The cost of developing Culrose into a viable manufacturing plant would have been prohibitive. It was also said that there was a lack of knowledge and expertise in meat products within Cadbury's, and that the Culrose plant had experienced 'bad hygiene problems'. All of these factors suggested that Culrose should be sold.

Harvey's position was considered in the 1970 rationalisation process of the company's food interests. Harvey's was made up of several small factories which were not particularly profitable, mainly because of their high turnover of labour; some of the tasks involved highly skilled workers. It was thought that Harvey's would not be the most suitable vehicle for diversification and so it, too, was sold.

In the latter half of 1973, interest in textured vegetable protein products was rekindled. This time, however, they were seen as products in their own right, and not just as additives or extenders. There were several reasons for this re-emergence of interest.

First, and most important, Cadbury-Schweppes were keen to diversify into other fields, particularly the meat market. This intention was based on several factors that were significant

at that time. An analysis showed that the meat market was enormous (about £2700 million in 1974); that there was room for a well marketed national brand, since the market consisted mainly of locally available varieties; and, that the existing advertising expenditure in canned meats was surprisingly small.

Furthermore, there was a large and sudden increase in the price of meat in 1973 which seemed likely to continue and, consequently, meat consumption had fallen. In the USA, the big increase in the world price of meat had caused a sudden upsurge in the consumption of soya products. All of these factors indicated that there was a golden opportunity for the introduction of a TVP product. Moreover, the production of a TVP product would be ideal for Cadbury-Schweppes to enter the meat market because of its low capital investment, and the ease with which the product could be manipulated in terms of flavour and format. Finally, there was no legislation on soya products over and above the normal regulations pertaining to foods, except the FSC report on Novel Proteins 1974), which only made certain recommendations.

Thus, the development and manufacture of the right TVP product would serve Cadbury-Schweppes purpose of diversification, and other factors indicated that the time was right. Several other factors gave the development direction and purpose.

Changes in the marketing policy of the company ensured that the marketing department were interested in the possibilities of TVP. There was also a great deal of support from board level in the form of Mr. N. D. Cadbury (Chairman of the Cadbury-Typhoo Food Group). Finally, it was realised that several competitors were working along similar lines. There was a great incentive to 'pre-empt the market' by being the first company to retail a successful TVP product. Cadbury's expected several other companies to launch in 1974/75: Brooke Bond-Oxo, Courtaulds/Danoxa, and Crosse and Blackwell were all known to be working on textured vegetable protein products.

These were the main reasons for the setting up of 'Project Samantha' - the name given to the project for the development of a soya-based product.

It is interesting to study the roles of the Research Development department and the Marketing Department. These were the two main areas responsible for Project Samantha. The initial impetus undoubtedly came from R & D, who still had personnel from the days of Culrose and Harveys who were aware of the possibilities of a TVP product.

Within the Marketing Department, the New Products Development section had responsibility for Project Samantha. They undertook the task of finding out what type of product

was required. This was done in conjunction with the consumer research department by consulting consumers in a number of surveys. From this information they hoped to establish what the product's 'position in the market' should be, the price that consumers were prepared to pay, and the product format that was most popular.

Cadbury-Typhoo decided at an early stage that they would not become involved in the primary production of textured vegetable protein from soya beans: they had no expertise, capital or plant to make this a viable option. Besides, a number of manufacturers were already in this field in the UK.

In the early stages, I believe that there was a possibility of a joint venture between Cadbury-Typhoo Ltd and Courtauld's Kesp operation; but this was eventually vitiated by the two company's differing views on how textured vegetable proteins should be used as extenders or meat replacements, and cost. The principles involved in this disagreement have been discussed above.

Cadbury's wanted to produce a 100% meat replacement but also wanted to keep costs down. Their eventual decision to use an extruded vegetable protein manufactured by British Arkady Co Ltd was novel in that it was the first attempt to utilise a product intended as a meat extender as a complete substitute. It meant that more effort, and

expenditure, had to be put into flavouring the product and, consequently, the wisdom of the decision must be questioned. It also heightened the rivalry between Cadbury's and Courtauld's, especially when Courtauld's entered the retail market.

Nevertheless, Cadbury's were confident that their best opportunities lay in the field of total meat replacement, mainly because of existing meat legislation and the complications of incorporating TVP into retail products. Their market surveys confirmed that consumers were amenable to the idea, and would prefer a 'wet', canned product rather than a dried product, in terms of both convenience and aesthetic appearance.

Thus, Cadbury-Typhoo decided on the following development hypothesis:

1. The product should be a 100% replacement of meat.
2. Due to the adverse publicity concerning TVP at the time, it was important to emphasise the 'naturalness' of the soya product.
3. The product was to be as 'nutritious' as meat.
4. A 'wet-form' product was desirable because of the importance of convenience, aesthetic appearance and Cadbury's existing expertise in canning within the company.
5. An honest approach was important to allow the development of the market as a whole.

6. The product was to match, as far as possible, the taste and texture of meat.
7. The positioning of the product in the market was intended to promote the idea of the 'honesty of soya'; it was also important that advertising should be educational.

The above guidelines, which Cadbury-Typhoo's Marketing Department formulated, show that they were aware of the possible adverse reaction to 'meat made from beans'. In marketing jargon[61] they emphasised the need to educate the consumer, through an 'honest' approach, that textured vegetable proteins were produced from a natural and 'honest' source, soya beans, if they were going to successfully market their product.

At this stage, after cooperation between the New Product Development section and the R & D department the recipes for the product were formulated.[62] It was decided to produce two forms, mince and chunks, since this was standard for the existing meat market, and that the products would be beef flavoured and marketed in canned form. The R and D department produced a number of possible recipes. They had to overcome problems of flavour, the length of the product's shelf-life and bear production costs in mind.

These early recipes were tested at tasting trials. These tests were organised by outside agencies so that the people

participating in the tests did not know of Cadbury's involvement. Participants were asked to compare the flavour, texture, appearance and so on of Cadbury's unmarked product with the existing brand leaders in the canned meat market, including Fray Bentos and Tyne Brand.

Cadbury-Typhoo found the results of these tests encouraging because the new TVP product compared favourably with the canned meats, judging by the participants comments.

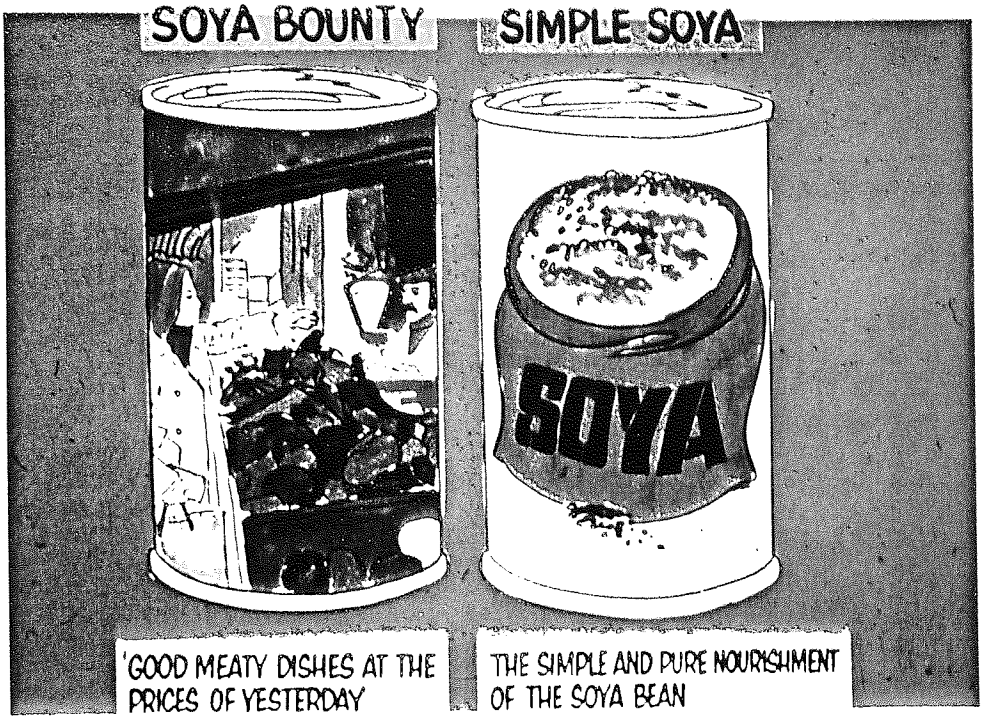
The marketing of the new product was also progressing rapidly. Two short films were made, originally for use in conjuction with the consumer tests, but they were thought to be ideal as a basis for a television commercial. One of the films used the easily recognisable David Bellamy to convey the fact that TVP is produced from the soya bean, a natural rather than artificial source of food. Bellamy was used because of his association with nature and his down-to-earth, 'honest' approach.

Ideas for the name and label of the product were carefully considered. Some examples are shown in Figures 7.5 and 7.6. Cadbury's originally settled for the name Country Farm, but unfortunately this name was very similar to County Farm, the name used by another company producing textured vegetable proteins.[63] It is interesting to note that two different companies independently came up with an almost identical name, both trying to convince the public of the natural aspect of their technological products.



**Fig 7.5**

Early marketing ideas for Soya Choice



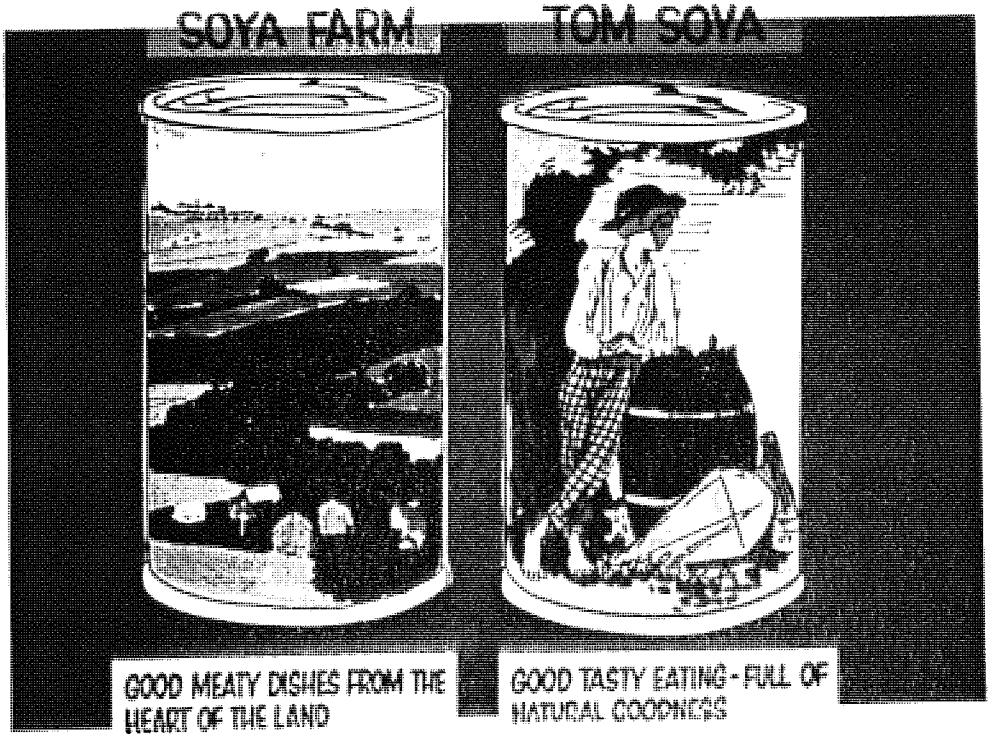




**Fig. 7.6**

**Early marketing ideas for Soya Choice**

This being the case, Cadbury's fell back on the name Soya Choice. The product itself had been continually improved such that problems of shelf-life had been overcome, and the flavour much improved.

During late 1975, while Cadbury's were putting the final touches to Soya Choice, several other companies showed their hand. Firstly, Crosse and Blackwell introduced their product, Mince Savour, which was simply a dried, minced TVP product available in small pouches; that is, Mince Savour was not a direct competitor to Soya Choice. Secondly, Brooke Bond-Oxo launched their product, Country Meadow, on test in the Channel Islands. Country Meadow was a TVP product like Soya Choice, but it did not perform well on test and was quickly withdrawn. The main complaint against Country Meadow was that it smelt strongly of methionine, which had been added to give the product a better amino acid profile.

Thirdly, S. Daniels and Sons introduced their canned TVP product called Danoxa Kesp Curry. This used Kesp spun vegetable protein made by Courtaulds as its basis, flavoured with curry sauce. S. Daniels and Sons were only a small concern and were heavily backed by Courtaulds, who obviously wanted Kesp to become a familiar in homes as well as catering institutions. The launch of Danoxa was a very low-key affair with limited advertising.

Cadbury's decided to launch their product on test market in January 1976 in the London and Southern television areas. The launch was heavily backed with advertising in newspapers and on radio and television. Also, concessionary offers were advertised with other Cadbury products (e.g. '4 pence off Soya Choice if you buy Cadbury's Smash').

Although Cadbury's were not the first to launch this type of product, they believed that Soya Choice would do well. This confidence was based on several factors.

Firstly, Cadbury's were confident in their product. It had been carefull researched, performed well in tests, and, although the quality and flavour of the product may not have been perfect, it was of a high standard.

Secondly, it was believed that the Cadbury's name suggested to the purchaser that the product would be of high quality and value. It was decided at an early stage that Cadbury's name would be prominent on the label and that none of Cadbury's brand names (Moorhouses, Hartleys, etc) would be used. It was thought, at first, that if the product failed then this would be detrimental to Cadbury's reputation for high quality goods but it was decided that this risk should be taken.

Thirdly, the product was powerfully marketed and heavily advertised; Cadbury's hoped that this 'hard-sell' approach would pay-off.[64]

In January 1976 Cadbury-Typhoo launched two products on trial in London and Southern television areas: Soya Choice mince and chunks in 15 oz cans, shown in the top part of Figure 7.7.

Assessing the performance of Soya Choice

It was difficult for Cadbury-Typhoo to estimate how their product would perform given the number of unknowns: how the consumers would react to the product; the price at which consumers would prefer Soya Choice to tinned meats; the rate at which meat prices would increase, etc. In many respects the launch of Soya Choice represents a comparatively low-risk venture for a company with Cadbury-Schweppes resources. The company, although entering a completely new area, was able to utilise resources from experienced sectors. It used its research and development departments experience and expertise, the marketing department's flair and its well established manufacturing capability to best advantage.

I have absolutely no estimate of the research and development costs, I doubt if Cadbury-Typhoo know themselves. I believe the initial capital investment was about £70 000, which is comparatively small for a new product in the food industry.[65] The product was heavily advertised especially in the first couple of years, but I shall discuss this in greater detail.


**Fig. 7.7**

The Soya Choice product range

When launched at the beginning of 1976, Soya Choice mince retailed at 27p, and the chunks cost 30p. This was decided by a combination of two factors: the cost to produce it; and, the cost of the canned meats it was competing with. At that time the cost of production was broken down roughly like this: TVP - 1p; other ingredients - 15p; packaging and distribution, etc - 6p. The astonishing fact is that the tin contains less than 1p worth of textured vegetable protein and, therefore, a fraction of a penny's soya beans.

Bearing these production costs in mind, Cadbury's then turned their attention to canned meat prices and eventually decided to price their products at 6p less than Sainsbury's sold their own brand of canned beef mince and beef steak. This would also enable them to increase the price of Soya Choice as meat prices increased.

It is extremely difficult to give a clear idea of the sales of Soya Choice or for any TVP product. All the manufacturers are guarded about their sales figures. A recent survey by the Vegetable Protein section of the Food Manufacturers' Federation estimated that the UK market for textured vegetable protein (including retail, catering and manufacturing use) was about 7000 tons.[66] Another report estimated the size of the market to be between 15000 and

20 000 tons, although this included between 8 500 and 13 000 tons for petfoods.[67] I would expect this to be on the low side. For example, I know that in 1977 one pet food company alone used 12 500 tons of TVP in its product and was expecting to use 14 000 tons in 1978. If the other petfood companies use TVP in the same manner, then at least 20 000 tons of TVP must be used in this industry alone.

In terms of value, again the manufacturers are loath to divulge information. Reports vary enormously: one report put retail market sales at £3.6 million in 1978, whereas another put it at £10 million.[68] I would have thought that £10 million was the more realistic figure.

Initially, sales of Soya Choice exceeded expectations and in January 1977 Cadbury's went national. In 1977, I estimate that Soya Choice grossed about £3 million in sales. At this stage, the market looked promising for Soya Choice as it dominated the other brands, taking about 60% of all sales.[69] Two other product lines were launched, shown in Figure 7.7.

In 1978 two other products were launched: Homepride's Soya Menu; and Brook Bond-Oxo's Soya Mince. Soya Menu was a direct competitor whereas Brooke Bond had re-entered the market with a dried product. The initial buoyancy in the market did not seem to last. In 1978, reports estimated that total sales were down by as much as 50%, that Cadbury's share of the market had also fallen to less than 50% and that

advertising had been cut drastically.[70] In 1976, I estimate that Cadbury-Typhoo spent in excess of £300 000 on Soya Choice on trial. In 1977, total advertising on TVP products was about £1 million, with Soya Choice accounting for between £500 000 and £600 000. In 1978, advertising expenditure on Soya Choice was cut to about £120 000 - £140 000.[71]

Two other factors suggested that the TVP market was stagnant. First, Chambers and Fargus (a British TVP manufacturer) pulled out of the industry in May 1978. Also Courtauld's sold their Kesp subsidiary to Dornay Foods, owned by the Mars conglomerate.[72] Incidentally, Mars also own Pedigree Petfoods, probably the largest user of TVP in the UK.

The reasons for these results and their consequences were twofold. The industry had banked on red meat prices rising more rapidly than experienced (see Fig 7.8). On the whole consumers were not tempted to buy the products repeatedly. The addition of two other national brands only served to give each manufacturer a smaller portion of a small, inelastic cake.[73]

A Cadbury's spokesman played down these results pointing to seasonality of canned meat sales and the fact that initial sales were far higher than anticipated and had since dropped back to expected levels. This does not seem to be a convincing assessment.

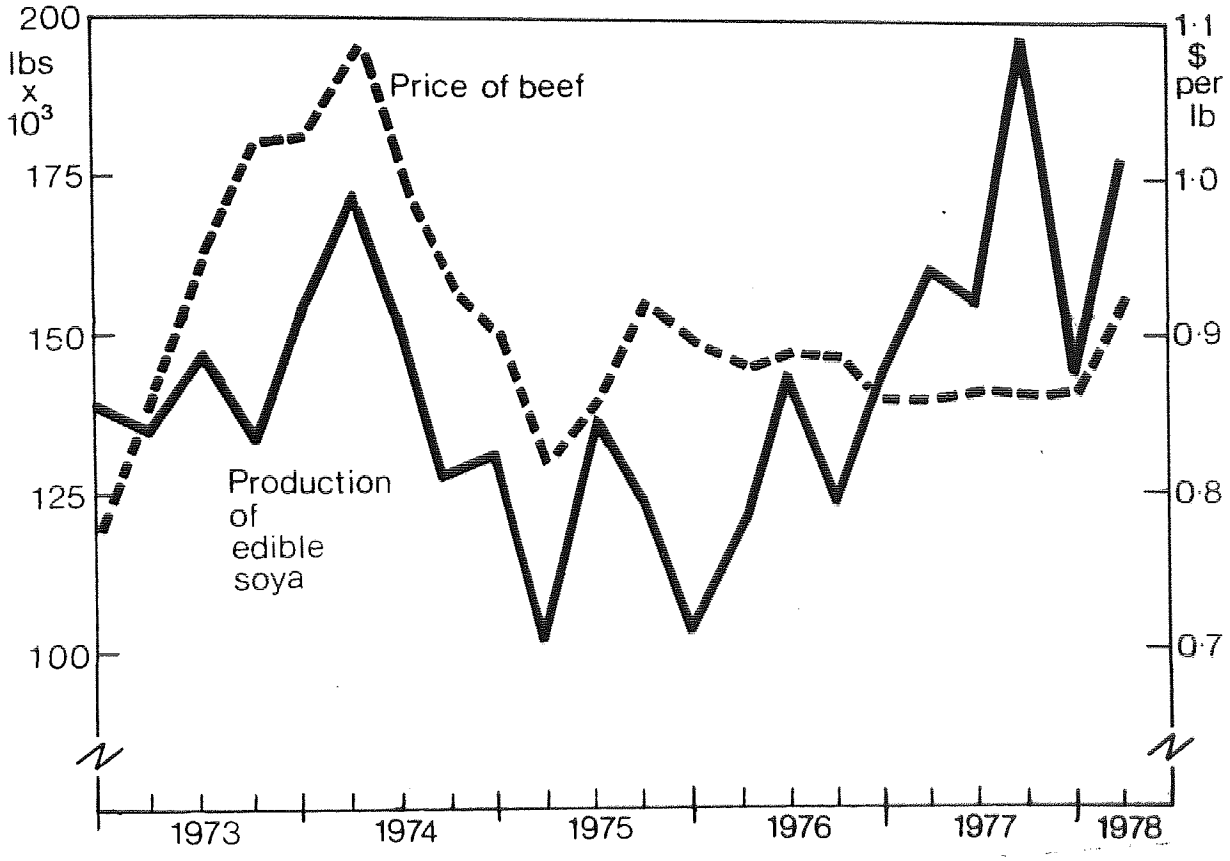



**Fig. 7.8**

**Production of edible soya and retail price of ground beef in United States, 1973–78**

Source: William W Gallimore, Effects of price fluctuations in livestock and meat products on protein markets, Journal of the Oil Chemists' Society, Vol 56, No. 3, March 1979, p 182

It is now apparent that the TVP market has stagnated or declined. Cadbury-Typhoo ceased production of Soya Choice at the end of 1979 in a rationalisation programme. Although it was the brand leader, the life-cycle of Soya Choice has been short and its success far from sweet. Until meat prices rise again, the market will probably remain static.

The value of textured vegetable proteins[74]

It is apparent that consumers have been reluctant to accept textured vegetable proteins on a large scale. No doubt this is simply interpreted by the food manufacturers as conservatism on the part of consumers. Nevertheless, the food industry, or certain parts at least, have gone to an awful lot of trouble and expense to try and convince people that textured vegetable proteins are valuable foods. Apart from the advertising, there has been a proliferation of literature, both of the manufacturers' glossy variety and those of more academic concern. Most of this has taken, on the face of it, a logical, rational, liberal and moral view of the world and where TVP fits into it. I believe it is important to look at how the food industry is trying to 'educate' us.

One manufacturers' TVP promotion booklet looks much like another. The following summarises their rationale for eating their products:

1. First, the world has a population problem and, furthermore, it is getting worse; statistics, tables and diagrams are used to emphasise the point.
2. There are millions of people starving around the world and because of population trends it will probably get worse. The major cause of famine and malnutrition is a lack of protein.
3. Therefore, we need more protein.
4. A comparison of protein yields shows that an acre of beef cattle would support a man for 77 days, whereas it would support him for 2 224 days if it were growing soya beans. In other words, livestock are wasteful of resources and energy, and soya beans are a wonder food.
5. Although soya beans are enormously nutritious, they are inconvenient to eat and do not taste pleasant. Therefore, why not convert them into something that people do like to eat - meat.
6. Thus, textured vegetable proteins are made from good wholesome beans; are nutritious; taste like meat but are much cheaper because they are efficient energy converters; and solve the world food problem.

Even though I have condensed the argument drastically, I believe the major points and the reasoning is maintained. It is possible to go through each point and argue that the statement is only partly true, false, irrelevant or does not follow from

the previous point. However, by arguing in minute detail, the major criticisms may be lost. So, for clarity's sake, I have tried to keep this critique short and hope that the absurdity of the argument is self evident.

Nevertheless, assuming that there are a lot of people in developing countries suffering from protein malnutrition, do the manufacturers really intend that they should be eating tins of textured vegetable protein? Leaving aside the question of its nutritive value, cultural unsuitability, etc, how are starving people going to pay for such products? If they cannot afford to buy grains, rice or vegetables (most malnutrition is a result of poverty) how on earth could they afford TVP?

Furthermore, the assumption that starving people are short of protein is misconceived: it is now thought that most people suffering from malnutrition lack calories more than protein. It is certain that expensive high protein foods in tins are not the answer for starving nations. Of course not everybody in the food industry would support these views. Many are enlightened about the food problem for developing nations. However, one company was planning to export a chocolate covered coconut-flavoured, soya-based bar (similar to the Bounty bar) to developing countries with food problems:

....this major development could take chocolate bars into the food class. And it would also be a very acceptable form of protein for people in the Third World countries.[75]

This is a nutritious food in its own right and could have an exciting future as a meal replacement in various underdeveloped countries of the world.[76]

If textured vegetable proteins have no use for developing countries it is dishonest for the food industry to imply that they have, and even more distasteful to try and justify their existence to UK consumers on that basis. If TVP is intended for use in the UK then all of the arguments about people starving become practically irrelevant. On the contrary, the average Briton consumes too much protein.[77] There certainly is not a shortage of protein in this country.

The argument then hinges on the yield of soya beans per acre compared with beef. It is true that the protein yield of soya beans is far higher than livestock, but is that the whole story? For example, using the rough figures quoted for Soya Choice, the cost of soya beans in a tin selling for about 30p was about 0.3 p. That represents roughly a 100-fold increase in value. The point is that by turning beans into TVP, making it edible and then canning it, an awful amount of energy and resources are used. Furthermore, the initial product, beans, are perfectly edible. In comparison with beans, TVP is costly. In comparison with the potato, a traditional meat extender, TVP is astronomically expensive.

The most generous I can be when summing up is that textured vegetable protein foods are generally nutritious and can be convenient. But, they are simply unnecessary and a diversion from the real task of making people more aware of the food they should be eating. The market seems to have stagnated for the time being and the only growth area seems to be in school and institutional catering, and petfoods.

## The role of the food industry within the strategies

A consideration of changes in the food industry within the intermediate and vegan strategies can only be qualitative in nature. The implications would obviously be great for the food manufacturing industry, but there is no reason to believe that it could not thrive within the suggested strategies.

The first impression is that the food industry would be much smaller. In the vegan system, there would be no need for a livestock industry and, in the intermediate system, the livestock industry would be much smaller. This would affect many related sectors including meat processing, abattoirs, butchers, and the infrastructure which supports the livestock industry from the production of pharmaceuticals, compound feedstuffs to the retail sector.

Furthermore, the reduction in size or elimination of the dairy sector would also have enormous repercussions for the food industry itself, and its supporting and allied trades. It is difficult to assess the extent to which the food industry would be affected, but it must be remembered that a large number of people work in the food and allied industries. Table 7.8 shows the number of people working in the production of food and its related industries. The table shows that more than two million people or about 11% of the working population

Table 7.9: Employment in food, agriculture and allied industries

| Industry | Number employed (thousands) |
|---|---|
| Agriculture, forestry and fishing | 395.2 |
| Food, drink and tobacco | 713.8 |
| Fertilisers | 12.3 |
| Agricultural machinery | 29.1 |
| Tractors | 33.8 |
| Distributive trades: wholesale food and drink | 226.3 |
| Retail food and drink | 598.7 |
| Agricultural supplies | 120.9 |
| Catering contractors | 67.1 |
| Restaurants, cafés, etc | 164.6 |
| Total | 2 361.8 |
| Total UK all industries and services | 22 539.3 |

Source: Department of Employment, British Labour Statistics Year Book, 1976, HMSO, London, 1977.

are employed in the production, processing, distribution, and retailing of food or agricultural machinery. A small reduction in the size of the industry could leave many thousands unemployed.

However, looking to the more positive effects, there are a number of new roles for the industry, and some areas which would expand. As a general principle, the food industry would play a more fundamental role in the production of food than it does now.

The food industry could assume a prominent position in controlling fluctuations in the supply of food. One likely characteristic of the more efficient production methods of the intermediate and vegan systems would be a greater tendency to produce surpluses. Current practice assumes that surplus cereal or vegetable production is channelled into the livestock industry, where it is 'upgraded' to meat and dairy products. In the vegan or intermediate system the food industry could assume this role by upgrading cereal or vegetable surpluses. The food industry would be employing a sophisticated storage technique and, by increasing the value or surpluses, would alleviate fluctuations in supply.

This role should not be underestimated. With an increased tendency to overproduce and the loss of the livestock industry as an outlet for surpluses, there would be both a great need

for support of prices and a potentially large market for the food manufacturers. One thing is clear: the route to success in agriculture is to produce, but nothing undermines agriculture more surely than overproduction.[78]

Thus, the food industry could process surplus agricultural produce thereby increasing the storage life of those goods and, perhaps of greater importance, providing a greater variety of foods to the consumer. Variety is important to any healthy diet but, in the schemes under discussion, the need for variety would be essential. Undoubtedly, the diet under these regimes would be basic and the addition of a range of processed foods would make the task of producing an exciting meal that much easier. Consequently the demand for these products would be enormous and there is no reason why the food manufacturing industry should not flourish in the circumstances.

The variety of foods could also be increased by the appearance of novel foods. It is not as easy as one would imagine to make worthwhile suggestions for new products for the food industry. Most novel foods that have appeared have many drawbacks for the industry or are inappropriate to our needs; most ideas for new products are mere speculation.

Personally, I do not believe that the production of products like textured vegetable proteins is a step forward - for our society or for the food industry. The other recent high technology innovation, single cell protein, has failed to

develop and does not now appear to offer anything in the way of human foods.[79] Perhaps the field of biotechnology may offer some other ideas in the future.

In direct relation to the strategies, it would be valuable for the food industry to utilise the large amounts of barley that would be available. Apart from traditional, but neglected, recipes (eg barley bread, barley added to casseroles, etc) it might be possible to produce barley cereals or barley-based snacks. Alternatively, Blaxter has suggested that the nutrients in barley might be stored most conveniently in the form of beer.[80]

It could be that the food industry will have to rethink its direction in the light of labelling, legislation and nutritional awareness. Should the strategies discussed in this thesis, or perhaps more practical suggestions, be implemented, they would certainly have to modify their views on what the consumer wants.

# CHAPTER 8

## IMPLEMENTATION OF THE STRATEGIES

This project has attempted to evaluate the effects of the introduction of radical agricultural strategies to the UK. Since the basis for this study was the high level of imported food and animal feed into the UK and the belief that this was responsible for severely detrimental effects to the UK balance of payments, this thesis has concentrated on the impact of the introduction of radical strategies to the balance of payments. The intention of the project was to discover if it was possible to alleviate Britain's constant balance of payments difficulties by the introduction

of schemes that would drastically increase its self-sufficiency in food.

The project has drawn on the work of colleagues within the Technology Policy Unit who examined the potential for vegetarian agriculture and novel food crops in the UK.[1] Consequently, two strategies have been studied in detail: first, a vegan system where the production, consumption, import and export of animal products would be excluded; and, second, an intermediate system which would include a restricted livestock sector.

Although other considerations have figured in this thesis, the primary concern has been the possible economic effects of the schemes. Thus, the study has concentrated on the balance of payments, the effects of agricultural expansion and agricultural change and, more specifically, the consequences for the UK balance of payments of the adoption of the vegan or intermediate strategies.

The impetus for this project was the work of eminent scientists and agricultural economists in the mid-1970s.[2] Their work was almost certainly prompted by the 1974 World Food Conference, where the concept of national self-reliance was much discussed. Although the idea that increased self-sufficiency could aid the balance of payments gained popularity in the UK in the 1970s, an extensive literature concerning

agricultural expansion, agricultural import saving and their effects on the balance of payments stretched back to 1950. It was essential to examine this literature and the controversial debate which it provoked to shed light onto the effects of the particular schemes proposed in this thesis.

More fundamentally, a review of the principles of agricultural economics and the history of food policy in Britain was necessary as a theoretical underpinning of the study. The inclusion of a chapter on the UK balance of payments arose as a result of lack of awareness of the international accounts. It was not my original intention 'to go back to first principles'. However, it became apparent that many assumptions about the balance of payments were either incorrect or were only half-truths. Since the way in which the balance of payments is perceived affects the interpretation of the impact of the strategies, the inclusion of the chapter became essential.

The work on the food manufacturing industry was prompted by the view that the industry could play an important role, within the strategies, by innovating new products. These products would either fill nutritional inadequacies in the diet, provide much needed variety, or utilise 'crops' which could not be eaten without some form of processing. Close cooperation between the Technology Policy Unit and Cadbury Typhoo Ltd allowed a study of the latter's involvement in innovating and marketing novel protein foods.

From the study of the effects of the strategies to Britain's food and feedstuffs trade, the following conclusions can be drawn:

1) The introduction of the vegan strategy could allow a potential contribution of between £1 482 640 000 and £2 118 058 000 to the UK balance of payments.
2) The introduction of the intermediate strategy could allow a potential contribution of between £1 452 801 000 and £2 075 431 000 to the UK balance of payments.

At first it would seem surprising that the potential contribution of the two schemes is almost the same (a contribution of roughly £1.45 billion to £2.1 billion). The reasons for this negligible difference are discussed in chapter 6. The major reason is that, despite its enormous import saving and the fact that it does not have intensively-fed livestock, the vegan strategy is still wasteful of resources. The most physical waste is, ironically, land.

Utilising this land to grow more crops would be superfluous, but animals could be reared without relying on imported feedstuffs. Of course, the impact of animals on agriculture and the economy depends on how they are incorporated into the system. We know that intensively-fed livestock consume a lot of energy and feed that could be profitably used elsewhere. But, it would be possible to

raise lower levels of livestock by more conservative husbandry methods without waste. In the intermediate system, as in mixed farming methods, animals would fill ecological niches in the system. Livestock would complement the fundamentally crop-based agriculture.

There is considerable scope for further research in this area. It would be valuable to have more information about the synergistic effects of the interaction of animals and crops. This could be best approached by studying current mixed farming practices. This could yield information about the efficiency of different farming methods, and optimum levels of livestock.

Other effects

Apart from the balance of payments effects, there would be other costs and benefits arising from the introduction of the strategies. The effects of the changes cannot be over-emphasised; the ramifications would be felt in all aspects of life.

The major costs of implementation would fall mainly on farmers currently involved in intensive livestock production, meat processors, animal feedingstuff manufacturers and suppliers, specialist meat retailers, skin tanners and those involved in animal by-products. The impact of the

vegan and intermediate system would be similar but, generally speaking, the effects of the vegan system would be greater.

The employment effects would be complex; an indication of the impact is given below. The major impact would occur in the meat and livestock industry. Thompson estimated that there are currently about 500 000 people involved in all aspects of the meat and livestock industry.[3] If the vegan strategy was introduced, all of these people would lose their jobs; in the intermediate system, the majority would have to look elsewhere for employment. A large proportion of these people would possess skills with little or no application elsewhere (butchers or skin tanners, for example); others would have substantial amounts of capital invested in livestock. Although there would be potential for people to adapt to new jobs in other sectors or for re-investment elsewhere (in agriculture, other parts of the food industry, or other industries), there would be costs in terms of redundant skills and loss of livelihood. The impact on jobs and investment would be cushioned if change were to take place over an extended period.

Against these costs would be offset the jobs created directly by the introduction of the vegan or intermediate schemes. The vegetarian cropping system would require,

in overall terms, an increase in labour; however the distribution of labour needs would change. These changes would be on both a regional and seasonal basis. Some labour could be absorbed by areas currently employing low levels of manpower. There would also be a need for greater seasonal and casual employment.[4]

Further employment would be created by the investment of capital released by the loss of the livestock industry and by the money saved through import substitution. Other benefits of introduction of the strategies would be reduced fertiliser use, reduced or more efficient energy use, and the environmental benefits of reduced animal wastes.

The dietary changes would also be great. The cropping plan's goal was nutritional self-sufficiency and so the diet produced would be adequate in both the vegan and intermediate systems, if a little plain.[5] The diet would consist mainly of cereals, potatoes, root and green vegetables, some legumes and dessert fruit. In the intermediate system there would also be dairy produce available and some meat, mainly lamb with some beef.

## Implementation in practice

The study of the strategies has looked at the theoretical effects of implementation, assuming that their introduction would be straightforward. It is important now to consider whether the plans could be introduced, under what circumstances, how it would be done and the conditions that would be necessary for the plans to be put into practice.

I have said that the basis for this study was concern over the poor position of the British balance of payments and reliance on imported food and feedstuffs. Thus, it is reasonable to assume that the intention to put such radical plans into practice would have to be as a result of the same concern; i.e. the position of Britain's balance of payments would have deteriorated so badly that drastic action was called for. This being so, one must immediately question whether a strict vegan system would be most appropriate.

Veganism usually springs from one of two ideological standpoints: that it is immoral to exploit animals for food; or, that the consumption of animal products is unhealthy, unclean or not sufficiently ascetic. It is conceivable that some catastrophic disease could infect all our animals and that veganism would be the only solution, but it is extremely unlikely. In general, the decision to become a vegan is individual, personal and is not likely to be motivated by economic criteria (such as poor position of the balance of payments). There would certainly

seem to be some incompatibility between the usual incentives for becoming vegan and that of the need to improve the nation's balance of payments. It should also be noted that the diet produced by the vegetarian cropping plan would only partially resemble a typical vegan's diet in Britain today.

Nevertheless, let us suppose that the balance of payments position is critical, that it is decided that the best method of solving the problem is a policy of agricultural import substitution and that the vegan strategy is seen as the most appropriate plan. In theory, the consumption of the population can be altered by their own voluntary action to eat particular foods, by pricing policies or by rationing.

I have pointed out the typical characteristics of the decision to become vegan and I believe it is safe to assume that the population, as a whole, would not voluntarily give up eating meat and other animal produce. In both the vegan and intermediate schemes, it would be imperative for consumption to meet production; I believe that this would inevitably involve rationing.

The need to produce according to a strict plan would also involve major changes. There would have to be direct, centralised (presumably state) control of production. Farmers would be instructed to grow particular crops in certain fields, be expected to produce a given quota, and would

not, generally speaking, be allowed to grow or produce anything else. Harvesting, distribution, financing, resource allocation, marketing, etc would have to be coordinated by a central agricultural body. This body would presumably have the power to sanction those who did not produce according to plan. In other words, there would have to be complete reorganisation of the structure and administration of agriculture and the complete food system.

Viewed in this way, it is apparent that the implementation of the strategies would not only involve radical agricultural and dietary change but would need a drastic change in the economic and political system to allow them to be introduced in the first place. A political system embodying direct state control to such an extent would bear little resemblance to our current regime. Moreover, in comparison with the associated political and economic upheaval, the matter of agricultural and dietary changes would pale into insignificance.

Without wishing to deviate too far and discuss at great length the concept of freedom of the individual, freedom to choose, etc, a number of points must be noted. When confronted by the changes involved in the vegan or intermediate plans, I believe that most people would feel

that the constraints placed on the individual were unacceptable. That is not to say that constraints on individual action, including an individual's freedom to choose what he will eat, do not exist already. The consumer's freedom of choice is restricted by the producer's freedom to produce what is convenient or profitable; Advertising, subsidies to producers, import restrictions, taxes and so on all impinge on consumer sovereignty.[6] Moreover, it is right that individual action should be controlled when it is a burden to others, or even when it is a burden on the individual. For example, for the benefit of society and the individual, parents are not given the choice of whether their children should be educated or not. If they choose not to send their child to the local school, some other form of teaching must be provided.

If it is acceptable for consumer freedom to be restricted by commercial factors then, in principle, it should be possible to restrict freedom of choice for other reasons; it depends on how much freedom is curtailled and for what purpose. It is my view that the introduction of the vegan or intermediate system would involve an unacceptable shackling of individual freedom in the pursuit of a goal that could be achieved by other means. There are reasons for the introduction of food and agricultural

policies that would inhibit personal freedom, the most notable being the improvement of health and nutrition.

Before going on to look at these, and other, motives for increased self-sufficiency, I want to return to the political changes involved in the vegan and intermediate strategies. Some writers have argued that agriculture is typically an uneasy partner in a capitalist framework:

> Agriculture cannot be neatly slotted into the logic of capitalist economies; if it could, there would be no excuse for the elaborate machinery of the CAP.[7]

The implication is that any radical agricultural change necessitates radical political change. This may sound like a truism and radical political change is undoubtedly the goal of some people interested in questions of UK self-sufficiency and food policy. Nevertheless, it re-emphasises the point that food and agricultural policies are based on political decisions as much as commercial criteria and rather more than goals of improved health, diet or nutrition, increased self-sufficiency or conservation of resources.

The above quote also raises the point about membership of the European Community.[8] Assuming that the UK adopted the vegan or intermediate schemes, there would be implications for Europe. If the other member states were

to decide not to adopt similar schemes themselves, continued UK membership of the EEC would not be possible. Quite simply, the plans for increased domestic output, increased self-sufficiency and strict import controls go against everything the EEC stands for.

Withdrawal from the EEC would have profound effects, and would also alter the contribution to the balance of payments of introducing the vegan or intermediate plans. The value of imports saved by the strategies was calculated according to 1976 import prices (i.e. when the UK was a member of the EEC). These figures represent artificially high European prices in relation to world prices. Upon withdrawal, the imports saved by the schemes would have to be valued at world prices.

According to Godley et al,[9] the prices paid for food by the consumer were, on average, about 12% higher in 1978 than if the UK had not adopted the CAP. It would not be unreasonable to expect the contribution to the balance of payments to be reduced by a similar amount if the UK were to adopt the strategies and withdraw from the EEC.

More fundamentally, the meaning of the balance of payments must be questioned in the light of the political and economic system that would exist. If the UK imposed

such control on imports of food, it is likely that other imports would be controlled. If other imports were not controlled, money saved on imported food would surely be transferred to other manufactured imports. This would render the imposition of strict food imports to help the balance of payments worthless.

Thus, it must be assumed that all imports would come under strict control. If this were the case, whether the balance of payments were £2 billion better-off would be largely academic. It was the view of one leading agricultural economist that, in this context, the balance of payments and calculations of import saving, etc would be rendered practically meaningless.[10]

It should also be recognised that a policy of increased domestic production coupled with import controls would have a detrimental effect on the countries with whom the UK currently trades. Although this was mentioned in Chapter 4 in relation to retaliatory effects, this was mainly discussed in connection with the implications for the UK. A large portion of the goods that the UK would no longer import would come from North America (i.e. wheat, maize and other cereals, animal feedstuffs, oilseeds, etc) and it must be assumed that the USA and Canada would be able to cope. But, many developing countries would lose a valuable export

market and also the income with which to pay for UK manufactured goods. This would be a particularly unfortunate side effect of the strategies, especially since one of the incentives for studying UK self-sufficiency is that developing countries might be helped in the process. Although grain, for example, that was destined for Britain's livestock would theoretically be released to developing countries, their ability to pay for the grain would depend on their ability to replace the lost UK market. It should be noted that the rigid trade restrictions inherent in the strategies go against informed opinion about the direction that international trade regulation should take.[11]

Finally, it should be noted that since this project began the position of Britain's balance of payments has undergone a complete turnaround. From a position of deficit in the late 1970s, a record surplus of about £2.4 billion on the current account was recorded in 1980.[12] In chapter 3 it was noted that a deficit on the balance of payments could be wiped out overnight without any 'real' problems being solved, because of its arbitrary nature. The reasons for the improvement in Britain's balance of payments are twofold.

First, North Sea oil is now being produced in large quantities such that the UK is now a net exporter of oil. This combined with the continued increase in world oil

prices, has boosted the balance of payments. Second, the recession in the UK economy has meant that Britain has imported and exported fewer goods. However, imports have fallen more sharply than exports causing a surplus to the balance of payments.

Neither of these factors offers much hope. A surplus caused by more rapid contraction of imports than exports is hardly desirable, emphasising the point that a balance of payments in surplus is not necessarily better than one in deficit. The fact that Britain is self-sufficient in oil is obviously good news but, if the revenues available only obscure the fact that our economy and industrial base are decaying,there is little to hope for in the future.

Britain's balance of payments is likely to stay in surplus for some time; even if the current recession ends, North Sea oil revenue will almost certainly keep the international accounts in surplus. In the light of this forecast, the instigation of policies for agricultural change, expansion, import substitution and restriction will not gain much support. I would conclude that, until Britain's supply of North Sea oil dries up, arguments pressing for agricultural change or expansion coupled with policies of restriction of agricultural imports will not carry much weight.

In principle, programmes like those studied in this project could potentially make a contribution to the balance of payments. However, evidence would suggest that balance of payments difficulties are tackled more effectively by capital movements. Furthermore, in practice, the implementation of the vegan or intermediate schemes would involve politically unacceptable change, rendering any contribution to the balance of payments meaningless.

Criteria for change in food and agriculture

From the work on the vegan and intermediate strategies, I would conclude that change in UK food policy will not, and should not, be based on the pursuit of maximising agriculture's contribution to the balance of payments: the aim of food policy is to provide the population with a varied and healthy diet at reasonable prices and to support the incomes of food producers, within many constraints, including economic goals. But, to jeopardise these primary objectives in the pursuit of questionable economic goals that could, if necessary, be met more effectively and appropriately by alternative means would be irresponsible.

The lobby for increased self-sufficiency, which grew up in the UK in the 1970s, gained momentum more on a wave of emotion than a rational understanding of the

effects of greater self-sufficiency. The concept seemed attractive and many people supported it because of dissatisfaction with urban life, the type of food that was available, or the way the food was produced; the belief that decentralisation, 'going back to nature', conservation of resources, etc were 'good'; or because it seemed immoral to raise animals on food that could be consumed by people who were starving elsewhere in the world. Often arguments for greater self-sufficiency were ill-thought out and only articulated as a collection of well-meaning phrases: i.e. by increasing self-sufficiency in food we would save money on imports; use scarce resources more efficiently; not exploit animals; produce a more healthy diet; ensure security of food supplies; help to solve the world food problem, etc. Unfortunately, the ramifications of greater self-sufficiency are rather complex, and research has shown that plans for greater self-sufficiency are fraught with difficulties.

That is not to say, however, that agricultural change (involving increased self-reliance in food) is not desirable. But, greater self-reliance should be pursued as part of a coordinated and integrated policy, taking account of objectives for food, agriculture, nutrition and health. This attitude is reflected in current academic thinking.[13] The move is almost certainly a result of

improved nutritional understanding (or, at least, greater consensus)[14] and the view that agricultural policy should be formulated within the light of this nutritional information and in pursuit of dietary goals.

This has led the Centre for Agricultural Strategy to propose that policy should consist of two parts: first a statement of the food needs of the population in the light of nutritional information, dietary goals and health objectives; and second, a food supply policy dealing with the best way of producing the desired supplies.[15] This leads them to define a national food policy as:

> the provision of a statement of national food supply requirements which is coherent in terms of achievement of welfare and other objectives at the consumption level, and functional in that it provides the basis for determining the best means of attaining that supply.

Some countries are beginning to move in this direction[16] but, unfortunately, the relevant policy making bodies in Britain seem reluctant to even discuss the matter. In recent publications, and despite the current academic thinking, both the Department of Health and Social Security and the Ministry of Agriculture, Fisheries and Food have not indicated that they are thinking along these lines.[17]

There is still considerable scope for academic progress particularly in relating the pursuit of consumption, nutrition and health objectives to the production of food by efficient agricultural methods. Furthermore, academic advances in the future are likely to result from a more pragmatic and practically-oriented approach. However, improvements in Britain's food policy ultimately lie with the policy making bodies of government; until they respond to the consensus of opinion there is unlikely to be any progress.

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35. Ashton, et al, op cit, Ref 34; M. L. Anson and M. Pader, Unilever Limited, 1956, UK Patent 746859 (US Patent 2830902).

36. The conditions are provided by a protein concentration high enough to bring the protein molecules into close proximity, sufficient agitation to cause orientation of the molecules and rapid heating to coagulate the protein into shreds (see I. I. Rusoff, W. J. Ohan and C. L. Long, General Foods Corporation, 1962, US Patent 3047395).

37. M. L. Anson and M.Pader, Unilever Limited, 1959, UK Patent 810762 (US Patent 2813024).

38. In 1976, spun textured vegetable protein was sold to the catering trade at between 40 and 60 pence per lb; the extruded product cost 20 pence per lb (M. C. Greenhalgh and R. E. Thomas, The Textured Soya Protein Market, unpublished report, University of Manchester Institute of Science and Technology, August 1976.

39. Information on the differences between spun and extruded products was gained by personal sampling, and discussion with:
W. A. W. Cummings, Technical Director, Cadbury Typhoo Limited; D. Gwyther, New Products Development Marketing Manager, Cadbury Typhoo Limited; P. Fitch, Technical Services Manager, British Arkady Company Limited; and D. J. Hodgson, General Manager, Kesp Protein Foods, Courtaulds Limited.

40. Manufacturers' product information: The Craigmillar Guide to County Farm Vegetable Protein, Craigmillar, Sussex House, Burgess Hill, West Sussex RH15 9AW; Technical information on Protena, McDougalls Catering Foods Ltd, Worcester House, Basingstoke Road, Reading RG2 OQW; Bontrae: Textured Soya Protein, GMB Proteins Ltd,Blackhorse Lane, London E17 5QP; Textured Vegetable Proteins: A Guide for the Caterer from Miles Foods, Miles Foods, Stoke Court, Stoke Poges, Buckinghamshire SL2 4LY; Product information from British Arkady Co Ltd, Arkady Soya Mills, Old Trafford, Manchester M16 ONJ; KESP: Spun Vegetable Protein Food, Courtaulds Ltd, Kesp Protein Foods, Coventry CV6 5AE; Lotus Foods Limited, 29-31 St Lukes Mews, London W11 1DF; Europroteins Ltd, Chester House, 286 High Street, Brackley, Northamptonshire; Erith Oil Works Limited, Church Manorway, Erith Kent, DA8 1DL.

41. British Arkady, op cit, Ref 40.

42. Ashton et al, op cit, Ref 34.

43. McDougalls Catering Foods, op cit, Ref 40.

44. FAO/WHO, Protein Requirements, FAO Nutrition Meeting Report Series 37, WHO Technical Report Series 301, Rome, 1965.

45. The most common units I came across were:
a) Grams of amino acid per 100 grams of product;
b) Grams of amino acid per 100 grams of protein;
c) Percentage of amino acid with product or protein unspecified;
d) Milligrams amino acid per gram of nitrogen;
e) Grams of amino acid per 16 grams of nitrogen.

46. Harold L. Wilcke, Daniel T. Hopkins and Doyle H. Waggle, Soy Protein and Human Nutrition, Academic Press, New York, 1979; R. Bressani, 'Nutritional contribution of soy proteins to food systems', Journal of the American Oil Chemists' Society, Vol 52,April 1975; Cadbury's Information Service, Nutrition, Soya Beans and Textured Vegetable Proteins - a Review, Cadbury-Schweppes Ltd, Bournville, Birmingham, 19 February 1975; M. M. Handy, 'Nutritional aspects in textured soy proteins', Journal of the American Oil Chemists' Society, Vol 51, January 1974, pp 85A-90A; I. E. Liener, 'Nutritional aspects of soy protein products', Journal of the American Oil Chemists' Society, Vol 54, June 1977, pp 454A-472A; MAFF, Manual of Nutrition, HMSO, London, 1970; R. A. McCance and E. M. Widdowson, The Composition of Foods, HMSO, London, 1967; D. S. McClaren, Nutrition and Its Disorders, Livingstone Medical Press, 1976; J. Watson, 'New protein food', Nutrition, Vol 28, pp 249-254.

47. Ministry of Agriculture, Fisheries and Food, Control of the Introduction into the Human Diet of New Foods from Novel Sources or Prepared by Novel Processes, Discussion Paper, Food Standards Division, February 1978; Op cit, Ref. 21.

48. MAFF (1974), op cit, Ref 47.

49. The Food and Drugs Act 1955 (4 and 5 Eliz 2c16).

50. Labelling of Food Regulations 1970, SI 1970 No 400 as amended by SI 1972 No 1510.

51. Ministry of Agriculture, Fisheries and Food, op cit, Ref 21.

52. Ibid.

53. Ibid, p 37.

54. Brooke Bond Leibig's canned product, Country Meadow, was launched in late 1975 in the Channel Islands. It was withdrawn after a short period and has never been launched nationally.

55. MAFF, op cit, Ref 21, p37.

56. Report of the Panel on Novel Foods of the Committee on Medical Aspects of Food Policy, Foods Which Simulate Meat: The Nutritional Aspects of Vegetable Protein Foods Which Are Meat Analogues, Report on Health and Social Subjects 17, HMSO, London, 1980.

57. For background reading on the company, see I. A. Williams, The Firm of Cadbury, 1831-1931, Constable, 1931; Cadburys of Bournville: The Building of a Modern Business, Publication Department, Bournville, 1966; Cummings, op cit, Ref 6.

58. The advertising slogan used was: 'It's a Harvey's duo-can, dear'.

59. 'At what price canned meat?', The Grocer, 22 February 1975, p59-60.

60. Cadbury-Typhoo Ltd, Cadbury's Library and Information Service, Birmingham, 1976.

61. The guidelines were taken from internal working documents. Although the points have been modified through a number of drafts of this thesis, they remain, essentially, as they were formulated.

62. The basic recipe for Soya Choice (1976) is reproduced with the main suppliers below:
Textured vegetable protein - British Arkady Ltd.
Caramel powder - Hay Lambert Ltd.
Beef dripping - Midland Cattle Products Ltd.
Sugar - Maubré Sugar Ltd.
Salt - ICI.
Spices - Bush, Boake and Allen Ltd.
Colouring - Williams Ltd.
Blood Albumen - Fibrisol Ltd.
Wheat flour - Rank Hovis MacDougall Ltd.
Onion powder - S. and S. Services Ltd.
Sliced onion - M. L. Foods Ltd.
Amylopectin - Corn products (UK) Ltd.
Citric Acid - J. and S. Sturge Ltd.
Valox - Denby Hamilton Ltd.
Tomato puree - R.J. Hall Ltd.

63. County Farm is the brand name for Van den Bergh and Jurgen's textured vegetable protein product.

64. Examples of their publicity material include: Cadbury's and the Meat Bean; and Cadbury's Soya Choice Recipes.

65. This figure was mentioned in a conversation with an employee of the company. In comparison, a new plant to produce textured vegetable protein plant would have cost about £250 000 in 1976.

66. Personal communication with Heather Paine, Vegetable Protein Section, Food Manufacturers' Federation. She commented that the estimate was thought to be 'a little on the low side'.

67. Vegetable Protein Foods, Mintel Report, 1978, p23-32.

68. Ibid; Barry Wilson, 'Soya meat sales collapse', British Farmer and Stockbreeder, 22 July 1978, p15.

69. Mintel Report, 1978.

70. Ibid; Wilson, op cit, Ref 68.

71. Ibid.

72. Ibid; D. Churchill, 'Chambers to quit soya foods', Financial Times, 31 May 1978.

73. 'Soya meat flop', British Farmer and Stockbreeder, 22 July 1978, p3.

74. Material for this section was gathered from manufacturers' promotional material, op cit, Ref 40; 'Soya can support market for meat', Big Farm Weekly, 23 November 1978; D. M. Beloglavec, 'Meat-like products and their possible impact on the demand for meat', FAO Monthly Bulletin of Agricultural Economics and Statistics, Vol 23, No 7/8, 1974; R. A. Boyer, 'Early history of the plant protein industry', Cereal Foods World, Vol 21, 1976, pp 297-298; Z. Duda, Vegetable Protein Meat Extension and Analogues, FAO, Rome 1974; J. N. Greenfield, 'Effects of price changes on the demand for meat', FAO Monthly Bulletin of Agricultural Economics and Statistics, Vol 23, No 12, 1974; M. C. Greenhalgh and R. E. Thomas, The Textured Soya Protein Market, unpublished report, 1976; 'Textured vegetable protein', The Guardian, 14 February 1975; R. Leslie and A. Sutton, 'Why soya?', New Scientist 18-25 December 1975, pp 734-737; C. Medawar, Insult or Injury: An Enquiry into the Marketing and Advertising of British Food and Drug Products in the Third World, Social Audit Ltd, London, 1979; L. J. McCarney, 'Communication problems in the marketing of synthetic meats', European Journal of Marketing, Vol 9, No 3, 1975, pp 188-197; J. C. McKenzie, 'Overcoming resistance to new food products', Proceedings of the Nutrition Society, Vol 28, 1969; D. Rosenfield, 'The changing climate of plant protein foods', Cereal Foods World, Vol 21, 1976, p 302;

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75. John Stock, chief confectioner, Bush Boake and Allen, quoted in Albright World, September 1975, p1.

76. Dr. Lionel Bould, General Manager, GMB Proteins Ltd, quoted in Albright World, October 1976, p20.

77. Department of Health and Social Security, Eating for Health, HMSO, London, 1978.

78. Tudge, op cit, Ref 74.

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80. K. Blaxter, 'Can Britain feed itself?', New Scientist, 20 March 1975, p 697.

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5. Supplementation would be necessary with calcium, possibly iron and those micronutrients not present in plants (Ibid, p 396).

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10. Op cit, Ref 8.

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