The Influencing Factors of Farming Households' Production Decisions

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Abstract: The rural village of Huanong in the hilly region of Liaodong is the This article is based on the research site, where most of the residents are engaged in agriculture due to historical and cultural influences, and therefore agricultural income has become their main economic source, but the villagers are unable to make decisions that are conducive to increasing their income due to various factors. Therefore, it is an urgent problem to find the factors that influence the production decision of farmers. Based on this, this paper mainly uses a logistic binary logistic regression model to conduct descriptive statistics and empirical analysis on the factors influencing farmers' production decisions. Using big data and information technology to analyze the influencing factors, it is found that the years of education of the household head has a significant influence on the production decision of farmers, the income of farmers and the area of farmland owned by farmers have a positive influence on the production decision of farmers, and the risk-averse attitude of farmers hinders the rational decision of farmers. Finally, scientific and effective suggestions are provided to farmers based on these factors affecting farmers' production decisions.

1 INTRODUCTION

With the continuous development of information technology of big data, the digital technology represented by Internet, cloud computing, big data, Internet of Things and artificial intelligence is becoming more and more prominent in the world economy, and the deep integration of information technology and traditional industries is releasing powerful vitality. The Central Document No. 1, "Opinions of the Central Committee of the Communist Party of China and the State Council on Deepening the Structural Reform on the Supply Side of Agriculture and Accelerating the Cultivation of New Dynamic Energy for Agricultural and Rural Development" proposes to optimize the structure of agricultural practitioners and improve the quality of decision-making. Therefore, the use of big data and information technology to improve farmers' overall skills and management knowledge provides great help for production decisions.

Since villagers in rural Hua have been making a living by farming for generations, yet making little profit from it, this makes them negative about the next year's planting decisions and the cycle fails to achieve true wealth. Therefore, it is important to investigate the basic situation of rural Chinese farmers, their production income and investment status, as well as their response to market changes, to analyze the relationship between farmers' increase in production inputs and their basic situation and response to the market, and to provide farmers with scientific suggestions and opinions to help them make reasonable production decisions and increase their income based on the analysis of factors affecting production decisions.

In order to have a comprehensive understanding of how farmers make production decisions, this study was based on a survey of 195 rural households in China. A questionnaire was distributed to understand the production status of farmers. The study was conducted by combining the theories of economics, statistics and management to investigate the production decision making behavior of farmers.

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2 QUESTIONNAIRE

2.1 Questionnaire Design

This questionnaire contains the basic personal information of the farmers, the production status of the farmers, and the capital investment status of the farmers. The first part of the questionnaire is to understand the basic situation of the farmers, because this survey is household-based, so the basic information of the farmers refers to the basic situation of the person who is responsible for making decisions in the household, i.e., the head of the household. The second part of the survey is about the production input status and decision-making of farmers. The third part investigates the risky behavior in the crop-growing process, from which the influence of farmers' risky attitudes on decision-making is understood. The fourth section investigates the association between market price changes and farmers' production decisions. It provides accurate and sufficient data for future analysis of factors influencing farmers' production decisions.

2.2 Questionnaire Distribution

This questionnaire survey was conducted with a sample of 195 households in rural China, all of which were native villagers of the village and owned their own land. The total number of questionnaires distributed in this survey was 195, and the total number of questionnaires collected was 180. Among the 180 questionnaires collected, 5 invalid questionnaires were excluded for the following reason: the farmers in these five questionnaires chose to work outside the village and rented out their land use rights to collect rent as their income, which was not relevant to the analysis of the factors influencing the production decisions of the farmers in this study. In summary, 195 questionnaires were distributed, of which 175 valid questionnaires were recovered, and the questionnaire recovery rate reached 89.74%. The data were entered using EXCEL software to ensure the completeness and accuracy of the data for later analysis using SPSS software.

2.3 Reliability Test of the Questionnaire

The reliability analysis of questionnaires is divided into two ways: intrinsic reliability analysis and extrinsic reliability analysis. Intrinsic reliability is mainly used to examine whether a set of evaluation items is set to measure the same concept and to examine whether there is a relatively high degree of internal consistency among the items. The Alpha reliability coefficient method is currently more commonly used in the statistical field. It is usually specified as shown in Table 1. Tables 2 and 3 show the reliability and validity results of the questionnaire.

Table 1: Criteria for judging the Kronbach alpha coefficient.

α Coefficient	≥0.9	0.9>α≥0.8	0.8>α≥0.7	α<0.7
Meaning	High intrinsic credibility	Intrinsic reliability is acceptable	Scale design is problematic, but still informative	There are significant problems with the scale design

Table 2: Case Processing Summary.

		N	%
Cases	Valid	175	100.0
	Excluded[a]	0	0
	Total	175	100.0

a. Listwise deletion based on all variables in the procedure.

Table 3: Reliability Statistics.

Cronbach's Alpha	N of Items
.801	6

The reliability test of the questionnaire was 0.801, which is between 0.9 and 0.8 indicating that the intrinsic reliability of the questionnaire is acceptable.

3 EMPIRICAL ANALYSIS

3.1 Theoretical Framework

Cheng (2006) argues that the beginnings of behavioral decision theory began with the Allais Paradox and the Edwards Paradox, which were developed in response to problems that were difficult to be solved by rational decision theory in an alternative way. Domestic scholar Tang (2013) used a logistic model and Blinder-Oaxaca decomposition to argue that the income situation of farm households, the education level of the head of household and the level of household labor are the main influencing factors that affect farm households' production decisions. Li (2016) concluded that under the conditions of semi-closed markets, consumption

factors have a significant impact on the production decisions of farm households. Lu (2015) considered the lower decision rate of farmers with low land utilization, poor land resources and livelihood conditions for agribusiness investment under agribusiness investment conditions. Song (2015) in analyzing the production decision-making behavior of farm households found that whether farmers make rational decisions is influenced by the personal characteristics of decision makers, farm household characteristics, market factors, risk attitudes of decision makers, and the ability to use market information.

3.2 Index System Construction

A total of nine variables were introduced in this paper for the empirical analysis of the factors influencing farmers' production decisions, and the implementable significance of the variables is detailed in Table 4.

Table 4: Definition of implementability of explanatory variables.

Variable Name	Definition of variables
Dependent variable (Y) Agricultural production inputs Age of head of household	1=increase; 2=no change/decrease
Independent variable (X)	
Age of head of household	Actual age of the head of the farm household (years)
Years of education of the head of household	Years of cultural education received by the head of household (years)
Farmers' growing experience	Time farmers have been engaged in farming (years)
Size of household labor force	Number of laborers in households engaged in vegetable farming (persons)
Farmers' arable land surface	Area of land used by farmers for crop cultivation (mu)
Annual income status of farm households	Annual income of farmers from vegetable cultivation (million yuan)
Farmers' risk attitude	0=risk aversion/neutral; 1=risk appetite
Farmers' attention to market price information	1=basically not; 2=occasionally/generally; 3=often

3.3 Model Setting

The dependent variable of this study is the production decision behavior of farm households, while the independent variables are the factors influencing including farm household endowment (age of the household head, years of education of the household head, farming experience, size of household labor force, arable land area, and income status of the farm household), risk attitude of the farm household (risk aversion, risk neutrality, and risk preference), and market price information of the crop. Logistic binary logistic regression models were constructed to study the effects of the above three major variables on farm households' production decisions in the following form.

$$\text{logit}(P) = \ln(\frac{P}{1-P}) \quad (1)$$

rewrite the form as:

$$\text{logit}(\text{P}) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_8 X_8 + \varepsilon \quad (2)$$

β_0 is the constant term of the model, $\beta_{1\text{-}8}$ The coefficients of the age of the household head, years of education of the household head, experience the household head in farming, annual income of the farming household, size of the household labor force, area of land under cultivation, risk attitude of the farming household and attention of the farming household to market price information, respectively, ε is the random error term.

3.4 Logistic Regression Results of Variables

The variables X1-X6 represent the age of the household head, the years of education of the household head, the farming experience of the farmer, the income status of the farmer, the number of household laborers, and the area of land cultivated, respectively. First of all, the sig value of the constant is 0 as can be seen from the variables in the equation in Table 5, indicating that the constant is significant. Table 6 is a test of the goodness of fit of the model, and the result shows that the sig value of 0.648 is greater than 0.05 indicating that the model fits well and there is no significant difference.

Table 5: Variables in the Equation.

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	1.536	.198	60.169	1	.000	4.645

Table 6: Hosmer and Lemeshow Test.

Step	Chi-square	df	Sig.
1	5.997	8	648

Table 7: Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	.055	5.019E3	.000	1	1.000	1.057
	Years of education	.545	.123	19.613	1	.000	.580
	Planting experience	.098	5.019E3	.000	1	1.000	1.103
	Arable land area	.576	.355	2.630	1	.007	.562
	Family Labor	.103	.973	.011	1	.916	1.108
	Agricultural income	.149	.378	.156	1	.005	1.161
	Risk attitude	20.327	2.062E4	6.005	1	.044	.035
	Market price information concern	-1.215	.768	2.503	1	.014	.297
	Constant	1.604	9.034E4	.000	1	0.002	4.975

a. Variable(s) entered on step 1: Age, years of education, farming experience, acreage, family labor, farm income, risk attitude, and attention to market price information.

3.5 Analysis of Factors Influencing Farmers' Production Decisions from the Empirical Results

According to the analysis of the binary logistic regression results in the previous chapter, the influencing factors: years of education of the head of household, income status of the farmer, risk attitude of the farmer and arable land area have significant effects on agricultural production inputs. The rest failed the significance test, and their effects on agricultural production inputs were not significant.

(1) Years of education of the household head

The influence of the number of years of education of the household head on the production decision of the farming household is positive. More years of education means that farmers are highly educated, open-minded and not conservative, and more receptive to new varieties and technologies, and tend to take into account all the available information around them to make a decision that is conducive to increasing their income. On the contrary, farmers with less years of education or even no education are more conservative in their decision making and can hardly accept the advanced agricultural business model, and can only follow the previous year's planting decision unchanged.

(2) Farmers' income

Farmers' income has a significant positive influence on agricultural production inputs. When considering increasing agricultural production inputs, farmers tend to consider the adequacy of the capital

they need to invest. When their income situation is not satisfactory, they will reduce their inputs in order to prevent their income from falling short of their income. Farmers with good incomes are bold in their production inputs, which helps them to make positive decisions to increase their production income.

(3) Arable land area

The area of land under cultivation has a positive effect on farmers' production decisions. Farmers with more acreage have more choices in what to produce and are more willing to increase agricultural production inputs than those with small-scale land, which is more conducive to making decisions that are conducive to increasing income.

(4) Farmers' risk attitudes

Farmers' risk attitude has a significant influence on how farmers make agricultural production inputs, the more risk attitude is preferred the more they can increase production inputs and make reasonable production decisions; when risk attitude is avoided or risk-neutral it means that farmers' decisions are more conservative, which is not conducive to making decisions to increase agricultural income.

In summary, the most significant factor in farmers' endowment on production decision is the years of education of the head of household, followed by farm income and arable land area; the level of influence of farmers' risk attitude on production decision is lower than that of farmers' endowment, and the influence of farmers' attention to market price information on production decision is not significant.

4 SUGGESTIONS FOR OPTIMIZING FARMERS' PRODUCTION DECISIONS

4.1 Strengthen the Construction of Rural Culture

From the empirical analysis, it is clear that the influence of the number of years of education of the household head on the production decision is very significant. Farmers with fewer years of education and lower literacy levels have limited factors to consider in decision-making and are unable to make decisions that are beneficial to increasing income. In order to improve the economic strength of rural areas, the first step is to use information technology to promote cultural construction in rural areas, provide quality cultural activities, and improve the overall quality of farmers. By continuously learning advanced planting knowledge and planting methods, farmers can improve their knowledge and make reasonable decisions that are conducive to increasing their income.

4.2 Improve Government Subsidy Policy

Improve the government subsidy policy so that farmers can receive subsidies in case they encounter such risks as climate change, pests and diseases and are unable to recover the losses by themselves. This will help motivate farmers to plant and increase their income, and also provide a reliable aid for farmers to make reasonable decisions.

4.3 Increasing the Productivity of the Land

Arable land size also has a positive effect on farmers' production decisions. Farmers who own more arable land have more options. To increase income, the productivity of the land must be increased. With technical support from the government, the land should be properly fertilized, irrigated and pesticides applied to reduce the damage to the land and maintain the fertility of the soil. The fertility of the soil can also be increased by returning straw to the fields or by applying more organic fertilizers such as farmyard manure to increase the productivity of the land, thus increasing the yield per unit of crops and increasing the income of farmers and facilitating them to make more rational decisions for the next production.

4.4 Improve Rural Social Security System

First, strengthen market management and provide farmers with a stable sales market. The market self-regulation has the disadvantages of spontaneity, blindness and lagging, which requires the government to supervise and manage the market players and their behavior according to the law. The government functions to regulate the operation of the national economy to improve the market mechanism, unify pricing, strengthen the management of external supply, and reduce the losses of farmers caused by significant price reductions.

Second, provide comprehensive agricultural insurance services to enhance farmers' confidence in planting. Since farmers cannot afford alone the loss of not receiving the expected income after increasing production inputs. Therefore, it is necessary for the government to provide preferential agricultural insurance services to farmers and include all risks that

may cause losses to farmers' income as part of the insurance, in order to reduce farmers' losses, increase farmers' confidence in planting, and promote farmers' active decision-making.

5 CONCLUSION

This study mainly obtained first-hand data for the study by distributing questionnaires and in-depth interviews. The data were summarized using Excel software, and the factors affecting farmers' production decisions (farmers' endowment, farmers' risk attitude, and market information) were analyzed empirically using SPSS statistical software and the logistic model. The higher the number of years of education, the more educated the farmer is and the more able he or she is to make reasonable decisions.

Farmers' risk attitudes also have a significant influence on production decisions. When farmers' risk attitudes focus on risk neutrality and risk avoidance, this can lead to negative decision-making and is not conducive to increasing farm income.

The surveyed farmers have the habit of paying attention to market price information, but their ability to use market price information for decision-making is still lacking. If farmers can make full use of market price information to make decisions, this will greatly reduce farmers' production losses and increase their farm income.

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