Research on the Measurement of Agricultural Green Development Level in Qinghai Province

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Abstract. By constructing the evaluation index system of agricultural and green development level in Qinghai Province, using the entropy weight grey correlation topsis model and obstacle degree model, we calculated on the agricultural green development level during second national agricultural survey to the third national agricultural survey and analyzed the level in the view of the time and space. The analysis of the level of agricultural green development in Qinghai Province is based on two aspects—time and space. The results show that the level of agricultural green development in Qinghai Province has rose with fluctuation, but it has not yet broken through the intermediate level. In view of this, this paper proposes countermeasures such as optimizing the structure of agricultural industry, strengthening the construction of talents and infrastructure, and promoting the implementation and supervision of ecological agriculture.

1. Introduction
With the rapid development of the economy, ecological destruction and waste of resources have become the most prominent problems in economic development. The traditional economic development mode urgently needs be transform from the sustainable development of agriculture to the green development of agriculture, reflecting the innovation on the concept of agricultural development. Qinghai Province, a major ecological province and the birthplace of the Yangtze River, the Yellow River and the Lancang River, bears the responsibility of protecting the "Chinese Water Tower" and promotes the green development of agriculture. It is an inevitable requirement for implementing the spirit of the 19th National Congress and implementing the new concept of agricultural development.[1-2]. Under this background, it is of great significance to objectively evaluate the level of agricultural green development and obstacles in Qinghai Province and explore the green road of sustainable development of agriculture on the Qinghai-Tibet Plateau.

2. Status of agricultural green development in Qinghai Province
Since the development of the western region, Qinghai Province has increased investment in agriculture, adjusted the planting structure, improved the scientific and technological level of agriculture, and the agricultural economy has developed steadily.

In 2016, the agricultural economic development was stable and progressed, and the added value of agriculture reached 22.119 billion yuan, an increase of 5.4%. The grain output was 1,034,500 tons, an
increase of 0.7% over the previous year. The townships that concentrate or partially concentrate water supply in the province account for 69.1%, and the towns that treat domestic garbage account for 69.7%; The proportion of wheat cultivating area in the province reached 85.1%, and the proportion of corn cultivating area reached 60%. The towns with social welfare house and adoption institutes account for 29%; towns with nursing houses established by the local government at the corresponding level account for 15.9%. The per capita disposable income of rural residents was 8664 yuan, an increase of 9.2%; the per capita living expenditure of rural residents was 9222 yuan, increased of 7.7% over the previous year; the rural Engel coefficient decreased significantly. At the end of 2016, the province's forest coverage rate was 6.3%. The amount of agricultural chemical fertilizer application decreased by 13.5% compared with the previous year, the use of agricultural plastic film increased by 7.7% over the previous year, and the use of pesticides decreased by 0.9% compared with the previous year.

3. Estimation and evaluation of agricultural green development level in Qinghai Province

3.1 Construction of Evaluation Index System of Agricultural Green Development Level in Qinghai Province

In order to accurately access the dynamic changes of the level of agricultural green development in Qinghai Province from 2006 to 2016, we fully considered the systematicness and scientificity on indicator selection and availability on date when we set up specific evaluation indicators. Also, we established the elevation system of agricultural green development level in Qinghai Province. The research results[3]-[6] constructed the evaluation index system of agricultural green development level in Qinghai Province (see Table 1).

| Table 1. Evaluation Index System of Agricultural Green Development Level in Qinghai Province |
|-----------------------------------------------|------------------|--------------------------|---------------------------------|
| aims                                         | Primary indicator| Secondary indicators     | Three-level indicator           | Indicator attribute | Total sort weight, | Single sort weight |
| Agricultural economic development             | Economic scale   | Per capita food production x1 (kg/person) | positive           | 0.0551             | 0.1715             |
|                                              | Total planting area of crops x2 (thousand hectares) | positive           | 0.0305             | 0.0950             |
|                                              | Agricultural practitioners x3 (10,000 people) | positive           | 0.1016             | 0.3162             |
| Economic efficiency                          | Gross agricultural output value x4 (100 million yuan) | positive           | 0.0496             | 0.1544             |
|                                              | Agricultural labor productivity x5 (yuan/person) | positive           | 0.0521             | 0.1621             |
|                                              | Degree of agricultural mechanization x6 (kW/ha) | positive           | 0.0324             | 0.1008             |
| Rural social development                     | Standard of living | Engel coefficient of rural residents x7 (%) | negative          | 0.0720             | 0.1903             |
|                                              | Per capita net income of rural residents x8 (yuan) | positive           | 0.0631             | 0.1668             |
|                                              | Per capita living area x9 (m2) | positive           | 0.0665             | 0.1756             |
| Infrastructure                               | Rural hydropower construction x10 (thousand hectares) | positive           | 0.0667             | 0.1761             |
|                                              | The number of medical institutions x11 (a) | positive           | 0.0688             | 0.1819             |
|                                              | Number of mobile phones per 100 households x12 | positive           | 0.0414             | 0.1093             |
| Environmental pollution                      | Fertilizer application intensity x13 (ton/acre) | negative           | 0.0476             | 0.1584             |
|                                              | Agricultural plastic film application strength x14 (ton/hectare) | negative           | 0.0567             | 0.1888             |
|                                              | Pesticide application intensity x15 (ton/hectare) | negative           | 0.0369             | 0.1229             |
| Ecological governance                        | Forest coverage x16 (%) | positive           | 0.0609             | 0.2028             |
|                                              | Soil erosion control area x17 (thousand hectares) | positive           | 0.0678             | 0.2257             |
|                                              | Afforestation area x18 (thousand hectares) | positive           | 0.0305             | 0.1014             |

1 The original data in this paper is derived from statistic yearbook.
3.2 Evaluation of Agricultural Green Development Level in Qinghai Province Based on Entropy Weight Grey Correlation Topsis Method

This study uses the grey relation-topsis comprehensive evaluation model based on entropy weight. The main ideas are: (1) determining the weight of the evaluation index after standardization by the entropy weight method; (2) determining the ideal value (positive and negative) of each evaluation index; (3) Using gray correlation analysis to judge the closeness of the index; (4) Using the toss method to determine the relative closeness of the evaluation unit and the ideal program, and sort[7-9]. Using this method, the agricultural green development level of Qinghai Province from the time dimension of 2006-2016 and the space dimension of six prefectures and two cities in Qinghai could be elevated objectively and reliably.

3.2.1 Using entropy weight method to determine index weights

On the basis of constructing the evaluation index of Qinghai's agricultural green development level, the “Second National Agricultural Census Data of Qinghai Province”, “The Third National Agricultural Census Data of Qinghai Province” and “Qinghai Statistical Yearbook (2017)” were reviewed. The relevant raw data of Qinghai Province from 2006 to 2016 were sorted out, the data was standardized, and the weight of the index was determined by the entropy method (see Table 1).

From the distribution of the weights of agricultural green development evaluation indicators in Qinghai Province, the indicators that have an important impact on the evaluation of agricultural green development capacity are indicators of agricultural economic development, such as agricultural employees and per capita food production; Engel coefficient of rural residents and the number of medical institutions, rural hydropower construction, per capita living area, per capita net income of rural residents and other indicators reflecting rural social development; soil erosion control area, agricultural plastic film application intensity and other indicators reflecting the agricultural ecological environment. There are 8 indicators with a weight greater than 0.06, including one for agricultural economic development, five for rural social development, and two for agricultural ecological environment, which indicates that it constitutes a subsystem of Qinghai Province’s agricultural green development system. The social development subsystem is the most important. At present, the first condition for Qinghai Province to achieve green development of agriculture is to increase financial support for rural agriculture, vigorously develop productivity, strive to improve the living standards of farmers, and strengthen population quality construction and infrastructure construction; At the same time, we must pay attention to the agricultural ecological environment, reduce environmental pollution, and strengthen ecological governance.

3.2.2 Calculate the closeness of each evaluation unit

After calculating the index weights, the closeness of each evaluation unit is calculated separately (Table 3) according to the steps of the entropy weight gray correlation-topsis method. In order to reflect the dynamic change of the agricultural green development level in Qinghai Province, The table 1 was created in line with the comprehensive evaluation data in Table 2.

Table 2. Development level and closeness of various indicators of agricultural green development water in Qinghai Province from 2006 to 2016

| Years | Overview | Economic development evaluation | Social development evaluation | Ecological environment assessment |
|-------|----------|---------------------------------|------------------------------|---------------------------------|
|       | Closeness | The level of development | Closeness | The level of development | Closeness | The level of development | Closeness | The level of development |
| 2006  | 0.4119    | intermediate                  | 0.4970    | intermediate              | 0.2361    | Poor                    | 0.4385    | intermediate              |
| 2007  | 0.4083    | intermediate                  | 0.4821    | intermediate              | 0.2535    | Poor                    | 0.4472    | intermediate              |
| 2008  | 0.4272    | intermediate                  | 0.5343    | intermediate              | 0.2557    | Poor                    | 0.4427    | intermediate              |
| 2009  | 0.4614    | intermediate                  | 0.5490    | intermediate              | 0.3285    | intermediate            | 0.4961    | intermediate              |
| 2010  | 0.4423    | intermediate                  | 0.5398    | intermediate              | 0.3125    | intermediate            | 0.4573    | intermediate              |
Note: Closeness 0-0.3 is the poor level, 0.3-0.6 is the intermediate level, 0.6-0.8 is the good level, 0.8-1 is the high level.

Figure 1. The overall level of agricultural green development and level changes of various subsystems in Qinghai Province from 2006 to 2016.

3.2.3 Analysis of Agricultural Green Development Evaluation Results in Qinghai Province from 2006 to 2016

(1) Analysis of the overall level of agricultural green development. It can be clearly seen from Table 2 and Figure 1 that the level of agricultural green development in Qinghai Province has fluctuated from 2006 to 2016, and the level of green development has been continuously improved. In 2006, the Qinghai Agricultural Green Development Index was 0.4119, and in 2016 it reached 0.5777. Among them, the level of agricultural economic development during the “Eleventh Five-Year Plan” period generally showed an upward trend but declined during the “Twelfth Five-Year Plan” declined. After the decline, it began to increase again in 2012. It shows that the level of agricultural green development has improved since the second agricultural census; however, it has not changed its status at the intermediate level.

(2) Analysis of various subsystems of agricultural green development

It can be seen from Table 2 and Figure 1 that the development of various subsystems of agricultural green development in Qinghai Province is not synchronized. From the perspective of the agricultural economic system, the agricultural economic development index of Qinghai Province in 2006-2016 fluctuated, from 0.4970 in 2006 to 0.4982 in 2016, only increasing by 0.24%, and the agricultural economic development in Qinghai Province remained at the intermediate level in recent years. From the perspective of rural social development system, the social development index of Qinghai Province increased rapidly from 2006 to 2016, from 0.2361 in 2006 to 0.6779 in 2016, with an average annual growth rate of 11.12%. From the perspective of agroecological environment system, the trend of agricultural ecological environment development in Qinghai Province in 2006-2016 is basically the same as that of agricultural green development. The overall trend is a slow upward, from 0.4385 in 2006 to 0.5837 in 2016. And an average annual growth rate is 2.9%.
4. Conclusion and countermeasures for the improvement of agricultural green development level in Qinghai Province

4.1 Conclusion
(1) By constructing the evaluation index system of agricultural and green development level in Qinghai Province, using the entropy weight grey correlation topsis model to dynamically evaluate the agricultural green development level in Qinghai Province, the evaluation results are in line with the actual situation, indicating that the evaluation indicators and methods are appropriate.

(2) The results show that the overall level of agricultural green development in Qinghai Province is on the rise in 2006-2016. However, the development of the three subsystems is not balanced, among which the development level of social subsystems is the most significant, and the ecological environment subsystems are also significantly improved. The level of development of subsystems has declined, hindering the green development of rural areas in Qinghai Province.

4.2 Countermeasures for the improvement of agricultural green development level in Qinghai Province
First, Qinghai Province needs to optimize the structure of the agricultural industry and promote the healthy development of the agricultural economy. According to the needs of the market, it is important to adjust the ratio of food crops to cash crops. At the same time, Qinghai Province, as a minority area, should also vigorously develop feed crops, promote the transformation of crop plant structure to grain, economy and feed, and coordinate regional development gap. Adjust and optimize the structure, layout and scale of livestock and poultry breeding, encourage the aquaculture industry to focus on moderate scale development, strengthen the industrial linkage between animal husbandry and plantation, and improve the efficiency of agricultural resource utilization. we must accelerate the integration of the first, second and third industries and continuously increase the added value of agriculture while improve the structure of the agricultural industry.

Second, strengthen the construction of talents and infrastructure to promote social sustainability. Qinghai Province should pay attention to the education of farmers and cultivate talents in all aspects, especially those related to agriculture. In the process of green development of agriculture, it is necessary to ensure that farmers produce with technology, live in guaranty, have sales with channels, and have goals of development. It is necessary to speed up the construction of urban and rural transportation infrastructure, establish a comprehensive transportation system coordinated by roads and railways, strengthen connectivity between urban and rural areas, strengthen the construction of supporting infrastructure such as communication and electric power in agricultural and pastoral areas, and improve the public service facility for farmers and herdsmen.

Third, it has to promote the implementation and supervision of ecological agriculture and improve the agroecology and environment. Farmers should use pesticides and chemical fertilizers scientifically in the process of agricultural production, improve the utilization efficiency of pesticides and fertilizers, promote the use of organic fertilizers. In addition it need to control excessive use of chemical fertilizers and pesticides, eliminate high-toxic and high-residue pesticides, as well as improve farmland ecological environment. It is necessary to establish a green agricultural monitoring and evaluation system, strengthen the monitoring of cultivated land quality, and achieve the implementation and supervision of agricultural green development.

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