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Agro-food Quality and Safety Based on Agro-ecological Compensation

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Abstract Reflection of the rise of agro-food production costs is analyzed based on the introduction of the quality safety situation of agricultural products in China. Firstly, rise of production costs caused by the demarcation of prohibited areas; secondly, rise of production costs caused by using environment-friendly agricultural inputs; thirdly, rise of production costs caused by quality control; fourthly, rise of production costs caused by product identification. The ecological compensation mechanism which is beneficial to agro-food quality safety is set up according to the principle "the one who is benefited compensates". Firstly, laws and regulations of agricultural production compensation are to be actively perfected. Secondly, experience of developed countries can be borrowed to establish a fiscal transfer payment system of production compensation. Thirdly, ecological agriculture is to be developed to produce products with safety and excellent quality. Since agro-ecological compensation can make up for the costs paid for protecting agro-ecological environment and producing safe agro-products by agro-food producers and is beneficial to motivating producers' initiative, compensation is made for agricultural producers from compensation objects, compensation scope and compensation mechanism to improve the quality safety level of agricultural products.

Key words Ecological compensation, Agriculture, Agricultural products, Quality safety, China

Ecological compensation is a kind of social economic activity providing compensation for eco-environmental protectors by beneficiaries, aiming at the protection and sustainable use of ecosystem service^[1]. Ecological compensation mechanism is a series of regulations and political arrangements built to coordinate and implement ecological compensation. To be specific, it is a public system which uses governmental and marketing methods to adjust the benefit-based relationship among stake holders of ecological protection according to the service value of ecosystem, ecological protection costs and developmental opportunity costs with the purpose of protecting ecological environment and promoting the harmonious development between man and nature^[2].

Ecological compensation covers various aspects of ecological construction and ecological protection among which agricultural ecological compensation counts much. Agriculture possesses not only the production function of providing food and industrial raw materials for human beings' survival and development, but also the living and ecological function of preserving nature, stabilizing ecology and achieving harmonious coexistence of man and nature. Yet, ecological function of agriculture can be directly transformed into neither agriculture economic benefits nor peasants' income. Especially in recent years, the government and producers take a series of measures in the process of agricultural production to protect agro-ecological environment and ensure the quality safety of agro-products, which, however, increases agriculture production costs and causes a fall in the comparative benefits of production. The

quality safety of agro-products touches on the health of the mass, the vital interests of mass peasants and the sound and sustainable development of rural economy. Therefore, the principle of "the one who is benefited compensates" must be kept according to the requirement of scientific development concept with the overall economic and social development in urban and rural areas as the main line and system innovation, policy innovation as well as management innovation as the motive forces. A fair and impartial, active and effective agro-ecological compensation system is to be established gradually, taking compensation for quality safety costs of agro-products as the key aspect of agro-ecological compensation.

1 Quality safety situation of agro-products in China

In recent years, agricultural departments at all levels take the control of highly toxic pesticide residue in vegetables, clenbuterol pollution in animal by-products and "malachite green" pollution in aquatic products as the key points and focus on solving problems concerning highly toxic pesticide, illegal use of veterinary drugs and over residue which are among the top of the mass' concern. Overall supervision from farmland to markets is promoted with management of agricultural inputs, production of agro-products and market access as the key point. Routine monitoring is carried out as the breakthrough point to speed the improvement of quality safety awareness in various places and management responsibilities are to be committed. Production of agro-products with quality safety and management abilities are improved with the advancement of standardization as the carrier. The result of the second routine monitoring of the Ministry of Agriculture in 2010 shows that the quali-

fied rates of vegetables, livestock and poultry products and aquatic products are 96.9%, 99.8% and 95.8% respectively, while the qualified rate of sample inspection of melamine in fresh milk keeps to be 100%. On the whole, quality safety of agro-products in our country keeps a relatively high level successively. Besides, 76 862 kinds of products have passed the identification of healthy agro-products, green food and organic agro-products by June 30, 2010 and the identification monitoring area reaches over 60 million hm² which takes up more than 45% of the overall cultivated area in our country.

2 Reflection of the rise of agricultural production costs

Economics laws show that the improvement of product quality will surely lead the rise of production costs and the same is true of the production of agro-products. At present, the added costs of agricultural production caused by the insurance of quality safety of agro-products is mainly reflected in control costs of environmental security in the producing area, control costs of the quality of inputted products, control costs of product quality, product identification costs and so on.

2.1 Rise of production costs caused by the demarcation of prohibited producing area The fifteenth article of *Law on Quality and Safety of Agricultural Products* implemented on November 1, 2006 prescribes: " According to the requirement of ensuring quality safety of agro-products and various factors such as the varietal characteristics of agro-products, the atmosphere, soil as well as the poisonous and harmful substances in the water in the producing area, administrative departments in charge of agriculture of local people's governments above the county-level can propose the prohibited producing area which is regarded to be inappropriate for the production of specific agro-products and the result shall be announced after the approval of people's government at the corresponding level." In order to coordinate the demarcation of prohibited producing area, Ministry of Agriculture put in place *Administrative Measures for the safety of the Producing Area of Agricultural Products* to specifically prescribe how to divide and manage the producing area. The first section of the eighth article in *Administrative Measures for the safety of the Producing Area of Agricultural Products* prescribes that the prohibited producing area of agro-products is the agricultural producing area where the poisonous and harmful substances do not meet the safety standards of the producing area as well as the quality safety standards of agro-products. Since the environment of the producing area is destroyed, the original usage of the farmland changes. Taking into consideration of quality safety of agro-products, farmland which can be used to cultivate certain crops (such as vegetables) can not be used as usual. Other crops can be planted and even no crops can be planted in the area, which causes a fall or loss in the original economic benefits of the farmland^[3]. And this, to a certain degree, causes a phase rise in agricultural production costs.

2.2 Rise of production costs caused by using environment-friendly agricultural inputs A key point which causes

quality safety problems of agro-products is the utilization of prohibited inputs by the country or over utilization of inputs in agricultural production. Such as, the clenbuteral problem in pork is caused by the illegal use of clenbuteral during the cultivation, red-coed duck eggs are caused by Sudan added in the forage and over standard of pesticide residue in vegetables and fruits is mainly caused by the utilization of prohibited highly-poisonous pesticide. Those agricultural inputs have low costs, quick effect and high comparative profit but negative influence on the environment as well as people's health. Using environment-friendly agricultural inputs can effectively protect the environment as well as people's health, but with high costs. For example, the price of novel pesticide with high effect but low poison and low residue is higher than the traditional one. It is estimated that the costs will increase by nearly 20% with the same pesticide effect. Similarly, using organic fertilizer can better protect the ecological environment than using inorganic fertilizer and can improve the quality of agro-products, but the costs are much higher.

2.3 Rise of production costs caused by the control of product quality The control of agro-product quality includes environmental inspection service of the producing area of agro-products, physical control of insect pest, record of production process and file creation, self-control and self-inspection of agro-product quality as well as standardized technical trainings and so on. All these sections increase the production costs. However, the added costs will not surely bring gains. According to the asymmetric information theory, the quality safety attribute of agro-products possesses a typical experience goods attribute. Consumers can not precisely measure the quality safety conditions of the products before purchasing and usually depress the prices to make up for the lack of information. That is to say, under the current circumstances of unsound market credit mechanism, compared with normal production methods, producers conducting quality safety control and producing agro-products with high quality bear higher production costs, but their market benefits won't increase.

2.4 Rise of production costs caused by product identification Quality identification of agro-products has an important role in ensuring quality safety of agro-products, creating brands of agro-products and promoting the convenient and smooth entrance of the market. The appliance of quality identification of agro-products has related added costs, including product inspection fee, identification fee and logo utilization fee and so on. Take green food as an example. According to the identification procedures of green food and related regulations, time from appliance to identification of an agro-product counts nearly one year. And the paid expenses mainly contain four parts, namely environment monitoring fee, product inspection fee, identification fee and logo utilization fee. Monitoring of the producing area and product inspection fee amounts nearly 5 000 yuan and identification fee 3 000 yuan, logo utilization fee 5 000 yuan and other costs 1 000 yuan. On average, the paid costs of one product is at least 14 000 yuan while the identification costs of organic food would be higher. At the mean time, *Ad-*

ministrative Measures on Packing and Marks of Agricultural Products clearly regulates that agro-products with the identification of healthy agro-products, green food and organic agro-products need to be labeled, which then also brings slight increase in production costs.

3 Gradual establishment of agro-ecological compensation mechanism beneficial to quality safety of agro-products

The massive use of agricultural inputs, such as chemical fertilizer, pesticide and forage, has greatly improved the output of agro-products and the output value of farming in our country and meanwhile caused the deterioration of agro-ecological environment, such as eutrophication of surface water, over standard of nitrate of underground water and worsening of environmental pollution in the producing area of agro-products, which greatly affects the quality safety level of agro-products and international competitiveness of our country. The agro-ecological compensation mechanism beneficial to quality safety of agro-products is to be gradually established. Farmers should be encouraged and guided to adopt environment-friendly productive techniques and inputs to improve the quality of agro-products, which is significant to the agricultural development of our country.

3.1 Actively perfecting laws and regulations of agro-ecological compensation At present, there are regulations and policy papers in our country prescribing the requirements and operating methods of support and compensation to ecological protection and construction. However, generally speaking, the system of laws and regulations on agro-ecological compensation in our country is relatively weak. Stipulations defining the rights and obligations of each beneficiary and content, methods as well as standards of compensation are not clear and regulations on compulsory compensation are not common. Legislation of agro-ecological compensation trails the development of ecological reservation and construction and some of the regulations have difficulties in adapting to the new systematic change as well as the need of economic improvement. Thus, new agro-ecological problems and agro-ecological compensation lack effective legal support. Therefore, the range, standards, methods and objects of compensation should be defined and be fixed in legal forms through the legislation of agro-ecological compensation.

3.2 Fully mirroring the experience of developed countries to establish a fiscal transfer payment system of ecological compensation As the "green box policy" of the WTO, agro-ecological compensation is a crucial method of developed countries granting direct subsidies to farmers^[4]. Developed countries and areas, such as the USA and the European Union, conduct agro-ecological compensation much earlier and have built a set of complete system and methods with fairly obvious achievement^[5]. Compensating ecological constructors through public finance is an important means of developed countries. For example, Sweden has a compensation rate of 50% to afforestation of poor land. China should take full advantage of the "green box policy" of the WTO and borrow the experience of

developed countries to establish a mechanism of agro-ecological compensation according with the actual conditions in our country. Fiscal transfer payment has become a key method of central authorities balancing local development and compensation since the implement of the system of tax distribution in China in 1994. Every year, the large sum of fiscal transfer payment of central finance provides a solid foundation for ecological compensation. From now on, compensation to the protection and construction of agro-ecological environment should be added to the project of national fiscal transfer payment. Different guidance to different types should be made to strengthen the subsidies for important fields of agro-ecological construction.

3.3 Developing ecological agriculture and producing agro-products with safety and high-quality The ultimate goal of establishing the mechanism of agro-ecological compensation is to protect agro-ecological environment and build an eco-agriculture developmental mode integrating economic, social and environmental benefits. To establish the mechanism of agro-ecological compensation, active support in capital as well as policy, technique and many other aspects should be given to agricultural development and the external environment beneficial to eco-agricultural development should be built. A main part of developing eco-agriculture is to ensure the quality safety of agro-products and actively develop agro-products with safety and high-quality, such as healthy agro-products, green food and organic agro-products. Therefore, subsidies to quality safety costs of agro-products of the producers should be listed in the process of establishing the mechanism of agro-ecological compensation and regarded as an important part of subsidies. Producers should be leaded and encouraged to adopt advanced and appropriate production technology and environment-friendly agricultural inputs, actively protect agro-ecological environment and cultivate agro-products with safety and high-quality through the excitation effect of the agro-ecological compensation mechanism.

4 Improving quality safety level of agro-products by adopting agro-ecological compensation

Agro-ecological compensation can make up for the costs of agro-producers paid additionally for protecting agro-ecological environment and cultivating healthy agro-products. It is beneficial to motivating the producers' initiative, thus providing a direct and effective way of ensuring the quality safety of agro-products.

4.1 Compensation objects According to the current rural management system in our country, manufacturing industries of agro-products and economic organizations for specialized cooperation among farmers can be the main part of the compensation objects, which can lead and promote the scale production and specialized production of agro-products as well as the development of economic organizations for specialized cooperation among farmers.

4.2 Compensation range According to the actual operating situation of the whole process of producing healthy agro-products, the compensation range should include 7 aspects.

4.2.1 Subsidies for the control costs of environmental safety in the producing area. Land income loss of the demarcation of prohibited producing area, inspection and monitoring as well as management of the environment of the producing area and so

on are included.

4.2.2 Subsidies for the replacement costs of using environment-friendly inputs. With the widening of the prohibited and limited range of using agricultural inputs, such as pesticide and veterinary pharmaceuticals with high residue, agricultural producers should use new inputs, such as agricultural chemicals with high effectiveness but low poison as well as residue according to the requirement of standardized production, thereby the production costs will slightly increase.

4.2.3 Subsidies for the costs of using physical control technology of insect pest. Physical control of insect pest is the main content of agricultural standardization. It possesses the features of reducing the utilization of agricultural chemicals as well as preserving ecological environment, and insects won't have resistance. Seen from the practice in various areas in China, it has fairly obvious effect. The purchasing and utilization of necessary equipment, such as pest killing lamps and pest sticky cards, brings obvious rise in production costs.

4.2.4 Subsidies for production record and file building. According to the requirement of standardized production, agricultural producers should record all productive behavior faithfully and thoroughly, especially the breeds, dosage, times, withdrawal period and plastochron of the utilization of pesticide and veterinary pharmaceuticals, to prove the regulatory and scientific production process and make the quality safety traceable. The establishment and maintenance of production records and files may cause the rise of production and operating costs directly.

4.2.5 Subsidies for apparatus of quick testing products and self-inspection. According to the requirement of *Laws on Quality Safety of Agricultural Products*, all agro-products on sale should be qualified in self-inspection. The implement of self-checking will surely increase the productive costs of agro-products, including the equipment of quick testing apparatus for self-inspection, the consumption of inspected reagent, the expenditure of water and electricity in the process of inspection as well as the maintenance of apparatus.

4.2.6 Subsidies for the costs of product identification and logo utilization. The optimizing and breeding of products is the ultimate goal of standardized production and the final demand of consumers. The identification of agro-products consists of the identification of healthy agro-products, green food, organic agro-products as well as the geographical indication of agro-products. However, product identification usually requires environment inspection of the producing area and quality inspection of the products neither of which is free of charge. Besides, product identification and logo utilization also bring relative costs.

4.2.7 Subsidies for the costs of standardized trainings. Agricultural standardized production covers various sectors before, during and after production. Knowledge and techniques concerning production, management, supervision and so on should be mastered. Strengthening trainings and advancing

qualities are the key task of implementing standardized production which should be persisted. Training activities may increase production costs.

4.3 Compensation mechanism Supported by items, ecological compensation of the quality safety of agro-products is implemented. At present, the form of project support is adopted in many aspects in China, such as converting cultivated land into forests and returning grazing land to grassland. And the implement of ecological compensation has got sound effect. Considering the risk factors that can influence quality safety of agro-products, such as the deterioration of agricultural producing environment in China and the unreasonable utilization of chemicals and pesticide, ecological compensation with special purposes should be established as soon as possible, guiding farmers to use environment-friendly productive techniques and inputs.

5 Conclusion

To summarize, the mechanism of agro-ecological compensation is to internalize the externality of the protection of agro-ecology through certain political means, making the "beneficiaries" of the achievement of ecological protection pay related fees and the "losers" get some compensation. To put it another way, the biggest achievement of establishing agro-ecological compensation mechanism is to be the preservation of agro-ecological environment and the effective supply of agro-products with safety and high-quality. The establishment of agro-ecological compensation mechanism beneficial to the quality safety of agro-products can effectively resolve the "hitchhike" phenomenon in the supply and consumption of agro-products with safety and high-quality, encourage producers to adopt advanced and proper productive technology and safe agricultural inputs and improve the level of quality safety of agro-products.

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