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Analysis on Farmer's "Non-grain" planting choice: Based on a survey of major grain-producing areas

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Abstract: The "non-food" problem of planting structure caused by farmland circulation has raised concern about food security. Using the survey data of 805 households of various scales in six counties of Jiangsu and Henan provinces, this paper analyzes the impact of economic development level, human capital, social capital and resource endowment of farmers and land property rights on the decision-making of large-scale farmers, and pay more attention on whether the large-scale farmers have a non-food structure. Results show that large-scale farmers will be more inclined to grow food crops, and the planting structure will be more-grain instead of non-food.

Key words: large-scale farmers, planting structure; non-food production; food security

JEL classification: Q12

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1. Introduction

The report of the 19th National Congress of the Communist Party of China stated that it is necessary to ensure the national food security and put the Chinese people's rice bowl in their own hands. In fact, the No. 1 Documents of the Central Committee over the years emphasize the importance of national food security. With the deepening of the mobility and marketization of agricultural production factors, the scale of agricultural land circulation has also expanded. According to the Ministry of Agriculture and Rural Affairs of China, the proportion of land transfer in the country had exceeded 35% at the end of 2016, and the number of different kinds of large-scale farmers had reached 877,000. In this context, the controversy over whether the transfer of agricultural land will lead to “non-grain” of the planting structure becomes fiercer. Some scholars insist that compared with cash crops, grain crops have the characteristics of high input and low yield, and the planting structure of households who transfer in agricultural lands tend to "non-food" (Zhang et al., 2014). Wan et al. believe that farmland circulation will threaten China's food security. Another group of scholars insists that the transfer of agricultural land caused by the non-agricultural transfer of rural labor will promote the "more-grain" of agricultural planting structure instead of resulting in "non-food" (Zhong et al., 2016).

Planting structure refers to the proportion and interrelationship of planting area of crops within the planting industry.As rational brokers, different kinds of large-scale farmers will make use of all agricultural production factors which they own and take market demand and their own consumption needs into consideration, to determine the production targets and the variety and scale of crop cultivation. Thus form the planting structure which makes effective use of land and labor, and obtain the best economic benefits of agricultural production under this condition. Most studies have explored the factors affecting the adjustment of farmers' planting structure from following four aspects: natural resource condition, farmer resource endowment, market economic environment and government macro policy.

Liu (2008) found that the fragmentation of land will affect the planting structure of farmers, for example, it will reduce the multiple cropping indexes of farmers and hinder the increase of the average land output rate [13]. Feng (2013) found that if the operating period of inflowing land is short, farmers will give priority to planting high-yield commercial crops,

resulting in a significant decline in the areas which planted grain [15]. Feng Jun et al. (2013) found that the degree of education of farmers and the degree of economic development of the region have significant impact on the planting structure [18]. In Addition, Hu (2005) believed that farmers' selection of planting structure was not only affected by their own characteristics, but also affected by local policies, agricultural and non-agricultural employment opportunities [19]. Xu Mingfan et al. (2013) also believed that the development of urbanization promoted the adjustment of crop planting in the direction of improving economic efficiency [23]. Wu (2012) [31] found that the promotion of agricultural technology, the government's support for planting commercial crops and encouragement for transfer of cultivated land had impact on the planting structure. Zhou and Guo (2014) found that farmers' planting structure was a rational behavior under the constraints of external conditions. If government provided external conditions such as industry management and information disclosure, the decision-making of farmers' planting structure would be more rational and effective [29]. Zhong (2016) believed that with the increase of labor rigidity constraints, the agricultural planting structure would adjust in the direction of planting food crops with less labor input and higher mechanization. The empirical research of Qiu and Luo (2018) indicated that the non-agricultural transfer of rural labor, the improvement of the stability of land rights and the improvement of the degree of mechanical use would induce farmers to be more inclined to grow food crops, thus showing the trend of more-grain of planting structure. From the perspective of farmers' differentiation, Zhao and Zhou (2018) insisted that the changes of planting structure within the farmer were affected by the topography and the area of cultivated land at the end of the year, and part-time household would increase the proportion of grain crops.

Will different kinds of large-scale farmers have a "non-grain" of planting structure, and whether their decisions of planting structure adjustment are affected by the economic development level of different regions, farmers' human capital, social capital, resource endowment and land property rights, and how it is affected? These are important issues to be studied in this paper. Based on the survey data of 805 households of various scales in six counties of Jiangsu and Henan provinces, this paper uses Probit model to analyze the influencing factors of planting structure adjustment after farmers transfering in land. Also, this paper pays special attention to

whether the large-scale farmers will have a “non-food” of planting structure, thus to infer whether the speed of land transfer and the acceleration of scale will cause “non-food” of planting structure which will affect China's food safety. In addition, this paper could provide reference for government to guide farmers to rationally adjust the proportion of crop cultivation, effectively promote the agricultural supply-side structural reform, and expand quality supply and adequate supply.

2. Theoretical analysis framework

With the advancement of industrialization and urbanization, the mobility and marketization of agricultural production factors have continued to deepen, the speed and scale of agricultural land circulation have also continued to expand, and the homogeneous farmers have gradually differentiated. Neglect of other revenues such as household assets and assume that agricultural income comes from food crops and cash crops, and non-agricultural income includes work income and off-crop income. Due to the pursuit of maximizing household income, farmers, as rational broker, would choose highly rewarding industry according to their resource endowments and comprehensive comparative benefits, thus becoming pure farmers, part-time farmers, and non-farmers. With the development of socialized service system, the part-time farmers may plant food crops with higher mechanical substitution, which effectively release the labor force to obtain higher non-agricultural remuneration, or entirely abandon agriculture and become non-farmers after the non-agricultural income is guaranteed. However, pure farmers would choose to inflow more land to obtain economies of scale, and they are exactly the main bodies which would been studied in this paper.

There are relationships between the decision-making of planting structure of different kinds of large-scale farmers and their operation scale. Small-scale land operation will not exceed the rigid constraints of the family labor force. Thus, farmers' planting decisions will aim to increase labor productivity and land output rate, thereby maximizing profits. In this way, small-scale farmers will rationally and effectively allocate labor and land on the scale of planting of food crops and cash crops. With the expansion of the operation scale, the rigid constraints on the agricultural labor force faces by farmers continue to increase. On the one hand, farmers will be encouraged to purchase socialized services to improve labor utilization efficiency. On the other hand, farmers will be more mechanized and use large quantities of machinery to replace labor. This also indicates

that large-scale farmers may be inclined to specialization. The crops which large-scale farmers are specialized in planting depends on the comparative advantage of crops brought about by the improvement of transaction efficiency, namely, whether the planting structure is “non-grain” or "more-grain" needs to be verified.This paper combines the normative analysis and empirical analysis, the qualitative analysis and quantitative analysis.

3. Data source, model setting and variable selection

3.1. Data source and descriptive statistics

The survey data of Henan Province and Jiangsu Province used in this paper comes from the survey of Technical Innovation, Financial Support and Agricultural Scale Management Subjects conducted by the Ministry of Agriculture of China The purpose of the questionnaire survey is to obtain the situation of farmer's field planting in recent years and to understand the changes in farmers' planting behavior.

Jiangsu Province， which located in the eastern coastal areas, has the characteristics of developed economy, high degree of agricultural modernization and diverse crops. In 2016, the total grain output of Jiangsu Province was 34.66 million tons, and the province's grain sown area was 81.41 million mu, where the rice planting area was 34.42 million mu. Henan is a major agricultural province. The output of major agricultural products such as grain, cotton and oil ranks ranked the forefront in the country. At the end of 2016, the province's grain planting area was10.26 million hectares, and the annual grain output was 54.47 million tons. The sample farmers were from different villages in different towns and villages of Suqian, Huai'an, Xuzhou in Jiangsu province and Gongyi, Yucheng and Zhaoling in Henan province. A total of 936 samples were obtained, and 805 complete and valid questionnaires were compiled, including 222 samples in Jiangsu Province and 583 samples in Henan Province.

The basic statistical characteristics of farmers in two provinces are showed in Table 1 and Table 2.

Table 1 Basic statistical characteristics of farmers in Jiangsu Province (n=222)

	Variable	Mean	Maximum	Minimum	Standard deviation
Human capital	age of head of household	50.75	73	23	10.32

	years of education of head of household	8.11	16	0	3.51
	Maximum years of education of family members	11.94	20	2	3.04
Social capital	Whether to participate in cooperatives	0.78	1	0	0.42
	Non-agricultural employment opportunities	0.49	1	0	0.50
Natural resources	Original farmland operation scale	6.66	35	0	5.54
	net income per mu	833.87	10000	500	916.76
	rent	492.54	1800	0	248.23
	Regional dummy variable	1	1	1	0
Property	Transfer years	6.23	20	1	4.57
	Whether sign a contract	0.88	1	0	113.91
Instrumental variable	Number of agricultural brokers in the village	3.55	8	1	1.46
	Land transfer	54.89	58.4	35.6	12.36

Table 2 Basic Statistical Characteristics of farmers in Henan Province（n=583）

	Variable	Mean	Maximum	Minimum	Standard deviation
Human capital	age of head of household	47.16	78	21	10.32

	years of education of head of householder	9.76	16	0	3.51
	Maximum years of education of family numbers	11.10	16	3	3.04
Social capital	Whether to participate in cooperatives	0.29	1	0	0.42
	Non-agricultural employment opportunities	0.43	1	0	0.50
Natural resources	Original farmland operation scale	9.88	10000	0	5.54
	net income per mu	657.65	4050	500	916.76
	rent	266.67	2225	360	248.23
	Regional dummy variable	0	0	0	0
Property	Transfer years	7.77	33	1	4.57
	Whether to sign a contract	0.70	1	0	113.91
Instrumental Variable	Number of agricultural brokers in the village	3.53	8	1	1.46
	Land transfer	37.1	39.4	35.8	9.75

Data source: According to the survey data

The average age of head of household surveyed in Jiangsu Province was 50.75 years old, and that of Henan Province was 47.16 years old. It indicated that the large-scale farmers or farmers who flowed into land were generally older. The proportion of participating in cooperatives of farmers surveyed in Jiangsu Province was higher than that in Henan Province, which was related to the development of local agricultural cooperatives,

and the opportunities for non-agricultural employment in Jiangsu Province were also more than those in Henan Province. The average net income of farmland in Jiangsu Province was 833.87 yuan/mu, which was higher than that in Henan Province of 657.65 yuan/mu. The average rent for agricultural land transfer in Jiangsu Province was 492.54 yuan/mu, which was higher than that in Henan Province of 266.67 yuan/mu, They were related to the level of regional economic development. The average transfer time of land in Jiangsu Province was 6.23 years, which was lower than that of Henan's 7.77 years. However, the proportion of contracts signed by farmers when they transferred land in Jiangsu Province was higher than that in Henan Province. As for the instrumental variables, the average labor force of two provinces was equivalent, and the overall land transfer rate in Jiangsu Province was higher than that in Henan Province.

In Jiangsu Province, the samples whose operating scale was less than 10 mu, accounting for 36.9% in the total samples. The proportion of samples whose operating scale was between 10 mu and 25 mu, 25 mu to 50 mu, 50 mu and 100 mu and 100 mu and 200 mu was 18.9%, 14.9%, 11.3% and 9.5%, respectively. The samples whose operating scale was more than 200 mu were 19 households, accounting for 8.6%. In Henan Province, the samples whose operating scale was less than 25 mu were 55 households, accounting for 9.4% in total samples. The proportion of samples whose operating scale was between 25 mu and 50 mu, between 50 mu and 100 mu, 100 mu and 200 mu, between 200 mu and 500 mu and between 500 mu and 1000 mu was 12.2% ,18.4%, 19.4%, 22.6%, 12.0%, respectively. The samples whose operating scale was more than 1,000 mu were, accounting for 6.0%. Generally speaking, although the proportion of land transfer in Jiangsu Province was high, the scale of land operation was generally small. There were about 80% of the total samples in Jiangsu Province whose operating scale was below 100 mu. While the scale of land operation in Henan Province is generally large. There were about 50% of the total samples in Henan Province whose operating scale was several hundred mu.

Table 3 shows the adjustment of planting structure of sample farmers before and after transferring in cultivated land. According to the preliminary analysis of the survey data, about 12% of the farmers in Jiangsu and Henan province would change the current planting structure after transferring in cultivated land. Structural adjustments range from grain and oil cultivation to vegetable, fruit, seedling, livestock, fruit and

aquaculture, grain and oil and vegetables, vegetables and fruits, or from abandonment to grain and oil, grain and oil, vegetables, grain, oil and fruit; The structural adjustments were originally to grow grain and oil, or to grow grain, oil and fruit.

Among the farmers who had adjusted planting structure, more than 80% of the farmers who transferred in cultivated land has a operation scale of 50 to 60 mu. This paper speculates that it is possible that farmers with large scales will not adjust their planting structure due to market risks and management problems. Farmers with small scales and part-time farmers are also not willing to adjust their planting structure due to the low land rents which could guarantee returns.

Table 3 Statistical of Sample Farmers' Planting Structure

Structural adjustment	Changes in agricultural products before and after the transfer of farmland	Number of households	proportion
Structural adjustment	Grain and oil → vegetables	25	3.1%
	Grain and oil → fruit	16	2.0%
	Grain and oil → seedlings	9	1.1%
	Grain and oil→livestock	2	0.2%
	Grain and oil → fruit, aquatic products	2	0.2%
	Grain and oil → grain and oil, vegetables	21	2.6%
	Grain and oil → vegetables, fruits	9	1.1%
	Wasteland → grain and oil	6	0.7%
	Wasteland → grain oil, vegetables	4	0.5%
	Wasteland → grain oil, fruit	3	0.4%

total		97	12%
No structural adjustment	Grain and oil → grain and oil	486	60.4%
	Grains and oils, vegetables → grain and oil, vegetables	222	27.6%
total		708	88%

3.2. Variable selection and definition

Based on the existing research and the theory of farmers' decision-making behavior, this paper selects the land transfer situation and the number of agricultural brokers in the village as the instrumental variables to solve the endogeneity problem of the model, and analyzes the factors influencing the decision-making of large-scale farmers from perspective of farmer's human capital, social capital, resource endowment and land transfer property rights. The dependent variable in this paper is whether to change the planting structure, namely, whether farmers will adjust the planting area of grain crops and cash crops, and shift from grain and oil planting to cash crops planting such as vegetables, fruits and seedlings for profit maximization when maintaining or expanding the operation scale. In this paper, the adjustment of planting area of farmers over 30% of the total operation area is taken as the standard to define whether the adjustment of planting industry structure occurs.

The explanatory variables are summarized into the following aspects:

1) Human capital: number of family labor, age of the head of household, number of years of education of the head of household, and years of education of the family members with the highest level of education.

2) Social capital: whether to participate in cooperative and non-agricultural employment opportunities.

3) Resource endowment: original farmland operation scale, scale of transfer to farmland, net income per farm of farmland and regional dummy variable.

4) Property variable : land rent, transfer years.

5) Instrumental variables: land transfer situation (proportion of land transfer), and number of agricultural brokers in the village.

This paper argues that the human capital of farmers is mainly reflected in the quality of human capital. With the development of large-scale operation of family farms, the substitution of machinery for labor is extensive, but the quality of human capital is irreplaceable as a critical

factor in decision-making. The existing research always uses the education period of the head of household or the average number of years of education as the indicator to measure the quality of human capital. The actual investigation showed that with the advancement of urbanization, the education level of the children of the farmers has been continuously improved. When the education level of other family members is higher than that of the head of household, the family's operation decision-making will depend more on the most educated person than the head of household. Therefore, the education years of the most educated members of family members is used as the proxy variable for the education level of head of household. The agricultural brokers in the village refer to the information workers who adjust the structure of agricultural products. They master the information and understand the market, and provide farmers with correct production information and effective technical advice according to the needs of the market. At present, a large part of the brokers in China are large-scale farmers themselves.

Table 4 Variable description

	variable	Variable description
dependent variable	Whether to change the planting structure	1=Change planting structure 0=Do not change planting structure
human capital	Household age	Household age（years old）
	Age education of the householder	The length of education of the householder（year）
	Maximum years of schooling	The highest level of education among family members（year）
Social capital	Whether to participate in cooperatives	Whether to participate in cooperatives 1=yes,0=no
	Non-agricultural employment opportunities	Non-agricultural employment opportunities 1=yes,0=no
Natural	Original farmland	The size of the family's own

resources	operation scale	contracted land (mu)
	Transfer to farmland scale	According to the actual area of cultivated land transferred (mu)
	Average yield per mu	Net income per mu after transfer (yuan/mu)
	rent	Average annual rent (yuan/mu)
	area	Jiangsu=1, Henan=0
property	Transfer years	Lease period (year)
	Whether to sign a contract	Whether to sign a contract 1=yes,0=no
Instrumental variable	Land transfer z1	Land transfer ratio（z1%）
	Number of agricultural brokers in the village z2	Number of agricultural brokers in the village (a)

3.3. Model setting and instrumental variable selection

This paper uses the Probit model with endogenous variables to analyze farmers' decision-making of planting, namely, whether farmers will adjust the planting structure based on the goal of maximizing income. This paper takes the endogeneity of the per capita pure income variable in the decision model into consideration. It is generally believed that the greater the net income per mu of farmland is, the more likely farmers are to transfer more land to achieve large-scale operation. However, farmers who can achieve large-scale operation tend to obtain higher returns. Therefore, there is two-way causality Relationship, and endogenous problem will occur if regress the model directly. This paper selects the land transfer situation (the proportion of land transfer) and the number of rural brokers as the instrumental variables. The land transfer situation in each region reflects the effect of policy implementation, which has an impact on the local farmers' operating income, so it meets the relevant requirements of instrumental variables. The land transfer situation does not directly affects

the scale of transferred land and farmers' planting decisions, and thus meets the exogenous requirements of instrumental variables. Therefore, land circulation can be used as an instrumental variable. Similarly, the economic activities of the agricultural brokers in this village cover all agricultural products. The number of rural brokers in various places will affect the income of farmers, but not directly affects the scale oftransferred land and farmers' planting decisions, which meets the relevant requirements and exogenous requirements of instrumental variables. Therefore, he number of agricultural brokers in the village can be used as another instrumental variable.

4 . Empirical analysis

In this paper, the Probit model with instrumental variables was used to analyze the influencing factors of planting decision-making of large-scale farmers by Stata 8.0. The results of Probit model without instrumental variables showed that the coefficient of the average net yield of the mu was not significant. Therefore, it was suspected that the average net yield of the mu was an endogenous variable. For this reason, the use of land circulation and the number of agricultural brokers were considered as the instrumental variables of the average yield per mu. The Wald test results of IV Probit had a p-value of 0.000, which indicated the average net yield per mu was endogenous. In fact, when estimating IV Probit, the estimated coefficient of the average yield per mu not only changed the symbol, but also was significant at the 1% level. It showed that the endogenous nature of the average yield per mu would be neglected when use Probit model without instrumental variables, and the positive effect of the average net yield per mu on the tendency of farmers to change the planting structure would be overestimated. Then a two-step estimation is performed. The estimated coefficient of the two-step estimation is similar to the IV Probit estimation. The regression results of the model are shown in Table 5.

Table 5 Whether the farmers change the factors affecting the planting structure（Probit）

	General Probit estimate	IV Probitestimate	First step regression estimation	Two regression estimates
Transfer to cultivated land	-0.008***	-0.004***	0.050***	-0.008***
	（0.000）	（0.000）	（0.000）	（0.000）
Average yield per mu	0.000	-0.001***		-0.002***

	（0.832）	（0.003）		（0.000）
Turnover rate（z1）			67.012***	
			（0.000）	
Number of agricultural brokers in the village(z2)			-16.100	
			（0.396）	
age	-0.015**	-0.011***	-4.053	-0.021**
	（0.023）	（0.007）	（0.166）	（0.015）
Maximum years of schooling	-0.054**	-0.045***	-11.722	-0.084**
	（0.019）	（0.009）	（0.258）	（0.015）
Non-agricultural employment opportunities	-0.048	-0.015	-66.564	-0.028
	（0.699）	（0.877）	（0.250）	（0.868）
Whether to participate in cooperatives	0.152	0.199**	81.164	0.371*
	（0.255）	（0.011）	（0.193）	（0.052）
Original land operation scale	0.000	0.000	0.082	0.001
	（0.974）	（0.844）	（0.892）	（0.860）
area	-1.065***	-0.085	-689.317***	-0.168
	（0.000）	（0.565）	（0.001）	（0.618）
rent	0.001**	0.002***	0.991***	0.003***
	（0.042）	（0.000）	（0.000）	（0.000）
Whether to sign a contract	-0.093	0.026	-17.990	0.048
	（0.503）	（0.727）	（0.785）	（0.808）
Transfer years	0.025*	0.013	1.237	0.024
	（0.094）	（0.212）	（0.847）	（0.218）
-cons	1.384***	0.767***	-2273.205***	1.439**
	（0.002）	（0.010）	（0.000）	（0.022）
Number of observations				
Wald test		0.000		0.000

Note: * indicates significant at the 10% confidence level, ** indicates significant at the 5% confidence level, and *** indicates significant at the 1% confidence level.

The coefficient of the scale of transfer to cultivated land is negative and is significant at the level of 1%, which is consistent with the actual results. Most of the farmers who change the planting structure are those with an operation scale of dozens of mu. They are more willing to adjust the planting structure to obtain more benefits. Due to the small operation scale, the risk of management of farmers is also small. The larger the operation scale of the farmer, the less likely is to change the planting structure. The large-scale operation has enabled farmers to enjoy the benefits of economies of scale, and they are unwilling to accept the market risks and management pressure caused by changing the planting structure.

The coefficient of the average yield per mu is negative, and is significant at the level of 1%. The effect of the average net yield of mu on the change of planting structure of farmers is similar to the impact on the transfer scale of farmer. Farmers are rational, and the higher the net income per acre of farmland is, the less are the farmer willing to bear the input costs, the unknown market risks and the management risks brought about by adjusting the planting structure, so the income per acre of farmland has a negative effect on the farmers' decision to change the planting structure.

The coefficient of the head of household is negative, and is significant at the level of 5%, which indicates that the older age of the head of households will hinder the change of the planting structure, which is consistent with the theoretical hypothesis analysis. When farmer gets older, their physical strength labor ability and the ability to use new technologies will decline and they will tend to be conservative. The coefficient of the highest education years is negative, and is significant at the level of 5%, indicating that the higher the education level of the family members of the farmers, the less likely is to change the planting decision, which may be related to the operation scale of farmer. If the household member has a higher education level, the scale which they choose to engage in agricultural management will not be small. They will rely more on advanced technology, machinery, and management to increase their income. Changing the planting decision is not the main way to increase their income.

The coefficient of whether to participate in the cooperative is positive; and is significant at the 10% level, which is consistent with the previous theoretical analysis. Farmers who participate in cooperatives can obtain

more information about agricultural operations and agricultural products, and obtain more training and exchange opportunities, so farmers will make decisions to change the planting structure.

The coefficient of rent is significant at the level of 1%. The higher the cost of transferring land, the higher the opportunity cost of the farmer's land management, so the farmer's tendency to plant higher economic crops on the farmland will be higher. In addition, according to Marx's extremely poor rent theory, the rational allocation of superior land resources is more inclined to “non-food” crops with higher economic value. Yi (2010) analyzed the factors affecting the “non-grain” tendency and scale, and the result showed that the rent is significant at the level of 1%, and the coefficient is also positive, which explained the issue from the perspective of opportunity cost [37].

5. Conclusions and implications

It is the direction of agricultural development to cultivate moderate-scale farmer households and develop moderate scale operation of agriculture. The central government also proposes to increase agricultural benefits, reduce production costs and improve competitiveness by developing moderate scale operation. Based on the data of 805 households of various scales in Jiangsu and Henan provinces, this paper empirically analyzes large-scale farmers' decision of planting structure adjustment. This paper draws the following conclusions: The large land transfer of major grain production area will not bring large-scale non-grain production tendencies. At the same time, the adjustment of planting structure of small-scale farmers is conducive to the adjustment of agricultural industrial structure. One issue must be concerned is that the increase of agricultural land rent is not conducive to the grain production of small-scale farmers, and once the structural adjustment fails, it will have adverse effects.

According to the above conclusions, the following policy recommendations are proposed: Firstly, moderately developing the scale operation of agricultural land and obtaining the scale economy of the land need to promote the rational and order circulation of the land. The cultivation of moderate-scale farmer households needs to accelerate the development of different kinds of land transfer such as substituting, subcontracting and buying shares, which is contribute to reduce the pressure on the rising land rent. Secondly, gradually establish a rural land transfer transaction market regulated by the government, so that information is open and transparent, and the ability of a rural land market

to serve agricultural land transactions is improved. Thirdly, accelerate the construction of rural professional cooperatives, provide pre-production, mid-production and post-production services for farmers' agricultural production, help farmers overcome the technical problems encountered in the adjustment of crop production structure, and increase income by reducing production cost, increasing sales price, output and quality of products, adjusting planting structures, increasing employment opportunities, and directly investing in cooperatives. Fourth, the adjustment of the planting structure has risks and it is necessary to guide farmers in a reasonable and effective manner in different situations and avoid blind follow-up behavior. last but not least, encourage agricultural science and technology innovation to drive product innovation; encourage large-scale farmers to carry out agricultural product quality certification, promote agricultural product quality and safety and reduce environmental pollution; encourage large-scale farmers to integrate into agricultural industry and increase market competitiveness; government increase the amount and accuracy of support to promote the healthy development of large-scale farmers; develop agricultural insurance to reduce the systemic risks of large-scale farmers.

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