

Analysis on the Influencing Factors of Farmers Adopting the Key Breeding Technology of Fattening Pigs

-- Based on the Investigation of the Sichuan Live Pig Technology Promotion Demonstration Area

Mingyan Huang¹, Pengjuan Shi¹, Wenyong Tian^{1, a, *}

¹Qinghai University, Qinghai, Xining, 810000, China

^aCorresponding author e-mail: 18385909783@163.com

Abstract

In order to verify the positive effect of the Sichuan Suining Technology Promotion Demonstration Zone on pig farmers, it is proposed to improve the precision of technical training and guidance services, strengthen the promotion of disease prevention and control and drug control technology, and the test randomly selects 373 pig farmers. The households are the research objects, first-hand data are obtained by using the questionnaire survey method, and the Probit model and Logit model are used to conduct empirical analysis on the factors affecting their decision-making.

Keywords

Breeding technology; Adoption decision; Influencing factors.

1. Introduction

Technology is the primary productive force. There is no doubt that farmers can obtain better economic benefits without the adoption of key aquaculture technologies. With the rapid economic development, people's requirements for the quality of life are getting higher and higher, and at the same time, the requirements for the quality of livestock and poultry meat are also getting higher and higher [1]. Whether to use key breeding techniques to improve the fattening effect of growing and fattening pigs is the key to meeting people's demand for high-quality pork [2]. According to statistics, my country has always been a major country in the production and consumption of live pigs, but not a strong country in the live pig industry. The reason is that the use of pig breeding technology in my country is not mature enough. Sichuan Province, a major pig farming province in China, took the lead in implementing the "Science and Technology Innovation Industrial Chain Demonstration Project" in the country. Among them, the "Research and Integrated Demonstration of High-Efficiency Supporting Technologies for the Modern Industrial Chain of Pigs" has been developed to "improve the efficiency of pig fattening" for pig fattening. And the key breeding technology of pork quality" [3], and has been promoted and demonstrated in Suining City, a major pig breeding city in Sichuan. The use of key breeding technologies to fundamentally improve pork quality can not only transform key breeding technology achievements into actual economic benefits, It can also improve the professional level of China's aquaculture industry [4].

Through combing the research on the factors affecting the decision-making of the key breeding technology of fattening pigs adopted by farmers, it is found that many scholars have conducted research on them and have achieved fruitful results, which provide a lot of theory and experience for reference for this research. At present, the existing researches mainly focus on three aspects: One is the application of pig breeding technology. Wu Xiumin [5] used the Logistic model to conduct a quantitative analysis on the influencing factors of the use of safe

veterinary drug technology, and concluded that the use of safe veterinary drug technology by farmers is positively correlated with government support. Tang Guohui and Zhang Feng [6] used the Logit regression model to study the new technology selection behavior of farmers' pig breeding. The results showed that the farmers' education level, pig breeding scale, and the proportion of pig income in the total income of the family were used to study the new technology of farmers' pig breeding. The influence of his choice behavior is significant. The second is the decision-making aspect of the adoption of pig breeding technology. Liu Wanli [7] and others used empirical research methods to conduct a quantitative analysis on the use of safe veterinary drugs in the process of pig breeding by farmers, and concluded that farmers have a low level of awareness of the use of veterinary drugs. Based on modern agricultural extension theory, Jin Shuping [8] analyzed and studied the use of animal epidemic prevention, a key breeding technology, and found that individual factors of farmers and the degree of service extension are significant factors in technology adoption. Tang Yingmei [9] and others believe that education level and family labor status are the main factors that affect farmers' pig production decisions. Tian Wenyong and Yu Hua [10] based on the research on the key breeding technology behavior of fattening pigs in the technology promotion demonstration area, they found that factors such as technology awareness, technology promotion, and convenient transportation have a significant impact on the adoption of pig house management technology by farmers. Li Wenyong and Xiao Xiaoyong [11] used the binary Logit model to conclude that the degree of professionalization of pig raising has a negative impact on breeding decision-making behavior. The third is breeding management and technological progress. Gu Guoqing [12] put forward the modern breeding concept of strengthening live pig production management, strengthening technical personnel training, and improving the breeding level. Shen Yinshu [13] believes that the development trend of my country's pig industry is large-scale breeding, and technology and management complement each other. Ma Chenglin and Zhou Deyi [14] based on the panel data of major pig breeding provinces (municipalities and autonomous regions) in my country from 2006 to 2010, conducted an empirical study on the relationship between the growth of pig scale and breeding technology in my country, and found that breeding scale was negatively correlated with technological progress. Among them, the medium-scale and large-scale aquaculture technology has changed significantly.

To sum up, there have been domestic studies on the factors affecting the adoption of fattening pig breeding techniques by farmers. Tang Yingmei [9], Li Wenyong and Xiao Xiaoyong [11], Tian Wenyong and Yu Hua [10] conducted research on the adoption of pig breeding technology, pig breeding technology adoption decision-making, breeding management and technology, but most of them did not conduct empirical analysis. Therefore, in order to make up for the insufficiency of the existing research on the factors affecting the decision-making of the key breeding technology of fattening pigs by the farmers, this paper will draw on the theoretical basis of the existing research results, through descriptive statistical analysis and econometrics (Probit model and Logit model) and other methods are used to conduct a more in-depth analysis and research on the factors that influence the decision of farmers to adopt the key breeding technology of fattening pigs, in order to provide countermeasures and suggestions for farmers to adopt the key breeding technology of fattening pigs.

2. Research Methods, Variable Selection and Data Sources

2.1. Research Method

Since pig farmers adopting the key breeding technology of fattening pigs to make decisions are binary variables, it is difficult to measure the influencing factors that affect their decision by using conventional linear regression analysis. Two models of binary Probit and Logit are

adopted for farmers to adopt the key breeding technology of fattening pigs. Statistical analysis of factors affecting decision-making is more appropriate.

2.1.1. Probit Model

$$\text{The original expression Prob}(Y = \beta X_i + \mu) \quad (1)$$

$$\text{Prob}(X_i, \beta) = \Phi(\beta_0 X_i + \beta_1 X_i + \beta_2 X_i + \dots + \beta_n X_i + \mu) \quad (2)$$

Equations (1) and (2) are dependent variables, which represent the decision-making probability of farmers adopting the key breeding technology of fattening pigs (use=1, not use=2), $\beta_0 \sim n$ are constant terms, which are independent variables, indicating that it is possible Factors that affect the decision of farmers to adopt key breeding techniques for fattening pigs, Φ represents the accumulation function of the standard normal distribution, $i=1, 2, 3, \dots, 21$, which is the error term.

2.1.2. Logit Model

The specific Logit model is set as follows:

$$\text{Logit}(y_i=0 \mid X_i, \beta) = F(-X_i \beta) + \omega \quad (3)$$

$$P_t = F(\alpha + \sum_{i=1}^m \beta_i X_i) = 1 / \{1 + \exp[-(\alpha + \sum_{i=1}^m \beta_i X_i)]\} + \omega \quad (4)$$

In formulas (3) and (4), P_t is the dependent variable, which represents the probability that the pig farmer adopts the key breeding technology of fattening pigs, and represents the regression coefficient of the factor. m represents the number of factors that affect this probability. It is an independent variable, i Indicates the i -th influencing factor. In this paper, $i=1, 2, 3, \dots, 21$, α means regression intercept, ω means random disturbance term.

2.2. Variable Selection

In this paper, based on the existing related research of Wu Xiumin [5], Tang Yingmei [9], Li Wenying and Xiao Xiaoyong [11], Tian Wenying and Yu Hua [10], combined with the actual situation of the research, the selection of the key factors that influence the farmers to adopt fattening pigs is selected. The influencing factors of technical decision-making are shown in Table 1.

2.3. Data Sources

The data in this article comes from a field survey. 373 pig farmers in the Technology Promotion Demonstration Zone of Suining City, Sichuan Province were the subjects of investigation. First, use stratified random sampling to select the total production output value of agriculture, forestry, animal husbandry and fishery in the 21 cities and prefectures of Sichuan Province in 2012, and use the location quotient model to calculate the location quotient of the animal husbandry of each city and state to determine each city and state. The advantages and disadvantages of animal husbandry in the region, and then classify the cities and prefectures. Secondly, Suining City, which has obvious advantages in regional animal husbandry, was selected as the sample city, and based on the number of pigs slaughtered in 2012 in the districts and counties under the jurisdiction of the city, whether it was a major national pig transfer county and a key county for modern animal husbandry in Sichuan Province. Select 3 counties (districts) within the jurisdiction of Suining City as sample counties; Thirdly, based on the core area of live pig production, whether it is a transfer base, and the annual scale of slaughter, 15 towns in each of the selected 3 counties (districts) are selected as the

questionnaire survey points; finally, the selection is based on factors such as traffic conditions and the scale of business owners. In sample villages, 15 sample farmers are selected from each sample village to conduct a questionnaire survey. The distribution of the questionnaire is shown in Table 2.

Table 1. Variable table

Factor type	Variable name	Index description	Mean	standard deviation
Dependent variable	Whether to adopt (Y)	Adopt=1; Not Adopt=2	1.143	0.349
	Gender (x1)	Male=1; female=0	1.120	0.325
	Age (x2)	Continuous variable in years	49.586	10.180
	Education level (x3)	Elementary school and below=1; junior high school=2; high school (secondary school)=3; junior college and above=4	1.895	0.786
	Identity category (x4)	Ordinary farmers = 1; company members of farmers = 2; members of cooperatives or associations = 3; others = 4	1.573	1.773
	Risk attitude (x5)	High risk and high profit=1; face carefully=2; avoid risk; give up the adoption=3	2.059	0.918
	Number of breeding people (x6)	Continuous variables, with people as the unit	2.000	1.091
	Pig breeds (x7)	Ocean ternary = 1; soil ternary = 2; Soil miscellaneous pig=3; others=4	3.295	9.880
	Farming years (x8)	Continuous variable, in years	2.796	1.426
	Proportion of revenue (x9)	Below 50%=1; 50%~80%=2; Above 80%=3	1.804	1.273
Independent variable	Convenient information (x10)	Very inconvenient=1; inconvenient=2; general=3, more convenient=4; very convenient=5	3.284	0.961
	Location (x11)	Countryside = 1; Surrounding township = 2; Around the county seat=3	1.249	0.513
	Terrain (x12)	Plain = 1; Hill = 2; Mountain = 3	2.048	0.494
	Traffic convenience (x13)	Inconvenient=1; Normal=2; Very convenient=3	2.429	0.637
	Easy to sell (x14)	Difficulty=1; Normal=2; Easier=3	2.327	0.635
	Farming scale (x15)	Free range = 1; small scale = 2; Medium scale=3; large scale=4	2.710	0.774
	Promotion degree (x16)	Not promoted=0; promoted=1	1.350	0.477
	Policy support (x17)	No=0; Yes=1	1.441	0.496
	Subsidy level (x18)	No=0; Yes=1	1.501	0.499
	Training level (x19)	1-2 times=1; 3-5 times=2; 6-10 times=3; >11 times=4	1.777	0.897
	Awareness (x20)	Don't know=0; know=1	1.211	0.488
	Obtaining method (x21)	Free=0; Paid=1	0.161	0.408

Data source: questionnaire survey

Table 2. Questionnaire distribution

Counties	Investigate the township	Number of Questionnaires
Shehong County	Tuopai Town (National Livestock and Poultry Observation Point), Jinhua Town, Taiyi Town (National Livestock and Poultry Observation Point)	168
Anju District	Anju Town, Dongchan Township, Ximei Township, Baima Town, Moxi Township	112
Chuanshan District	Guihua Town, Liujia Township, Renli Town, Yongxing Town, Baosheng Township, Xining Township	93

Data source: questionnaire survey

3. Analysis on the Status Quo of Farmers Adopting Key Breeding Techniques for Fattening Pigs

The questionnaire data has been sorted out in this part, mainly from the farming scale and breeding years of the farmer, the way the farmer uses the key farming technology, the actual situation of the key farming technology for fattening pigs, and the factors considered in the key farming technology for fattening pigs. Analysis, all the following data comes from questionnaire surveys.

4. An Empirical Analysis of the Factors Influencing the Decision of Farmers to Use the Key Breeding Techniques of Finishing Pig

Through the selection of Probit model and Logit model, using Eviews9.0 econometrics software, the econometric analysis of various influencing factors is carried out. The results are shown in Table 3.

Table 3 shows that education level (x3), identity type (x4), traffic convenience (x13), and sales difficulty (x14) are significant at a significant level of 10%; information level (x10) is significant at a significant level of 5% Significant; training level (x19) and awareness level (x20) are significant at the 1% significance level; pig breeds (x7) pass the Probit model significance test at the 10% significance level, but fail the Logit model significance test. From Table 3, it can be seen that education level, transportation convenience, sales difficulty, training level, and awareness have a positive relationship with the farmers' decision-making on adopting key fattening pig breeding technologies, indicating that the higher the education level of the farmers, the more convenient the transportation and the sales. The easier it is and the more convenient it is to obtain the technology, the greater the probability that it will adopt the key breeding technology of fattening pigs. Identity type, pig breed, and information level have a negative impact on farmers' decision to adopt key fattening pig breeding technologies, indicating that compared with formal farmers such as cooperatives or associations, ordinary farmers have a lower degree of information about key fattening pig breeding technologies. , More conservative in using traditional breeding techniques to breed traditional pigs, the probability of adopting key breeding techniques for fattening pigs is relatively small. This is consistent with some research results such as Tian Wenying and Yu Hua (2017).

Table 3. Model results

Variable name	Probit model		Logit model	
	coefficient	Z value	coefficient	Z value
constant	-0.390	-0.325	-0.748	-0.346
Gender (x1)	-0.357	-1.115	-0.637	-1.115
Age (x2)	0.012	0.939	0.021	0.945
Education level (x3)	0.317*	1.823	0.606*	1.897
Identity type (x4)	-0.293*	-1.910	-0.516*	-1.822
Risk attitude (x5)	-0.072	-0.359	-0.110	-0.300
Number of pigs (x6)	0.016	0.220	-0.001	-0.005
Pig breeds (x7)	-0.213*	-1.860	-0.342	-1.602
Farming years (x8)	-0.073	-0.826	-0.133	-0.821
Proportion of revenue (x9)	0.202	1.373	0.367	1.311
Information level (x10)	-0.277**	-2.305	-0.471**	-2.118
Location (x11)	-0.258	-1.099	-0.469	-1.094
Terrain (x12)	-0.167	-0.777	-0.340	-0.851
Traffic convenience (x13)	0.345*	1.917	0.590*	1.768
Easy to sell (x14)	0.302*	1.752	0.549*	1.691
Farming scale (x15)	-3.35E-05	-0.188	5.57E-05	0.136
Promotion degree (x16)	-0.466	-1.431	-0.730	-1.186
Policy support (x17)	0.1199	0.384	0.175	0.296
Subsidy level (x18)	0.036	0.142	0.061	0.133
Training level (x19)	1.313***	4.657	2.279***	4.411
Awareness (x20)	1.187***	3.714	2.021***	3.558
Obtaining method (x21)	0.270	0.860	0.364	0.658
test	Akaike Information Guidelines	0.679	Schwartz Information Guidelines	0.684
	Schwartz Information Guidelines	0.912	Schwartz Information Guidelines	0.918
	Log likelihood function value	-102.892	Log likelihood function value	-103.894
	Maximum likelihood function value	-158.645	Maximum likelihood function value	-158.645
	Mean of log likelihood function	-0.280	Mean of log likelihood function	-0.282
	Hannan-Queen Criteria (HQC)	0.772	Hannan-Queen Criteria (HQC)	0.777
	Likelihood ratio indicator (R2)	0.351	Likelihood ratio indicator (R2)	0.345
	LR test statistic value	111.506	LR test statistic value	109.502
	LR test statistic P value	0.000	LR test statistic P value	0.000

Note: *, **, *** mean significant at the 10%, 5%, and 1% significance level respectively

5. In Conclusion

Vaccination is a breeding skill that farmers have to master more; the key technologies that are used more are disease control and rational drug use technology with high awareness; the understanding of key breeding technologies for fattening pigs is low; the technology is mainly

learned from the animal husbandry and veterinary station; Technical training and guidance services are mainly provided by the agricultural technology extension station; the methods of using key breeding techniques for fattening pigs are mainly obtained through their own exploration.

In the process of fattening pig breeding, 85.25% of pig farmers indicated that they need key breeding technology for fattening pigs; 18.37% of farmers need to adopt disease prevention and control and rational drug use technology; the main factor considered by farmers to adopt technology is to reduce the investment in breeding costs. Increase economic benefits; the key breeding technology that hopes to adopt more is the difficulty of disease prevention and control and the control of the amount of medicine; the main reasons why farmers do not want to adopt it are high input costs, insufficient funds, and small scale of pig breeding.

Education level, identity type, transportation convenience, pig breeds, information level, sales difficulty, training level, and awareness variables are the main significant factors that affect the adoption of key fattening pig breeding techniques by farmers. It shows that the higher the education level of the farmers, the easier it is to access the key breeding technology of fattening pigs, and the higher the probability of adopting the key breeding technology of fattening pigs.

6. Countermeasure

6.1. Actively Develop Live Pigs to Improve the Precision of Technical Training and Guidance Services

To increase the probability of farmers adopting the key breeding technology of fattening pigs, it is necessary to encourage agricultural technology extension stations, feed companies, cooperatives or associations to provide technical training and guidance services to pig farmers, and increase the acceptance of experts from pig breeding companies and scientific research institutions. Highly educated ordinary farmers, company farmers, cooperatives or members of associations provide precise aquaculture technical training and guidance services.

6.2. Strengthen the Promotion and Publicity of Epidemic Prevention and Control and Dose Control Technology

It is conducive to increasing the awareness of farmers about the key breeding techniques of fattening pigs, and actively relying on the animal husbandry and veterinary station to promote the use of disease prevention and control and drug control technology, so that farmers can use scientific key breeding techniques to properly raise and reduce breeding costs, Improve economic returns.

6.3. Strongly Support the Agricultural Technology Extension Station to Promote Vaccination Technology to Fattening Pig Farmers

Improve the technical level of pig breeding, and voluntarily popularize the farmers who have difficulty in obtaining technical information through the popularization of technology. Encourage farmers to update their pig breeds, scientifically use key breeding techniques for fattening pigs in their own explorations, and guide farmers to try scientific innovations and advance technological progress.

6.4. Strengthen the Education of Key Breeding Technology Knowledge

There are differences in the educational level of pig farmers, and education on key breeding techniques should be actively provided to farmers with a high level of education. According to the technical needs of the farmers, timely training of pig breed improvement technology is provided to the farmers; through the introduction of talents and technical knowledge education, the farmers are guided to make decisions about the adoption of key breeding technologies while recognizing the current situation and being cautious about risks.

6.5. Intensify the Precise Support of Fiscal Policies

The completeness of the government's infrastructure construction determines the convenience of transportation. In view of the disadvantaged situation of fattening pig farmers in terms of geographic location and topography, it is recommended that the competent government departments increase the precise support of subsidy policies, improve infrastructure construction, and rely on this as a subsidy policy for ordinary farmers to encourage them to provide subsidies to large and medium-sized farmers. Moderate breeding scale development.

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