# Factors Influencing the Adoption of Intelligent Agriculture Production Technology by Large-Scale Agricultural Growers in Shandong Province, China

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**DOI: https://dx.doi.org/10.47772/IJRISS.2025.9020233**

**Received: 06 February 2025; Accepted: 14 February 2025; Published: 14 March 2025**

## ABSTRACT

The development of intelligent agriculture is an important condition for transforming the mode of agricultural production and accelerating the modernisation of agriculture and rural areas, and it is an important part of China's sustainable development strategy. In order to transform agricultural production methods and accelerate the development of modernisation of agriculture and rural areas, the paper applies rootedness theory to qualitatively analyse the constraints on the adoption of smart agriculture production behaviours by large agricultural growers based on 16 in-depth interviews in Shandong Province. Based on 16 in-depth interview data in Shandong Province, the paper applies rootedness theory to qualitatively analyse the constraints on adopting intelligent agriculture production behaviours by large agricultural growers. Through triple coding construction using Nvivo 11 software, a theoretical model including the social level (policy environment), the user level (personal cognitive situation, degree of cognition of intelligent agriculture technology), and the level of supply of intelligent agriculture technology (supply of resources) is established, for which suggestions are made to strengthen policy publicity and technology promotion, and to increase policy support to promote the development of intelligent agriculture in Shandong Province. This study deepens the theoretical mechanism of the adoption behaviour of large-scale farmers' intelligent agriculture production technology, providing suggestions for the government to introduce more targeted policies for the development of intelligent agriculture, which will help promote the transformation and development of China's agricultural modernization.

**Keywords:** Grounded Theory, Intelligent Agricultural Production Technology, Influencing Factors, Shandong Province

## INTRODUCTION

Shandong Province is a major agricultural-producing province in China. Most of the current agricultural production and operation is still based on the traditional business model; the natural and market risks are more significant, and it is difficult to adapt to the current development trend of the modernisation of agriculture. The emergence of intelligent agriculture provides a scientific idea for transforming and upgrading agricultural production in Shandong Province. The basic framework for intelligent agriculture has been established in some areas of Shandong Province, effectively promoting large-scale and intensive agricultural operations. Therefore, this study adopts the grounded theory approach to analyse the influencing factors affecting the adoption of intelligent agricultural production technology by large growers in Shandong Province, with a view to providing a reference for the development of intelligent agriculture in Shandong Province.

## LITERATURE REVIEW

Located in the east of China, Shandong Province has favourable conditions for agricultural production and is a central producing area for agricultural products in China (Yang et al., 2021). Its favourable resource conditions have laid the foundation for developing intelligent agriculture in Shandong. From the perspective of the development of the times, agricultural production methods can be divided into traditional agricultural production and intelligent agricultural production (Elbasi et al., 2022; Sulaiman et al., 2022), so this study mainly analyses the status quo of traditional agriculture and intelligent agriculture and the influence factors of adopting intelligent agricultural production methods.

**Current Status of Research on Traditional and Intelligent Agriculture**

The current status of traditional and intelligent agriculture can be analysed comparatively from several aspects, including technology application, production efficiency, environmental impact, and economic development.

From the point of view of technology application, traditional agriculture relies mainly on farmers' experience and traditional methods, such as manual plowing, natural pollination, and rainwater irrigation. Technological progress is slow and limited by natural conditions (Khanna et al., 2022). Intelligent agriculture mainly uses modern information technology, such as the Internet of Things, big data, artificial intelligence, and drones, to achieve precise agricultural management (Kumar et al., 2022). Through sensors and remote monitoring, crop growth information and soil conditions can be obtained in real time, improving the scientific nature of decision-making.

From the perspective of productivity, traditional agriculture is relatively low in productivity, labour-intensive, and highly affected by weather and natural disasters (Wang et al., 1996). Intelligent agriculture focuses on automation and intelligent equipment to improve production efficiency, reduce manpower requirements, and lower production costs (Boursianis et al., 2022; Rashid et al., 2023).

From the perspective of environmental impact, traditional agriculture may have problems such as over-cultivation and misuse of chemical fertilizers and pesticides, which puts a certain pressure on the ecological environment. Intelligent agriculture mainly promotes precise fertilizer application and pest control, reducing chemical fertilizers and pesticides and being more environmentally friendly (Ragaveena et al., 2021).

From the economic development perspective, traditional agriculture is mostly small-scale production with limited market competitiveness and low returns for farmers. Intelligent agriculture improves the quality and yield of agricultural products, enhances market competitiveness, and increases farmers' income (Goel et al., 2021; Vorodam et al., 2023). Overall, intelligent agriculture represents the development direction of agricultural modernisation, but traditional agriculture still occupies an important position in some regions.

**Current Status of Research on Factors Influencing the Choice of Production Methods in Intelligent Agriculture**

Farmers' choice of agricultural production methods is constrained by many factors, which will directly or indirectly affect their choice (Brown et al., 2021). Based on a summary of previous research and literature analysis, the factors affecting farmers' choice of agricultural production methods can be grouped into three levels: the first is the level of social factors, the second is the level of personal factors, and the third is the level of external resource factors.

Georgopoulos et al. (2023) analysed the established literature. They concluded that the most important factors influencing farmers' adoption of intelligent agricultural technologies are whether the production method is profitable, whether farmers can afford the initial capital investment, and the reliability of the technology. Sulaiman et al. (2021) and Ena and Siewa (2022) concluded through the quantitative causal research method that performance expectancy, effort expectancy, social influence, and facilitating conditions play a significant role in whether farmers in Malaysia adopt intelligent agricultural technologies play an important role. Li et al. (2023) concluded that behavioural attitudes (positive or negative attitudes) have a significant impact on farmers' adoption of intelligent agricultural technologies, followed by subjective norms (external pressures felt by farmers) and perceived behavioural control (subjective will). Yoon et al. (2020) argued that the degree of willingness of Korean farmers to adopt intelligent agricultural technologies depends more on the degree of supply chain sophistication, the availability of resources, and the personal intentions of the farmers. Chuang

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue II February 2025

et al. (2020) argued that farmers' perceptions and perceived importance of intelligent agricultural technologies in Taiwan Province, China, influence whether farmers adopt intelligent agricultural technologies.

In summary, with the development of society, traditional agricultural production methods are facing difficulties, and intelligent agricultural production models have emerged. For rural areas, intelligent agricultural production technology has not yet been popularised, and large farmers play an indispensable role as important players in agricultural production.

# RESEARCH METHODOLOGY AND DATA SOURCES

## Research methodology

Grounded theory mainly emphasises in-depth analysis and construction of relevant social theories from textual data, especially interview data, which can be used to study intelligent agriculture issues (Zhao, 2021). Grounded theory attaches importance to data collection and organisation of empirical data (i.e., subjective facts) and specific coding of the obtained material, which leads to research conclusions (Fig. 1). Through face-to-face interviews with large farmers (more than 800 acres, 1 acre is approximately equal to 667$m^2$) and later data analysis, this study is conducive to scholars' further discovery of problems in the behaviour of intelligent agricultural development that are more in line with the actual situation of intelligent agricultural development and more effective identification of influencing factors.

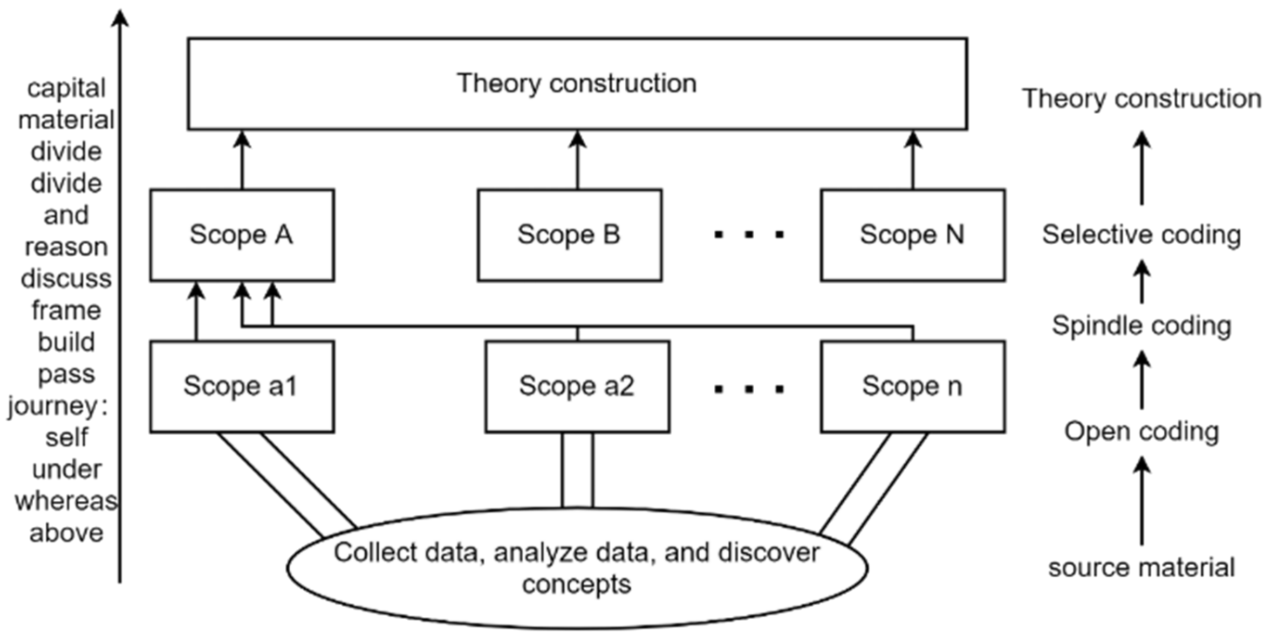



Fig.1 Encoding process of grounded theory

Source: Author (2024)

## Data sources

### Interviewees

The interview subjects were selected using a random sampling method to determine, mainly in the towns and villages of Shandong Province, the scale of operation reaches a certain range (more than 800 acres, 1 acre is approximately equal to 667$m^2$) or more, and has a nationally recognised local planting large household. This study selected 16 large households in Yangliuxue, Nanqu, Qijia and Facheng villages in Shandong Province. Among 16 planting large households, the adoption of intelligent agricultural development technology or intelligent agricultural production of 12, did not adopt 4. Overall, more large-scale farmers have adopted intelligent agricultural technology or agricultural production than those without.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue II February 2025

### Interview process

The interview process was to obtain real first-hand information. The researcher used field visits in the form of research, with the help of government departments, and face-to-face communication interviews with the interviewees, who were relatively concentrated in age. To ensure the reliability and validity of the research process, a pre-survey was conducted before the development and implementation of this research, in which three large-scale planting households were pre-surveyed, interviews were conducted, and the interview outlines were modified and improved according to the results of the feedback from the pre-survey.

Semi-structured interviews were used during the field interviews, with a single interview lasting about 40-60 minutes, and all interviews were experienced for three weeks. Basic content: First, ask about the scale of agriculture operated by the interviewees, the number of years, the main business content, etc., to cut into the theme of intelligent agricultural development. Secondly, ask whether to adopt intelligent agricultural production methods or technologies, whether the neighbours around them have adopted intelligent agricultural production methods or technologies and through which channels to learn about the information of intelligent agricultural production and others.

Thirdly, ask in adopting the development of intelligent agriculture, whether there are any encountered difficulties or problems, and how to solve the usefulness and ease of use of intelligent agricultural production technologies and others. Finally, the interviewees were asked about their perceptions of the risks and benefits of intelligent agricultural development and the impediments to the development of intelligent agriculture. About 13 hours of interview recording time was obtained for this study, and more than 30,000 words of primary data (interview transcript) and 20,000 words of secondary data (basic development situation) were obtained.

## SCOPE REFINEMENT AND MODEL CONSTRUCTION

### Open coding

This study utilised Nvivo 11 software to code the interview textual material. The raw textual data were gradually conceptualised and abstracted during the coding process, and the data and concepts were compared and summarised to derive categories and characteristics. During the open coding process, the interview data were gradually processed around the research theme of ‘big farmers’ intelligent agricultural development behaviours and their influencing factors, resulting in 37 concepts and 15 categories (Table 1).

Table 1 Open coding list

| Categorisation | Initial Concepts | Interview Transcript |
|---|---|---|
| B1 Altruistic motivation | C1 Intelligent agricultural products are beneficial to others | “Intelligent agricultural produce is good for people's health” |
| | C2 Intelligent agricultural products are favourable to environmental improvement and beneficial to others | |
| | C3 Intelligent agricultural products are beneficial to long-term development | |
| B2 egoistic motivation | C4 Beneficial to one's own health; | “What you grow yourself with intelligent agricultural technology is also a bit more secure for you to eat” |
| | C5 Improvement in quality of life | |
| | C6 Peace of mind in eating | |
| B3 Risk Perception | C7 High risk | “We don't dare to change the production method all of a sudden, and we can only change it gradually” |
| | C8 Concerns | |
| | C9 Difficulty in obtaining information | |
| | C10 Uncertainty | |

| | | |
|---|---|---|
| B4 Benefit Perception | C11 Long payback period | “The cost of intelligent agricultural products is higher than that of ordinary products, but the manufacturers charge us for ordinary products” |
| | C12 High product cost | |
| | C13 Low product price | |
| B5 scale of operation | C14 Scale of operation and scale of trials | “I contracted more than 4,000 acres of land and took out 200 acres for the experiment; even if I lost money, it would not affect me much” |
| B6 Other people's influence | C15 Experience sharing | “If anyone grows well, we'll go and see; we'll learn” |
| | C16 Herd behaviour | |
| | C17 Learning from others | |
| B7 Policy stability | C18 Policy change | “When we started, the government said there was a policy so that we could do it without worry, but after we finished, we were informed that the policy was gone” |
| | C19 Policy fulfilment | |
| B8 Policy support degree | C20 Policy subsidy | “To change production methods, we pay part of the money ourselves, and the government pays part” |
| | C21 Subsidy ratio | |
| B9 Publicity and Promotion | C22 Calling | “Other people all say we're doing intelligent agricultural production using drones, and I'll do it when I see the benefits” |
| | C23 Atmosphere | |
| B10 Intelligent agriculture project support | C24 Special projects | “The county's Agriculture and Rural Affairs Bureau has signed a contract with me for an intelligent farmland renovation and construction demonstration site” |
| | C25 Base | |
| B11 Financial Resources | C26 Financial constraint | “Trying a new way of planting must cost much money at the beginning. We lacked the funds ourselves, so we had to borrow from the bank, and the interest rate was very high” |
| | C27 Insufficient cash flow | |
| | C28 High interest rates | |
| B12 Human Resources | C29 Rural population loss | “Nowadays, all the young people in the countryside who can earn money are working outside” |
| | C30 Insufficient skilled manpower | |
| B13 Technology Ease of Use | C31 Too difficult | “Most of us are educated in primary and junior high school, so it's hard for us to learn new skills” |
| | C32 Cumbersome | |
| | C33 Difficult to learn | |
| B14 Technology usefulness | C34 Poor results | “The effect is still different. At first, the difference in average yield per acre is still quite big” |
| | C35 Decrease in yield | |
| B15 Technology Behavioural Willingness | C36 Willingness to continue adopting intelligent agricultural technology | “If the yield is good, I'll continue to use intelligent farming techniques.” |
| | C37 No willingness to continue adopting intelligent agricultural technology | |

Source: Author (2024)

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue II February 2025

**B Spindle type coding**

Main axis coding is based on open coding, exploring the logical relationship between individual categorised concepts by further refining the categorised concepts, reconstructing the logical relationship between concepts and concepts, and then summarising the main categories. In this study, the 37 initial concepts obtained from open coding were further summarised and integrated to obtain 15 sub-categories, which were grouped into four main categories (Table 2), namely personal cognitive situation, policy environment, resource supply, and the degree of cognition of intelligent agricultural technology.

Table 2 Spindle type code list

| **Primary Category** | **Category** | **Meaning** |
|---|---|---|
| A1 Individual perceptions | B1 Altruistic motivation | Large-scale farmers' intelligent agricultural technology development behaviours are designed to benefit others |
| | B2 egoistic motivation | Large-scale farmers' intelligent agricultural technology development behaviours are designed to benefit themselves |
| | B3 Risk Perception | Large-scale farmers' subjective judgments of the risks of intelligent agricultural technology development behaviours |
| | B4 Benefit Perception | Large-scale farmers' subjective judgment of the benefits of intelligent agricultural technology development behaviours |
| | B5 scale of operation | The extent to which large-scale farmers' scale of operation influences the behaviour of intelligent agricultural technology development |
| | B6 Other people's influence | The degree of influence of other people around the large-scale farmer on the behaviour of intelligent agricultural technology development |
| A2 Policy environment | B7 Policy stability | Persistence of policies faced by large-scale farmers |
| | B8 Policy support degree | The degree of policy support for large-scale farmers' intelligent agricultural technology development |
| | B9 Publicity and Promotion | Social climate for intelligent agricultural technology development |
| | B10 Intelligent agriculture project support | Degree of support for large-scale farmers from pilot projects for intelligent agricultural technology development |
| A3 Resource Provision | B11 Financial Resources | Financial resources required for intelligent agricultural technology development in large-scale farmer agriculture |
| | B12 Human Resources | Situation of human resources required for the development of intelligent agricultural technology in large-scale farming agriculture |
| A4 Awareness of Intelligent Agricultural Technologies | B13 Technology Ease of Use | Subjective judgment of large-scale farmers on the ease of use of intelligent agricultural technology development technology |
| | B14 Technology usefulness | Subjective judgment of large-scale farmers on the usefulness of intelligent agricultural technology development technology in agricultural development |
| | B15 Technology Behavioural Willingness | Subjective willingness of large-scale farmers to use intelligent agricultural technology development |

Source: Author (2024)

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue II February 2025

### Selective coding

Selective coding is the process of categorising and summarising the information data collected and centralising it into a theoretical model, where the relationship between the main categories and the core codes is first identified. The selection of the core categories revolves around the following three aspects: the first aspect is the relationship between the importance of the core categories and the main categories; the second aspect is the frequency of the core categories in the research process; and the third aspect is the content of the analyses that the core categories are to cover.

Table 3 Structure of the relationship between main categories and core codes

| Relationship Paths | Relationship Structure |
|---|---|
| Individual cognitive situation → Choice of production method | Direct influence |
| Intelligent agricultural technology cognitive level → Choice of production method | Direct influence |
| Resource supply → Choice of production method | Direct influence |
| Policy environment → Individual cognitive situation → Choice of production mode | Indirect influence |
| Policy environment → Degree of awareness of intelligent agricultural technology → Choice of production method | Indirect influence |
| Policy environment → Resource supply → Choice of production method | Indirect influence |

Source: Author’s Data Analysis (2024)

Accordingly, this paper takes ‘large-scale farmer's intelligent agricultural technology development behaviour’ as the core category, which is influenced by many aspects, including individual cognitive situation, policy environment, resource supply, and the degree of knowledge of intelligent agricultural technology. Table 3 shows the specific influence paths and relationship structure.

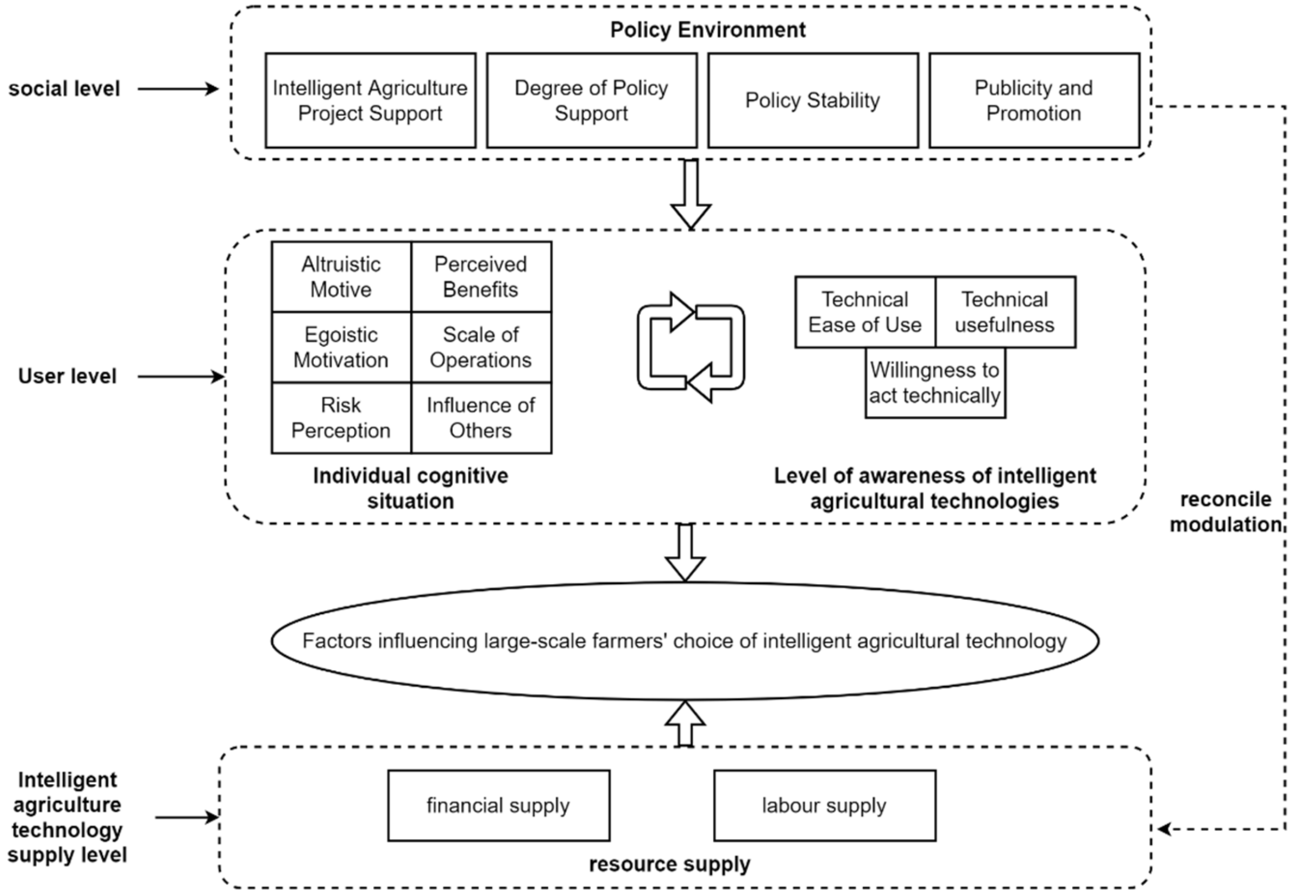
## RESULTS AND DISCUSSION

### Theoretical Modelling

The model of influencing factors of intelligent agriculture technology selection of large-scale farmers in Shandong Province was constructed through the study of the main and core categories' mutual influence relationship (Fig. 2). Also, because the categories affect subject differences, three more levels were sorted out based on this model: the social, user, and intelligent agriculture technology supply levels. The social level is mainly the influence of the social environment on individuals and the moderating effect on the supply of intelligent agricultural technology; the user level mainly refers to the large-scale farmer's own situation, including the influence of personal cognitive situation and the degree of large-scale farmer's cognitive level of intelligent agricultural technology on the choice of intelligent agricultural production methods.

The level of the supply of intelligent agricultural technology is the intelligent agricultural technology services provided by the government or professional organisations. The supply level of intelligent agriculture technology is the intelligent agriculture technology services provided by the government or professional organisations.

Fig. 2 Theoretical model of factors influencing the development of large-scale farmers' adoption of intelligent agricultural technologies




Source: Author (2024)

## Analysis of results

### Personal perceptions

The analysis found that personal situation perceptions accounted for a large proportion of large-scale farmers' choice of agricultural production methods. Personal situation perceptions included altruistic motivation, egoistic motivation, risk perception, benefits, scale of operation, and influence of others.

Among them, the motivation aspect includes altruistic motivation, egoistic motivation and benefit cognition. Altruistic motivation is to think that adopting intelligent agricultural technology development is beneficial to others, and egoistic motivation is to think that adopting intelligent agricultural technology development is beneficial to oneself (Adeel et al., 2024). The concepts of altruism and egoistic motivation in large-scale farmers are mainly due to the improvement of modern people's living and production conditions and the gradual increase of health awareness so that people are more willing to pursue green and healthy production and living. Therefore, people are more willing to pursue green and healthy products in production and life and benefit others while considering their own health. Benefit perception believes that there will be benefits (positive/negative) from adopting intelligent agricultural technology development behaviours (Li et al., 2020), i.e., large-scale farmers are pursuing benefit maximization.

Risk perception is a factor that large-scale farmers must consider when adopting intelligent agricultural technology development behaviours, and they need to consider their ability and degree of risk tolerance. In the interviews, 4 interviewees believed that the risk was too high and that they did not have the financial ability to bear the risk associated with the change in production methods. In addition, other large-scale farmers were still concerned as the returns from the development trials of adopting intelligent agricultural technologies were not so good. Among them, 8 interviewees thought the risk was small because they had invited technicians to guide, learn and observe, reducing the risk.

Finally, the scale of operation and other factors also impact the decision of large-scale farmers to adopt intelligent agricultural technology development behaviour. The scale of operation directly reflects the capital situation of large-scale farmers and influences the willingness of large-scale farmers to adopt small-scale intelligent agricultural technology cultivation trials. Among the 16 large-scale farmers interviewed, the larger the scale, the more inclined the large-scale farmers were to conduct small-scale trials. The influence of others is the influence of people and society around them, and the good or bad business and business experience of others will affect the production decisions of large-scale farmers.

**Technology Awareness of Intelligent Agriculture**

The degree of technology perception mainly contains 3 aspects: technology ease of use, technology usefulness, and technology behavioural willingness. Technology perception is the judgment of large-scale farmers on whether the development of intelligent agricultural technology is easy to use; the easier the technology is to use, the more large-scale farmers tend to adopt it. In the interviews, 7 interviewees thought that drone pesticide spraying technology operation was more complicated and strenuous to learn. They were less inclined to continue to adopt it, and the operation of intelligent water and fertilizer-integrated drip irrigation technology was simpler and would continue to be adopted.

Technology usefulness refers to whether large-scale farmers find intelligent agricultural technologies useful. The key to whether a new technology can be widely promoted and applied lies in whether the users can benefit from it (Takahashi et al., 2020). In the interviews, 16 interviewees agreed that intelligent agricultural technologies, especially intelligent water and fertilizer-integrated drip irrigation technology, have greatly saved production costs in the long term.

The behavioural willingness of technology refers to the willingness of large-scale farmers to adopt intelligent agricultural technology development after the assessment of technology usefulness and technology ease of use; the stronger the behavioural willingness, the stronger the behaviour of intelligent agricultural technology development, and the easier it is to carry out the transformation of agricultural production methods.

**Resource supply**

Resource supply mainly includes financial resources and human resources related to agricultural economic development. Financial resources refer to the funds that large-scale farmers need for agricultural production and operation, and human resources refer to the technical talents and manpower that large-scale farmers need for intelligent agricultural technology production and operation. In the interviews, 6 interviewees indicated that it was difficult to transform due to a lack of financial resources, and all 16 interviewees indicated that they needed the support of professional and technical talents. When financial and human resources are satisfied, intelligent agricultural technology development behaviour will be stimulated. Still, the current difficulties in financing and the lack of technical talents and manpower prevent large-scale farmers from adopting intelligent agricultural technology.

**Policy environment**

The policy environment covers policy stability, policy support, publicity and promotion, and intelligent agriculture project support. Policy stability is mainly about how fast large-scale farmers perceive policies to change; the faster the rate of change, the worse the stability, and the lower the willingness of large-scale farmers to transform their production methods.

Policy support, i.e., the size of government policy support on intelligent agricultural technology: 5 interviewees in the interview said that the stronger the policy support, the stronger their willingness to adopt intelligent agricultural technology.

Publicity and promotion refer to the social environment for the development of intelligent agriculture; when social opinion and publicity create an environment conducive to the development of intelligent agriculture, large-scale farmers, as the main body of production and management of intelligent agriculture, will be affected and promoted by a larger impact, which will help them to transform from the traditional mode of agricultural production to the mode of intelligent agricultural production. In the interviews, 4 interviewees talked about adopting intelligent agricultural technology production because of social publicity and promotion.

Intelligent agriculture project support refers to the government's financial, technological and targeted policy preferences for the first pilot projects of intelligent agriculture, 3 interviewees indicated that they are carrying out small-scale pilot projects for intelligent agriculture development with acceptable returns and that they intend to increase the scale in the future and gradually turn it into a large-scale adoption of intelligent agriculture technology, and 4 interviewees indicated that they had not sought project support and that transforming the technology of irrigated farmland, for example, requires more capital and risky, and did not make large-scale transformation.

**Theoretical saturation test**

In this paper, the saturation test of grounded theory was divided into two steps. Firstly, 8 interview data were randomly coded to form a three-level coding framework to obtain the grounded theory model. It was found that the factors affecting large-scale farmers' adoption of intelligent agricultural technology were divided into four aspects: personal cognitive situation, policy environment, resource supply, and the degree of knowledge of intelligent agricultural technology. After completing the partial coding of the data, the remaining 4 interview data were coded one by one, and the emergence of new research categories and concepts outside the scope of the studied areas was not found in this coding process, indicating that the theory was basically saturated.

## CONCLUSION

The future development of agriculture needs to combine the advantages of intelligent agriculture with those of traditional agriculture, modernizing and transforming traditional agriculture while maintaining sustainable development. Therefore, it is necessary to conduct an in-depth study on the intelligent agricultural production behaviour of large farmers to summarise the obstacles to the development of intelligent agriculture, to better promote the development of intelligent agriculture, and to promote the development of China’s agriculture in the direction of modernisation.

This study used grounded theory to qualitatively analyse the factors influencing the behaviour of large-scale farmers in adopting intelligent agricultural technologies. Through 3 levels of open coding, spindle coding, and selective coding, it was found that their behaviour in adopting intelligent agricultural production technologies was mainly influenced by the social level (policy environment), the user level (personal situation awareness, intelligent agricultural technology awareness), and the level of the supply of intelligent agricultural technologies (resource supply) influence, for which the following policy recommendations are proposed.

The idea is to guide farmers in changing their production methods, add impetus to the development of intelligent agriculture, achieve precise and intelligent management of the agricultural production process, optimise the allocation of resources, reduce production costs, and improve the yield and quality of agricultural products.

Secondly, policy support should be increased to enhance farmers' risk-resistant capacity. The government should set up a special fund for intelligent agricultural production, reasonably allocated according to the level of economic development and agricultural production needs of different regions, and develop price index insurance and other special types of insurance to enhance the industry's risk-resistant ability. In addition, the government should also formulate relevant intelligent agriculture tax reduction and tax exemption policies and expand financing channels for intelligent agriculture.

Thirdly, we should speed up the promotion of intelligent agricultural technology and give full play to the role of farmers who have first adopted intelligent agricultural technology in exploring the way forward, leading

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue II February 2025

demonstrations and leading by radiation. The government should actively build an agricultural market service platform to popularise and promote intelligent agricultural products and intelligent agricultural production technology. At the same time, intelligent agricultural demonstration households drive the enthusiasm of local farmers to learn intelligent agricultural production technology, enhance the scientific and technological transformation ability of farmers, and cultivate a number of new professional farmers who are competent in modern intensive management.

In summary, in order to further enable large-scale farmers to understand the importance and superiority of the development of intelligent agriculture, firstly, it is necessary to strengthen the publicity and education of the concept of the development of intelligent agriculture; secondly, it is necessary to increase the intensity of financial support for agriculture, to reduce the losses caused by natural disasters and low prices of stagnant sales as much as possible, and to ensure the basic income of farmers; thirdly, it is necessary to speed up the process of technical guidance, increase the number of agricultural professionals and technicians, and popularise the knowledge of agricultural intelligent agricultural production techniques and other knowledge, in order to promote the rapid and healthy development of intelligent agriculture in Shandong Province.

## REFERENCE


1. Adeel, H. B., Sabir, R. I., Shahnawaz, M., & Zafran, M. (2024). Adoption of Environmental Technologies in the Hotel Industry: Development of Sustainable Intelligence and Pro-Environmental Behavior. *Discover Sustainability, 5*(1), 79.
2. Boursianis, A. D., Papadopoulou, M. S., Diamantoulakis, P., Liopa-Tsakalidi, A., Barouchas, P., Salahas, G., Karagiannidis, G., Wan, S., & Goudos, S. K. (2022). Internet of Things (IoT) and Agricultural Unmanned Aerial Vehicles (UAVs) in Smart Farming: A Comprehensive Review. *Internet of Things, 18*, 100187.
3. Brown, C., Kovács, E., Herzon, I., Villamayor-Tomas, S., Albizua, A., Galanaki, A., Grammatikopoulou, I., McCracken, D., Olsson, J. A., & Zinngrebe, Y. (2021). Simplistic Understandings of Farmer Motivations Could Undermine the Environmental Potential of the Common Agricultural Policy. *Land use policy, 101*, 105136.
4. Chuang, J.-H., Wang, J.-H., & Liou, Y.-C. (2020). Farmers' Knowledge, Attitude, and Adoption of Smart Agriculture Technology in Taiwan. *International Journal of Environmental Research and Public Health, 17*(19), 7236.
5. Elbasi, E., Mostafa, N., AlArnaout, Z., Zreikat, A. I., Cina, E., Varghese, G., Shdefat, A., Topcu, A. E., Abdelbaki, W., & Mathew, S. (2022). Artificial Intelligence Technology in the Agricultural Sector: A Systematic Literature Review. *IEEE access, 11*, 171-202.
6. Ena, G. W. W., & Siewa, A. L. S. (2022). Factors Influencing the Behavioural Intention for Smart Farming in Sarawak, Malaysia. *Journal of Agribusiness, 9*(1), 37-56.
7. Georgopoulos, V. P., Gkikas, D. C., & Theodorou, J. A. (2023). Factors Influencing the Adoption of Artificial Intelligence Technologies in Agriculture, Livestock Farming and Aquaculture: A Systematic Literature Review Using PRISMA 2020. *Sustainability, 15*(23), 16385.
8. Goel, R. K., Yadav, C. S., Vishnoi, S., & Rastogi, R. (2021). Smart Agriculture–Urgent Need of the Day in Developing Countries. *Sustainable Computing: Informatics and Systems, 30*, 100512.
9. Khanna, M., Atallah, S. S., Kar, S., Sharma, B., Wu, L., Yu, C., Chowdhary, G., Soman, C., & Guan, K. (2022). Digital Transformation for a Sustainable Agriculture in the United States: Opportunities and Challenges. *Agricultural Economics, 53*(6), 924-937.
10. Kumar, P., Singh, A., Rajput, V. D., Yadav, A. K. S., Kumar, P., Singh, A. K., & Minkina, T. (2022). Role of Artificial Intelligence, Sensor Technology, Big Data in Agriculture: Next-Generation Farming. In *Bioinformatics in Agriculture* (pp. 625-639). Elsevier.
11. Li, J., Liu, G., Chen, Y., & Li, R. (2023). Study on the Influence Mechanism of Adoption of Smart Agriculture Technology Behavior. *Scientific Reports, 13*(1), 8554.
12. Li, W., Clark, B., Taylor, J. A., Kendall, H., Jones, G., Li, Z., Jin, S., Zhao, C., Yang, G., & Shuai, C. (2020). A Hybrid Modelling Approach to Understanding Adoption of Precision Agriculture Technologies in Chinese Cropping Systems. *Computers and Electronics in Agriculture, 172*, 105305.

13. Ragaveena, S., Shirly Edward, A., & Surendran, U. (2021). Smart Controlled Environment Agriculture Methods: A Holistic Review. *Reviews in Environmental Science and Bio/Technology, 20*(4), 887-913.
14. Rashid, M. F., Sulaiman, N. K., Kamarudin, K. H., & Zanudin, K. (2023). Assessing Socioeconomic Differentiation of Rural Household Groups in Malaysia. *Planning Malaysia, 21*(1), 415-426.
15. Sulaiman, N. K., Misnan, S. H., & Rashid, M. F. (2021). Dimensions of Rural Web as Factors Influencing Farmer's Adoption of Sustainable Agricultural Practices: A Review. *IOP Conference Series: Earth and Environmental Science, 881*(1), 012061).
16. Sulaiman, N. K., Misnan, S. H., & Rashid, M. F. (2022). Farmer's Adoption of Sustainable Agricultural Practices: A Review from the Perspective of Rural Development. *Environment, 7*(27), 321-331.
17. Takahashi, K., Muraoka, R., & Otsuka, K. (2020). Technology Adoption, Impact, and Extension in Developing Countries' Agriculture: A Review of the Recent Literature. *Agricultural Economics, 51*(1), 31-45.
18. Vorodam, J. B., Rashid, M. F., & Misnan, S. H. (2023). Exploring the Multidimensional Determinants of Local Economic Development in Rural Communities in Ghana: A Comparative Analysis. *IOP Conference Series: Earth and Environmental Science. 1274*(1), 012017.
19. Wang, J., Cramer, G. L., & Wailes, E. J. (1996). Production Efficiency of Chinese Agriculture: Evidence from Rural Household Survey Data. *Agricultural Economics, 15*(1), 17-28.
20. Yang, Z., Shen, N., Qu, Y., & Zhang, B. (2021). Association between Rural Land Use Transition and Urban–Rural Integration Development: From 2009 to 2018 Based on County-Level Data in Shandong Province, China. *Land, 10*(11), 1228.
21. Yoon, C., Lim, D., & Park, C. (2020). Factors Affecting Adoption of Smart Farms: The Case of Korea. *Computers in Human Behavior, 108*, 106309.
22. Zhao,C.J (2021). Development Status and Future Prospects of Smart Agriculture. *Journal of South China Agricultural University, 42*(6),1-7.