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Analysis of Factors Influencing the Productivity of Smart Agriculture

-- An Example from Shandong Province

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Abstract

Smart agriculture is a product of the combination of traditional agriculture and the Internet. It is a process of growing crops through the front-end sensors among the agricultural industry, which transmits real-time analyzed data to a database, and then the database transmits each data to the computer side or mobile phone side, and then the farmer controls and observes the production of crops in real time through the computer or mobile phone. The data from Shandong Province from 2009 to 2019 were selected to measure the productivity of smart agriculture and to analyse the influencing factors. A non-angle non- radial super-efficiency SBM model was chosen to measure the production efficiency of smart agriculture in each region of Shandong Province. Based on the scale payoff as a constant quantification, MaxDeaUltra8 software was used to measure the production efficiency of smart agriculture in each region of Shandong Province, and the improvement path was proposed according to the conclusion.

Keywords

Smart Agriculture; SBM; Influencing Factors; Enhancement Path.

1. Background of the Project

1.1. Project Object --Smart Agriculture

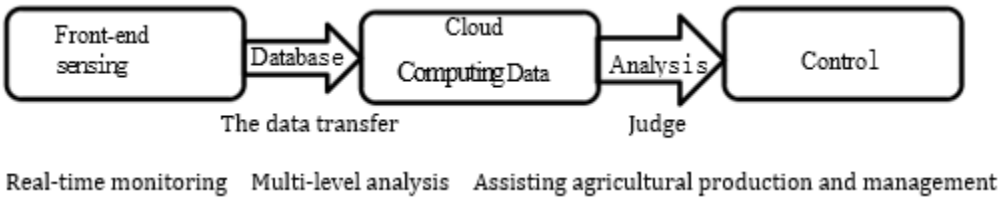

Figure 1. Smart Agriculture system map

2. Definition of Smart Agriculture

Wisdom agriculture is the combination of the traditional agriculture and the Internet, it is by the agricultural industry between the front of the sensor, the real-time analysis of the data in the database, and then from the database to various data transfer on the computer or mobile phone set, then the farmers through computer or mobile phone real-time control and observation of crop production, crop planting such processes, agriculture is wisdom. It is an advanced stage of the agricultural industry. It not only integrates water and fertilizer, but also provides real-time data feedback on environmental temperature and humidity, soil

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temperature and humidity, carbon dioxide content and light intensity. Farmers can accurately manage crops based on the data feedback (see Figure 1).

The intelligent agricultural information service system collects and processes agricultural data through advanced information technologies such as Internet of Things and cloud computing, which is not only the process of materialization of information, but also the process of converting information into productivity. The main information content of the information service system for the reform of smart agricultural credit economy includes agricultural market, agricultural science and technology, agricultural finance and other information. It can help farmers accurately and efficiently locate the market and timely grasp the market price of agricultural products, thus directly affecting farmers' planting, breeding structure and income status. Agricultural big data platform is improving day by day. Big data can assist agricultural production decision-making and deployment. It can help analyze the environment in agriculture, reduce the yield loss caused by natural factors, and help agricultural production decision-making, thus improving efficiency and productivity.

3. Strategic Background of Smart Agriculture

Without agricultural and rural modernization, there can be no modernization of the country. To develop modern agriculture, the way out lies in science and technology. "13th Five-Year Plan" proposed to take the road of agricultural modernization, to improve agricultural technology and equipment and information level, promote agricultural information construction, the development of smart agriculture. The party central committee and the State Council published in 2019 "three agriculture" the guidance of the central file no. 1, the central committee of the CCP, the State Council about insist on priority to the development of agriculture and rural areas to do a good job of "three agriculture" the several opinions (hereinafter referred to as the "files"), and this is the central file number one 16 years in a row is focused on the "three rural", file stressed wisdom is the ultimate way of agricultural modernization of agriculture. The fifth Plenary Session of the 19th CPC Central Committee clearly proposed the construction of smart agriculture. Comprehensively promoting rural revitalization and accelerating the modernization of agriculture and rural areas is a major issue of overall interest to which the whole Party must attach great importance. Scan widely the world, wisdom agriculture is general trend. Based on the national conditions, smart agriculture is the inevitable choice to improve agricultural quality, efficiency and competitiveness. To grasp the development trend of smart agriculture scientifically and explore the development path of smart agriculture in accordance with China's reality is an important subject that we need to study deeply in the new development stage.

4. The Applicable Characteristics of Smart Agriculture --Adapt Measures to Local Conditions

Thanks to the development of smart agriculture, the transformation from traditional agriculture to modern agriculture can be realized, and the production efficiency can be improved by leaps and bounds. However, as China is a large agricultural country, the geographical environment, agricultural industrial structure and crop characteristics of different regions differ greatly, which puts forward higher requirements for smart agriculture. It is necessary to adjust the way of smart agriculture assisting agricultural production judgment and decision-making according to local conditions, so as to realize the continuous improvement of production efficiency of smart agriculture.

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5. Project Analysis of the Scope of Business of the Project Unit

(i) Project unit business scope analysis

6. Business Scope - Northeast China, North China, Yangtze River Delta

6.1. Business Scope Analysis

6.1.1. Business Scope of Agricultural Production Structure

Agricultural production structure, also known as agricultural sector structure, refers to the agricultural production of a country, a region or an agricultural enterprise and the composition of each sector and the proportion between each other. For example, the composition and proportion of planting, forestry, animal husbandry, sideline and fishery in various agricultural production sectors. Agricultural production structure is a basic problem of rational organization (or rational allocation of productive factors) and development and utilization of agricultural productive forces. Whether it is reasonable or not plays a very important role in the smooth development of agricultural production.

Agricultural production structure within the scope of business: Northeast China: black soil, chernozem and other soils are widely distributed in northeast China. These soils have deep dark topsoil and fertile cultivated land are concentrated and distributed in contiguous clusters, giving northeast China good agricultural production conditions. The main crops are spring wheat, corn, sorghum, soybean, potato, sugar beet and so on. As an important commodity grain base in China, northeast China has made outstanding contributions to the national grain supply. Northeast of the big and small Xing 'an Mountains and Changbai Mountains, is our country's forest resources Treasury, forestry development outstanding.

North China: Grain livestock agriculture is the regional type of agriculture in north China Plain. Cereal livestock agriculture is a type of agriculture that combines the cultivation of dry grain with the raising of livestock. Grain livestock agriculture is mainly concentrated in Asia, where: a. Wheat is the dominant crop; Next are barley, oats, rye, millet, sorghum, corn, potatoes and other food crops; Soybean plays an important role in legume crops. B. Cash crops include cotton, tobacco, flax, hemp and sugar beet. Due to the arid climate and unstable rainfall, irrigation plays a very important role in ensuring the stability and growth of yield.

The Yangtze River Delta region: the agricultural land structure is mainly cultivated land and woodland. In terms of agricultural land structure, 2017

In 2016, the proportion of cultivated land area, garden land area and grassland area in the Yangtze River Delta was 47.6%, 4.7% and 0.0% respectively. If the woodland area of 2016 is used to estimate the woodland area of 2017, the proportion of woodland area is 28.5%. The agricultural land in Yangtze River Delta is mainly cultivated land and forest land. Compared with the agricultural land structure in China, the Yangtze River Delta region has abundant cultivated land and garden land resources, with relatively less forest land and grassland resources, and relatively more other land resources. Among them, the proportion of arable land is 27 percentage points higher than the national average, the area of other agricultural land is 7.8 percentage points higher than the national average, and the area of garden land is 2.5 percentage points higher. B. Focus on planting and attach equal importance to fishing and animal husbandry. In 2019, planting accounted for 48.7% of the total agricultural output value in the Yangtze River Delta, followed by fisheries and animal husbandry, which accounted for 20.8% and 20.1%, respectively. Forestry and agriculture, forestry, animal husbandry and fishery services accounted for 4.4% and 5.9%, respectively. Compared with the previous year, the proportion of agriculture and fisheries fell more obviously, and the proportion of animal husbandry rose.

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6.1.2. Analysis of Agricultural Production Problems Within the Scope of Business

Ecological problems in agricultural development in northeast China: A. Black soil loss and over-reclamation; Destruction of vegetation; Spring flood; With the pace of urbanization, the rural population is decreasing, which brings harm to the development of agriculture. Climate change, ecological environment quality decline, soil erosion, rivers dry up, agricultural production of adverse factors increased. Due to the distinct changes of the four seasons and the long and cold winters in northeast China, the conditions for agricultural development are not favorable enough and the conditions for agricultural production are difficult, so the farmers' enthusiasm for production is not high. B. Slow development of specialty agriculture: Northeast China has long been famous for its specialty agriculture and cash crop yield, providing the whole country with many high-quality agricultural products. In recent years, affected by many factors, the development of agricultural production in northeast China is slow. The most typical is northeast soybean, as a non-GM cash crop, affected by the impact of imported GM soybeans, the planting area keeps shrinking, the yield declines, and the price competitiveness loses. The traditional main soybean producing areas have been severely impacted, agricultural security and national agricultural security have been threatened, and land utilization rate and economic benefits have been affected. The decline of the long-established high-quality soybean industry is worrying not only farmers, but also ordinary people. Over the past 15 years, China's soybean import dependency rising year by year, especially the past six years, China's soybean's far more than 80%, in 2014 at about 86%, external dependency soybean production in China in 2004 after a record high of 17.4 million tons, began slipping into the channel, especially since 2011, domestic soybean production is sharply lower, the annual decline in output was close to 5%.

North China: A. Lack of water resources. The precipitation in North China is low and the surface runoff is small. Precipitation season and interannual variation; Precipitation concentrated in summer; spring prone to spring drought (less precipitation; Evaporation capacity is large; Spring farming uses a lot of water). Human reasons: dense population, large demand for domestic water; Developed industrial and agricultural economy, large production water consumption; Serious pollution and waste. B. Crops grow slowly because of cold weather. C. Inconvenient transportation. North China is located on the Loess Plateau (another reason for the water shortage) and has no well-developed means of transport-to-transport large quantities of grain abroad.

The Yangtze River Delta region: cultivated land decreased, soil fertility decreased, pollution accelerated urbanization, construction land increased, cultivated land decreased; Groundwater level decreased, seawater intrusion, soil salinization, soil fertility decreased; Heavy use of chemical fertilizers, pesticides, serious pollution.

Five aspects reflect the development level of smart agriculture:

(1) The Internet of things

Agricultural Internet of things refers to the comprehensive utilization of all kinds of sensors, RFID, visual acquisition terminal, such as sensors, widely collect field planting, horticultural facilities, livestock breeding, aquaculture, agricultural products circulation of information, understand a line of production and operation situation in real time, through the wireless sensor network, telecommunication network, the Internet and other channels

In addition, the obtained information is integrated and processed to provide various data support for smart agricultural production and operation.

(2) Artificial intelligence -- agricultural robots

High and new technologies can improve agricultural robots in three aspects:

① the robot receives the system's commands faster and responds more accurately.

②Increasing the number of robots that can be accessed can improve the reliability of the system.

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③Higher ductility, can be combined with virtual or augmented reality technology, development of more functions.

Agricultural robot, the outstanding achievement of artificial intelligence, is committed to the development of intelligent agriculture, improving the production efficiency of intelligent agriculture and improving the development level of intelligent agriculture.

(3) Big data -- Agricultural automation

Automatic operation of agricultural machinery mainly depends on the progress of navigation and control technology, positioning navigation system and machine vision are the most widely used automatic navigation technology, in addition to laser navigation, geomagnetic navigation, inertial navigation, dynamic path planning and obstacle avoidance technology. Agricultural navigation and control technology has high requirements on data transmission efficiency. Similar to automatic driving in road traffic scenes, map data and road condition information need to be updated in real time and control judgment should be made based on relevant information. 5G network can ensure data transmission with high efficiency and high precision.

(1) Farming service

Using high technology to build agricultural service system, covering the whole cycle from planting management to market behavior decision, so that farmers can grow better and sell more. Improve farmers' happiness and satisfaction, stimulate farmers' enthusiasm and initiative to participate in smart agriculture.

(2) Agricultural cultivation

Through the Internet of Things, 5G network, intelligent equipment and other intelligent breeding system, realize the control of the whole breeding process.

With the improvement of scale and intensification of breeding industry, the monitoring, prevention and control of animal diseases and biosafety management have been put forward higher requirements.

Using individual electronic identification technology, automatic perception technology, control technology, etc., collect the information of all aspects of animal husbandry, excavate the relationship between environmental animal health, animal disease and growth cycle, establish animal feeding model, improve the level of intelligent breeding.

To sum up, the five levels mentioned above comprehensively reflect the current development level of smart agriculture.

Big data, artificial intelligence, remote sensing technology and other high-tech, smart agriculture in today's era is full of opportunities, prospects are predictable.

7. Analysis of Factors Affecting Production Efficiency Within the Business Scope

7.1. Analysis of the Factors Affecting the Development Efficiency of Smart Agriculture in China

7.1.1. Selection of Input-output Indicators

Wisdom agriculture is a kind of agricultural production mode, thus some indicators used to measure the efficiency of agricultural production is just as applicable to the wisdom of agricultural production efficiency, and producers in the wisdom of agricultural production under the condition of the established technology, through the factors of production configuration, pursue and realize the equilibrium, cannot leave the traditional factors of production, and to integrate technology into agricultural production. In this study, human capital, agricultural input, agricultural mechanization level, irrigation input, land input and electricity input are selected as input indexes. In order to reflect smart agriculture, rural mobile

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communication input, rural Internet input and scientific innovation input are included in the input index system, and agricultural gross output value is selected as output index.

Table 1. Smart Agriculture Productivity Indicator Evaluation System

Tier1 indicators	Secondary indicators	Tertiary indicators
Input indicators	Human capital	Number of people employed in agriculture, forestry and fishery (10,000)
	Volume of agricultural inputs	Amount of pesticides and fertilizers applied (tonnes)
	Rural mobile inputs	Number of rural mobile phone subscribers (million)
	Rural Internet input	Number of rural Internet users (million)
		Proportion of administrative villages with broadband access (%)
	Level of agricultural mechanisation	Total agricultural machinery power (million kW)
	Irrigation inputs	Effective irrigated area (million hectares)
	Land input	Area sown to crops (million hectares)
	Electricity input	Primary industry electricity consumption (million kWh)
	Science and innovation input	Expenditure on R&D investment in primary industry (RMB million)
Output indicators	Total agricultural output	Total output value of agriculture, forestry, animal husbandry and fishery (billion yuan)

7.1.2. Selection of Influencing Factors

Selection of influencing factors Labor productivity, financial agricultural support level, agricultural machinery density, agricultural scale level, planting structure, urbanization rate, industrialization level and other regional factors were selected as influencing factors of intelligent agricultural production efficiency in Shandong Province.

Among them, the improvement of financial support agriculture is helpful to promote the wisdom to enhance the efficiency of agricultural production, but on the one hand, China's finance support agriculture capital factors of production such as fertilizers and pesticides used in subsidies, on the other hand, support agricultural technology investment need long time to receive in return, the short-term effect is not obvious, therefore anticipation is negative; With the rapid economic development, the agricultural production structure changes, and the proportion of cash crops increases obviously. The input of cash crops is much higher than that of food crops, and the utilization rate of cash crops is lower. Therefore, the influence of planting structure is predicted to be negative. The improvement of urbanization rate leads to the hollowing out of rural areas and the aging of agricultural employees, which is not conducive to the application and development of smart agriculture. Therefore, it is predicted to be negative.

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Table 2. Influence factor index selection

Indicators	Characterisation methods and units	Effect prognosis
Labour productivity	GDP of primary sector/number of persons employed in primary sector (RMB 10,000/person)	Positive
Level of financial support to agriculture	Expenditure on agriculture, forestry and water affairs/crop sown area (million yuan/ha)	Negative
Density of agricultural machinery	Total agricultural machinery power / crop sown area (million kW/ha)	Positive
Level of agricultural scale-up	Area of arable land operated by rural households (666.7 m2)	Positive
Planting structure	Area sown to food/total area sown to crops (%)	Negative
Urbanisation rate	Urban population/total population (%)	Negative

7.1.3. The Data Source

Data from 2009 to 2019 in Shandong province were selected to measure the production efficiency of smart agriculture and analyze the influencing factors. Agricultural workers number, total power of agricultural machinery, the first industrial R&D investment funds, the first industrial electricity consumption, such as agricultural GDP data from 2010-2020 statistical yearbook of Shandong province, Shandong province various prefectures statistical yearbook and statistical bulletin, China statistical yearbook, China rural statistical yearbook, China's county regional economic statistical yearbook and China statistical yearbook, In order to eliminate the influence of price factors, the total agricultural output value is adjusted at constant prices in 2009.

7.1.4. The Research Methods

DEA method is a linear programming technique, which is the most common nonparametric frontier efficiency analysis method. DEA method is a method to evaluate the difference between each DMU (DMU) according to the input and output data, that is, the relative effectiveness. The most basic model in DEA method is CCR model, which can calculate the technical efficiency of decision unit (DMU), namely: when the output level of the JTH decision unit (DMU) remains unchanged (input-oriented), if the decision unit (DMU) with the best performance in the sample (on the frontier of efficiency) is taken as the standard, the input proportion actually required.

Considering the SBM model with slack variables, the relative efficiency of decision-making units (DMU) is estimated by overcoming the deviation caused by Angle and radial direction. However, in the actual test process, there will be multiple cases with efficiency value of 1, and the effective decision-making units cannot be ranked. In 2002, Tone proposed the super-efficient SBM model, which made up for the defect that traditional DEA could not distinguish multiple effective decision units. Therefore, the non-angular and non-radial super-efficiency SBM model is firstly selected to calculate the production efficiency of intelligent agriculture in various regions of Shandong Province. From the perspective of Shandong province as a whole, it is assumed that there are n regions, and each region has m inputs and S outputs, which are respectively represented by input variable X and output variable Y. According to the super-efficiency SBM model, the expression is as follows:

In the formula, λ is a weight vector; Xj and Yj represent the input and output of the JTH region in Shandong Province respectively. Xi0 and yr0 represent the input quantity and output quantity of the evaluated region respectively. And are new subsets of production possibilities excluding (x0, y0), and δ* is the efficiency value of super-efficiency SBM.

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$$\delta^{*}=\min\delta=\frac{\frac{1}{m}\sum_{j=1}^{m}\frac{\bar{x}_j}{x_{j0}}}{\frac{1}{s}\sum_{r=1}^{s}\frac{\bar{y}_r}{y_{r0}}}\lim_{x\to\infty};$$

$$\text{s. t. } \bar{x}\geq\sigma\sum_{j=1,\neq0}^{n}\lambda_j x_j;\quad \bar{y}\leq\sigma$$

$$\sum_{j=1.\neq0}^{n}\lambda_j x_j;\bar{x}\geq0,\ \bar{y}\leq y_0,\quad \bar{y}\geq0;$$

$$\lambda\geq0 \text{ furthe}\sigma\sum_{j=1,\neq0}^{n}\lambda_j=1$$

Secondly, exploratory spatial data analysis (ES-DA) was used to describe the spatial distribution characteristics and spatial structure of data in order to analyze the change trend of intelligent agricultural production efficiency in Shandong Province from a spatial perspective.

Finally, on the basis of efficiency measurement, in order to explore the reasons for the change and development of smart agricultural efficiency in Shandong Province, the factors affecting the production efficiency of smart agriculture were further analyzed. Since the efficiency value calculated in this study is limited to 0 and has obvious merging characteristics, the to-bit model is selected to be effective for smart agricultural production in Shandong Province, the influencing factors of the rate are analyzed, and the expression is:

$$y_{it}=x_{it}+\mu_i+\varepsilon_{it}$$

In the formula, the explained variable y_{it} is the wisdom agricultural production efficiency of the ith region in the t year in Shandong Province, and the value is limited. When $y_{it}\geq0$, the actual observed value is taken. x_{it} is the explanatory variable, ε_{it} represents the parameter, and μ_{it} is the individual effect of the ith region in the t year.

7.1.5. Results and Analysis

Based on the constant quantity of return to scale, MaxDeaUltra8 software and non-angular and non-radial super-efficiency SBM model were used to calculate the production efficiency of intelligent agriculture in various regions of Shandong Province:

Table 3. Production efficiency of smart agriculture in Shandong Province from 2009 to 2019

Region	Year											Average	Ranking
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		
Jinan	1.137	1.108	1.127	1.134	1.143	1.151	1.146	1.156	1.084	1.088	1.097	1.125	3
Qingdao	1.004	1.027	1.019	1.055	1.064	1.054	1.052	1.007	1.002	1.021	1.015	1.022	9
Zibo	0.525	0.757	0.567	1.001	0.752	1.004	1.007	0.629	0.526	0.728	0.681	0.663	16
Zaozhuang	1.061	1.038	1.029	1.018	1.01	1.01	1.012	1.003	0.669	1.01	1.019	0.988	11
Dongying	1.104	1.158	1.066	1.063	1.199	1.206	1.196	1.054	1.066	1.129	1.032	1.104	4
Yantai	1.019	1.04	1.018	1.064	1.014	1.011	1.011	1.021	1.02	1.02	1.027	1.021	10
Weifang	0.814	0.748	0.722	0.771	0.738	0.758	0.778	1.001	0.749	0.799	0.758	0.802	15

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Jining	1.243	1.171	1.218	1.213	1.152	1.155	1.14	1.166	1.088	1.022	1.102	1.157	2
Tai'an	1.045	1.049	1.032	1.039	1.052	1.037	1.031	1.006	1.028	1.065	1.05	1.038	5
Weihai	1.32	1.306	1.283	1.269	1.336	1.396	1.417	1.388	1.61	1.501	1.353	1.379	1
Sunshine	1.039	1.016	1.045	1.024	1.042	1.029	1.039	1.025	1.056	1.019	1.023	1.032	7
Laiwu	1.044	1.048	1.034	1	1	1.012	1.006	1.012	1.013	1.068	--	1.026	8
Linyi	0.728	0.666	0.608	0.607	0.607	0.605	0.601	0.592	0.56	0.499	0.612	0.61	17
Texas	1.218	1.147	1.15	1.032	1.032	1.025	1.033	1.035	1.067	1.008	0.608	1.035	6
Liaocheng	0.821	0.694	0.716	0.717	0.717	0.744	1.004	1.015	0.76	1.024	0.663	0.833	14
Binzhou	0.787	0.809	0.837	1.231	0.885	0.865	1.002	1.002	1.002	0.699	0.648	0.881	12
Heze	0.742	0.687	0.68	1.011	1.01	1.006	1.002	0.668	0.618	1.099	1.032	0.869	13
Average	0.979	0.969	0.95	1.058	0.986	1.004	1.028	0.987	0.988	0.988	0.92	0.982	

(Note:2019 Laiwu is subsumed into Jinan, so the efficiency value is empty.)

7.1.6. Conclusion

Overall, the average production efficiency of smart agriculture in Shandong province from 2009 to 2019 is 0.982, that is to say, the actual output accounts for 98.2% of the ideal output, and each efficiency value is above 0.8, which is in a good state of efficiency. In terms of regional development, the average production efficiency of smart agriculture in Weihai city was the highest, reaching 1.379, while that in Linyi city was the lowest, only 0.610. The average production efficiency of intelligent agriculture in Jinan, Qingdao, Dongying, Yantai, Jining, Tai 'an, Weihai, Rizhao, Laiwu and Dezhou was above 1, indicating high efficiency. The average production efficiency of smart agriculture in Zaozhuang, Weifang, Binzhou, Heze, Liaocheng and other cities was above 0.8, with good efficiency. The production efficiency of intelligent agriculture in Zibo, Linyi and other cities is low. It can be seen that the production efficiency of smart agriculture varies greatly in different regions of Shandong Province, and the regional development of smart agriculture is unbalanced. Qingdao, Dongying, Yantai, Jining, Weihai and other 10 cities have high production efficiency of smart agriculture, indicating that these areas have achieved good results in resource utilization, agricultural science and technology development and other aspects of smart agricultural production. The production efficiency of intelligent agriculture in Linyi, Binzhou, Zibo, Weifang, Liaocheng, Heze and other cities is lower than the average level of Shandong Province, with the annual mean less than 1, indicating that there are different degrees of input redundancy in these areas. In the actual output unchanged, under the condition of agricultural resources use efficiency is not high in these areas, relatively low level of agricultural mechanization development, and attaches great importance to development of agricultural science and technology is not enough, especially for agricultural mechanization, mobile phones, the Internet and the first rural industrial R&D funds utilization efficiency is low, in promoting the wisdom has large room to improve agricultural development.

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8. The Upgrading Path

8.1. Improvement Programme

As can be seen from the second part, areas with high production efficiency of smart agriculture have high investment in resource utilization, agricultural science and technology development, and Internet big data, while some areas with annual mean less than 1 have low investment in agricultural resource utilization efficiency, agricultural mechanization development, and agricultural science and technology.

The author thinks that there are two ways to improve:

8.2. Research and Development of Science and Technology

(1) Strengthen scientific and technological research and development to improve the application level of information technology.

(2) The combination of hardware and software means to break through the technical bottleneck of micro-data acquisition.

(3) Implement technology integration to meet the regional suitability of smart agriculture.

(4) Strengthen the construction of information infrastructure and reduce the development cost of smart agriculture.

8.3. Software Development

A. Background: Business entities face A high knowledge threshold in adopting smart agricultural technologies. Whether smart agriculture can be promoted, the scope of promotion and the effect of promotion depend on the cognitive degree and acceptance ability of agricultural operation subjects. Farmers do not know much about information technology and their ability to apply information technology is not strong, which affects the market development of agricultural products, agricultural product innovation and agricultural information development.

B. Development purpose: To combine high-standard basic farmland construction with digital agriculture and rural development. Based on the confirmation and registration of the contracted management rights of rural land, the digitalized dynamic monitoring of high-standard farmland, the warehousing of the map and the quality information of cultivated land is realized, and the decision-making analysis of farmers in specific stages is given.

C. Software introduction: According to the evaluation model of production efficiency of smart agriculture, the software draws a horizontal line according to the current development level of farmers, which can be divided into green, yellow and red horizontal lines. Green -- normal level, at this time the development level of smart agriculture is better, farmers can continue to follow up; Yellow -- warning level, when the development of smart agriculture encounters obstacles and fluctuates, the software provides solutions according to possible problems caused by natural and human factors; Red -- alert level. Long-term problem retention may cause great development risks of smart agriculture. In this case, the software will provide solutions at different stages to help farmers break through the problem of retention at different stages, so as to solve the development status of smart agriculture and improve the development level.

D. complement (new technology): at the same time actively introducing new visual communication tools such as virtual reality (VR), will be the real process of farmers to use new technology, basic principle, etc., according to the operating links or knowledge into a short video, through the relevant institutions and farmers share to social networking platform, make the new knowledge new technology in production and business operation widely spread in the body.

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