



**AgEcon** SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

*No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.*

# Exploration on Ecological Compensation Mechanism of Family Farm

Qiang ZHANG \*

College of Economics and Management, Baoji University of Arts and Sciences, Baoji 721013, China

**Abstract** Family farm is a new type of agricultural operation, and the research on ecological compensation for its production behavior is conducive to consolidating the basic position of agriculture and protecting agricultural resources and environment. By summarizing and drawing lessons from the domestic research results in related fields, the family farm is selected as the object, and the opportunity cost method is used to analyze the setting of the ecological compensation standard of the family farm. The basic framework of ecological compensation mechanism of family farm is constructed from three aspects: ecological compensation responsibility determination mechanism; compensation object establishment mechanism; compensation standard determination and mode selection mechanism. The operation mechanism of ecological compensation of family farm is analyzed from three aspects: farmer; farm production; resources and environment. The results show that the family farms' pursuit of agricultural products and ecological services is the response mechanism of ecological compensation for their production behavior. On the basis of this, this paper puts forward some measures and suggestions to ensure the ecological compensation mechanism of family farms from three aspects: perfecting the land use system; widening the compensation channels; constructing the green GDP accounting.

**Key words** Ecological compensation, Production behavior, Family Farm, Mechanism, Agricultural business entity

## 1 Introduction

Family farm is an important part of the innovation and development of national agricultural operation system and mechanism. The No.1 document of the Central Committee in 2018 clearly pointed out that family farms, as a new type of agricultural business entity cultivation project, together with cooperatives, leading enterprises, social service organizations and agricultural industrialization consortia, form a variety of forms such as appropriate scale operation of agriculture. This points out the direction and provides policy support for the further development of family farms. Family farm refers to the organization which takes the family as the management unit and the family members as the main labor force, specializes in agricultural production and then provides agricultural products for the society. Its agricultural production and operation has the characteristics of scale, intensification and commercialization. The purpose of exploring and revealing the ecological compensation mechanism of family farm production behavior is to establish a set of operable ecological compensation mechanisms of family farm and to provide scientific basis for government departments' decision-making. This is a useful exploration of agricultural resources and environmental management. From the perspective of family farm ecological compensation, on the basis of the existing achievements, this paper aims to promote the relative perfection of the theory of agricultural ecological compensation

mechanism, and has a certain theoretical significance to solving the relevant problems in the process of agricultural ecological compensation mechanism analysis. The establishment of ecological compensation mechanism for family farms can reduce the contradiction between economic development and agricultural ecological protection, and provide practical reference for ecological compensation research in different fields. Furthermore, it provides decision-making reference value for ensuring the sustainable development of agriculture and promoting the construction of ecological civilization.

## 2 Literature review

Ecological compensation is an effective way to transform external and non-market environmental values into real financial incentives, aiming to encourage participants to provide more ecosystem services<sup>[1]</sup>. From the perspective of production process, both family farm economic production process and natural production process are obviously dependent on natural resources and environmental resources. The focus of compensation lies in the farm production activity itself, and the function of its policy is to guide and give full play to the ecological function of the family farm. Agricultural ecological compensation is defined under the meaning of ecological compensation, and the ecological compensation of family farm production behavior is defined under the meaning of agricultural ecological compensation. This paper holds that the ecological compensation of family farm refers to the compensation for farm production activities, which focuses on giving full play to the ecological function of family farm. Ecological compensation mechanism is a public institutional arrangement that regulates the interest relationship among ecological protection stakeholders by means of government and market according to the value of ecosystem services, the cost of ecological protection and the opportunity cost of development. Its purpose is to protect ecological resources and

Received: September 15, 2020 Accepted: November 11, 2020  
Supported by National Natural Science Foundation of China (71703001); Scientific Research Project of Shaanxi Provincial Department of Education (2018JK038); Scientific Research Project of Baoji University of Arts and Sciences (ZK15006).

\* Corresponding author. Qiang ZHANG, master, lecturer, engaged in urban and regional economics.

Editorial Office E-mail: asiaar@163.com

environment and promote the harmonious development of man and nature<sup>[2]</sup>. Chen Haijun *et al.* reviewed the research status of agro-ecological compensation in China in the past 10 years, and considered that the discussion on the mechanism of agro-ecological compensation can be divided into two categories: one is the macro-level and theoretical discussion, and this kind of literature focuses on grasping the agro-ecological compensation mechanism as a whole, and agrees that the mechanism framework includes four aspects of compensation subject, standard, mode and scheme; the other is the discussion of the specific mechanism of the specific region, and the starting point of this kind of literature is to study the actual environmental problems in the region, and the difference in the regional background is obvious, which mainly lies in pushing the theory into practice, so the conclusions drawn and the measures and suggestions formed are also quite different<sup>[3]</sup>. On the basis of the present situation of agricultural ecological compensation policy in China, Liu Zunmei analyzed the problems existing in the current agricultural ecological compensation policy from three aspects of policy formulation, policy implementation and policy support, and constructed the theoretical framework of China's agricultural ecological compensation policy, and put forward the operation path of China's agricultural ecological compensation policy<sup>[4]</sup>.

The research on family farm mainly focuses on three aspects: the definition of family farm, the influencing factors of development and the choice of business behavior. In China, the family farm is defined as a new type of management subject, which takes the family members as the main labor force engaged in large-scale, intensive and commercialized agricultural production and management, and the main source of family income is agricultural income<sup>[5]</sup>. Zhu Qizhen *et al.* believed that the main body of the family farm operation is a new type of professional farmers who are educated, understand technology, can manage and take agriculture as their livelihood, and the comprehensive farm with diversified economy is the ideal model for development. Its scale takes the maximum area that family members can operate under the existing technological conditions as the upper limit, and the livelihood needs of family members as the lower limit; its development needs the support of the government and specific social conditions<sup>[6]</sup>. Qu Xueshu held that the agricultural production relations shown by family farms can meet the requirements of the current development of productive forces and meet the requirements of the duality of agricultural production<sup>[7]</sup>.

With the establishment of the new agricultural operation status of the family farm, its production behavior is directly related to the development and utilization of agricultural resources and environment. Taking 1 322 family farms across the country as samples, Cai Yingping *et al.* analyzed the production behavior of family farms and found that the production behavior of family farms was beginning to show ecological consciousness. Farmers' education, training and years of agricultural scale operation, joining cooperatives, being rated as model family farms, products passing "three products and one indication" certification, having registered trademarks and other factors have a significant positive im-

pact on the ecological production behavior of family farms<sup>[8]</sup>. Chen Bifen *et al.* believed that the establishment of a subdivided selection system of ecological compensation can promote the realization of ecological civilization management model of family farms in animal husbandry<sup>[9]</sup>. Weng Boqi *et al.* expounded that the construction and management of green family farms must pay attention to the five links of policy, management, service, training and security<sup>[10]</sup>. Scholars' research on the problems related to family farms also reflects that the production behavior of family farms is affected by four aspects: land transfer, farm financing, agricultural service system and the quality of farmers. This also reveals the necessity and feasibility of studying the ecological compensation of family farm production behavior from one side.

Most of the researches on ecological compensation in the existing literature focus on the macro aspect, and there are more mature achievements in the connotation, content and principle of ecological compensation. The research at the micro level is mostly focused on the field of natural resources or a certain resource area, such as the ecological compensation of water resources, grassland resources, mine resources and lakes and watersheds. However, there is little literature on the ecological compensation of family farms. As an economic organization, family farm has become an important component of modern agricultural development, and its development is affected by its own production behavior and agricultural environment. The purpose of agro-ecological compensation to protect the agricultural environment can improve the production behavior of family farms. This study puts forward the framework design, constituent elements and policy suggestions of the family farm ecological compensation mechanism from the macro level, and discusses the determination of the compensation standard under the opportunity cost method, in order to realize the effective and scientific family farm ecological compensation mechanism.

### 3 Setting of the standard of ecological compensation for family farms

The ecological compensation standard is the basis of the operation of the ecological compensation mechanism, and the analysis of the compensation standard of the family farm is related to the long-term operation of the mechanism. The compensation standard solves the problem of compensation amount, which is the core of the ecological compensation mechanism, and the reasonable setting of compensation standard is the key to ensuring the implementation effect of ecological compensation.

At present, the opportunity cost method is most widely used in determining the standard of ecological compensation, and it is also considered to be a scientific and reasonable method. The basic principle of this method is that a certain resource is used for the production of one product while giving up the maximum benefit from the production of other products. For the family farm ecological compensation, the core of the compensation standard is the process of using qualitative and quantitative methods to determine the ecological value of the farm. There are two problems in this process: one is the opportunity cost of the ecological function area

of the family farm, and the other is the calculation of the ecological service value of the family farm. According to the experience of previous accounting standards, the value and opportunity cost of ecological services are the upper and lower limits of the compensation standard.

**3.1 Opportunity cost of ecological functional areas of family farms** The requirements of environmental governance will cause the relevant subjects to lose part of their right to development. According to the different subjects in the ecological functional areas of family farms, the opportunity cost mainly includes the following two aspects: (i) The opportunity cost of the family farm itself is affected by the requirements of ecological and environmental protection, and the administrative means of the government will intervene in and control the production of the family farm. It will take restrictive measures such as closing, suspending production, changing production and merging for family farms with serious pollution, and those with less pollution will also require rectification in order to meet the requirements of environmental protection. (ii) For the farmers after the transfer of land, the family farm production is affected by scale factors, and its development process will occupy certain land resources, and these land resources are mainly the land transferred by nearby farmers. As farm production and management or ecological function reconstruction will change the original land use, it will lead to the loss of opportunities for farmers engaged in planting and other farmers on the original land. The above analysis shows that the opportunity cost ( $OC$ ) of environmental protection in family farm areas mainly includes the opportunity cost of farms ( $FOC$ ) and the opportunity cost of farmers ( $FLOC$ ) after land transfer.

The formula is  $OC = FOC + FLOC$ , in which the opportunity cost of the farm mainly includes the loss caused by closure and shutdown ( $I_1$ ), and the loss caused by conversion and merger ( $I_2$ ).

The formula is expressed as:

$$I_1 + I_2 = \sum_{i=1}^n \frac{P_i}{n} + \sum_{i=1}^n \frac{P_a^* - P_a}{n}$$

where  $P_i$  represents the net profit of the farm before closure and cessation of production;  $P_a^*$  represents the net profit of the farm before conversion and merger;  $P_a$  represents the net profit of the farm after conversion and merger;  $n$  is the natural number of years of compensation.

The opportunity cost of farmers after the transfer of land mainly includes the income loss of crop farming, forestry, animal husbandry and fishery.

The loss of income of farmers engaged in crop farming ( $CF$ ) can be expressed as:  $CF = N_i \times S - R$

where  $N_i$  is the net income per unit area of crops;  $S$  is the planting area;  $R$  is the rent of the land transferred by farmers.

Under the condition that the data are available, the opportunity cost of crop farming can be calculated more accurately according to the relevant parameters. It should also be noted that in order to simplify the problem, we only discuss the situation of the crop farming, and the determination of the value of farm ecological

services in the following part is also limited by the land use for the crop farming.

**3.2 Ecological service value of family farm** The value of ecological service is an important aspect of ecological compensation. According to the theory of labor value, value is human labor (social average working time) condensed in commodities. Drawing lessons from the relevant research results of natural resources management and the construction of ecological civilization, the value of ecological services can be regarded as the average action time of ecosystems condensed in ecosystem products and services. In this way, the ecological service value of the family farm can be defined as the value of the products and services provided by the farm through its ecological function, which mainly measures the ecological output of the farm management. Although there is no unified understanding of the calculation of the value of ecological services, the ecosystem method per unit area proposed by Xie Gaodi *et al.* is a useful attempt to calculate the value of ecological services. The core of this method is to determine the economic value of ecological services through the equivalent factor value of ecological service value, and define a standard equivalent factor as the economic value of annual natural grain output of farmland with national average yield of 1 ha. Its significance is to reflect the potential capacity of the ecosystem to the relative size of ecological services<sup>[11]</sup>. At the same time, they also empirically calculated the value of ecological services in China, established the equivalent scale of ecological service value factors, and divided ecosystem types and ecological service functions<sup>[11]</sup>. According to this idea, the ecological service value of the family farm is equal to the product of the unit price of each functional unit of the farm ecological service and the farm area.

The formula is as follows:

$$ESV = \sum_{i=1}^n AE_i$$

where  $ESV$  is the total value of farm ecological services;  $A$  is the farm area;  $E_i$  is the unit price of type  $i$  ecological services provided by farms ( $i = 1, 2, 3, \dots, n$ ).

By querying the equivalent scale of the value of ecological services, we can actually calculate the total value of farm ecological services and determine the upper limit of compensation.

## 4 Framework design and element analysis of ecological compensation mechanism for family farm

As an institutional arrangement to coordinate farm production activities and agricultural environmental protection, the ecological compensation mechanism of family farm is intended to adjust the pattern of relevant interests through economic means to achieve the purpose of improving the ecological environment. A complete framework of ecological compensation mechanism for family farms includes at least the following three aspects: the first is to establish the mechanism of ecological compensation responsibility of family farm, to clarify the subject of ecological compensation of family farm, that is, to define the responsibility of compensation and how to bear it; the second is to establish a mechanism for the object of ecological compensation for family farms, to clarify the

scope of compensation for family farms, that is, who will be compensated; the third is to determine the family farm ecological compensation standard and mode selection mechanism, that is, how much is the compensation and how to compensate.

#### **4.1 Behavior of stakeholders in ecological compensation of family farms**

In the ecological compensation behavior of family farms, the government, farm management departments, social organizations farms and farmers are all important stakeholders, and they are interrelated and influence each other. Centering around the consistent interest goal of ecological environment, it is very important to determine their compensation subject status for the establishment of family farm ecological compensation responsibility mechanism. According to the provisions of the main body of ecological compensation, on the one hand, the government, as the main body, plays a leading role in the formulation of laws, regulations and policies in farm compensation because of its special attributes of performing state functions and representing public interests. On the other hand, the public attribute of farm products and farm ecological service function determines that its property right is difficult to define, which requires the government to use economic means to regulate and guide, while the farm management department is treated as a first-level government and should also bear the main responsibility of compensation. As the main body, social organizations can increase the source channels of compensation funds, make up for the lack of compensation funds, and form the communication effect of ecological compensation on family farms. The farm itself as the main body lies in that the farm and the farmers themselves are the beneficiaries of ecological compensation, but the waste and destruction of agricultural resources and environment caused by farm production and management activities require them to bear the corresponding responsibility of ecological compensation. Specifically, the farmer determines the management behavior of the farm and the specific use of agricultural resources and environment; in order to protect the agricultural environment, farmers are required to adopt a management and production mode conducive to agricultural environmental protection and ecological function construction, to realize self-compensation and strengthen the self-compensation ability of the farm.

**4.1.1** Characteristics of government behavior in ecological compensation for family farms. The behavior characteristic of the government in the family farm ecological compensation is mainly to adjust the balance of interests of all parties in the family farm production activities by means of legal provisions, policy formulation and administrative means. Due to the different status of the government in all aspects of relationship weighing, the corresponding government behavior is also different. As the actual manager of farm ecological resources, the government needs to adjust the relationship between the exploitation of farm resources and the protection of farm ecology. As the actual receiver of the income from the use of farm resources and the main implementer of environmental protection behavior, the government needs to adjust the relationship between the income from the use of farm resources and the expenditure on farm protection behavior. As the planner of farm

economy, the government needs to adjust the relationship between economic development and farm ecological protection. As the intermediary between farm interests and farmers' interests, the government needs to adjust the relationship between farmers' interests and farm interests. In the process of specific regulation, the effect will also be affected by the level of policy, the will of farmers and the interests of the government and other factors.

**4.1.2** Characteristics of farm production behavior in ecological compensation for family farms. The main characteristic of the production behavior of the family farm is to maximize the operating benefits. If the production activity is regarded as a process of input and output, in order to maximize benefits in this process, on the one hand, it is necessary to increase the farm output, mainly by increasing land resources, improving market environmental conditions and improving business efficiency; on the other hand, it is necessary to reduce all kinds of farm expenses and losses, such as investment in environmental protection, resource taxes and other expenses related to family farms. Accordingly, all the policies and regulations that affect this process, the characteristics of farms and farmers, the will of farmers and other factors will promote the choice and decision of farm production behavior.

**4.1.3** Characteristics of farmers' behavior in ecological compensation for family farms. Farmers' behavior is characterized by economic utility maximization and risk aversion in the process of family farm ecological compensation. As the basic unit of farm production and management, farmers are supporters of agricultural ecological protection, but when their own point of view changes, their position may also change. For example, when the benefits of family farm development outweigh the impact, these people may become supporters of family farm production behavior. When the family farm production behavior has no obvious impact on some people, but ecological taxes and fees obviously affect the income of these people, they may also become opponents of eco-environmental protection.

#### **4.2 Compensation scope in ecological compensation for family farms**

The scope of compensation is to solve the problem of what to compensate, and it is necessary to make clear the object and subject of compensation as well as the geographical area of compensation. The object of family farm ecological compensation refers to the individuals and organizations engaged in farm ecological environment protection or providing farm ecological function services. In the process of managing the farm, the development of the farm is limited because of the responsibility to protect the environment, and the scattered distribution of farmers, and the different endowments of farmland resources will also affect the choice of family farm operation. Therefore, the scope of ecological compensation for family farms is mainly divided into two categories: one is about the production behavior of reducing agricultural pollution, mainly the production behavior of "one control, two reductions and three basics" in the process of farm production<sup>[8]</sup>, including strictly controlling the total amount of agricultural water, reducing the use of chemical fertilizers and pesticides, basically realizing resource utilization of livestock and poultry manure, crop straw

and agricultural film, *etc.*; the other is the behavior that is conducive to giving full play to the value of farm ecological services. According to the classification of ecological services described in the article *World Ecological Services and the Value of Natural Capital*, three kinds of production behaviors related to family farms (such as raw material production), ecological services (such as biodiversity conservation) and social services (such as entertainment functions) should all fall into the category of family farm compensation.

#### **4.3 Compensation methods in ecological compensation for family farms**

The research of ecological compensation in other fields shows that capital-based economic compensation is the most widely used means of ecological compensation at present. Non-economic ecological compensation means in policy, resources and intelligence have a good effect on solving some difficult compensation problems. Therefore, the ecological compensation means for family farms can be divided into government means, market means and other means.

**4.3.1 Government means of ecological compensation for family farms.** As the main body of compensation, the government provides compensation to the beneficiaries and protectors of the farm ecological environment in the form of ecological taxes, financial payments and administrative means<sup>[12]</sup>. It mainly includes the following. (i) Taxes and fees on ecological environment. Based on the principle of "who uses and who pays", the users of the ecological environment of the family farm pay a certain fee according to the degree of damage to the environment caused by the farm production behavior. This method has been implemented earlier in foreign countries, and has achieved good results in environmental protection, but our country is still lacking in effective ecological tax system. (ii) Government payment. The government compensates the protectors of the ecological environment in the form of transfer payment of financial funds. Financial transfer payment employs a unified allocation of funds to adjust the balance of interests of the relevant parties, in order to achieve the goal of protecting the ecological environment. The transfer payment of farm ecological compensation specifically refers to the compensation of the central finance to the local government and farmers. (iii) Policy compensation. It refers to the behavior that the government compensates the ecological compensation object of the family farm by formulating preferential policies, such as tax return, special subsidies, and various settlement subsidies. The family farm is a new type of business entity, and the scope of policy compensation is wider and the effect is better.

**4.3.2 Market means of ecological compensation for family farms.** The market means of ecological compensation for family farms means that the main body of the market makes reasonable compensation for the value of various elements of the farm environment through the transaction of property rights in the environmental market, so as to achieve the purpose of improving and protecting the ecological environment of the farm. It includes the following two ways. (i) Ecological certification of farm products. It is the authoritative certification of the products produced by the fami-

ly farm, specifically referring to the fact that the production and sale of the products have not caused harm to the ecological environment. Such products can improve consumers' recognition and purchase desire, so as to enhance the added value of the products, and achieve indirect compensation for the ecological conscious behavior of family farm production. The key of this means is that consumers recognize the authority of ecological products and consumers realize the importance of environmental protection and are willing to buy ecologically certified products. (ii) Point-to-point transactions. It refers to the transaction through economic means on the basis of defining the rights and obligations of both parties. Usually, the parties to the transaction determine the amount and implementation of ecological compensation through negotiation under the constraints of laws and regulations.

#### **4.3.3 Other means of ecological compensation for family farms.**

The way of ecological compensation can be not only money, but also goods or services, manpower, technology and so on<sup>[13]</sup>. Goods or services, manpower, technology and other means can be used as an important supplement to the compensation means of the government and the market. First, we can set standards and grades to compensate farmers according to the scale of family farms and the function of ecological services. Second, it is necessary to vigorously popularize and promote the basic application technology of agriculture, optimize the product quality of family farms, and enhance the scientific and technological level of farm industry management. Third, it is necessary to introduce agricultural technicians and increase the training of farmers and farm employees, to improve the quality structure of farm operators and improve the level of modern farm management.

## **5 Measures for the ecological compensation mechanism of the family farm**

### **5.1 Perfecting the land use system and improving the policy guidance of environmental protection**

The current land management system does not clearly define the permanent right to the use of land, resulting in the short-term behavior of land management, which can not fundamentally guarantee the construction of ecological environment. In order to realize the virtuous circle of ecological function, it is necessary to perfect the corresponding land property right system. First, it is necessary to define land rights and ensure farmers' permanent management and use of farm land, so as to be able to expand investment in farm operation and production and carry out environmental development and governance. The second is to improve the level of land circulation, and adopt the market mechanism to achieve the concentration of land, and invigorate the right of land management in accordance with the way of replacement and merger<sup>[14]</sup>. In addition, it is necessary to improve the vocational skills of farmers and help them to work on family farms, so that they can get a certain wage income while getting the rent of the transferred land. The third is to increase policy support. The government actively supports the development of various models of family agricultural practice, and provides policy support from finance, taxation, land use, insurance and other as-

pects to create convenient conditions, which is also the practical need of agricultural supply-side reform.

### 5.2 Broadening the sources of compensation funds and supporting the implementation of ecological compensation

At present, the main source of funds for ecological compensation is financial expenditure. As the protection and improvement of family farm resources and environment is a complex system project with large investment and slow effect, which needs a lot of financial support, diversified financing channels should be established. (i) It is necessary to establish family farm ecological compensation fund to provide stable funds for the implementation of ecological compensation. The subsidy funds, agricultural subsidies and related taxes and fees for the construction and development of family farms can be put into the fund according to a certain proportion, and the amount of the fund can be adjusted according to the changes in government revenue and the operating conditions of family farms. (ii) It is necessary to levy taxes on pollutant discharge or products in the process of family farm production. The tax standard of pollutant discharge behavior is based on actual discharge amount. The tax on products is based on the sales quantity at the rated tax rate. A compensation tax should be levied on the beneficiaries of the farm ecological environment to compensate for the cost of farm ecological protection and governance. (iii) It is necessary to increase the investment of credit funds. There is a need to give full play to the supporting role of commercial banks and other financial institutions in the ecological compensation for family farms, increase the credit line of policy banks for family farm construction projects, and support the infrastructure construction of family farm areas.

### 5.3 Building a green GDP accounting system to promote the rational use of resources

Green GDP accounting system is a comprehensive environmental and economic accounting system with green GDP as the core. Its essence is to get the net growth value of GDP by revising the accounting system of GDP and deducting the negative effects of environmental pollution and ecological loss caused by the growth of GDP. The traditional GDP accounting ignores the value of products and services provided by ecological assets, which has an impact on the sustainable development of human society. The CPC Central Committee clearly pointed out that it is of great significance for green GDP accounting to include environment, ecology and resources in the evaluation of social and economic development. The current green GDP accounting only considers the cost of environmental pollution and resource depletion, which is inconsistent with the reality that the ecosystem can provide a variety of products and services. Therefore, it is necessary to build a suitable green GDP accounting system according to the function of ecological services. The implementation of green GDP accounting can change the concept and way of using resources in organizational units, from extensive to intensive, and from focusing on economic production value to giving consideration to both economic and ecological value. This is

beneficial for family farms to change the one-sided behavior of pursuing the increase of economic production, reduce the predatory development of resources, and achieve the balance of economic and ecological development.

## References

- [1] WU WJ, GAO LH. A concept discrimination on value compensation and ecological compensation[J]. Journal of Nanyang Institute of Technology, 2010, 2(5): 102–105. (in Chinese).
- [2] LI XY. A theoretical study on the construction of coupling mechanism between ecological capital operation and ecological compensation[J]. Enterprise Economy, 2013, 33(12): 101–106. (in Chinese).
- [3] CHEN HJ, CHEN G. A review of studies of agro–ecology compensation in recent ten years[J]. Journal of Anhui Agricultural Sciences, 2013, 41(5): 1883–1888. (in Chinese).
- [4] LIU ZM. Study on the frame construction and the running path of our agro ecological compensation policy[J]. Ecological Economy, 2014, 30(5): 122–126. (in Chinese).
- [5] XIAO EF. Family farm development: Formation mechanism, influencing factors and path trend[D]. Wuhan: Huazhong Agricultural University, 2017. (in Chinese).
- [6] ZHU QZ, HU PH, XU HZ. Discussion about family farm: advantage, requirement and scale[J]. Problems of Agricultural Economy, 2014, 35(7): 11–17. (in Chinese).
- [7] QU XS. Analysis on the motivation of family farm development in China[J]. Journal of Agrotechnical Economics, 2016, 35(6): 106–112. (in Chinese).
- [8] CAI YP, DU ZX. Analysis on the ecological consciousness of family farm production behavior and its influencing factors: Empirical test based on the national household farm monitoring data[J]. Chinese Rural Economy, 2016, 32(12): 33–45. (in Chinese).
- [9] CHEN BF, LIU FX, ZHANG WM. Family farm management modes in livestock breeding from the perspective of ecological civilization in Fujian[J]. Journal of Fujian Agriculture and Forestry University, 2015, 18(3): 31–36. (in Chinese).
- [10] WENG BQ, ZHAO YJ, ZHANG WL, *et al.* Agricultural ecological civilization construction and green family farm management[J]. Journal of Fujian Agriculture and Forestry University, 2014, 17(3): 1–5. (in Chinese).
- [11] XIE GD, ZHANG CX, ZHANG CS, *et al.* The value of ecosystem services in China[J]. Resources Science, 2015, 37(9): 1740–1746. (in Chinese).
- [12] LI YY. Study on construction method and implementation approaches of ecological compensation mechanism for China's nature reserves[J]. Ecology and Environment, 2011, 20(12): 1957–1965. (in Chinese).
- [13] DU WP. Suggestions on improving the ecological compensation mechanism in the western regions of China[J]. China Population · Resources and Environment, 2001, 11(3): 119–120. (in Chinese).
- [14] ZHAO D, XU AP. The origin, experience and enlightenment of developing family farm in Japan[J]. Agricultural Economy, 2019, 39(2): 18–20. (in Chinese).
- [15] OUYANG K. The theory of green GDP performance evaluation: Origin, path and value[J]. Journal of Huazhong University of Science and Technology(Social Science Edition), 2017, 31(6): 1–5. (in Chinese).