Farmer Differentiation, Land Transfer and Farmer's Seed Use Behavior

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Abstract: In this paper, the Ordered Logit model and the Logit model of new variety selection behavior of farmers are constructed. The field survey data of peanut growers in Chuzhou City, Anhui Province were used. This paper empirically studied the effects of peasant differentiation and land transfer on peanut growers' selection behavior of purchasing proportion and new varieties. The results show that farmers' occupational differentiation, income structure differentiation and identity differentiation will have a positive impact on the proportion of farmers purchasing and the probability of adopting new varieties. The proportion of land-to-household purchases and the probability of adopting new varieties will be significantly improved, and the proportion of land-based households to be purchased and the probability of adopting new varieties will be significantly reduced. The impact of land transfer on the purchase ratio of farmers and the probability of adopting new varieties is greater than the transfer of land.

1. Introduction

China has been a big agricultural producer since ancient times. Planting occupies a pivotal position in China. Seed is the source of planting production and the most basic agricultural production material that can not be replaced. It is also the technology that contributes the most to the development of agriculture and the progress of science and technology in China (Rozelle S, 2003). The annual seed consumption of peanuts in China is over 1.2 million tons. The huge amount of seeds makes the peanut seed market the focus of competition among seed companies (Hu et al, 2005). Farmers are the decision makers of agricultural production and consumers of seeds, and their use will have a direct impact on the promotion of new varieties and the development of seed markets.

At present, many scholars have conducted research on the behavior of farmers' crops. On the one hand, research on the behavior of farmers' retention, although seed retention will lead to a significant decline in crop yields (Hu et al., 2005; Li Daoguo, Tan Tao, 2006; EA A siedu, et al., 2006). However, the lack of standardization and transparency in seed market competition makes most farmers lack sufficient information to select their own varieties. Some farmers still tend to choose their own seeds to avoid market risks (Chen Ruijian et al., 2009). On the other hand, research on farmers'adoption behavior of new varieties. Meng Xiufeng et al. (2005) concluded that farmers'choice of new crop varieties was influenced by internal factors and external factors of farmers. In addition, more scholars focus their research on farmers'selection behavior of a specific new variety of staple grain crops and its influencing factors. Chang Xiangyang (2006), Li Dongmei et al. (2009) and Qi Zhenhong et al. (2012) studied the influencing factors of farmers' new rice variety selection behavior.

It can be seen that although scholars have drawn many useful conclusions in studying farmers' choice behaviors for crops, the current research mainly focuses on the selection behavior of general crops or a staple crop, and on non-crop crops. There are fewer related studies. Peanut, as the first oil crop in China with the second planting area, plays an important role in China's oil industry. In addition, the differentiation of farmers will lead to changes in the focus and types of farmers'demand for agricultural technology (Zhong Funing, 2008), and land transfer will inevitably lead to the polarization of cultivated land. Therefore, based on the perspective of peasant differentiation and land transfer, this paper takes new peanut varieties as an example to explore the

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behavior of peanut farmers and its impact mechanism.

2. Data source, model setting and variable selection

2.1 Data source

The data used in this paper are mainly from the field survey of peanut growers in Chuzhou City, Anhui Province in April 2012. The survey is mainly divided into four parts: the basic information of the head of household, the basic situation of the household, the household management and the use of peanut varieties. The survey selected three districts of Mingguang County, Nanxun District and Quanjiao County of Shuozhou City. A random sampling survey method was used to select 150 peanut growers for questionnaire survey. A total of 450 questionnaires were distributed, of which 142, 139 and 132 valid questionnaires were collected from Mingguang County, Nanxun District and Quanjiao County, respectively, with a total of 413 questionnaires. The effective rate of the questionnaire reached 91.78%.The data used in this paper are mainly from the field survey of peanut growers in Chuzhou City, Anhui Province in April 2012. The survey is mainly divided into four parts: the basic information of the head of household, the basic situation of the household, the household management and the use of peanut varieties. The survey selected three districts of Mingguang County, Nanxun District and Quanjiao County of Shuozhou City. A random sampling survey method was used to select 150 peanut growers for questionnaire survey. A total of 450 questionnaires were distributed, of which 142, 139 and 132 valid questionnaires were collected from Mingguang County, Nanxun District and Quanjiao County, respectively, with a total of 413 questionnaires. The effective rate of the questionnaire reached 91.78%.

2.2 Model setting

About the farmer household purchase ratio selection behavior model.

In this paper, the proportion of farmer purchases is set to an ordered categorical variable, and there are four different evaluations. That is to say, “all kinds of seedlings”, “mainly by seed retention, supplemented by purchases”, “mainly by purchasing seeds, supplemented by seeding” and “all kinds of seeds”. For ordered multi-class dependent variables, the ranking probability model is often used to describe the selection process. In view of this situation, this paper uses Ordered Logit model to estimate, the form of the model is as follows:

$$Y_i^* = X_i\beta + \varepsilon_i \tag{1}$$

In (1), Y_i^* is an unobservable latent variable. Observable is Y_i^*, Y_i represents the ordered response variable taking values on {1, 2, 3, 4}. Y_i is the explanatory variable; β is the parameter to be estimated; ε_i is the random error term obeying the logical distribution.

About the farmer's new breed selection behavior model.

The choice behavior of the new variety when the farmer purchases the seed is a dichotomous variable, that is, the farmer chooses to purchase the new variety and takes the value 1 and vice versa. In this paper, the Logit model is used to empirically analyze the factors affecting the selection behavior of new peanut varieties. The basic equations of the model are as follows:

$$Ln(\frac{P}{1-P}) = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \delta_3 x_4 + ... + \delta_n x_n \tag{2}$$

In (2), $Ln(\frac{P}{1-P})$ is the natural logarithm of the incidence rate of the new peanut variety selected by the farmer, and P represents the probability that the farmer chooses the new peanut variety. $x_i(\mathrm{i}=1,2,\ldots\mathrm{n})$ is the various explanatory variables described above. δ_0 is a constant term and $\delta_i(\mathrm{i}=1,2,\ldots\mathrm{n})$ is the coefficient to be estimated.

This paper focuses on the impact of peasant differentiation and land transfer behavior on farmers'

behaviors. The explanatory variables of this paper mainly include farmers' differentiation variables, land flow conversion and control variables: (1) peasant differentiation variables. This paper mainly considers the characteristics of peasant differentiation from three aspects: occupational differentiation, income structure differentiation and identity differentiation. Among them, the occupational differentiation of farmers is characterized by the variable proportion of non-agricultural employment. The income structure differentiation of farmers is characterized by the variable ratio of household non-agricultural income. The differentiation of farmers' identity is characterized by two dummy variables: model households and village cadres. (2) The amount of land transfer. With regard to land transfer, this paper mainly uses the two virtual variables of whether there is land transfer and whether there is land transfer. The effects of land transfer and land transfer on farmers'seed use behavior were investigated. (3) Control variables. In addition to the above two types of variables, this paper also contains three personal characteristics variables: age, gender and cultural level of the head of household. And three family characteristic variables are family per capita income, the proportion of peanut income to total income and the proportion of peanut sales.

Table 1 Descriptive statistics of variables

Variable name	Variable definitions	Minimum value	Maximum	Average value	Standard deviation
Interpreted variables					
Selection Behavior of Purchasing Proportion	All the seeds are kept as =1; the main species are retained, and the purchased seeds are supplemented by 2; the main species are purchased, and the remaining species are supplemented by 3; all purchased species = 4	1	4	1.864	1.197
New Variety Selection Behavior	There are behaviors to buy new varieties = 1; other =	(0)	(1)	(0.744)	(0.438)
Explanatory variable					
Variables of Farmer Differentiation					
Proportion of household non-agricultural employment population	The proportion of non-agricultural employment in the household to the total population of the family (%)	0(0)	0.778(0.778)	0.407(0.476)	0.208(0.208)
Non-farm household income ratio	Household non-agricultural income as a percentage of total household income (%)	0(0)	0.957(0.957)	0.360(0.453)	0.297(0.287)
Model households	Peanut model households=1; other=0	0(0)	1(1)	0.138(0.280)	0.345(0.451)
Village cadres	Among the family members are village cadres=1; others=0	0(0)	1(1)	0.131(0.177)	0.338(0.383)
Land Flow Conversion Quantity					
Are there any land transfers?	In 2011, there was land transfer=1; other=0	0(0)	1(1)	0.220(0.341)	0.415(0.476)
Are there any land transfers?	Land transfer out in 2011 = 1; other =	0(0)	1(1)	0.143(0.061)	0.350(0.240)
control variable					
Age of head of household	The age of the head of the household (years)	31(33)	80(80)	49.554(49.756)	8.892(9.239)
Gender of head of household	Male=1; female=0	0(0)	1(1)	0.954(0.970)	0.210(0.172)
Educational level of head of household	Below primary school = 1; primary school = 2; junior high school = 3; high school or secondary school = 4; college and above = 5	1(1)	5(5)	2.692(2.890)	0.887(0.844)
Per capita household income	Total household income / total family size (yuan / person)	1500 (1500)	58666.67(58666 .67)	9389.748(11124 .07)	5980.908(6895. 725)
Peanut income as a proportion of total income	Peanut income / total household income	0(0)	0.658(0.600)	0.147(0.127)	0.132(0.110)
Peanut sales ratio	Peanut sold / total peanut yield	0(0)	1(1)	0.779(0.759)	0.209(0.206)

Note: The statistical value of 164 households remaining after excluding all the samples selected from the original 413 samples in parentheses

3. Empirical analysis

In this paper, the Esta13.0 measurement software is used to calculate the estimated results of the

Ordered Logit model and the Logit model (see Table 2). It can be seen from the LR values that both models are very significant, and the Pseudo R2 value also shows that the two models fit well. The detailed estimation results are shown in Table 2.

Table 2 Ordered Logit model and Logit model estimation results

Variable name Variables of Farmer Differentiation	Purchase ratio selection behavior (Ordered Logit model)		New variety selection behavior (Logit model)	
	Coefficient	Z statistic	Coefficient	Z statistic
Proportion of household non-agricultural employment population				
Non-farm household income ratio	1.346**	2.42	2.178*	1.85
Demonstration households	0.808*	1.89	3.354***	3.46
Village cadres	0.712***	2.60	2.242**	2.50
Land Flow Conversion Quantity	0.713**	2.36	2.067**	2.27
Are there any land transfers?				
Are there any land transfers?	0.956**	2.37	2.081***	3.01
control variable	-0.527**	-2.10	-2.015**	-2.07
Age of head of household				
Gender of head of household	0.025**	2.00	0.026	0.82
Educational level of head of household	-0.218	-0.37	-0.726	-0.51
Per capita household income	0.396***	3.09	0.505	1.37
Peanut income as a proportion of total income	5.500E-05***	2.95	5.570E-05*	1.72
Peanut sales ratio	-1.338	-1.15	-5.650*	-1.76
Variable name	-0.592	-1.11	-0.734	-0.51
Constant term	-	-	-2.341	-0.80
cut1	3.543	-	-	-
cut2	4.253	-	-	-
cut3	4.853	-	-	-
	Sample size	413	Sample size	164
	Pseudo R^2	0.116	Pseudo R^2	0.407
	Log likelihood	-397.636	Log likelihood	-55.304
	LR chi2(12)	104.150	LR chi2(12)	76.000
	Prob>chi2	0.000	Prob>chi2	0.000

Note: ***, **, and * indicate significant statistical levels at 1%, 5%, and 10%, respectively.

3.1 The influence of peasant differentiation factors on farmers' behaviors

It can be seen from the estimation results of the two models that the four variables representing the three dimensions of peasant differentiation have significant positive effects in the farmers' purchase ratio selection behavior model and the new variety selection behavior model. But the level of significance is not the same. This shows that the larger the proportion of non-agricultural employment in the household, the more farmers tend to buy seeds rather than keep seeds, and the greater the probability of buying new varieties. The higher the proportion of non-farmer income in households, the more likely farmers are to buy seeds rather than keep seeds, and the more likely they are to buy new varieties. Village cadres and demonstration households are more likely to buy seeds than non-village cadres and non-demonstration households, and they are more likely to buy new varieties.

3.2 The impact of land transfer factors on farmers' behaviors

Whether there is land transfer and whether there is land transfer has a significant positive and negative impact on the purchase ratio of farmers and the probability of adoption of new varieties. It shows that the proportion of land purchased and the adoption rate of new varieties will increase significantly. The proportion of land transfer and the adoption rate of new varieties will be significantly reduced. In addition, from the coefficient point of view, the absolute value of the estimated coefficients of whether there is land transfer in the two models is greater than the estimated coefficients of whether there is land transfer or not. It shows that the influence of land transfer on the proportion of purchasing seeds and the probability of using new varieties is greater than that of land transfer.

3.3 The influence of other factors on the behavior of farmers

It can be seen from the estimation results of the two models that in addition to the peasant differentiation factors and land transfer factors, there are still some factors that affect the behavior of farmers. The older the head of the household, the higher the level of education. The more they tend to buy new varieties rather than keep them. But it has no significant effect on whether to buy new varieties. The gender ratio of household heads and the proportion of peanuts sold have no significant effect on the proportion of farmers purchasing and the probability of adopting new varieties. Farmers with higher per capita income tend to buy seeds rather than keep them, and they are more likely to buy new varieties. There is no significant difference in purchasing and reserving seeds between peanut farmers whose income accounts for a higher proportion of total household income and peanut farmers whose income accounts for a lower proportion of total household income. However, peanut farmers whose income accounts for a higher proportion of total household income have a higher probability of purchasing new varieties.

4. Discussion

This study has the following policy implications: First, the state should pay more attention to the cultivation of new crop varieties and encourage breeding institutions to engage in high-level innovation. At the same time, the cultivation of new varieties of crops should be guided by agricultural production, and the difference in performance between new varieties and original varieties in agricultural production should be increased. Second, the state should continue to implement and strengthen policies to encourage rural labor transfer and increase farmers' non-agricultural employment income. Provide a good policy environment to further promote land transfer in rural areas. Farmers are encouraged to operate on a moderate scale to create good market conditions for the promotion of new crop varieties. Thirdly, Agricultural Technology Extension departments can take demonstration households and village cadres as entry points to encourage demonstration households and village cadres to actively adopt new varieties and new technologies in their work of promoting new varieties. We will strengthen the radiation-driven role of demonstrative households and village cadres. At the same time, we should consider the differences of new varieties selection behavior of different types of farmers. To formulate different strategies for the promotion of new varieties for different types of farmers. For example, we should focus on promoting new varieties with time-saving and labor-saving characteristics for part-time farmers and new varieties with improved yield and quality characteristics for large farmers.

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