Journal of Electrotechnology, Electrical Engineering and Management (2023)
Clausius Scientific Press, Canada
DOI: 10.23977/jeeem.2023.060201
ISSN 2560-6697 Vol. 6 Num. 2

The Process, Problems and Countermeasures of Modern Enhanced Technology on Agricultural Reshaping

Qingda Li, Hong Chang*

Zhongkai University of Agriculture and Engineering, Guangzhou, Guangdong, 510225, China
**Corresponding author*

Keywords: Emerging enhanced technology, technological risk, agricultural management

Abstract: This paper sorts out and analyzes the application of modern emerging enhanced technologies in agriculture, studies the reshaping and significant impact of emerging enhanced technologies on modern agriculture, reflects on the risks and problems arising from the application of emerging technologies in agriculture, and tries to put forward an agricultural management model in the era of modern science and technology. On the basis of clear management objectives, management principles and management paths, combined with typical cases of Chinese domestic agricultural management, this paper tries to construct a management system of Chinese contemporary agricultural enhancement technology.

1. Introduction

Modern augmentation technology mainly refers to the technology used to enhance the function under NBIC convergence technology, and the application in agriculture is mainly reflected in intelligent agriculture and biological breeding. The introduction of modern enhancement technology into agricultural machinery can promote the modernization, integration and intelligent development of agricultural machinery, which can help reduce the manual labor intensity and also achieve the improvement of agricultural production efficiency. China's agriculture is mostly based on traditional information construction, agriculture is still in the informationization and digitalization stage, and there is still a distance from smart agriculture, there is no nationwide unified standards and platforms, the lack of data and information interconnection, intelligent perception technology coverage is not comprehensive and other problems. At the same time, the defects caused by the application of modern enhanced technology in the process of smart agriculture and smart breeding, such as technical problems and bioethical issues, also need urgent attention to solve.

2. Reconstruction of agriculture by modern enhanced technology

2.1 The reshaping of agricultural objects by modern enhanced technologies

Under the Internet + smart agriculture model, agriculture will no longer be a dependable industry, but will change to high yield, low energy consumption and ecological safety. The Internet of Things (IoT), 5G, blockchain, artificial intelligence (AI), augmented reality (AR), digital twins, and drones are driving the "smart agriculture revolution", helping agriculture to achieve rational use of

agricultural resources, reduce production costs, improve the ecological environment, enhance crop yield and quality, and enhance the added value of agricultural products and brand influence in the market.

In the context of the development environment of the future virtual-reality symbiotic metaverse and modern wisdom agriculture, human enhancement technology is the main body, that is, nanotechnology, biotechnology, information technology and cognitive science that converge the technology of enhancing human functions are applied to agriculture, and through augmented reality technology and gene editing technology, the transformation of biological breeding of plants and animals in agriculture such as nano and gene editing is carried out to promote the development of wisdom agriculture.

2.2 Intelligent transformation of agricultural processes

The wisdom transformation of agriculture by modern enhanced technology can be reflected in the following major technologies.

(1) The introduction of new energy technology technology in agricultural production can provide agricultural machinery production more stable power supply to ensure that agricultural machinery and equipment to efficiently complete the harvesting, irrigation, planting and pest control work. Such as intelligent photoelectric greenhouse design. Computer technology and solar energy intelligent collection technology, water energy design intelligent irrigation system, and combined with wind power generation to improve the refinement of irrigation, can do intelligent control of the irrigation amount of different crops.

(2) GPS navigation technology for agricultural machinery and equipment. The most significant advantages of this technology are low cost, high accuracy, high speed and easy operation. For example, the United States has installed GPS navigation systems on agricultural machinery harvesting equipment, which has improved the intelligence and automation of agricultural production through the convenience and efficiency of automatic navigation systems. It can also be combined with Internet technology to analyze and process data information such as crop yield and quality in the planting area to provide guidance for subsequent crop farming.

(3) Automatic control technology to achieve intelligent agricultural machinery. Install electronic video monitoring devices in agricultural machinery to unify the control and management of the production, processing and treatment of agricultural products to achieve savings in labor costs while improving the value of resource utilization. At the same time, the production activities of agricultural machinery are managed and controlled automatically.

(4) Robotics. The application of robotics in agricultural production can intelligently identify, precisely locate and track agricultural products in real time, and intelligently manage agricultural production. For example, the new pulse laser robot developed by the United States can automatically collect information on the coverage, actual growth and product diameter of agricultural products, and analyze and process the collected data and information.

(5) Augmented reality technique (AR) is applied to agriculture to promote the development of agricultural intelligence. The application of computer simulation of plant growth and development in three-dimensional space, the simulation of crop morphological structure research is relatively fast development, a representative one is the Danish botanist Lindenmayer proposed in 1968 L-system; Clausnitzer and Hopmans in the United States used the finite element method for three-dimensional root growth and transient simulation modeling of soil water flow and programmed to implement their model; in China, the concept of virtual agriculture was proposed in the National 863 Program in November 1996 and virtual agriculture was listed as the 863 Advance Start Program.

2.3 Brain-computer interface for the transformation of agricultural processes

In recent years, brain-computer interfaces have become one of the hottest directions for global research. In foreign countries, in July 2016, Elon Musk of the United States established Neuralink to work on the development of ultra-high bandwidth brain-computer interface systems.

In the field of virtual reality and human-computer interaction, brain-computer interface technology can help users interact with computers more naturally, allowing computers to better understand human intentions and needs, thus improving the efficiency and convenience of interaction. The current application of brain-computer interface in agriculture is usually embodied by virtual reality technology, which is yet to be explored.

2.4 The transformation of agricultural processes by the meta-universe

Like biotechnology, information technology and blockchain technology, the application of metaverse in agriculture is becoming a new hot spot in the industry. One of the explorations of agricultural metaverse is to integrate real agricultural scenes such as farming scenes and farmland management into the virtual world by digital means, thus empowering the industry. At the same time, the metaverse and other related technologies are combined with custom agriculture, order agriculture, leisure agriculture and other models to form a new business, thus achieving a complete disruption of agriculture. At present, metaverse is applied to all aspects of agriculture, including agricultural production management, experience and sales. For example, in the production process, agricultural operators use virtual reality technology to show users or consumers the whole process of agricultural production and management, so that users can watch and experience agricultural production and management in a full and visual way.

3. Problems and risks in the reshaping of agriculture by modern enhanced technologies

3.1 Technical deficiencies in the application of modern agricultural enhancements

Modern enhanced technologies are mostly cross-intersectional fields, which put higher demands on the talent pool and infrastructure, which is a major bottleneck for its application in agriculture.

First, the construction of agricultural infrastructure is not perfect. With the rapid development of China's economy, agricultural technology is also being gradually improved, and many supporting infrastructures are being constantly updated. However, in the central and western regions of China, there are still many places where there are difficulties in communication between the government and the people, which seriously hinders the promotion of agricultural technology and leads to the lagging of rural revitalization in many areas.

Second, the construction of modern agricultural enhancement technology promotion team is not strong enough. The existing agricultural technology extension personnel lack scientific production concepts, are unable to carry out fine farming, and their knowledge level still needs to be improved, which seriously affects the promotion and application of high-tech agricultural technology, resulting in the inability to effectively expand agricultural technology.

3.2 Biological risks of modern agricultural enhancement technologies

Enhancement of technology, i.e., the improvement of nature by science and technology, is often seen as a concentrated expression of rational or rationalizing power. However, modern people have to face the problem of "after technology", and in the face of the advent of "post-technological era", they must first delve into the deep concern of "before ethics" [1]. Qiu Renzong analyzed and discussed

the ethical issues of human enhancement [2]; Fei Doyi suggested that the rapid development of science and technology has weakened the basis and paradigm of people's previous thinking and action, and there is a great deviation between risk perception and objective risk [3]; Li Jianhui analyzed the possible ethical, legal and social implications of human genome research based on the recognition of the great medical and biological value and economic value of human genome deciphering. The ethical, legal, and social issues associated with human genome research were analyzed by Li Jianhui based on the recognition of the great medical and biological value and economic value of human genome decipherment [4].

Modern technology poses a threat to biodiversity. The intensification of agricultural activities has led to habitat fragmentation, land use changes, increased use of pesticides and fertilizers, and increased mechanization intensity, which has resulted in biodiversity loss.

4. Analysis of modern agriculture enhanced technology management model

In order to promote the modernization and intelligent development of agriculture and advance the application of enhancement technology in agriculture, it is extremely urgent to strengthen the management of agricultural remodeling process. Many scholars have been actively exploring the process of agricultural development, and through modeling, standardizing the management mechanism to provide a good reference for the management of modern agricultural augmentation technology.

4.1 Competency model of agricultural science and technology personnel

Table 1: Initial competency characteristics of agricultural science and technology personnel

order number	Competent characteristics	order number	Competent characteristics
1	Ability to transform agricultural scientific and technological achievements	15	Problem solving ability
2	Development capability of agricultural intelligent decision-making system	16	Team collaboration ability
3	A strong sense of innovation	17	positive and optimistic
4	Data analysis and processing power	18	Persistent spirit of exploration
5	Ability to popularize agricultural science and technology	19	Lifetime learning ability
6	Data mining ability	20	independent personality
7	Frontier knowledge in agricultural research	21	Market knowledge
8	Rich and innovative thinking	22	stress tolerance
9	Solid professional knowledge of agriculture discipline	23	communication skills
10	Rigorous and pragmatic	24	Keen insight ability
11	Ability to apply modern information technology	25	Rich and interdisciplinary background knowledge
12	professional dedication	26	Epistemology and methodology of scientific research
13	Honesty and integrity	27	Strong curiosity
14	Self-achievement motivation	28	Rich experience in scientific research work

Exploratory factor analysis (EFA) and validated factor analysis (CFA) were used to construct and validate the competency model of agricultural science and technology talents. This competency

model can fully summarize the competency elements that agricultural science and technology talents should have to engage in science and technology innovation activities in the context of rural revitalization, and highlight the quality requirements of agricultural science and technology talents in the context of rural revitalization (see Tables 1 and 2, Figure 1) [5].

Table 2: Rotated factor loading matrix

Competent feature items	F1	F2	F3	F4	F5
Q13 compression capacity	0.909				
Q6 Lifelong learning ability	0.887				
Q24 Ability to popularize agricultural science and technology	0.879				
Q18 Agricultural scientific research achievements transformation capacity	0.878				
Q21 Team collaboration ability	0.841				
Q4 Problem-solving capability	0.830				
Q15 Communication skills	0.824				
Q8 Dedication		0.878			
Q14 Independent personality		0.868			
Q16 Integrity and integrity		0.827			
The Q19 is rigorous and pragmatic		0.817			
Q23 Self-achievement motivation		0.812			
The Q20 is positive and optimistic		0.789			
Q22 Epistemology and methodology of scientific research			0.837		
Q5 solid professional knowledge of agriculture discipline			0.828		
Q2 Frontier knowledge in agricultural research			0.813		
Q10 rich experience in scientific research work			0.764		
Q12 rich interdisciplinary background knowledge			0.753		
Q7 Data mining capability				0.832	
Q11 Ability to apply modern information technology				0.821	
Q9 Data analysis and processing capability				0.808	
Q17 Agricultural intelligent decision system development capability				0.795	
Q25 Rich and innovative thinking					0.838
Q1 A strong sense of innovation					0.810
Q27 persistent spirit of exploration					0.776
Q26 intense curiosity					0.767
Q3 Keen insight					0.737
eigenvalue	5.418	4.258	3.975	3.459	3.449
Contribution rate of variance	20.068	15.771	14.722	12.812	12.774
Cumulative variance contribution rate	20.068	35.839	50.561	63.373	76.147
Cronbach's α	0.949	0.913	0.932	0.941	0.876

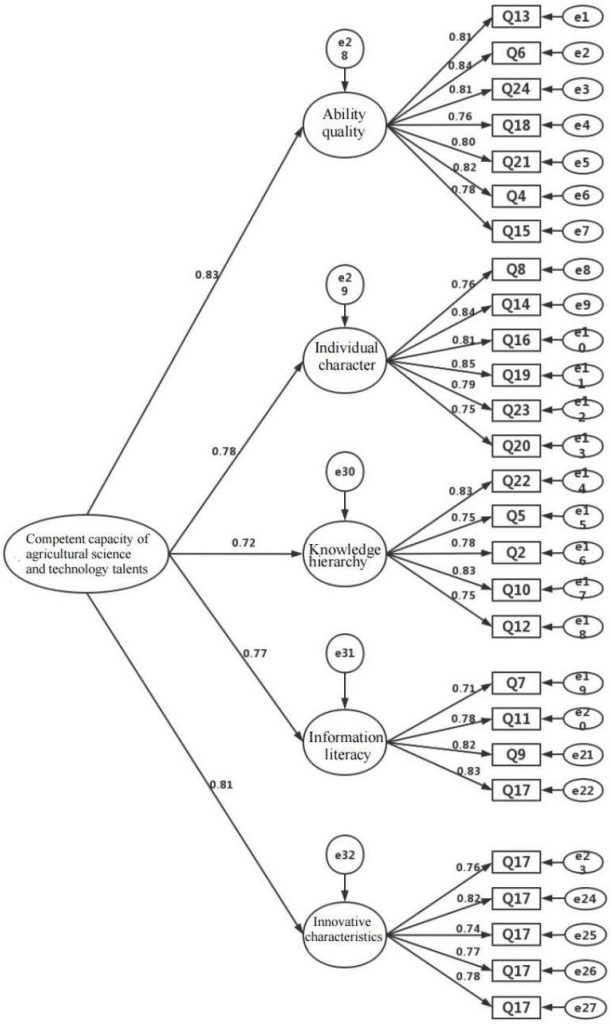

Figure 1: Second-order factor model of competency characteristics of agricultural science and technology personnel

4.2 Digital management model of intelligent agriculture

The smart agriculture development model will bring many benefits to the agricultural economy. The smart agriculture management system contains a wide range of systems, mainly the smart agriculture digital management system, the smart agriculture remote monitoring system and the smart agriculture Internet of things system. The digital management system of smart agriculture can realize the precise nutrient management of agricultural production, maximize the input-output ratio of agricultural costs, target the adjustment of crop growth conditions and nutritional conditions, and improve the yield per unit area. The remote monitoring system of smart agriculture can realize 360-degree monitoring of crops without any dead angle, and can zoom in and out at will, so that planters have a comprehensive understanding of crop growth conditions.

Food safety has become a major factor hindering the further development of agriculture in China. The use of Internet technology to implement full supervision of agricultural products in the process of transportation ensures that the agricultural products transported are traceable, enabling full supervision of agricultural products from field to table.

5. Constructing the management system of contemporary agricultural enhancement technology in China

5.1 Constructive goals

The agricultural administrative system should be adapted to the direction of agricultural development and international market rules. Its innovation must adhere to the direction of marketization from the following aspects, the adjustment of government department institutions, the transformation of government functions, the change of power configuration, and the reform of government management methods.

5.2 Constructive principles

The government provides public goods such as agricultural research and legal order, and manages agricultural farmers according to the law, establishing the basic functions of the government in public services, economic regulation, market supervision and social services.

In terms of government rules, the rule of law and transparency in government have become the direction of administrative system innovation. In order to adapt to the development of modern agriculture, a large ministry system should be established in agricultural management, and as far as possible, functions involving agricultural management should be assigned to the Ministry of Agriculture for the integrated management of issues concerning agricultural development.

In the process of establishing a large departmental system, attention should be paid to issues such as the boundary of the large departmental construction and the integration of the large departmental system, otherwise it is merely a pile of departments, which does not serve the function of integration.

In terms of technological innovation, advanced management techniques and tools should also be used, such as networking, e-government and other forms, which not only can significantly improve office efficiency and save money, but also have important significance for building a rule of law and transparent government.

5.3 Management path

Contemporary agricultural enhancement technology management pathway see Figure 2.

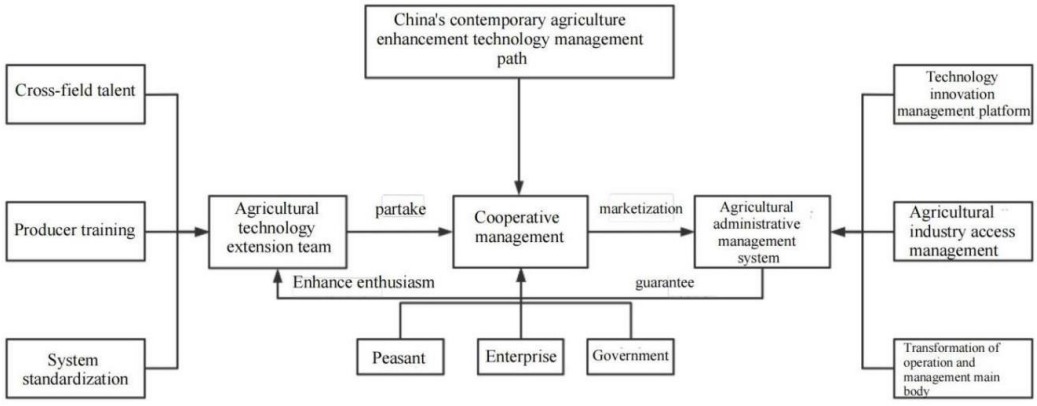

Figure 2: Our contemporary agricultural enhancement technology management pathway

5.3.1 Cooperative business management as the base

In accordance with the principle of "run by the people, managed by the people and benefited by

the people", a cooperative management community of "independent management, democratic management, benefit sharing and risk sharing" has been formed. On the basis of not changing the land management right, in accordance with the principle of farmers' voluntariness, the cooperative is the main body and adopts the "six unified" cooperative management production mode of unified purchase of production materials, unified planting, unified management, unified harvesting, unified sales and unified accounting to realize mechanized continuous planting, with all profits going to farmers. Effectively reduce physical and chemical, production costs and agricultural production risks, and improve the yield and quality of agricultural products.

Real-life case one: U stop village out of the new model of modern agricultural management.

Wuting Village, Wanrong County, Shanxi Province, has unified cultivated land in rural areas, transferred small plots of farmland, integrated it into a new mode of high benefit and modern agricultural industrialization management, unified and standardized management. Become the leading army of a new round of agrarian revolution.

Nearly a thousand acres of Lianshuo orchards, the specific management method is: the implementation of the "plant to determine the mu, to land into shares, the combination of the unity and division, joint production and joint venture, moderate scale, benefit sharing", specifically by the village collective economic organization to lead the cooperative, from within the cooperative selected love of agriculture, know technology, good management of farmers unified training and learning, engaged in production and management activities, other farmers within the cooperative is independent professional diversion. The other farmers in the cooperative will be independently engaged in professional triage. The income from the operation is divided into dividends according to the amount of the land in which the farmers have shares, in addition to the costs of each link, the wages of the members of the cooperative engaged in production and operation activities, and the public accumulation of the cooperative. The new type of cooperative operation is based on the shareholding of fruit farmers' land and the exploration of non-transfer of individual farmers' land on the basis of the mode of operation and agricultural industrialization.

Real-life case two: technology empowerment, farming in town to fulfill the agricultural dream.

In 2018, the Ministry of Agriculture launched the digital agriculture project, and Sun Zhenzhong cooperated with Zhongke Perception, an operating company under the Institute of Intelligent Machinery of the Chinese Academy of Sciences, to become the only national digital agriculture pilot in the province. In 2019, the company was selected as the first batch of typical cases of "full mechanization + comprehensive agricultural services" service center of the Ministry of Agriculture and Rural Affairs.

Building an agricultural production system that integrates farming, seeding, management, harvesting, drying, storage, processing and sales as well as the output of modern agricultural models. Operate in company+cooperative mode, and choose to give benefits to the people in improving farmers' motivation.

5.3.2 Enhance the construction of agricultural technology extension team as a grip

Accelerating the cultivation of modern agricultural talents The efficient operation of agricultural production and the great variety of agricultural varieties in developed countries are not only organizational and institutional factors, but also closely related to their having a large number of highly qualified agricultural producers. Cultivating a part of high-level production and management talents with a sense of modern agricultural production and management and a broad vision will enhance the enthusiasm of agricultural technology promotion, open the last mile with farmers and apply the technology to practice.

Real case: modern intelligent irrigation system in the tea industry.

Traditional irrigation methods are being replaced by modern intelligent irrigation systems, and the

cloud-based intelligent data communication and control suite, the "G+N" device, is an effective solution to the problem of irrigation and water conservation in agriculture.

The real-time monitoring data collected by "G+N" is transmitted to the cloud through the wireless network, and the algorithm carries out equipment linkage pre-setting to tell itself when the tea garden is short of water, and then by combining with watering equipment and water and fertilizer machines, it proposes scientific production operations, timing and quantification to give the tea garden more accurate watering and fertilization. The system was installed in the Fujian tea garden in July 2018 and has been running stably, with good adaptability to the field environment and able to meet the overall demand for environmental information collection in the tea garden. The system is also currently applied in date plantations, tobacco projects, urban agriculture, greenhouse sheds, aquaculture and other projects with good results.

5.3.3 Improve the agricultural administration system as a guarantee

In the process of reforming the administrative system of agriculture in China, marketization must be taken as the direction of our reform, so that the market plays a fundamental role in the allocation of agricultural resources. Through the collection of market information agricultural production and management subjects decide the type and quantity of agricultural production, obtain benefits in the market, and improve the overall welfare of society through the realization of self-interest. From the process of agricultural reform in China, it can be seen that whenever administrative intervention is more serious, agricultural production slides dramatically, and whenever agricultural producers have greater autonomy, agricultural production makes great progress. Along with the process of agricultural marketization, we have realized the transformation of the process from the era of food shortage to the era of food abundance. However, the current process of marketization of agriculture in China has only recently begun, the administrative color of agricultural administration is still relatively strong, and market-oriented reforms need to continue to advance.

Acknowledgement

This work was supported by "Human Enhancement Technology Risk Research: Causes, Models and Protocols", Ministry of Education, Humanities and Social Sciences Research Youth Project (22YJCZH012); "A Philosophical Hermeneutic Study on Emerging Human Enhancement Technologies", Guangdong Philosophy and Social Sciences Planning Project (GD20CZX01). "Application and Management of Contemporary Emerging Enhanced Technologies in Agriculture" Zhongkai University of Agriculture and Engineering, Master's Science and Technology Innovation Project.

References

[1] Yue Yuang. After technology and before ethics - the ethical dilemma faced by human enhancement technology and its way out [J]. Ethical Research, 2016(02):62-68. DOI:10.15995/j.cnki.llxyj. 2016.02.012.

[2] Qiu Renzhong. Philosophical and ethical issues of human enhancement [J]. Philosophical Dynamics, 2008(02):33-39.

[3] Fei Duoyi. Social acceptance of scientific and technological risks [J]. Nature Dialectics Research, 2004(10):91-94+110. DOI:10.19484/j.cnki.1000-8934.2004.10.026.

[4] Li J. H. The value and social ethical issues of human genome research [J]. Studies in Natural Dialectics, 2001(01):24-28. DOI:10.19484/j.cnki.1000-8934. 2001.01.007.

[5] Yang Yuekun, Chen Xin. Study on the construction of competency model of agricultural science and technology talents in the context of rural revitalization [J]. Leadership Science, 2021(08):94-98. DOI:10.19572/j.cnki.ldkx. 2021.08.027.