CSCanada
Management Science and Engineering
Vol. 5, No. 3, 2011, pp. 1-5
DOI:10.3968/j.mse.1913035X20110503.4z375

ISSN 1913-0341[Print]
ISSN 1913-035X[Online]
www.cscanada.net
www.cscanada.org

Empirical Study on the Factors Influencing the Willingness of Pig-Breeding Farms and Farmers to Keep Breeding Record

XIA Zhaomin[1,2,*]; SUN Shimin[2]; ZHANG Yuanyuan[1]

[1]School of Business Management, Shandong University of Finance, 250014, China
[2]School of Economics and Management, Shandong Agricultural University, 271018, China
[*]Corresponding author.
Female, lecturer, PhD candidate, mainly engaged in supply chain management.
Email: xzm@sdfi.edu.cn

Supported by The National Natural Science Fundation of China (2010, No. 70972121).

Received 24 May 2011; accepted 16 June 2011

Abstract
Establishment of pig-breeding record is fundamental to enforce the source supervision of pork production and construct the tracing mechanism of pork quality safety. Based on the result of 327 questionnaires, Logit Binary Choice Model is used in this paper to quantitatively analyze the factors influencing the willingness of pig-breeding farms and farmers to establish breeding record. It shows that six factors, which are education level, specialized level, participation in pig-breeding cooperative organization, recognition of breeding record, government's propaganda and supervision, have significant and positive impact on the willingness of pig-breeding farms and farmers to build breeding record.

Key words: Pig-breeding farm and farmer; Breeding record; Logit model; Influence factors

XIA Zhaomin, SUN Shimin, ZHANG Yuanyuan (2011). Empirical Study on the Factors Influencing the Willingness of Pig-breeding Farms and Farmers to Keep Breeding Record. *Management Science and Engineering, 5*(3),1-5. Available from: URL: http://www.cscanada.net/index.php/mse/article/view/j.mse.1913035X20110503.4z375
DOI: http://dx.doi.org/10.3968/j.mse.1913035X20110503.4z375

INTRODUCTION
The issue of food quality safety and health has received pervasive attention and become human's concern. Pork is the main type of meat consumed in China and is an important source of nutrition. But the widespread hidden danger in pork quality safety in China has affacted Chinese consumers' health as well as greatly contrained the competitiveness of China's pig-breeding industry. How to speed up the production of quality pork has become the common concern of Chinese government, scholars and consumers in general. Implementing pig-breeding record among pig-breeding farms and farmers (i.e. scale pig-breeding farms and specialized pig-breeding households) is an effective approach to enforce source supervision of pork production, execute whole-process control, establish the traceability mechanism of pork quality safety, as well as the demand of ensuring pork quality safety.

In recent years, some scholars have began studying the issue of building and managing pig-breeding record. Xiong Benhai, et al. (2009) have studied the electronic management system of pig-breeding record suitable for farmers breeding pig in semi-natural environment, based on the *Regulation on management of identification and breeding record of livestock and poultry*. It can realize the continual identification of pig ear tag, the continual record of the using of feedstuff, veterinary drugs and illegal drugs. Yuan Xiaoqin, et al. (2010) have analyzed the legal institutions and technology development of China's traceability system for pork quality safety from the perspective of breeding record management institutions. It concludes that difficulties exist for small farmers to build pig-breeding record, but the credibility of the breeding record of scale pig-breeding farmers is doubtful. Sun Shimin, et al. (2011) have analyzed the quality safety behavior of pig-breeding farms in quality pork supply chain, and indicated that only one third interviewed pig-breeding farms and farmers have kept breeding record, but problems like non-standard management and incomplete record also exist.

In summary, domestic study of pig-breeding record is just on the start, and it mainly deals with systematic

design and application analysis. This is a vacancy of empirical study of the factors influencing the willingness of pig-breeding farms and farmers to keep breeding record. In this paper, factors infuencing the willingness of pig-breeding farms and farmers to keep breeding record are studied from micro perspective, based on the result of 327 questionnaires from 9 provinces (municipalities and regions) like Shandong Province, with the purpose to offer some references and clues to promote the establishment of pig-breeding record.

1. DEFINITIONS AND HYPOTHESES

1.1 The Concept and Content of Pig-Breeding Record

Breeding record refers to the record of livestock and poultry, feedstuff, other inputs and vaccination during the breeding process. It is the legal duty of livestock and poultry breeding farms and farmers to keep it. As the actual record of the production process of breeding farms, breeding record can sufficiently demonstrate the quality safety coefficient of the products of a breeding farm. Breeding record is the deepening and forward expansion of quarantine inspection, and therefore it is a powerful tool to secure livestock product quality and the key to safeguarding the quality safety of livestock products.

According to the stipulation of *Animal Husbandry Law of People's Republic of China*, the following content should be included in pig-breeding record: the breed, quantity, reproduction record, identification, source, arrival and shipment date; the source, name, subject, time and dosage of feedstuff, feedstuff additives, veterinary drug and other inputs; information on quarantine inspection, vaccination and sterilization; information on pig diseases, deaths and hazard-free treatment; other contents according to the stipulation of administrative authority of husbandry and vaterinarian of the State Council. Apparently, the establishement of breeding record of pig-breeding farms and farmers can lead to source supervision, whole-process control of responsibility tracing of pork quality safety.

1.2 Hypotheses

Hypotheses of the willingness of pig-breeding farms and farmers to keep breeding record can be proposed based on characteristics of decision-makers, production and operation, breeding environments, and recognition.

(1) Charateristics of decision-makers have an impact on the willingness of pig-breeding farms and farmers to keep breeding record. They mainly include the gender, age and education level of decision-makers in pig-breeding farms and farmers. Younger and more educated male farmers are more inclined to keep breeding record.

(2) Charateristics of production and operation have an impact on the willingness of pig-breeding farms and farmers to keep breeding record. They mainly refer to the breeding model, breeding scale, specialization degree, years engaged in breeding pigs, and participation in pig-breeding cooperatives of pig-breeding farms and farmers. The degree of specialization is shown by the ratio of pig-breeding revenue to total revenue. Large-scale, more specialized pig-breeding farms and farmers are more inclined to keep pig-breeding record. Participation in a pig-breeding cooperative makes pig-breeding farms and farmers more inclined to keep breeding record. It still needs to be tested whether the years engaged in specialized breeding pigs have positive or negative correlation with the tendency of pig-breeding farms and farmers to keep breeding record.

(3) Charateristics of breeding environment have an impact on the willingness of pig-breeding farms and farmers to keep breeding record. They mainly refer to whether government promotes and supports the building of pig-breeding record, and whether government supervises and inspects breeding record. Propaganda and supervision from the government improve the possiblity of pig-breeding farms and farmers to keep breeding record.

(4) Charateristics of recognition have an impact on the willingness of pig-breeding farms and farmers to keep breeding record. They refer to the understanding of pig-breeding farms and farmers of the content, function, laws and regulations of breeding record. Pig-breeding farms and farmers that have better recognition are more inclined to keep breeding record.

2. CONSTRUCTION OF EMPIRICAL MODEL

2.1 Choice of Model

The willingness of pig-breeding farms and farmers to keep breeding record, i.e. their subjective probability to choose to keep breeding record, have two ends: yes and no. They will rationally make the optimal choice on the basis of tade-off of various elements. It is a typical decision-making problem of choosing one from two options. Thus Logit binary choice model is used to analyze the factors influencing the willingness of pig-breeding farms and farmers to keep breeding record.

Take the willingness of pig-breeding farms and farmers to keep breeding record as dependent variable y, i.e. 0-1 dependent variable. The willingness is defined as $y = 1$ and unwillingness is defined as $y = 0$. Assume the probability of $y = 1$ is P, and $\chi_i (i = 1, 2, \ldots, n)$ is independent variable, i.e. main influence factors like the charateristics of decision-maker, production and operation, breeding environment and recognition; $b_i (i = 1, 2, \ldots, n)$ is regression coefficient of influencing factor i. When the value of b_i is positive, it indicates that factor i has positive impact on the willingness of pig-breeding farms and farmers to keep breeding record and vice versa. The general Logit regression model is as follows:

$$P = F(Y) = \frac{1}{1+e^{-y}} \quad (1)$$

Here Y is the linear combination of variables $\chi_1, \chi_2, \ldots \chi_n$, that is:

$$Y = b_0 + b_1 x_1 + b_2 x_2 + \cdots\cdots + b_n x_n \quad (2)$$

Combine formula (1) and (2) and then make some transformation, Logit model represented by odds ratio is as follows:

$$Ln(\frac{P}{1-P}) = b_0 + b_1 x_1 + b_2 x_2 + \cdots\cdots + b_n x_n + \mathrm{e} \quad (3)$$

Here b_0 is constant term and ε is random error.

2.2 Data Source and Sample

The data used in this paper are based on the field research in Feb. 2010. Subjects are specialized pig-breeding household with yearly production of 100~500 pigs and scale pig-breeding farms with yearly production of over 500 pigs. Subjects are interviewed face-to-face by investigators and questionnaires are filled in on the site.

The choice of investigation regions allows for pig breeding and locational differences all over the country. Nine provinces, municipalities and autonomous regions like Shandong province are covered in this investigation. In terms of pig breeding number, Shandong, Hunan and Henan are main pig-breeding areas; Anhui, Zhejiang, Jilin and Shaanxi are average pig-breeding areas; and Tianjin and Inner Mongolia produce less pigs. In terms of location, Shandong, Zhejiang and Tianjin are in the east; Anhui, Henan, Jilin and Hunan are in the middle area; and Shaanxi and Inner Mongolia are in the west. In this survey, 327 pieces of valid questionnaires are collected, and see table 1 and table 2 for their distribution.

Table 1
Administrative Region Distribution of Interviewed Pig-Breeding Farms and Farmers

	Shandong	Hunan	Henan	Anhui	Zhejiang
Questionnaire (number)	176	26	35	17	18
Percentage(%)	53.82	7.95	10.70	5.20	5.50
	Jilin	Tianjin	Shaanxi	Inner Mongolia	Total
Questionnaire (number)	24	10	11	10	327
Percentage(%)	7.34	3.06	3.36	3.06	100

Table 2
The Distribution of Ocation, Production and Breeding Pattern of Interviewed Pig-Breeding Farms and Farmers

Pig-breeding farms(farmers)	Location			Production			Breeding patterm	
	East	Middle	West	Main	Average	Few	Pig-breeding farm	Pig-breeding household
Quantity(unit)	204	102	21	237	70	20	52	275
Percentage(%)	63.30	31.19	6.42	72.48	21.41	6.12	15.90	84.10

2.3 Choice of Variables

Based on the hypotheses, 11 independent variables of four groups are selected to explain the dependant variables when Logit model is built to demonstrate factors influencing the willingness of pig-breeding farms and farmers to keep breeding record. See table 3 for the details.

Table 3
Definition of Independent Variables and Descriptive Statistical Analysis in the Model

Name of Variables	Definition	Mean	Standard Deviation	Expected Correlation
1. Basic trait of decision-makers in pig-breeding industry				
Gender(χ_1)	Female=0; Male=1	0.83	0.37	postive
Age(χ_2)	Under 35 =1; age 36; 45 =2; age 46; 60 =3; over 60 =4	2.27	0.68	negative
Education (χ_3)	Under primary school education=1; primary school graduates=2; secondary school graduates=3; high school graduates=4; graduates from vocational college and above=5	2.95	0.85	positive
2. Production and operation characteristics				
breeding pattern(χ_4)	Specialized pig-breeding farmers=0; scale pig-breeding farms=1	0.18	0.39	positive

To be continued

Continued

Name of Variables	Definition	Mean	Standard Deviation	Expected Correlation
breeding scale(χ_5)	50~500 head=1; 500~2999 head=2; 3000~9999 head=3; 10,000~50,000 head=4; over 50,000 head=5	1.42	0.79	positive
Specialization degree(χ_6)	Under 30%=1; 30~49%=2; 50~80%=3; over 80%=4	2.75	0.90	positive
Years engaged in breeding pig(χ_7)	1~3 year=1; 4~6 year=2; 7~10 year=3; over 10 year=4	2.16	0.80	not clear
Participation in pig-breeding cooperatives(χ_8)	No=0; Yes=1	0.25	0.43	positive
3. Environmental characteristics				
Propaganda and support from the government(χ_9)	No=0; Yes=1	0.50	0.50	positive
Governmental supervision and inspection(χ_{10})	No=0; Yes=1	0.37	0.48	positive
4.Recognition characteristics				
Recognition of pig-breeding record (χ_{11})	Not important=1; relatively important=2; important=3; very important=4	2.54	1.06	positive

3. ESTIMATION AND ANALYSIS OF THE MODEL

By using SPSS, an econometic analytical tool, data from 327 samples are analyzed by Logit regression. See table 4 for the result.

Table 4 shows that R^2 in the model is 0.415, which is acceptable and has statistical meaning. Probability value is 0.000, which indicates the feasiblility of the model. According to regression result, six factors in four categories are statistically significant in terms of the willingness of pig-breeding farms and farmers to keep breeding record.

Table 4
Regression Result of the Factors Influencing the Willingness of Pig-Breeding Farms and Farmers to Keep Breeding Record by Using Logit Model

Model variables	Model		
	Regression coefficient	Standard deviation	Probability
Constant C	-4.169	1.709	0.921
gender (χ_1)	1.069	0.667	0.109
age (χ_2)	-0.300	0.379	0.428
education level (χ_3)	0.885**	0.131	0.021
breeding pattern(χ_4)	-0.771	0.762	0.312
breeding scale (χ_5)	0.568	0.386	0.175
Specialization degree (χ_6)	1.054***	0.332	0.002
Years engaged in breeding pig(χ_7)	0.455	0.368	0.219
Participation in pig-breeding cooperatives (χ_8)	1.414*	0.544	0.060
Propaganda and support from the governmen (χ_9)	1.737***	0.588	0.003
Governmental supervision and inspection (χ_{10})	1.506**	0.584	0.010
Recognition of pig-breeding record (χ_{11})	0.489*	0.264	0.071
Nagelkerke R-squared		0.415	
Forecast accuracy		78.0	
Probability value (P)		0.000	

Note:*,**,*** means statistical significance on the level of 10%, 5% and 1% respectively.

(1)The impact of the charateristics of decision-makers on the willingness of pig-breeding farms and farmers to keep breeding record. Among the elements of "basic trait of decision-makers in pig-breeding industry", the value of model coefficient of the variable "educational level"is 0.885, and statistical probability is 0.021. This

indicates that educational level has positive correlation with the willingness of pig-breeding farms and farmers to keep breeding record, which conform to the aforesaid hypothesis. It shows that pig-breeding farms and farmers that are better educated are easier to master the function and execution of breeding record, therefore they have stronger desire to keep breeding record.

(2)The impact of production and operation characteristics on the willingness of pig-breeding farms and farmers to keep breeding record. Among the elements of "production and operation charateristics", the value of model coefficient of the variable "specialization degree" is 1.054, and statistical probability is 0.002; those of the variable "participation in pig-breeding cooperative"are 1.414 and 0.06 respectively. This shows that the two elements have positive and significant impact on the willingness of pig-breeding farms and farmers to keep breeding record. Aforesaid hypothesis is verified. The higher the ratio of pig-breeding revenue to total revenue of pig-breeding farms and farmers is, the more dependent they are on pig-breeding industry, and they are more likely to keep breeding record to improve their production management and pig quality safety, which leads to higher revenue. Participation in pig-breeding cooperative makes pig-breeding farms and farmers guided, encouraged and supervised in terms of keeping and managing breeding record. It also facilitate their learning and communication, therefore they are more likely to keep breeding record.

(3)The impact of environmental characteristics on the willingness of pig-breeding farms and farmers to keep breeding record. Among the elements of "environmental charateristics", the value of model coefficient of the variable "specialization degree" is 1.737, and statistical probability is 0.003; those of "governmental supervision and inspection"are 1.506 and 0.01 respectively. It demonstrates the two factors have positive and significant impact on the willingness of pig-breeding farms and farmers to keep breeding record. Aforesaid hypothesis is verified. It is shown that government's promotion, support, supervision and inspection of breeding record can induce, encourage, urge and regulate the behavior of keeping breeding record. They also help to enhance the probability and initiative of pig-breeding farms and farmers to keep breeding record.

(4)The impact of recognition of pig-breeding record on the willingness of pig-breeding farms and farmers to keep breeding record. The value of model coefficient of the variable "recognition of breeding record" is 0.489, and statistical probability is 0.071. It demonstrates this factor has positive and significant impact on the willingness of pig-breeding farms and farmers to keep breeding record. Aforesaid hypothesis is testified. Pig-breeding farms and farmers that know well the content, function and regulation of breeding record are more likely to keep breeding record.

CONCLUSIONS AND POLICY PROPOSALS

The result of the empirical study shows that six factors, which are education level, prefessional level, participation in pig-breeding cooperative organization, recognition of breeding record, government's propaganda, and governmental supervision, have significant and positive impact on the willingness of pig-breeding farm and farmers to build breeding record.

Based on the conclusion, the following policy proposals are put forward in this paper in order to enhance the willingness of pig-breeding farms and farmers to keep breeding record: first, more efforts should be put on promoting, inducing, encouraging and supervising the establishement of pig-breeding record, thus pig-breeding farms and farmers can realize it is urgent, necessary and economic to keep breeding record; second, the establishment of pig-breeding cooperatives should be speed up, which helps to instruct and facilitate pig-breeding record-keeping and more pig-breeding farms and farmers will join them; third, government should support pig-breeding industry, facilitate the transformation of pig-breeding pattern, encourage qualified small pig-breeding farmers to specialize in breeding pig, and improve their specialization degree; fourth, specialized training are necessary, and the production and operation philosophy, professional skills and knowledge structure of pig-breeding farms and farmers should be improved in order to enhance their capability to keep and manage breeding record.

REFERENCES

[1] YUAN Xiaoqin, XIAO Haifeng. (2010). Status-Quo, Problem, and Countermeasures of Traceability System for Pork Quality Safety in China. *Agriculture Modernization, 31*(5), 557-560. (in Chinese)

[2] XIONG Benhai, FU Runting, LIN Zhaohui, et al. (2009). The Construction of Individual Pig Identification and Traceability System in Semi-natural Environment. *Journal of Agriculture Engineering, 25*(3), 98-102. (in Chinese)

[3] SUN Shimin, LI Juan, ZHANG Jianru. (2011). Analysis of Quality Safety and Recognition and Behavior of Pig-Breeding Farms and Farmers in Quality Pork Supply Chain. *Issues in Agricultural Economy*, (3), 76-81. (in Chinese)