



An Empirical Research on Pig Farmers' Adoption Behaviours of Waste Disposal

Wenjie Yao*(**)[†] and Liguo Zhang*

*School of Economics, Jiangxi University of Finance and Economics, Nanchang, 330013, China

**Zhejiang University of Water Resources and Electric Power, Hangzhou, 310018, China

[†]Corresponding author: Wenjie Yao; rantom_821024@163.com

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ABSTRACT

Based on the field survey data of 608 pig farmers in Zhejiang Province, this paper carries out empirical analysis on pig farmers' current adoption behaviours of waste disposal and its influencing factors and the change of pig farmers' waste disposal behaviour intention caused by the implementation of environmental subsidy and its influencing factors. The research shows that the implementation of environmental subsidy has a great impact on the willingness of pig farmers to change their waste disposal behaviours, and they will be more inclined to adopt the behaviours that can fully realize the utilization of resources to dispose of their waste. The implementation of environmental subsidy is effective and can encourage pig farmers to change the existing relatively unreasonable and inefficient waste disposal behaviours on the premise that the pig breeding scale, the expected net income from waste disposal, the knowledge of waste reduction methods, the willingness of waste disposal training, the awareness of policies to ban and limit pig breeding, the distance between the pig farm and the nearest river and many other factors can be controlled. Therefore, the government should focus on implementing environmental subsidy for waste disposal with high utilization of resources such as biogas technology and composting technology.

INTRODUCTION

Waste disposal in pig breeding production has direct environmental effects. Although there are many treatment methods at present, due to the shortage of funds, lack of experience and shallow understanding of the utilization value of waste, pig farmers tend not to adopt the treatment behaviour with a high degree of resource utilization. In many places, waste is applied excessively to cultivated land for a long time without any treatment, resulting in high nutrient concentration, soil structure destruction, crop yield reduction, diseases and insect pests (Jipeng et al. 2012). Especially, when the serious disconnection between agriculture and animal husbandry leads to insufficient supporting farmland (Kaijun et al. 2004), direct discharge of waste cannot produce economic benefits but aggravate environmental degradation.

In recent years, waste treatment technology has not been paid much attention. Most pig farmers have already bought some equipment but focus only on energy recycling or fertilizer processing, through which waste can be sold or given away. However, most of the organic fertilizer production enterprises lack economies of scale, it is difficult to make profits, product quality is uneven, and the industry is actually in a state of vicious competition with low price

and low quality (Cuimian et al. 2004, Hongtao et al. 2010). In *The Energy and Environment Project Construction Plan for Large and Medium-Sized Livestock and Poultry Farms* compiled by China's Ministry of Agriculture in 2000, the economic benefits of large and medium-sized methane projects such as Shanghai Spark Farm, Shenyang Masan Farm and Hangzhou Xizi Farm were calculated. The results show that large and medium-sized farms could produce good economic benefits by using biogas project to treat waste, but the promotion and construction of biogas were slow due to technical obstacles and scale constraints. Yubo et al. (2009) found that the biogas promotion and construction ratio of scale pig breeding enterprises around Wuhan was only 60%. To effectively realize harmless, reduction and resource utilization, waste disposal should meet the requirements of environmental tolerance and technical applicability (Hongkun 2002). Therefore, people begin to introduce advanced composting technology and equipment from abroad. However, the current problem is that some pig farmers blindly invest to cope up with the environmental protection inspection without carrying out comprehensive technical and economic evaluation and environmental effect evaluation, resulting in high cost, low efficiency and equipment idle and other consequences.

In many parts of China, the government has enacted various forms of policies to control non-point source pollution by reducing the number of pig farms. However, the positioning of such policies deviates and the implementation effect is not high, especially the farmers' behaviour is not given the necessary attention. To ensure the sustainable development of the pig breeding industry with unified economic and environmental benefits, the government should guide pig farmers to carry out more spontaneous environmental protection behaviours and share environmental protection input in the form of subsidies. Based on the field survey data of 608 pig farmers in Zhejiang Province, we have empirically studied the subsidy expectation and its influencing factors of pig farmers to dispose of waste by themselves under the established breeding mode. The results show that most pig farmers were willing to accept subsidies to deal with waste under the established breeding mode, and the environmental subsidy was indeed feasible, which is consistent with the research conclusion of Liange et al. (2016). However, whether environmental subsidy can motivate pig farmers to change the current relatively unreasonable and inefficient waste disposal behaviour is directly related to the effectiveness of the policy itself (Zilberman et al. 1997, Khanna et al. 2002). Some scholars have investigated the willingness of pig farmers to adopt safe veterinary drugs (Xiumin 2007), the adoption of biogas technology by livestock farmers (Xinyu 2007), the adoption of biogas technology for waste disposal by large-scale pig farmers (Hao et al. 2008), the development degree of biogas project in large-scale pig farms (Bin 2009), and the environmental protection investment level of livestock farmers (Yi et al. 2012). They not only talk about some problems related to waste disposal adoption behaviours, but also provide some useful methods and conclusions. However, most of these studies do not take environmental subsidy as exogenous variables to investigate livestock farmers' specific waste disposal behaviours. Systematic studies on livestock farmers' selection of multiple waste disposal methods under different conditions, especially as a way to evaluate the effectiveness of environmental subsidy, are still rare.

Based on the previous conclusions, we continue to carry out empirical analysis on pig farmers' current adoption behaviours of waste disposal and its influencing factors and the change of pig farmers' waste disposal behaviour intention caused by the implementation of environmental subsidy and its influencing factors. It is expected to provide a realistic basis for formulating the environmental subsidy for collective action motivation in the treatment of non-point agricultural pollution and lay a foundation for exploring effective forms of public participation in environmental protection action.

THEORY AND MODEL

Theoretical Framework

Based on the field investigation, we determined the four main adoption behaviours of pig farmers' waste disposal, namely "direct discharge", "sale or gift", "biogas fermentation" and "Compost, returning to the field, or aquaculture". The willingness to change the behaviour of waste disposal reflects the extent to which policy incentives can enable pig farmers to correct the practice of direct discharge and consciously adopt other recycling behaviours. Based on related literature (Khanna et al. 2002, Xiumin 2007, Xinyu 2007, Hao et al. 2008, Bin 2009, Yi et al. 2012, Ning 2014, Chao 2019, Jianhua et al. 2019, Limei & Yaqing 2019, Ruishi et al. 2019, Limei & Xiuling 2020) and combining the field survey, we first examine the current pig farmers' waste disposal adoption behaviours. Then, it is assumed that if the environmental subsidy is implemented based on the subsidy expectation (Liange et al. 2016) of the established breeding mode, pig farmers will inevitably have some behavioural change intention to dispose of wastes by themselves. The influencing factors of the above two situations are analysed from the perspectives of individual, economic, psychological and social characteristics.

Individual characteristics reflect the subjective possibility of pig farmers to adopt waste disposal behaviour. Generally speaking, the longer raising pigs, the richer the experience, but not necessarily a strong sense of environmental protection, which depends on the degree of education and cadre identity or not. People with low education level may choose "direct discharge" because they cannot master the environmental protection technology of waste recycling, and they are not willing to change the existing waste disposal behaviours. And for the current policies to ban and limit pig breeding, cadres can recognize the purpose of environmental protection, so it is possible to adopt the waste disposal behaviours that can effectively realize the utilization of resources, and is willing to change the existing waste disposal behaviours.

Economic characteristics reflect the objective ability of pig farmers to adopt waste disposal behaviour. The source of investment in environmental protection is not determined by the annual income of raising pigs alone, but by the average annual household income. The scale of environmental investment is directly controlled by the pig breeding scale. The economics of waste disposal behaviours can be expressed by the expected net income from waste disposal. The low average annual household income, the large pig breeding scale or the low expected net income from waste disposal means that the external environmental cost will be relatively high, and it is possible to choose "direct discharge"

at present. If the environmental subsidy is implemented, existing waste disposal behaviours may be changed.

Psychological characteristics reflect the conscious tendency of pig farmers to adopt waste disposal behaviours. It includes pollution level evaluation, waste management evaluation, knowledge of waste reduction methods, the willingness of waste disposal training, awareness of policies to ban and limit pig breeding. In general, the more active the tendency of environmental protection consciousness, the more likely to adopt the waste disposal behaviours that can effectively realize the utilization of resources, and the more willing to change the existing waste disposal behaviours.

The social characteristics reflect the constraints of pig farmers to adopt waste disposal behaviours. The large distance between pig houses and the nearest river means that it is not easy to discharge waste directly into the river. Therefore, pig farmers may be inclined to adopt economic and cost-effective treatment methods and are willing to change existing waste disposal behaviours. Technical support for waste disposal is more important than technical convenience. If the number of waste treatment technical service stations is small, rather than far away, pig farmers may choose to "direct discharge" due to lack of technical support and may not be willing to change existing waste disposal behaviours. The more annual number of pollutant discharge standard inspection, the less likely pig farmers are to choose "direct discharge", but the more likely they are to change existing waste disposal behaviours.

Model Building

Pig farmers' current adoption behaviours of waste disposal are disordered and multi-classification dependent variables. So we used the disordered multi-classification Logit model, and assigned values of 0, 1, 2 and 3 to waste disposal behaviours of "direct discharge", "sale or gift", "biogas fermentation", "Compost, returning to the field, or aquaculture". For "sale or gift", "biogas fermentation" and "Compost, returning to the field, or aquaculture", the degree and cost of waste resources utilization increase successively. Only "direct discharge" cannot effectively realize the utilization of waste resources. Therefore, in Logit regression, the group with an assigned value of 0 was used as the reference group to analyze the influencing factors of the other three kinds of adoption behaviours of waste disposal that can effectively realize resource utilization. The specific form of disordered multi-classification Logit model is as follows:

$$\log\left(\frac{B_{1i}}{B_{0i}}\right) = \alpha_0^1 + \sum_{k=1}^n \alpha_k^1 X_{ki} \quad \dots(1)$$

$$\log\left(\frac{B_{2i}}{B_{0i}}\right) = \alpha_0^2 + \sum_{k=1}^n \alpha_k^2 X_{ki} \quad \dots(2)$$

$$\log\left(\frac{B_{3i}}{B_{0i}}\right) = \alpha_0^3 + \sum_{k=1}^n \alpha_k^3 X_{ki} \quad \dots(3)$$

Here, B_{0i} , B_{1i} , B_{2i} and B_{3i} are the probabilities of waste disposal behaviours mainly adopted by the i -th pig farmer, including "direct discharge", "sale or gift", "biogas fermentation", and "Compost, returning to the field, or aquaculture", and $B_{0i} + B_{1i} + B_{2i} + B_{3i} = 1$; X_{ki} is the k -th influencing factor of a waste disposal behaviour mainly adopted by the i -th pig farmer; α_0^1 , α_0^2 , α_0^3 and α_k^1 , α_k^2 , α_k^3 are the corresponding regression coefficients.

If the environmental subsidy is implemented, whether a pig farmer is willing to change the existing main waste disposal behaviour is a type 0-1 dichotomizing dependent variable. So we used the binary Logit model to estimate the influencing factors of waste disposal behaviour change intention. For the dependent variable "waste disposal behaviour change intention", a pig farmer who had been willing to change the existing main waste disposal behaviour was assigned a value of 1, while a pig farmer who had been unwilling to change the existing main waste disposal behaviour was assigned a value of 0. The specific form of the binary Logit model is as follows:

$$\log it(T_i) = \alpha_0 + \sum_{k=1}^n \alpha_k X_{ki} + \eta \quad \dots(4)$$

Here, T_i is the probability that the i -th pig farmer is willing to change the existing main waste disposal behaviour; X_{ki} is the k -th influencing factor of the waste disposal behaviour change intention of the i -th pig farmer; α_0 and α_k are the corresponding regression coefficients; η is the random error. We set 13 independent variables (Table 1). Especially for subjective variables, due to the difference of qualitative dimension, the assignment is also different.

EMPIRICAL ANALYSIS

We conducted a random sampling questionnaire survey on pig farmers in 10 administrative villages in Jiaxing, 42 administrative villages in Ningbo and 17 administrative villages in Quzhou. Before the official survey began, we randomly visited 10 pig farmers in each area, conducted a preliminary survey in the form of face-to-face interview, and then modified and improved the questionnaire according to the actual situation. The official investigation was carried out from March 2018 to June 2019. Before that, the governments had planned prohibited and restricted breeding zones in some jurisdictions, and most pig farms in these zones

Table 1: Independent variables and their instructions.

Independent Variables		Symbol	Instructions
Individual characteristics	Degree of education	X1	Years of academic education: Primary school = 6, Middle school = 9, High school = 12, Junior college = 15, Undergraduate = 16
	Cadre identity or not	X2	No = 0, Yes = 1
Economic characteristics	Average annual household income	X3	Ten thousand Yuan
	Pig breeding scale	X4	The amount of pig raised at the end of every year
	Expected net income from waste disposal	X5	Not very good = -1, Almost flat = 0, Very good = 1
Psychological characteristics	Pollution level evaluation	X6	No =1, Slight = 2, General = 3, Serious = 4
	Waste management evaluation	X7	Very dissatisfied =1, Relatively dissatisfied = 2, Reserved opinions = 3, Relatively satisfied = 4, Very satisfied = 5
	Knowledge of waste reduction methods	X8	Very unclear =1, Relatively unclear = 2, Basically clear = 3, Relatively clear = 4, Very clear = 5
	Willingness of waste disposal training	X9	No = 0, Yes = 1
Social characteristics	Awareness of policies to ban and limit pig breeding	X10	No = 0, Yes = 1
	Distance between pig farm and the nearest river	X11	km
	Number of waste treatment technical service stations	X12	Number
	Annual number of pollutant discharge standard inspection	X13	Number

had been shut down. Therefore, to ensure the accuracy and reliability of survey information as far as possible, part of the data obtained from the official survey (especially “pig breeding scale”) comes from the actual situation at the time of the implementation of the policy. After a brief training on the purpose, content, scientific way of asking questions, questionnaire filling method and matters needing attention of the survey, 210 questionnaires (including 10 copies of pre-survey, 630 copies in total) were distributed in each village, and 625 copies were collected. Through information screening and reliability assessment, 608 valid questionnaires were confirmed, accounting for 97.28%.

Data Statistics

Considering that a pig farmer may adopt multiple waste disposal behaviours, we took the main adoption behaviour as the only adoption behaviour. The statistical results show that the waste disposal behaviours currently adopted by most pig farmers are inclined to fully realize the utilization of resources; if the environmental subsidy is implemented, 83.22% (506 households) pig farmers are willing to change the existing waste disposal behaviour, while 16.78% (102 households) pig farmers are not. As can be seen from Table 2, the implementation of environmental subsidy has a great

Table 2: Statistical results of pig farmers' waste disposal behaviour changes.

Existing status	Environmental subsidy assumption	Direct discharge		Sale or gift		Biogas fermentation		Compost, returning to field, or aquaculture		Total	
		Sample	Ratio, %	Sample	Ratio, %	Sample	Ratio, %	Sample	Ratio, %	Sample	Ratio, %
Direct discharge	Sample	21	100.00	17	18.28	38	15.97	77	30.08	153	25.16
	Ratio, %	13.73	-	11.11	-	24.84	-	50.33	-	100.00	-
Sale or gift	Sample	0	0.00	10	10.75	20	8.40	43	16.80	73	12.01
	Ratio, %	0.00	-	13.70	-	27.40	-	58.90	-	100.00	-
Biogas fermentation	Sample	0	0.00	16	17.20	29	12.18	93	36.33	138	22.70
	Ratio, %	0.00	-	11.59	-	21.01	-	67.39	-	100.00	-
Compost, returning to field, or aquaculture	Sample	0	0.00	50	53.76	151	63.45	43	16.80	244	40.13
	Ratio, %	0.00	-	20.49	-	61.89	-	17.62	-	100.00	-
Total	Sample	21	100.00	93	100.00	238	100.00	256	100.00	608	100.00
	Ratio, %	3.45	-	15.30	-	39.14	-	42.11	-	100.00	-

Note: - is the default.

impact on pig farmers' willingness to change their waste disposal behaviours, and pig farmers will be more inclined to adopt the behaviours that can fully realize the utilization of resources to deal with waste.

Regression Results

We used STATA 11 statistical software to estimate the parameters of the two models respectively with the maximum likelihood estimation method, and further screened the independent variables of the binary Logit model by the stepwise forward regression method (the standard of P-value of all variables selected was set at 0.100). The results show that the regression equations are well fitted (Table 3 and Table 4).

DISCUSSION

It can be seen from Table 3 that both "degree of education" and "cadre identity or not" in individual characteristics have a significant positive impact on the current two waste disposal behaviours of "biogas fermentation" and "compost, returning to field, or aquaculture", and have no significant impact on the current waste disposal behaviour of "sale or gift". Compared with "direct discharge", the higher the education level, the stronger the awareness of environmental protection, and the easier to master the corresponding advanced technology. In addition, cadres are more politically progressive and have a greater sense of responsibility to dispose of waste by themselves, so they are more inclined to adopt the two

Table 3: Regression results of disordered multi-classification Logit model for pig farmers' adoption behaviours of waste disposal.

Independent Variables	Sale or gift		Biogas fermentation		Compost, returning to field, or aquaculture	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
X1	0.035 2	0.045 9	0.085 3**	0.039 0	0.075 0**	0.034 4
X2	1.385 4	0.937 2	1.815 3**	0.791 4	1.835 6**	0.763 0
X3	0.015 8	0.036 7	0.018 4	0.037 1	-0.065 3	0.041 4
X4	0.000 8*	0.000 4	0.000 1	0.000 4	0.000 7*	0.000 4
X5	0.899 2***	0.334 0	0.752 4**	0.298 9	0.763 4***	0.270 8
X6	0.157 8	0.206 9	0.274 0	0.172 8	0.282 0*	0.153 8
X7	0.312 5	0.190 0	-0.085 7	0.156 4	0.238 8*	0.140 7
X8	0.240 0	0.204 3	0.306 3*	0.173 5	0.418 9***	0.155 8
X9	-0.327 2	0.333 4	-0.012 9	0.284 8	0.040 5	0.249 7
X10	0.152 6	0.314 8	0.218 8	0.262 2	0.051 9	0.229 1
X11	-0.166 7	0.588 2	0.588 0	0.468 9	0.896 2**	0.421 3
X12	-0.007 6	0.196 4	-0.003 5	0.163 4	-0.190 4	0.147 6
X13	0.102 5**	0.056 3	0.094 7**	0.047 8	0.016 0	0.044 0
Constant	-2.660 9**	1.070 8	-2.376 3***	0.905 8	-1.996 8**	0.811 1
Sample Size	608		Log likelihood		-750.165 1	
LR chi2	86.18***		Pseudo R ²		0.054 3	

Note: ***, ** and * respectively indicate that the estimated results are significant at the levels of 1%, 5% and 10%.

Table 4: Gradually (forward) regressive results of binary Logit model for pig farmers' willingness to change waste disposal behaviour.

Independent Variables	Coefficient	Standard Error
X4	0.001 1**	0.000 5
X5	-0.494 9**	0.227 9
X8	-0.240 9*	0.143 6
X9	0.675 1***	0.240 2
X10	0.917 7***	0.230 8
X11	1.083 3**	0.456 7
Sample Size	608	Log likelihood
LR chi2	42.51***	Pseudo R ²
		-253.757 7
		0.077 3

Note: ***, ** and * respectively indicate that the estimated results are significant at the levels of 1%, 5% and 10%. Pearson's test value of model regression is 520.04 (P value is 0.839 2), which doesn't reach the significance level of 5%.

waste disposal behaviours of “biogas fermentation” and “compost, returning to the field, or aquaculture”. This is similar to the research results of Yi et al. (2012). However, if the environmental subsidy is implemented, individual characteristics have no significant impact on pig farmers’ willingness to change their waste disposal behaviours. The possible reason is that the established education level and political status make pig farmers have a limited understanding of the adopted waste disposal behaviours, believing that the current is the most effective.

In terms of economic characteristics, “pig breeding scale” has a significant positive impact on the current two waste disposal behaviours of “sale or gift” and “compost, returning to the field, or aquaculture”, and has no significant impact on the current waste disposal behaviour of “biogas fermentation”. It may be because, in the pig breeding industry, the promotion and construction of biogas lags far behind the development of production scale. Besides, “expected net income from waste disposal” has a significant positive impact on the current three waste disposal behaviours of “sale or gift”, “biogas fermentation” and “compost, returning to the field, or aquaculture”. As can be seen from Table 4, if the environmental subsidy is implemented, “pig breeding scale” and “expected net income from waste disposal” have respectively significant positive and negative impacts on pig farmers’ willingness to change their waste disposal behaviours, while “average annual household income” has no significant influence. At the same time, “average annual household income” has no significant impact on the three current waste disposal behaviours of “sale or gift”, “biogas fermentation” and “compost, returning to the field, or aquaculture”. So the average annual household income may not necessarily go into waste disposal.

In terms of psychological characteristics, both “pollution level evaluation” and “waste management evaluation” have a significant positive impact on the current waste disposal behaviour of “compost, returning to the field, or aquaculture”, and have no significant impact on the current two waste disposal behaviours of “sale or gift” and “biogas fermentation”. Obviously, “compost, returning to field or aquaculture” is more environmentally friendly than “sale or gift” and “biogas fermentation” without “direct discharge”. In addition, “knowledge of waste reduction methods” has a significant positive impact on the current two waste disposal behaviours of “biogas fermentation” and “compost, returning to the field, or aquaculture”, and has no significant impact on the current waste disposal behaviour of “sale or gift”. The main reason is that the higher the awareness level of pig farmers, the easier it is to adopt these two kinds of waste disposal behaviours with higher utilization of resources. Meanwhile, if the environmental subsidy is implemented,

“knowledge of waste reduction methods” has a significant negative impact on pig farmers’ willingness to change their waste disposal behaviours. Because the efficient operation of the reduction link can greatly reduce the workload of the treatment link, there is no need to change the existing waste disposal behaviours. If the environmental subsidy is implemented, both “willingness of waste disposal training” and “awareness of policies to ban and limit pig breeding” have a significant positive impact on pig farmers’ willingness to change their waste disposal behaviours, but have no significant impact on the current three waste disposal behaviours of “sale or gift”, “biogas fermentation” and “compost, returning to the field, or aquaculture”. It can be seen that these two factors are merely the pure environmental protection consciousness tendencies towards “direct discharge”, and fail to produce an effect on the selection of waste disposal behaviours of resource utilization. Besides, if the environmental subsidy is implemented, both “pollution level evaluation” and “waste management evaluation” have no significant impact on pig farmers’ willingness to change their waste disposal behaviours. The possible reason is that the waste disposal behaviour change intention depends to some extent on the pig farmers’ own environmental benefit rather than environmental awareness, which is confirmed by the significant negative impact of “expected net income from waste disposal” in economic characteristics.

In terms of social characteristics, “distance between the pig farm and the nearest river” has a significant positive impact on the current waste disposal behaviour of “compost, returning to the field, or aquaculture”, and has no significant impact on the current two waste disposal behaviours of “sale or gift” and “biogas fermentation”. If the environmental subsidy is implemented, “distance between the pig farm and the nearest river” has a significant positive impact on pig farmers’ willingness to change their waste disposal behaviours. This is because, compared with direct discharge, the closer the pig farm is to the nearest river, the less likely it is to discharge directly into the river. However, the higher the cost of waste self-treatment, the more likely the pig farmers is to adopt the waste disposal behaviours with higher economic benefits. Also, the annual number of pollutant discharge standard inspection has a significant positive impact on the current two waste disposal behaviours of “sale or gift” and “biogas fermentation”, and has no significant impact on the current waste disposal behaviour of “compost, returning to the field, or aquaculture”. This is because, compared with direct discharge, if only to cope with environmental protection inspection, adopt the waste disposal behaviour of “compost, returning to the field, or aquaculture” will inevitably lead to high cost, low efficiency, equipment idle and other consequences. If it is not to cope

with the environmental protection inspection, that is to say, waste disposal is a conscious environmental protection behaviour, when the environmental subsidy is implemented, annual number of pollutant discharge standard inspection will naturally have no significant impact on pig farmers' willingness to change their waste disposal behaviours. Besides, if the environmental subsidy is implemented, the number of waste treatment technical service stations has no significant impact on pig farmers' willingness to change their waste disposal behaviours, and has no significant impact on the current three waste disposal behaviours of "sale or gift", "biogas fermentation" and "compost, returning to the field, or aquaculture". The former may be because objective environmental protection technology conditions still play a role through the subjective emphasis on environmental protection technology, which is confirmed by the significant positive influence of "willingness of waste disposal training" in psychological characteristics. The latter may be caused by the low technical requirements and environmental standards used by most waste treatment technical service stations for a long time, which are out of line with the current laws and regulations and existing some misleading results.

CONCLUSIONS

The implementation of environmental subsidy has a great impact on the willingness of pig farmers to change their waste disposal behaviours, and pig farmers will be more inclined to adopt the behaviours that can fully realize the utilization of resources to dispose of their waste. If the environmental subsidy is implemented, the bigger the pig breeding scale, the lower the expected net income from waste disposal, the less the knowledge of waste reduction methods, the more the willingness of waste disposal training, the higher the awareness of policies to ban and limit pig breeding, the greater the distance between the pig farm and the nearest river, the greater the incentive for pig farmers to change their existing waste disposal behaviours. Therefore, the implementation of environmental subsidy is effective and can encourage pig farmers to change the existing relatively unreasonable and inefficient waste disposal behaviours.

In terms of policies, the government should focus on implementing environmental subsidy for waste disposal with high utilization of resources, encourage pig farmers with higher education and cadre identity to adopt biogas technology and composting technology, and guide pig farmers with larger scale to adopt composting technology. In addition, the government should establish main roads and water source areas as prohibited and restricted breeding areas. In particular, pig farmers who discharge waste directly into rivers shall be severely punished and forced to adopt waste disposal behaviours that can effectively realize resource

utilization. Finally, the government should encourage pig farmers to participate in training on various waste treatment technologies, strengthen professional training on waste reduction methods for pig farmers, and increase the publicity of the environmental protection orientation of the policies to ban and limit pig breeding.

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