The Analysis of Factors Which Influence Consumers' Willingness to Pay for the Pork Traceability System Based on RFID Technology

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ABSTRACT: Traceability can be considered a key factor in agriculture-food sector. Based on the survey data of Yangzhou consumers, analyze the consumers' cognition of pork traceability system by descriptive statistics, and use regression analysis model to extract the main factors of influence customers' willingness to pay for traceable pork. The research obtains that three factors significantly influence on the customers' willingness to pay for traceable pork. They are that whether know the meaning of traceability, whether to go to supermarket to buy pork and whether queried traceable code .According to the conclusion of the research, this paper puts forward relevant policy suggestions to optimize the pork traceability system based on RFID technology.

KEYWORD: Pork Traceability System; Willingness to Pay; Regression Analysis Model; RFID

1 INTRODUCTION

Improving tracking and tracing without loosing data privacy is requested by both laws and market organizations. In many countries laws on traceability of agriculturefood have been made during last years. As the main meat of Chinese daily life, the quality and safety of Pork concerns the livelihood of the people. However, in recent years, pork safety accidents occur frequently has triggered intense attention. Due to the traceability system enables the only marking on product and tracking the whole process of production and consumption, is considered to be an effective method to solve the problem of food safety (Shi-ping Zhu etc., 2013). Therefore, there is an urgent need to establish pork traceability system to ensure the quality and safety of the pork.

The foundation and the core link of establishing traceability system is individual identification. Compared with other techniques, RFID has the advantages of easily read, strong penetrability, reusable, large data storage and high security, and so on. RFID is widely adopted as a contactless identification technology. Today, the size of the RFID tag memory allows recording directly on many agriculture commodities all useful information for the competent authorities to trace it. Therefore, applying RFID technology to pork supply chain, can well to track pig breeding, slaughtering, transportation, storage and sales, thus ensure the quality and safety of pork. (Yin-run-Lv, etc., 2013;

Juan Zhao etc., 2011) But compared with the traditional barcode, RFID tags cost higher, and in the process of the supply chain of traceability pork, information collection, and other items also increased the cost, will push up the market price of the pork, thus affect customers' willingness to pay for traceable pork. Meanwhile, the authenticity and validity of the information is also likely to affect the consumers' consumption desire and willingness to buy for traceable pork. Data acquisition and transmission of new methods based on RFID help consumers to obtain information effectively and to some extend. It can be able to ensure that the information is relatively real and effective.

For the issue of consumers' willingness to pay for meat traceability system, foreign scholars have done a lot research. Dickinson, Hobbs and Bailey (2003) through auction experiment measured the U.S. and Canadian consumers' willingness to pay for the beef that affixed label of the traceable information, the results show that: most consumers in the two countries have the willingness to pay for the beef affixed label that can be traced. Angelo and Gil (2005) found that, the beef with traceable label, Spanish consumers' willingness to pay influenced by the perception of food scares and the negative impact on the environment for agricultural produce.

The literature of Chinese scholars on meat traceability system is relatively abundant. Research focuses on the design and implementation of pork traceability system that based on RFID technology, two-dimensional code technology and the internet of

things technology (Wei Song, 2014), the research progress of pork and agricultural product traceability system based on RFID technology and so on. (Zhu Shiping, etc., 2013, Chen Qingang etc., 2013).lin-hai Wu etc. (2012) analyzed consumers' preferences for traceability pork with different quality and safety information based on orderly logistic regression model, the results indicate that the variables that the degree of consumers concern about food quality and safety, cognition of traceability food, etc. significantly affect their preferences on traceable pork with different quality and safety information.

As final buyers of pork products, consumers are not only the receivers of safety information of pork, but also the respondents of the construction of pork traceability system. Their acceptance and willingness to pay for the pork traceability system and factors which affect their willingness will play a crucial role for perfecting the pork traceability system.

2 SAMPLE SOURCE AND SAMPLE DESCRIPTION

This research, combined the characteristics of pork consumption with literature review, summarized the factors that affect consumers' willingness to pay for traceability pork, and next design the questionnaire. The survey sites are some supermarkets and farmers' markets. The questionnaires were distributed 430 and returned 390. The 90.6% of questionnaires were effective. The table 1 below gives basic characteristics of the sample:

Table 1 Basic characteristics of the sample

Characteristic		Sample size	Percentage (%)	Cumulative Percentage (%)
Gender	male	150	38.5	61.5
	female	240	61.5	100
Age	25and below	12	3.1	3.1
	26-35	182	46.7	49.8
	36-45	126	32.3	82.1
	46-55	51	13.1	95.2
	56and older	19	4.9	100
Educational background	Primary	8	2.1	2.1
	Junior high	57	14.6	16.7
	senior high	114	29.2	45.9
	Bachelor degree	186	47.7	93.6
	Masters & above	25	6.4	100
Marital status	married	358	91.8	91.8
	Spinsterhood	32	8.2	100
Income levels	1000 and below	21	5.4	5.4
	1001-2000	75	19.2	24.6
	2001-3000	116	29.7	54.4
	3001-4000	84	21.5	75.9
	4001-5000	42	10.8	86.7
	5001-6000	19	4.9	91.5
	More than 6000	33	8.5	100

Consumers concerned about the quality and safety for pork or not are the basis of expanding this research. Statistical results in Table 2 show that the high degree of consumers concerned about the quality and safety for pork, there is a good basis for the implementation of pork traceability system.

Table 2 The degree of consumers concerned about the quality and safety for pork

percentage	Totally not concerned	Less concerned	Does not matter	more attention	Very concerned
(%)	1.3	16.4	2.3	55.4	24.6

Consumers' understanding of the pork traceability system is also very important. Survey results (Table 3) showed that a large proportion of respondents, did not notice pork traceability code, indicating that consumers lack basic knowledge on the whole pork traceability system.

Table 3 Consumers' awareness of pork traceability system

Consumer awareness		Percentage (%)
Whether noticed pork traceability code	Noticed	21.3
	Not noticed	78.7
Whether know the meaning of pork traceability	Do not know	43.3
	Know a little	39.2
	General	10.0
	Know more	6.2
	Know a lot	1.3
Whether queried traceable code	No queried	93.8
	queried, but did not found	4.6
	queried and found	1.5

We enquired consumers that what kind of pork want to buy, the results (Table 4) showed that most respondents want to buy quality assurance and traceable pork, we can see that whether the pork can be tracked is not the decisive factor for consumers to buy pork, possibly because that in the mind of consumers, pork traceability is not guaranteed safety and quality for pork.

Table 4 what kind of pork you want to buy

	Pork can be traced	Pork that quality assurance	Quality assurance and can be traced
Percentage(%)	3.6	23.6	72.8

3 REGRESSION ANALYSIS OF CONSUMERS' WILLINGNESS TO PAY

In this research, the independent variables are whether consumers concerned about the quality and safety of pork, whether to go to supermarket to buy pork, whether noticed pork traceability code and so

on. We set the independent variables as X1－X10.The dependent variable is the higher price that consumers' willingness to pay for the traceability pork than the ordinary pork. The regression model is that:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6$$
$$+ b_7 X_7 + b_8 X_8 + b_9 X_9 + b_{10} X_{10} \quad (1)$$

The definition of variables and value meaning are as Table 5:

Table 5 Variables definition and value meanings

Variables	Definition	Value	value meanings	anticipate
X1	Concerned about quality and safety of pork	1-5	Totally not concerned=1, less concerned=2, does not matter=3, more concerned =4 , very concerned=5	+
X2	to supermarket to buy pork	1-5	never=1, seldom=2, occasionally=3, frequently=4, everyday=5	+
X3	Noticed pork traceability code	0,1	Not noticed=0, Noticed=1	+
X4	Know the meaning of pork traceability	1-5	Do not know=1, Know a little=2, General=3, Know more=4, Know a little=5	+
X5	queried traceable code	1-3	No queried=1, queried, but did not found=2, queried and found=3	+
X6	Gender	0,1	female=0,male=1	—
X7	Age	1-5	25and below=1, 26-35=2, 36-45=3, 46-55=4, 56 and older=5	+
X8	Marital status	0,1	married=0, spinsterhood=1	+
X9	Educational background	1-5	Primary =1, Junior high =2, senior high =3, Bachelor degree =4, Master's and above=5	+
X10	Income levels	1-5	1000and below=1, 1001-2000=2, 2001-3000=3, 3001-4000=4, 4001-5000=5, 5001-6000=6, more than 6000 =7	+
Y	The higher price that consumers willingness to pay for the traceability pork than the ordinary pork			

This article uses SPSS16.0 software, using the term culling method to estimate the regression model, the regression results are as Table 6:

Table 6 Regression results

Variables	Unstandardized Coefficients		Standard coefficient	t	Sig.
	B	Standard error			
Constant	1.001	.322		3.108	.002
whether to go to supermarket to buy pork	-.222	.079	-.142	-2.801	.005
whether know the meaning of traceability	.166	.086	.103	1.930	.045
Whether queried the information about pork traceability	.630	.250	.134	2.518	.012

According to the significant judgment, get the regression equation:

$$Y = 1.001 - 0.222 X_2 + 0.166 X_4 + 0.630 X_5$$

As we can see from the results of the regression analysis, whether consumers know the meaning of traceability, whether to go to supermarket to buy pork and whether queried traceable code significantly influence on the customers' willingness to pay for traceable pork. The relationship between whether to go to the supermarket to buy pork and consumers' willingness to pay for traceable pork presented negatively correlated. The reason may be that consumers may lose the trust to enterprises and supermarkets, thus affecting their confidence in the traceability pork. Bin Cui, Jing-jing Yi (2012) through their research showed that consumers' trust on the food safety significantly affected by their confidence in relevant food supplier and the relevant regulatory bodies. Secondly, the relationship between whether know the meaning of pork traceability and the consumer's willingness presented positively correlated, indicating that consumers the more understanding of pork traceability, the more learn about the properties and functions of pork traceability, the more likely to pay a premium to traceability pork. Whether queried the information about pork traceability, also through the test of significance, if consumers queried the traceable information on Internet, then they have stronger willingness to pay for it, probably because that it can increase their level of trust to pork traceability. And produce good impression to pork traceability.

4 SUMMARY AND RECOMMENDATIONS

This paper takes pork consumers of Yangzhou as investigation object, uses the regression analysis model to analyze the consumer's willingness to pay for pork traceability system and its influenced factors. Now its conclusions and policy implications summed up as follows:

Firstly, the consumers' awareness of pork quality and safety is higher and higher. Pork traceability system is necessary to be established and perfected. Consumers not only consider the price factor when they buying pork, but also consider more factors such as pork quality and safety. They wish to buy the pork of quality assured and can trace its origin. Establishment of pork traceability system can realized a directional recall to that in the event of pork security incidents, to avoid further incidents. While it also can strengthen the supervision of the government as well as raising awareness of integrity for related businesses, there by enhancing consumers' sense of security of pork consumption.

Secondly, consumers' cognition of pork's very low. These results of the research are consistent with the results of Zhi-gang Wang etc. (2013). After strengthening consumer's perception of pork traceability, most consumers believe that it is necessary to implement pork traceability system, and the majority of consumers willing to buy the traceable pork, that the traceability system can increase their confidence. This again, enhancing the understanding of the traceability system has played a significant role in promoting consumers to buy the traceability pork. Therefore, the government should strengthen the propaganda, widely publicized the role of the traceability system in pork safety, and promote consumers to self-learning, so that to consolidate and enhance the status of traceability system for consumers.

Thirdly, The extent of queried the traceability code for consumers is very low. Most consumers did not query the traceability code, the reason may be that for consumers, the perception of the traceability system is low and the consciousness of query is not strong. Another reason may be that existing way of query is more tedious, it needs to log in to website, and enter the traceability code. So, the relevant departments should optimize operating platform of pork traceability system, investment in mobile applications for querying the traceability information or make use of two-dimensional code technology and RFID to optimize the service, increase the rate of consumers query the traceability information, and improving consumer willingness to pay for pork traceability system. In short, the traceability of pork products supply chain based on RFID can be significantly enhanced.

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