Behavior of Smallholder to Improve Individual Breeding Environment and Tobacco Growing Environment-A Case Study of 184 Waterfowl Farmers and Tobacco Farmers in Jiangxi Province

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Abstract: Under the background of the structural reform on the agricultural supply side and the tightening of environmental protection policies, China's agricultural industry is facing prominent problems such as low scale, poor mechanization level and serious ecological environment pollution, especially the scattered breeding behavior of small farmers in waterfowl breeding industry and in tobacco growing industry, which has a serious impact on the surrounding ecological environment. In this paper, based on the survey data of 184 waterfowl farmers and tobacco farmers in Jiangxi province and from the perspective of small farmers of waterfowl breeding and tobacco growing, the factors influencing small farmers' behavior of improving their individual breeding environment and carrying out green ecological behavior are analyzed by using binary logistic regression model. It is concluded that the gender and age of farmers have a negative impact, while farmers' education level, farmers' concurrent employment, breeding technology training and government support have a significant positive impact on small farmers' behavior of improving their individual breeding and planting environment. Finally, some suggestions are

put forward, such as optimizing the production layout of waterfowl industry, improve green tobacco cultivation, constructing green ecological development system of waterfowl industry, popularizing green ecological breeding mode and strengthening policy support and supervision, with a view to improve the present situation of poor breeding environment and serious pollution of small farmers in China, promote the development and transformation of waterfowl industry and tobacco industry in China, and promote the sustainable development of ecological environment and ecological economy of waterfowl industry and tobacco industry in China.

Key words: breeding environment; tobacco growing; pollution; behaviour
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As the world's largest waterfowl breeding area, China has the absolute international competitiveness in the production of waterfowl industry, with the waterfowl feeding volume accounting for more than 75% of the world, including about 70% of the world's duck feeding volume and 90% of the world's goose feeding volume. Wang Yapeng, Zhu Lu, Liu Xuefen and other scholars pointed out that the waterfowl industry has led to a large number of farmers' employment, creating more employment opportunities for the remaining rural labor force in China, and the income of waterfowl breeding in the main waterfowl breeding areas has become the main source of income for many farmers.[1] However, Li Chaoyun and other scholars pointed out that China has a weak waterfowl breeding environment and quality.[2]

China is also a big producer and consumer of tobacco. Although the number of smokers in China has decreased recently, the total number of smokers still exceeds 350 million, ranking first in the world for a long time. China's tobacco planting area, purchasing quantity and the number of smoking-related diseases are all among the top in the world. Piesse, Andrea et al. analyzed the impact of smoking on people's health and put forward relevant valuable opinions.[3] Venugopal, P. D. et al pointed out that tobacco contains a large number of substances harmful to human health and safety as well as environmental protection, which requires the strengthening of tobacco-related regulatory activities.[4]

With the enhancement of people's environmental protection awareness, a series of problems have been exposed in the development of waterfowl industry and tobacco industry: unreasonable industrial development model, imperfect regulatory laws and regulations, inadequate market access control, human health awareness is weak, weak awareness of pollution prevention and control of farmers, threats to the ecological environment, etc, which have hindered the industrialization process of waterfowl and tobacco breeding in China. Then, the structural reform at the supply side of agriculture was carried out in a deeper way, and the key battle of fighting against pollution was put forward. More detailed and stricter division of the requirements for the prevention and control of breeding pollution was made in the policy of "three zones division" of livestock and poultry breeding and Food safety Act. Therefore, it is urgent to change the development mode of waterfowl industry and tobacco industry to develop green ecological agriculture, promote the transformation and upgrade of animal husbandry and farming.[5]

At the same time, the pollution caused by large-scale breeding and the quality and safety of waterfowl products have aroused widespread concern. With the severe food safety situation today, more and more consumers pay attention to the eco-breeding products.[6] As the traditional breeding mode and extensive management mode cannot meet the requirements of the development of modern waterfowl industry, and are not conducive to the prevention and control of epidemics and the management of product quality, also lead to the low level of breeding management, poor ability to resist risks and relatively low economic benefits, and serious impact on the natural environment and the quality of life of the residents around the breeding area, which urge the waterfowl industry to gradually develop towards low-carbon environmental protection, resource conservation and increasingly obvious trend of ecological breeding.[7] As a result, China is gradually studying and promoting such breeding modes as floor husbandry, net husbandry, duck breeding with biological fermentation bed, rice-duck co-breeding, fish-duck mixed breeding and ecological recycling. Scholars also believe that waterfowl breeding needs to be transformed. Wang Baowei pointed out that in order to realize the healthy and sustainable development of waterfowl industry, farmers must change their ideas and improve their breeding mode.[8] Zhu Lu studied the willingness of farmers to participate in the healthy breeding mode of waterfowl by taking duck farmers in six provinces in central and eastern China as examples.[9] But in general, there are relatively few studies on the green ecological breeding behavior of waterfowl in China and abroad at this stage, and it is still worth exploring how to reduce the environmental pollution brought by the breeding.

In view of this, in this paper, from the perspective of small farmers in waterfowl breeding and tobacco growing, the binary logistic model is used to analyze the key factors affecting small farmers' improvement of breeding environment and green ecological breeding and planting behavior, and through data analysis, some suggestions are obtained to improve the breeding environment and reduce the impact on the surrounding ecological environment, which provides a basis for the development and transformation of waterfowl industry and tobacco industry in China, promotes the victory of pollution prevention and control, and promotes the sustainable development of agricultural economy.

CONCEPT DEFINITION and RESEARCH HYPOTHESES

Concept Definition

Waterfowl

Waterfowl include ducks, geese, swan geese, gray geese, migratory waterfowl and other birds that live in the water. Waterfowl farmers refer to those who raise domesticated waterfowl such as ducks (ducks for eating and egg-laying ducks), geese and swan geese.

Tobacco

Tobacco leaf, annual or limited perennial herbs, solanaceae. Plants covered with glandular hairs, stems 0.7-2 m high. Petiole indistinct or winged. Panicle terminal. Calyx tubular or tubular campanulate, corolla funnelform, terminal pink.

Pollution from Livestock and Poultry

Pollution from livestock and poultry mainly refers to the impacts on the surrounding environment caused by the difficult collection of animal excreta, incomplete harmless treatment of dead animals and attached items during breeding production, including water pollution, soil pollution and air pollution, and pollution caused by the traditional decentralized breeding method used by small farmers in this paper.

Green Ecological Breeding

Green ecological breeding first appeared in breeding and is now also the most widely used in the field of breeding. The green ecological breeding of livestock and poultry was first proposed by Chen Feng (2009). He thinks that green ecological breeding refers to the production mode of planning, designing, organizing, adjusting and managing livestock and poultry production according to the principles of ecology, zoology and economics, so as to maintain and improve the ecological environment quality, maintain the ecological balance, maintain the coordination of livestock and poultry breeding industry, improve product quality and develop sustainably.[10]

In this paper, according to the different breeding modes, combining ecological and economic benefits, the green ecological breeding of waterfowl in China is mainly summarized as: rice-duck co-breeding mode, duck-fish co-breeding mode, forest-duck (geese) compound breeding mode, artificial pond mode (in dry land), duck-clam co-breeding mode, and duck-water bamboo co-breeding mode that combine ecological benefits with economic and social benefits.

Research Hypotheses

Small farmers in China are the main body of production and operation, and their behavior decisions are affected by a variety of factors, so whether they choose to improve their individual breeding environment for green ecological breeding is the result of a combination of various factors. In this paper, based on the theory of behavioral economics, combined with the characteristics of waterfowl breeding, the factors that affect the green ecological breeding behavior of small farmers are divided into three levels: individual endowment, production and operation status and the external environment.

Individual Endowment

(1) Gender, it is assumed that men have stronger behavior than women in improving individual breeding environment.

There are differences between men and women in thinking and cognition, women are relatively conservative, while men prefer to take risks. To carry out the green ecological breeding mode, the original breeding site will be modified, which will increase the cost, but the breeding effect still has certain risks.

(2) Education, assuming that the level of education has a positive impact on small farmers to improve their individual breeding environment.

The more education and knowledge people have, the better their ability to accept things. They can have a better understanding of the ecological environment to improve the surrounding environment. At the same time, they can also use animal excrement to create other profits.

(3) Age, it is assumed that the older the small farmers are, the less likely it is for them to improve their individual breeding environment.

Generally speaking, although the older the small farmers are, the more experience they have, the more conservative and old their thinking concepts will be, the less willing they are to break the status quo, to take risks and make new attempts and breakthroughs in the breeding mode and technology, and to change the existing breeding environment.

(4) Breeding period, assuming that the longer the breeding period, the more likely the farmers are to improve their individual breeding environment

The accumulation of breeding period represents the richness of breeding experience, more proficiency in breeding process and technology, so they will understand that a better living environment for animals can create more value and will have a longer-term development.

(5) Risk preference, assuming that risk preference has a positive impact on the behavior of small farmers to improve the breeding environment

The new technology of green ecological breeding has some risks, because more capital, manpower and material resources need to be invested for the industrial transformation. The stronger the risk preference of farmers, the more willing they are to carry out green ecological breeding.

Production and Management Status

(1) The nature of farmers, assuming that pure farmers are more willing to improve the individual breeding environment

Pure farmers refer to small farmers who take waterfowl breeding as the main source of income for their families. As the name implies, part-time farmers refer to farmers who take breeding as a sideline and income as a secondary source of income.[11] At present, China has a low large-scale and mechanized breeding, which is not conducive to the improvement of waterfowl breeding environment and the quality of waterfowl breeding.

(2) The scale of breeding, assuming that the scale of breeding of small farmers negatively affects farmers' behavior of improving breeding environment.

The larger the scale of breeding, the greater the threat and pressure it will bring to the surrounding ecological environment. Because large scale means high investment, farmers in a certain scale are willing to carry out industrial transformation, but operators with high investment are not willing to take risks, so scale effect is also applicable to the scale of waterfowl breeding.

External Factors

(1) Natural conditions, it is assumed that small farmers close to water sources are more willing to improve their individual breeding environment.

As waterfowl are close to water by nature, so being close to the water area is beneficial to their growth, but the water pollution is mobile and has a greater impact on the surrounding environment. Most farmers are more willing to improve their breeding environment due to moral constraints.

(2) For whether or not to receive relevant professional skills training, it is assumed that small farmers who have received technical training have a positive impact on the behavior of improving individual breeding environment.

Trained farmers have stronger adaptability in management and breeding, and have a certain technical and theoretical basis, which also affects their ability to carry out industrial transformation and adapt to the market.

(3) Government support, it is assumed that the strong support of government policies is beneficial to small farmers to improve their breeding environment.

As the government's actions will have a direct impact on the behavior of farmers, the more farmers are willing to carry out green ecological breeding and actively participate in the transformation of waterfowl industry under favorable policies. The government guides farmers to define the development direction through policies, and creates favorable development conditions for green ecological breeding.

DATA SOURCES and MODEL SELECTION

Data Sources

The data used in this paper are the survey data of the economic post team of waterfowl industry system in Jiangxi Province on the areas along the Yangtze River and around the lakes in Jiangxi Province. The survey data in this area can basically represent the general situation of waterfowl breeding in Jiangxi Province. By stratified random sampling, the same amount of waterfowl breeding small farmers were randomly sampled in northern, central and southern Jiangxi, with 200 actual questionnaires and 184 valid questionnaires recovered, with an effective rate of 92%.

Modeling

The dependent variable in this study is "willingness to improve the individual breeding environment", and the binary Logistic model is used. According to the above description of improving the individual's breeding environment, it is whether the small farmers are willing to improve the traditional breeding methods and carry out green ecological breeding. All the modes that combine ecological benefits with social and economic benefits, such as rice-duck co-breeding, duck-fish co-breeding, forest-duck (geese) compound breeding, artificial pond mode (in dry land), duck-clam co-breeding, and duck-water shoot co-breeding, are classified as green ecological breeding. Others, such as free-range breeding or captive breeding, which exceed the reasonable carrying capacity of the environment and cause pollution, are classified as not carrying out green ecological breeding. Assuming that the probability of the behavior of carrying out the green ecological breeding is P, and the probability of not carrying out the green ecological breeding behavior is 1－P, the ratio of the two is P /(1－P), and the following model can be constructed after transformation:

$$Y = \ln(P /1 - P) = \beta_0+\beta_1 X_1+ ... +\beta_{11} X_{11}+\varepsilon \quad (1)$$

Where, β_0 = regression intercept; ε= random disturbance term; X_1, X_2, …, X_{11} are explanatory variables; β_1, β_2, …, β_{11} are regression coefficients of corresponding explanatory variables, indicating degree and direction of influence of the explanatory variable on the explained variable.

Variable Selection

Based on the above research hypotheses, in this paper, "willingness to improve the individual breeding environment" is set as the dependent variable, and the variable is assigned as Yes = 1, No = 0. Independent variables are individual endowment, production and operation status, breeding convenience and government level of waterfowl farmers. Please refer to Table 1 for specific explanation.

Table 1
Variables Assignment and Their Influence Direction

Variables		Meaning	Assignment	Expected influence
Individual endowment	Gender	Gender of farmers	Male = 1; Female = 0	+
	Age	Age of farmers	Under 35 year-old =1; 36-45 year-old =2; 46 year-old and above =3	-
	Educational level	Educational level of farmers	Primary school and below =1; junior high school =2; senior high school or technical secondary school =3; junior college and above =4	+
	Breeding period	Years of breeding of farmers	1-5 years =1; 5-10 years =2; more than 10 years =3	+
	Risk preference	Risk preference of farmers	Dislike =1; general =2; like =3	+
Production and operation status	Sideline	Whether sideline or not	Part-time farmer =1; pure farmer =0	+
	Breeding scale	Breeding scale of farmers	20,000 or less = 1; 20,000 -40,000 = 2; 40,000 or more = 3	-
Convenience	Training	Whether the farmers have participated in relevant training in breeding	Yes = 1; No = 0	+
	Proximity to water sources	Whether the breeding farm is close to the water source (river, lake)	Yes = 1; No = 0	+
Government level	Policy support	Whether supported by national policies	Yes = 1; No = 0	+
	Financial support	Is there financial support (loans, etc.)	Yes = 1; No = 0	+

RESULTS and ANALYSIS

Descriptive Statistical Analysis

Table 2 shows that in the survey sample, 74.46% of the waterfowl farmers in the area along the Yangtze River and around the lake in Jiangxi Province carry out green ecological breeding, and the overall level of waterfowl green ecological breeding is good.

(1) Individual endowment of waterfowl farmers

From the gender perspective, the majority of the respondents are men, with a total of 152 people, accounting for 82.61% of the total number; 32 women, accounting for 17.39% of the total. Waterfowl farmers have a large age span, but the distribution is mainly concentrated at 36 years old and above, with a total of 146 people, accounting for 79.35% of the total number. Waterfowl farmers have an overall low education level, with 155 individuals in junior high school education and below, accounting for 84.24% of the total. The breeding years are divided into three grades, among which the proportion is the largest in 5-10 years, with 76 people, accounting for 41.3% of the total number. The most common risk preference of farmers is general, with 98 people, accounting for 53.26% of the total number.

(2) Production and operation status

The production and operation of the farmers mainly include the farmers' sideline and the scale of breeding. There are more concurrent farmers, including 150 households, accounting for nearly 82% of the total number, indicating that concurrent business of waterfowl breeding is widespread at present. There are 109 farmers whose breeding scale is less than 20,000 yuan, accounting for 59.24% of the total number, 58 farmers whose breeding scale is between 20,000 yuan and 40,000 yuan, accounting for 31.52% of the total number, and only 17 farmers whose breeding scale is more than 40,000 yuan, accounting for less than 10% of the total number of farmers.

(3) Convenience and policy support

According to the sample data, 66.75% of waterfowl farms are located near rivers or lakes and other water sources, and 47.83% of waterfowl farmers indicated that they had received relevant technical training; 48.37% of waterfowl farmers have got relevant national policy support, and 34.78% have received financial support.

Table 2
Basic Information of Sample Farmers

Variables	Descriptions	Quantity	Proportion / %
Dependent variables (Has green ecological breeding been carried out)	Yes	137	74.46%
	No	47	25.54%
Gender	Male	152	0.8261
	Female	32	0.1739
Age	Below 35 year-old	38	0.2065
	36-45 year-old	58	0.3152
	46 year-old and above	88	0.4783
Educational level	Primary school or below	80	0.4348
	Junior middle school	75	0.4076
	Senior high school or technical secondary school	24	0.1304
	Junior college and above	5	0.0272
Breeding period	1-5 years	49	0.2663
	5-10 years	76	0.413
	Over 10 years	59	0.3207
Risk preference	Large	57	0.3098
	General	98	0.5326
	No	29	0.1576
Sideline	Concurrent farmer	150	81.52%
	Pure farmer	34	18.48%
Breeding scale	20,000 or less	9	59.24%
	20,000 -40,000	58	31.52%
	40,000 or more	17	9.24%
Trained or not	Yes	88	47.83%
	No	96	52.17%
Close to rivers, lakes	Yes	123	66.75%
	No	61	33.15%
Supported by national policies or not	Yes	89	48.37%
	No	95	51.63%
Is there financial support	Yes	64	34.78%

	No	120	65.22%

Empirical Analysis

In order to test the validity and accuracy of the questionnaire, SPSS22.0 was used to analyze the questionnaire, and the Cronbach coefficient was 0.785, and the Cronbach coefficient based on standardized term was 0.876. In social science research, Cronbach coefficient is greater than 0.7, which indicates that the reliability of questionnaire is acceptable. Then, the validity test was carried out, and the KMO test value was 0.786>0.7. In addition, the significance of Bartlett sphericity test was below the significance level of 0.001, which indicated that the data of the questionnaire was valid.

Regression analysis of influencing factors on green ecological breeding behavior of waterfowl farmers is shown in Table 3:

Table 3
Regression analysis results of influencing factors of green ecological breeding behavior of waterfowl farmers

Independent variables		Unstandardized coefficients		Standardized coefficient	t	P	VIF
		B	Standard error□	Beta			
Constant		2.704	0.413	-	6.548	0.000	-
Individual endowment	Gender	-0.327	0.155	-0.347**	-2.109	0.043	1.253
	Age	-0.468	0.14	-0.928***	-3.337	0.002	3.574
	Educational level	0.232	0.137	0.469**	2.33	0.043	2.029
	Breeding period	0.069	0.088	0.052	0.34	0.643	2.845
	Risk preference	0.069	0.104	0.101	0.66	0.514	1.086
Production and operation status	Sideline	0.33	0.182	0.41**	2.402	0.039	2.619
	Breeding scale	0.152	0.127	0.301	1.204	0.137	2.263
Convenience	Training	0.261	0.146	0.314**	2.082	0.035	2.001
	Proximity to water sources	-0.066	0.127	-0.088	-0.517	0.309	1.001
Government level	Policy support	0.394	0.144	0.621***	3.651	0.006	3.237
	Financial support	0.058	0.139	0.068*	0.403	0.051	1.427

Note.
*, ** and *** indicate significance at the levels of 10%, 5% and 1% respectively.

(1) Individual endowment. The gender term has a regression coefficient value of -0.327, P value of 0.043, less than 0.05, which means that gender will have a significant negative impact on the small farmers' behavior of improving the individual breeding environment, indicating that women prefer green ecological breeding, which may be caused by women's more attention to the breeding sanitation environment.

Age has a regression coefficient value of -0.468, P value of 0.002, less than 0.01, which means that age has a significant negative impact on the behavior of improving individual breeding environment, indicating that the older the age, the less willing to try green ecological breeding.

The education level has a regression coefficient value of 0.232, P value of 0.043, less than 0.05, which means that the education level will have a positive impact on the improvement of individual breeding environment for small farmers. The higher the education level, the stronger the farmers' green ecological breeding behavior.

The breeding period has a regression coefficient of 0.069, P value of 0.643, greater than 0.05, which means that the breeding period will not affect the behavior of small farmers to improve their individual breeding environment, so the original hypothesis is not valid.

Risk preference has a regression coefficient value of 0.069, p value of 0.514, greater than 0.05, which means that risk preference will not affect the improvement of individual breeding environment and the green ecological breeding behavior, so the original hypothesis is not valid.

(2) Production and operation status. Sideline breeding has a regression coefficient value of 0.33 and P value of 0.039, less than 0.05, which means that the small farmers who work part-time have a positive impact on improving the individual breeding environment, and the pure farmers have stronger behavior in improving the individual breeding environment. Breeding scale has a regression coefficient value of 0.125 and P value of 0.137, greater than 0.05, which means that the scale of breeding will not affect the green ecological breeding behavior of farmers.

(3) Convenience. The variable of proximity to water sources has a regression coefficient value of -0.06, P value of 0.309, greater than 0.05, which means the water source condition will not affect the green ecological breeding behavior of farmers, so the hypothesis is not valid. Technical training has a regression coefficient value of 0.261, P value of 0.035, less than 0.05, which means that technical training will have a positive impact on small farmers' behavior in changing the breeding environment, and farmers who have received technical training are more willing to adopt green ecological breeding.

(4) Government level. Policy support has a regression coefficient value of 0.394, P value of 0.006, less than 0.01, indicating that policy support will have a positive impact on green ecological breeding behavior, and that the stronger the policy support is, the more willing the farmers are to improve the individual breeding environment and carry out green ecological breeding. The government's financial support factors have a regression coefficient of 0.058, P value of 0.051, less than 0.1, indicating that farmers who receive financial support are more inclined to green ecological breeding.

RESEARCH CONCLUSIONS AND POLICY IMPLICATIONS

The above analysis results show that the gender and age of small farmers in waterfowl breeding and tobacco growing have a negative impact on their green ecological breeding behavior; farmers' education level, concurrent employment, technical training, government policy support and financial support will have a significant positive impact on farmers' green ecological breeding behavior. According to the research results of this questionnaire survey, the countermeasures and suggestions for small farmers to improve their individual breeding environment are put forward from four aspects.

Optimizing the Layout of Waterfowl Breeding Industry and Vigorously Promoting Large-Scale Breeding

At present, it is still common for small waterfowl breeding and tobacco growing farmers to operate concurrently, which is not conducive to the improvement of breeding environment and the development of waterfowl industry. On the one hand, the industrial layout should be optimized, improve green tobacco cultivation, moderate scale breeding should be carried out on the principle of "adapting to local conditions" according to the local environmental carrying capacity, so as to improve the scale and specialization of waterfowl breeding industry. On the other hand, the development of new business entities should be vigorously promoted, such as large-scale leading enterprises, large-scale breeding households and breeding cooperatives, which integrate breeding ducks, hatching eggs, feed processing, commercial ducks breeding, slaughtering and processing, and down production and processing. They should have the ability to better control and deal with the pollution caused by breeding, reduce the impact on the surrounding ecological environment, and push forward the industrial development and transformation.

Constructing the Green Ecology Development System of Waterfowl Industry

As most of the waterfowl breeding and tobacco growing farmers have low educational level, deeply rooted traditional concept of "one pond, a group of ducks and one shed", first of all, publicity and education on green ecological breeding and food safety knowledge should be strengthened to enhance the awareness of waterfowl farmers on safe production. Secondly, the traceability system should be improved to reversely urge farmers to improve the quality of their products. In addition, the government can increase supervision and technical support for waterfowl industry, coordinate with the provincial waterfowl industry system, formulate operation rules for green ecological production of waterfowl industry in Jiangxi Province, and innovate green ecological technology, so as to promote the "green" production of the whole industry.

Innovating the Breeding Mode and Increasing the Popularization and Application of the Ecological Breeding Mode

Green ecological breeding mode is the inevitable trend for the development of waterfowl industry. Scientific and technological innovation of waterfowl green ecological breeding technology should be strengthened, so as to reduce the pressure on the surrounding ecological environment during waterfowl breeding, improve the utilization efficiency of waterfowl breeding waste resources and realize low-carbon life breeding. Low-carbon breeding modes, such as rice-duck breeding and combination of agriculture and animal husbandry, which use rice fields, fish ponds and forest land to share breeding waste, should be promoted, and targeted pilot and promotion should be carried out according to local regional characteristics and production conditions. The construction of waterfowl industry technology system should be strengthened, and the system of science and technology commissioners should be improved to promote the transformation of waterfowl industry technology achievements, carry out various forms of related technical training, and improve the professional and technical level of farmers.

Strengthening Publicity and Supervision

Strengthening green ecological breeding concept propaganda and popularization, and vigorously promote the ecological breeding technology promotion, let the broad masses of farmers and farming enterprises with ecological cultivation idea, independent and able to achieve ecological breeding behavior, and encourage people to grow green tobacco to protect the environment and human health. At the same time, strengthen the supervision system, vigorously promote ecological farming and tobacco green production, consumption and other behavior supervision.

Strengthening Government Support and Supervision

Practical supporting policies for waterfowl industry should be formulated and relevant financial supporting mechanisms should be improved. The green ecological development of waterfowl breeding industry needs a complete financial support system, and stable funds can improve the current situation of small and scattered breeding scale. Therefore, to promote the transformation of breeding industry, it is necessary to establish a convenient financial loan and financing mechanism, learn from the agricultural subsidy policy implemented in pig breeding industry, and establish professional financial institutions to provide targeted services for waterfowl farmers.

At the same time, the relevant government functional departments should enhance the supervision of all aspects of waterfowl breeding process, from waterfowl breeding to the final table consumption, so as to speed up the establishment of waterfowl product traceability system and ensure food safety. Due to the complicated situation of waterfowl breeding industry in Jiangxi Province, such as small and scattered breeding scale and various varieties, it is necessary to improve the industry access threshold, perfect and strictly implement the industry access system, restrict and eliminate farmers who fail to meet the standards and develop irrationally, and give support to farmers or breeding enterprises that meet ecological breeding. To a certain extent, the above approaches can promote the development and transformation of waterfowl industry in China and promote the sustainable development of ecological environment and ecological economy.

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References

1. Zhu L, Wang YP. Willingness of waterfowl breeding farmers to participate in healthy breeding mode. Wuhan: School of Economics and Management, Huazhong Agricultural University. 2012;1-67 (in Chinese).
2. Li CY. Educating Professional Composite Talents to Create a Healthy Aquaculture Way-Interview with Tian Yunbo, Vice President of Zhongkai University of Agriculture and Engineering. *Guangdong Feed*. 2016;25(06):8-10 (in Chinese).
3. Piesse A, Opsomer J, Dohrmann S, et al, Longitudinal Uses of the Population Assessment of Tobacco and Health Study. *Tobacco Regulatory Science*. 2021;7(1):3-16.
4. Venugopal PD, Hanna SK, Gagliano GG, & Chang HW. No butts on the beach: aquatic toxicity of cigarette butt leachate chemicals. *Tobacco Regulatory Science*. 2021;7(1):17-30.
5. Philippe B, et al. Oranic farming and the oreening of the common agricultural policy made walloon agriculture become more environment friendly in 2015. *Studia Universitatea Babeş-Bolyai Ambientum*. 2016.
6. Meldan T, Yin N, Wang YP and Yan JW. Current situation and production policy research of Chinese waterfowl industry-from the perspective of international and domestic resource utilization. *Guangdong Agricultural Science*. 2015;42(17):178-186 (in Chinese).
7. Zhao LP, Qiu W, Wang YP, He K. Analysis on Cognition and Behavior Inconsistency of Farmers in Ecological Aquaculture-Taking Waterfowl Breeding Farmers as an Example. *Journal of Huazhong Agricultural University (Social Science Edition)*. 2015;06:44-50 (in Chinese).
8. Wang BW. Strategies to ensure the healthy and sustainable development of China's waterfowl industry. *Waterfowl World*. 2015;01:10-13 (in Chinese).
9. Zhu L. Willingness of Waterfowl Breeding Farmers for Healthy Breeding Mode. Huazhong Agricultural University. 2012;1-79 (in Chinese).
10. Chen F, Zhou CY, Wang C. Discussion on Green Ecological Livestock and Poultry Culture Mode. *Stockbreeding Market*. 2009;05:21-23 (in Chinese).
11. Mei JM. Analysis of Part-time Rural Households Operating Conditions during the Transition Period - Taking Hubei Province as an Example. *Journal of Finance and Economics*. 2003;08:69-75 (in Chinese).