# Ethical issues with development status of Modern Agricultural Production

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## ABSTRACT

This article analyzes the legally collected real data and explains the analysis process and results of the unregulated third-party traceable agricultural product sales data in the current environment. We use a hybrid method that combines qualitative and quantitative analyses to process the regional data and quantitative analysis to process the count and proportion of data. To the greatest extent, it helps businesses obtain more information. At the same time, it discusses the development status and ethical issues of traceable agricultural products in China based on the literature and analysis process.

**Keywords:** AI for agriculture, data analysis and privacy, ethical issues for agriculture, modern agricultural production, traceable agriculture product.

## 1. INTRODUCTION

With the continuous development of science and technology, the process of informatization of human life has gradually accelerated, and many industries have been revolutionized by the information age, including agriculture. In agricultural production, there will be more or fewer problems with the quality of agricultural products. These problems are being paid more attention to buy more people today in the information age. In order to better trace the production environment, quality and sales of agricultural products.

Nowadays, artificial intelligence technology in modern agricultural production is mainly divided into three parts: the pre-agricultural production stage, the middle agricultural production stage, and the post-agricultural production stage.[1]

### 1.1 Pre-agricultural production stage

In the pre-agricultural production stage, artificial intelligence can be involved in the preparation of many things. For example, the analysis of crop growth soil, collection of soil composition information, selection of suitable crop varieties, accurate crop planting, this process is called precision agricultural technology by the industry. Machine learning can be used to predict whether this land is suitable for the growth of certain crops and help farmers choose the varieties they are about to plant with great efficiency. In addition to soil, irrigation of agricultural products is also one of the very important aspects. In modern agricultural production, the main problem solved by irrigation water consumption analysis and a null value is to reduce the occurrence of crop drought and flood caused by insufficient or excessive irrigation water under the condition of ensuring crop growth. Artificial neural networks can be used to analyze water consumption, climate, and other data to support only irrigation systems. In the aspect of seed quality identification, the labor-intensive workforce can only participate in it. Compared to those using machine vision to identify the seed quality without destroying the seed structure, the detection speed is fast, and the accuracy is high. It has played a significant role in improving the quality and yield of agricultural products.[2]

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### 1.2 Middle agricultural production stage

It is essential to use all kinds of information that can be used in agricultural production and give full play to the advantages of information collection, storage, analysis, processing, prediction and decision-making. In the middle stage of agricultural production, two ways are suggested to help farmers with low educational levels. First, an agricultural expert system has been developed using artificial intelligence, which has the knowledge and ability of human agricultural experts and can answer farming and aquaculture instead of human agricultural experts—various agricultural technical problems such as fishery facility agriculture. Second, artificial intelligence can also help production personnel to control agricultural equipment intelligently.[3] For the example of the greenhouse control system, the Internet of things technology automatically perceives the temperature, humidity, light, carbon dioxide concentration, moisture, soil and other production environmental factors, pre-process the collected environmental data.[4]

They use the fuzzy control of artificial intelligence and artificial neural network algorithm to design the controller. Combined with the measurement and analysis of crop growth status data, temperature control, irrigation and other equipment for uterine control effectively control each crop growth cycle.[5]

### 1.3 Post-agricultural production stage

After agricultural production, artificial intelligence is involved closely in the traceability and marketing process of agricultural products, combining network technology to mark agricultural products to achieve the traceability function of agricultural products.[6] The location data generated in the traceability process is applied to the agricultural product sales operation and transportation processes. Use data analysis to analyze the data generated in the process of online sales, guide enterprise production, formulate flexible sales strategies, and enable agricultural enterprises to grasp the market situation. Agricultural products sold online will inevitably be sent to users through logistics. The emergence of intelligent logistics systems effectively solves this problem.[7] By combining the Internet, microelectronics technology, Internet of things and artificial intelligence technology. The main strategy is to forecast the demand of agricultural products according to the production season, sales area and market demand, prepare the important areas for supply in advance, and optimize the transportation route to further reduce the loss in the transportation process.[8]

### 1.4 Traceable agricultural product

The traceable agricultural product system is also constantly being developed and improved. While providing people with safer and higher-quality traceable agricultural products, some businesses also collect information about the purchaser and generate user portraits on private servers. This move inevitably violated everyone's data privacy issues. From the perspective of merchants, this article uses hybrid methods to analyze how to use limited data sets to help merchants obtain more information to the greatest extent. At the same time, it discusses the development status and ethical issues of traceable agricultural products in China based on the literature and analysis process.[9]

## 2. LITERATURE REVIEW

Regarding the research of agricultural product traceability, foreign countries started early. As early as the 1980s, European experts proposed food traceability to investigate the cause of mad cow disease.[10] Subsequently, Europe began to trace the road to the construction of the system. In 2000, "Food The promulgation of the Safety White Paper and the 2002 Food Basic Law laid the legal foundation for the food traceability system;[11] China's food safety quality traceability system started in 2002. Due to frequent food safety incidents, the state advocates gradually Established laws and regulations on traceability food (agricultural products) systems and promulgated relevant regulations and guidelines. The introduction of the "Product Quality and Safety Law of the People's Republic of China" in 2006 provided a legal guarantee for traceability from field to table. In 2015, "Food Safety The law was revised for the first time, and the food safety traceability system was confirmed by law for the first time in China.[12] Since then, the food (agricultural product) traceability industry has flourished, and more than 30 provinces and autonomous regions across the country have carried out the construction of agricultural product traceability systems., Traceability products are not limited to vegetables and fruits. Chinese medicinal materials, wine, beef and mutton, etc. are also added to the traceability system.[13] Government agencies, private organizations, and third-party companies have launched their own traceability systems, and China's agricultural product traceability business has entered a stage of rapid development. With the maturity of traceability technology and the

development of the traceability industry, traceability industry standards are gradually being established and improved [14]. The Ministry of Agriculture has issued a series of related agricultural products traceability quality control requirements, including fruits, vegetables, aquatic products, livestock products, grains, etc. Operational norms; the Ministry of Commerce has also issued specific coding rules for the meat and vegetable market circulation traceability system in conjunction with the construction of the meat and vegetable market circulation and quality traceability system.[15] The application of information technology, Internet of Things technology, and big data technology in the production process of agricultural products is helpful to realize the whole-process supervision and traceability of agricultural production, and to a certain extent, can avoid some traditional systemic risks, such as internal operation risks and external cooperation risks. However, the addition of new technologies will also introduce other systemic risks. The first system risk is information security risks. A large amount of information collection accompanies the process of agricultural product traceability. The sensitive information of agricultural product manufacturers, such as inventory information, processor information, customer information, etc., is the data that the traceability system needs to collect. Once sensitive information is leaked, it will affect the reputation of the company and cause immeasurable losses.[16] The second system risk is the risk of information error. The traceability information collection of agricultural products is divided into two types, the enterprise's active output and the automatic collection of the Internet of Things equipment, among which the enterprise's active output mode has artificial information collection, transmission, and entry[17]). Error risk and automatic equipment collection are affected by environmental conditions, hardware equipment, human interference and other factors, and there is a risk of error. If there is a large error in the information disclosed to the public, it is likely to affect the reputation of the company. In this regard, most of the measures taken by companies are to reduce the information displayed to consumers and even only show consumers product names, company names, and other information that has little relevance to the quality of agricultural products.[18]

## 3. TRACEABLE AGRICULTURAL PRODUCT DATA ANALYSIS

In this project, data analysis is divided into six steps: data collection, data cleaning, data preprocessing, data analysis, data visualization, and conclusion.

Figure 1 shows the process of data analysis in this project. Generally speaking, these data come from different legal sources, such as data collected by businesses or large databases. After collecting the data that needs to be analyzed, enter the data cleaning step. The main purpose of data cleaning is to process the unavailable values in the data set and delete the wrong values to make the deviation of the analyzed results smaller. It is usually necessary to preprocess the data before data analysis. In the process of preprocessing, according to the problems to be studied, the data sets are classified and the corresponding small data sets are made, which is more conducive to the efficiency of data analysis. This data set adopts a mixed research method, which combines qualitative research with quantitative research.

### 3.1 Data selection

The data set used in this article comes from the QR code scanning record of the client of Gan'nan Navel Orange under Ruijin Pinguan Agricultural Development Co., Ltd. Scan the QR code on each navel orange through the WeChat "Scan" function and jump to the corresponding display webpage. The webpage displays the growth environment of Gan'nan navel oranges and the company's basic information. It records every scan code information of the customer, and the information includes the scan code sequence, scan code date and time, and the city where the code is scanned. When using the WeChat "scan" function, even the user's gender information, because through the WeChat scan platform, you can directly obtain the user's basic information. At the same time, the merchant will display all the data on the web page in the form of a list, which can be downloaded by every customer who scans the code.

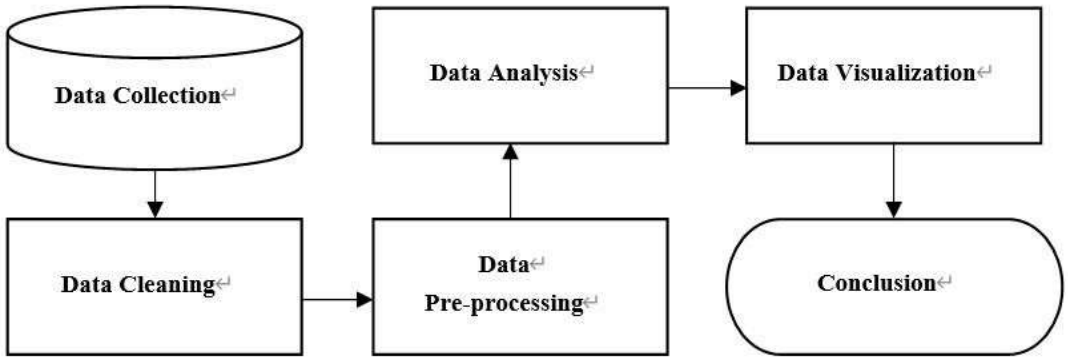


Figure 1. City coloring map

### 3.1.1 Data Collection and cleaning

This data set is downloaded from the web. There are 11246 instances in total, and each instance has five attributes: scan order, gender, scan date, scan time, and scan city. Among them, the number of scan codes and the date and time of scan codes can be used for quantitative analysis, and the cities and genders that can be used for quantitative analysis are scan codes. Since the attributes of the data set are mainly descriptive data, quantitative research will be the main focus of qualitative and quantitative research, focusing on the distribution of agricultural products, drawing user portraits, and formulating specific sales plans for specific customer groups.

Data cleaning is divided into three steps. First, remove all null values. Second, there are not only data with cities as addresses in the original data, but also a part with countries as addresses. In order to ensure that more accurate data can be obtained from the data when the data is cleaned, the data with the country as the address is mainly cleared. Third, the date and time are divided into two attributes to perform statistics on the data set better. In qualitative statistics, the year, month, and scanning time can be analyzed separately. Analysts can add the province where the city is located in front of the city, which can appear to be more noticeable when generating the heat map.

## 3.2 Analysis and finding

Since this data set records the date, time and location when the user scans the code, in this study, we use the data from the scan code to analyze the sales of oranges. Therefore, first, conduct a qualitative analysis of the scan code area. From the coloring map Figure 1, it can be seen that the scope of the sale of oranges covers most provinces and cities in the country except Tibet, allowing businesses to control their sales scope has covered the entire country.

Figure 2. Data analysis flow chat

Most areas. It can be seen from Figure 2 of the heat map that most of the scanning locations for oranges are in North China and Northeast China, and the Northeast has more sales data.


Figure 3. City heat map

In addition, quantitative analysis is used to count the number of scan codes in various regions. In the data set, the province with the most scan codes is Liaoning Province, accounting for 28.38%, followed by Beijing, accounting for 10.95%. From the histogram of the total number of scanning codes in each province and city in Figure 3.

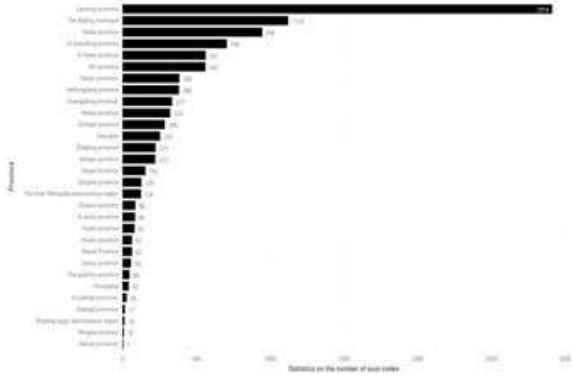

Figure 4. Scanning times in different provinces

It can be seen that among the top ten cities in the count, eight cities are located in North China and Northeast China, and the total count accounts for 67.86% of the data set. From the above analysis, it can be seen that the company's main sales locations are concentrated in North China and Northeast China, far from the production location of Jiangxi Province. Therefore, the storage method of agricultural products should be suitable for long-distance transportation.

When users scan codes, most of them use the WeChat "scan" function. Therefore, during the process of scanning the code, the user's gender information disclosed on WeChat will also be recorded. Through gender counting and statistics, among the users who scan code, the proportion of women is 60.11%, and the proportion of men is 39.89%. Combining gender information with regional information, we can see that female users in Liaoning Province accounted for 29.05% of all users, the highest proportion.

In the scanning records of Liaoning Province, the proportion of women is higher than that of men by 1.68%. In the remaining provinces, the difference in the ratio of men to women is smaller than that in Liaoning Province. Therefore, businesses can conclude through analysis that in all customer groups, women account for the majority. Among female users, users from the Northeast region account for the majority. At the same time, combined with

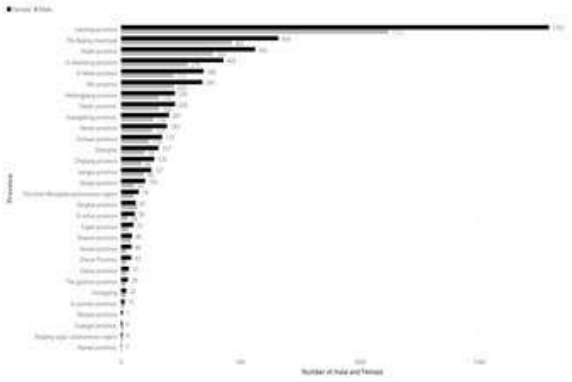

Figure 5. Scanning times in different provinces with gender

the qualitative analysis of the region, in order to meet the needs of most customers and reduce the time wasted in long-distance transportation, merchants can set up a centralized warehouse in the northeast region, which can reduce the number of shipments to the northeast region and shorten the delivery of agricultural products. The time in the hands of customers guarantees the freshness of agricultural products.

Next, in the scan code time data analysis, quantitative analysis can be used to count the data recorded from 2019 and obtain the scan code every month from September 2019 to March 2021. The number of times, and produced a line chart as shown in the figure.

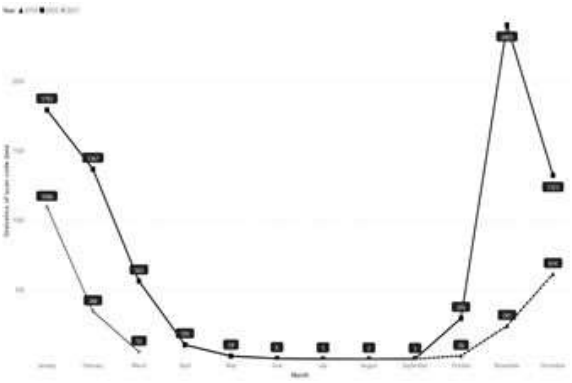

Figure 6. Numbers of scanning code in 2019 2021

Scanning codes began to appear in September 2019, and until January 2020, they reached the first peak of scanning code counts, accounting for 17.46%. From January to April 2020, the scan code record showed a downward trend. From April 2020 to September 2020, the scan code record has been approaching zero. The reason is that the period of time is the growth cycle of oranges, out of stock status. From September 2020 to January 2021, it can be seen that in November 2020, the number of scan codes reached the highest point in history, accounting for 23.40%. From the above analysis, it can be seen that excluding the force majeure factors such as growth cycle, the company's agricultural product sales have been on an overall upward trend, and sales are in the best condition around the Lunar New Year. It cannot be ruled out that people take oranges as gifts for each other, the act of giving away, so you can use the date and other information in the orange sales process to market oranges and increase sales.

## 4. ETHICAL RISKS OF TRACEABLE AGRICULTURAL PRODUCTS

The retrospective ethical risk mainly refers to the disclosure of unsuitable information to the public, causing business losses to the enterprise. In this regard, the first is to optimize information transmission technology, use high-precision information collection equipment to improve the accuracy of information collection, avoid incorrect information from entering the

system, and at the same time provide abnormal warnings for data input and output. Once data is found to be abnormal, conduct investigations in time to prevent errors. Data can be entered into the system to prevent sensitive information from flowing out of the system. Second, it is essential to strengthen staff training to ensure that the staff correctly use the traceability system and ensure that the staff members have a certain amount of agricultural product production knowledge to avoid artificial input of misinformation. Third, the focus is to strengthen industry supervision. Conduct industry investigations on the traceability system to ensure that the traceability system, especially the third-party traceability system, does not have obvious system loopholes. In addition, the traceability system that leaks customer information is held accountable to purify the industry environment.

## 5. DISCUSSIONS

In today's rapid development, technology has also penetrated the link of agricultural products. People have a certain inherent impression of agricultural products. This inherent impression makes it impossible for people to discover the ethical issues in agricultural products for the first time. However, the unified supervision by the national department appears to be very important currently. Suppose we plan to solve the ethical issues of agricultural products in China. In that case, the best strategy is to adopt high-tech services to monitor and predict the expected growth of crops. From this article alone, it is not difficult to see that businesses can still analyze more information through limited data sets. Artificial intelligence and agriculture will have more and more contacts in the future, and the ethical issues and data leakage issues of traceable agricultural products are still worthy of attention.

The potential of the application of artificial intelligence in agriculture is unlimited, and the challenges it brings are unknown. In order to improve the economic benefits of agricultural production, it is a significant development direction of modern agriculture to bring agriculture into the digital and information age. However, the combination of artificial intelligence and agriculture has just started, with the continuous deepening, many problems are revealed. Although the researchers divide agriculture into three stages, there are numerous applications in each stage, making it more difficult to implement the technology. There is a lot of evidence and research to show that the combination of artificial intelligence and agriculture has some good results. These include using machine vision to identify the quality of agricultural products and seeds, intelligent greenhouse control systems, and automatic control of agricultural equipment. However, some applications are currently facing great challenges, for example, in the predictions of weather, pest control, soil change, market demand, and so on.[19] Due to the uncertainty in agricultural production, including the different levels of education of employees, the lack of exchange of agricultural equipment and other problems, artificial intelligence cannot completely replace human beings in actual production. It can be predicted that because the technical problems have not been completely solved, the ethical issues are less likely to be widely concerned. Therefore, it is important to remind people to pay attention to the ethical problems in artificial intelligence and agriculture. Among them, the stage where personal privacy is most likely to be widely disclosed is in the later stage of agricultural production. Information such as the sale of agricultural products is involved in this stage, it is easy to collect and store the personal information of buyers and use it for market analysis and forecasting. Although the data analyzed in this paper is based on the basic geographical location and time information, we can still see the market scope and other favorable information from the visual data. Generally speaking, it is beneficial for businesses to have this information, but due to the lack and immaturity of supervision in data collection, businesses without notifying customers, the collection of their personal information and use for business analysis, this move largely touches on ethical and moral rules. At present, many researchers pay more attention to how to realize the application of technology, but people from all walks of life should pay more attention to data privacy and ethics. This not only requires the combination of artificial intelligence engineers and agriculture, but government regulation should also communicate more with scientists to avoid paying too much attention to technology while neglecting ethical issues.[20]

On the issue of agricultural ethics, we should pay attention to human beings themselves and the relationship between human beings and nature. Although, with the rapid development of industrialization, information and automation, human activities interfere with the original appearance of the environment to a great extent, especially after the addition of artificial intelligence, the problems we need to consider still exist among the three. And the ethical relationship between artificial intelligence and human beings, the ethical relationship between human beings and nature, and the ethical relationship between artificial intelligence and nature. As China is a largely agricultural country, there are many people engaged in agriculture in China, and their every move will involve these three ethical issues. However, many people in this group have not received higher education, and they have far less understanding of artificial intelligence than those who are currently

engaged in artificial intelligence. Therefore, it is urgent and necessary to tell them how to pay attention to ethical issues while implementing agricultural activities that are easy to implement and understand. This involves the early and middle stages of agricultural production: the preparatory work before the beginning of agricultural activities and the ongoing work of agricultural activities.

Only by predicting the various ethical problems that can occur in the three stages of agricultural production can artificial intelligence be better combined with modern agriculture and achieve the purpose of intelligent agricultural production. However, this process is long and challenging, so it requires active communication and communication among various industries to achieve the ultimate goal.

## 6. CONCLUSION

In the next few years, countries with other key development agriculture should set up a few aspects to solve the ethical ethics of intelligence agriculture. First, we should continue to improve the basic agricultural hardware facilities, expand the scope of digital services, promote digital agriculture as the core of digital agriculture, and gradually be close to the city. For example, in the Netherlands, there is high-tech urban agriculture, using gardening LED and the environmental control system, transplanted the crop growth environment to the city center. This can greatly reduce the time between crops from picking up from farms to cooking, so people are late getting fresh vegetables.[21] The recommendation is to improve the agricultural digital industrial chain, helped by the government, promote agricultural production intelligent construction, promote the use of the Internet, cloud computing, big data, and artificial intelligence in agricultural production and operation, continuously improve the agricultural data resource pool of the entire country. Additionally, according to the corresponding ethical issues that may encounter in various fields, learn from the ethical experience in other industries, and is applied to digital agricultural fields. Secondly, innovate in the theoretical foundation of digital agriculture, enhance the feasibility of intelligence agriculture from the source, and incorporate smart agriculture into an existing agricultural teaching system as a course, more let low education people can expire the updated knowledge. Change the inherent concept of agriculture and cultivate more composite talents.

In rapid high-tech development, agriculture also needs to combine with wisdom. In the process of smart agriculture, there will be a variety of problems, and the public, our work often ignore ethical issues. Market analysis with the data that can be tracked in intelligence agriculture and market analysis to help SME companies understand their products and user groups. In the future, our work can be combined with artificial intelligence to develop a market analysis model for agricultural products sales and help the government to improve the potential research direction of laws and regulations on ethical morality in smart agricultural production.

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