Study on Influencing Factors of Responsibility Division of Agricultural Carbon Emissions At County Level in China

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Abstract: At present, the climate change caused by the high content of greenhouse gases in the atmosphere has brought a serious impact on human society, and the development of low-carbon economy has become the universal consensus of all countries in the world. Low-carbon economy mainly refers to the process of economic development, by reducing energy consumption or developing new energy sources to replace coal and oil, etc., to reduce carbon emissions in energy consumption, thereby reducing the carbon content in the atmosphere and reducing greenhouse gases. In order to reduce the negative externalities caused by carbon emission, the implementation of carbon emission reduction policy needs to quantify the environmental pressure, and allocate the responsibility according to certain division principles. The principle of carbon emission responsibility division is not only closely related to national development interests, but also has a profound impact on global climate policy. This paper studies the division principles of County Agricultural carbon emission responsibility, and analyzes the impact of these principles on China's carbon emission responsibility, so as to seek a more equitable division principle of carbon emission responsibility for China and seek long-term stable development of the country.

1. Introduction

Since the industrial revolution, with the continuous growth of global population and economic scale, developed countries have consumed a large amount of energy in the process of industrialization, leading to a continuous increase in the concentration of greenhouse gases in the atmosphere, causing significant changes in the global climate with warming as the main feature [1]. In the process of economic production, primary production factors such as natural resources, labor resources, or capital input are produced and processed through production and processing. This economic process not only meets production and consumption needs, but also brings negative externalities such as environmental pollution [2]. In the early days of human civilization in China, people used stone and wooden tools as the main farming system, and slash-and-burn as the main farming system. At that time, the population was sparse and the sown area of crops was small, so the amount of agricultural carbon emissions produced by humans was limited [3]. In recent years, with the large-scale application of agricultural materials such as chemical fertilizers and pesticides, agricultural production has become more and more dependent on the input of fossil energy, and the resulting carbon emissions have become an important carbon source [4]. Greenhouse gas emissions directly or indirectly caused by chemical fertilizers, pesticides, energy consumption, and land plowing during agricultural production [5]. With the rapid development of global economy, production and life, carbon dioxide emissions have increased, and global natural disasters and ecological environmental problems have become increasingly serious, which have threatened the survival and development of mankind.

As a large developing country, with the rapid economic development and the rapid growth of fossil energy consumption, China has always ranked among the world's top greenhouse gas emissions. In the agricultural production process that mainly consumes raw coal, electricity and agricultural diesel,

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not only high energy consumption and low efficiency are widespread, but also with a large amount of carbon emissions, the energy saving and emission reduction situation in China's agricultural sector is grim [6]. The combination of agriculture and modern science and technology has greatly increased China's unit output of agricultural products and the commodity rate of agricultural products, but over-reliance on agricultural materials such as fertilizers, pesticides, and mulching films has caused China to face an ecological environment such as soil compaction and soil structure destruction. Question [7]. As the issue of climate warming poses a huge threat to the sustainable development of human society, a low-carbon economy based on "low energy consumption, low pollution, and low emissions" has become an inevitable choice for the transformation of the social economic development model [8]. In order to reduce the negative externalities brought about by carbon emissions, the implementation of carbon emission reduction policies needs to quantify the environmental pressure and allocate responsibilities according to a certain division principle [9]. This idea of distribution of responsibilities is essentially to reduce environmental pollution by internalizing external costs. This article studies the principles of division of responsibility for carbon emissions in county agriculture, and analyzes the impact of these principles on China's carbon emissions responsibility, with a view to seeking a fairer principle of division of carbon emissions for China and seeking long-term stable development of the country.

2. Measurement and Significance of Carbon Emissions in China's Counties

Divided by attributes, agriculture is the primary industry, and it is a basic industry that supports the construction and development of the national economy. Agricultural carbon emissions refer to the carbon emissions generated directly or indirectly in the various production links of agriculture. To achieve the goal of optimizing county industrial structure under the background of low-carbon economy, it is necessary to make comprehensive use of market regulation and policy regulation. Compared with industrial carbon emissions, transportation carbon emissions and tourism carbon emissions, the sources of agricultural carbon emissions are characterized by diversification and complexity. To promote the evolution of the county's industrial structure towards low-carbon, we must first analyze which industries will increase carbon emissions and which industries will help reduce carbon emissions. In the process of planting crops, humans' land plowing, and a series of activities such as agricultural fertilizers, agricultural mulch, pesticides, and agricultural machinery and equipment, will indirectly or directly consume fossil energy and promote carbon emissions. The theory of sustainable development of agriculture inherits and promotes the core of the theory of sustainable development. It emphasizes that in the development of agriculture, the continuous realization of technological innovation, adjustment of the farming system, and continuous satisfaction of contemporary people's demand for the quantity and quality of food crops, cash crops and poultry products [10]. Compared with the traditional high-input, high-cost and low-yield agricultural production model, low-carbon agriculture has significant advantages. It inherits the concept of sustainable development and circular economy, realizes the internal circulation of agriculture, fundamentally changes the mode of agricultural growth and consumption, and promotes sustainable agricultural development.

The object of county industrial structure optimization is the internal connection and proportional relationship between the carbon sink industry and carbon source industry in the county economy. By adjusting the structural relationship between various industries, the development of carbon sink industry is encouraged and the growth of carbon source industry is restricted. Specifically, low-carbon agriculture means that in the links of agricultural production, processing, transportation, sales, and agricultural waste treatment, it is necessary to make every effort to emit a small amount of greenhouse gases while obtaining the greatest economic benefits. The carbon emissions of different counties have different spatial cohesion effects, and due to the spatial correlation between regions, carbon emissions are highly dependent on space.

3. Element Model of County Carbon Emission

3.1 Establishment of Spatial Econometric Model

The development method of low-carbon economy is different from specific development methods. It refers to the basic operators, behaviors, attitudes and cognitive orientations in the process of achieving low-carbon economic development goals. China's carbon emissions problem is not only reflected in the increase in total emissions, but also in the spatial pattern of carbon emissions. The respiration of plants and animals converts part of the carbon ingested into carbon dioxide and releases it into the atmosphere, while the other part constitutes the organism or is stored in the organism. After the death of animals and plants, the carbon in the residues is finally discharged into the atmosphere through the decomposition of microorganisms into carbon dioxide.

Due to China's vast territory, the economic development between regions is uneven, and the consumption level varies greatly. At the same time, it is affected by physical geography and socio-economic development, so there is a big difference between per capita carbon emissions and various influencing factors. Build the model:

$$I = aP^b A^c T^d \quad (1)$$

In the formula: I is carbon emissions, P is population size, A is wealth per capita, and T is technology level. In order to directly obtain the direct impact coefficients of related factors on carbon emissions, and at the same time, to better eliminate heteroscedasticity, take the logarithm of both sides of equation (1) to obtain:

$$\ln I = \ln a + b \ln P + c \ln A + d \ln T \quad (2)$$

In the formula: b, c, d directly reflect the impact of population, wealth and technological factors on carbon emissions. lna is a constant term.

When carbon emission influencing factors penetrate the grid at a high level or are connected to a weak grid, the method of carbon emission influencing factors will change the original power flow distribution, line transmission power and the inertia of the entire system affecting the grid. In the long run, the proportion of nitrogen fertilizer in chemical fertilizers, the proportion of animal husbandry in agriculture, and the intensity of agricultural energy have a positive impact on the intensity of agricultural carbon emissions, and public investment in agriculture has a negative impact on the intensity of agricultural carbon emissions.

3.2 Calculation of Regional Carbon Emission Intensity

The inefficiency of carbon emissions is affected by factors such as the level of economic development, economic structure, trade opening, foreign direct investment, energy structure and energy policy. In the context of a low-carbon economy, the advancement of the industrial structure not only requires the continuous development of the industrial structure from low to high based on the traditional law of industrial structure evolution, but also based on the development model of the low-carbon economy, and it is more necessary to improve energy efficiency industries The proportion is to gradually reduce or eliminate industries with serious energy waste and large carbon emissions [11]. Under certain grid-connected scale conditions of the carbon emission impact factor, if the predicted output value of the carbon emission impact factor is greater than the actual available power value, the existing equipment will immediately increase the power to compensate for the missing power of the carbon emission impact factor change and maintain the system .

The emissions from fossil fuel combustion can be calculated by multiplying the recommended carbon emission factor by the total amount of fuel burned in a certain angle and city in a specific year to get the carbon emissions for that year. Spatial correlation refers to the spatial interaction relationship of specific attribute values between adjacent geographic regions, which can be specifically divided into spatial dependence and spatial heterogeneity. In the optimization process, it is necessary to perform feasibility analysis and constraint processing on the test offspring, try to

search separately in the feasible area, and improve the global optimization ability. The specific process is shown in Figure 1.
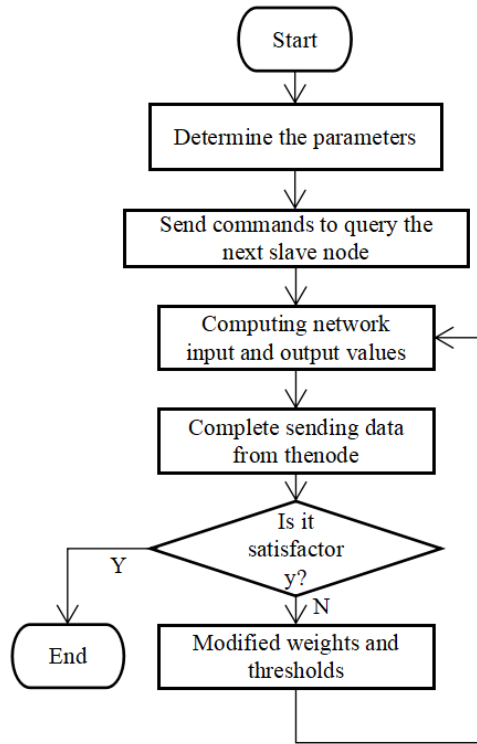

Fig.1 Algorithm Operation Process

Emission factors, the energy consumption method, can be used to estimate carbon emissions. Its essence is to calculate from the regional production side, count the consumption of common energy types, and use its carbon emission coefficient to convert all energy consumption quality into ideal coal quality. The carbon dioxide emission coefficient of standard coal uses 2.457 recommended by the Energy Research Institute of the National Development and Reform Commission. Calculate the mass of carbon produced by combustion:

$$CE = \sum_{n} E_n \times c_n \times B \times 2.457 \times 12/44 \tag{3}$$

In the formula: CE province is the carbon emission of the province; n is the serial number of the energy type; E_n is the energy consumption; c_n is the standard coal conversion factor for energy; B is the carbon oxidation rate. The electric field penetration power of the carbon emission influencing factor will affect the radiation library. The greater the electric field penetration power of the carbon emission influencing factor, the larger the required radiation reserve.

The low-carbon industrial structure must not only follow the law of industrial structure evolution, but also must be guided by the eco-economics of low-carbon economy, persistence and concomitant eco-economy, and follow the principles of low-carbon economy development. In the developing countries in the process of industrialization, the proportion of industry in the national economy will occupy a dominant position for a long time. Only after full industrialization can the service industry dominate the national economy [12]. The less the increase in carbon emission factors, the less power other devices must suppress, and the spin reserve of the system becomes negative. In the demand structure, the personal consumption structure has the greatest impact on changes in the industrial structure [13]. Personal consumption desire and consumption structure directly affect the production structure and production scale of the consumption material industry, thereby indirectly affecting the development of the production material industry required by the consumption material industry, and then affect the changes in the industrial structure. When the proportion of consumption in national income is too large, driven by consumer demand, it will promote the rapid development of industrial sectors that produce consumption materials. It is necessary to guide residents' consumption concepts,

promote reasonable consumption of residents, advocate low carbon and low consumption, guide residents to use clean energy, and improve the energy consumption structure.

4. Conclusions

County economy, as the basic unit of national economy, is facing the increasingly arduous task of industrial structure adjustment under the background of low-carbon economy development. To realize the low-carbon development of county industrial structure is of great significance and function to the development of low-carbon economy in China. Compared with the traditional agricultural production mode with high input, high cost and low output, low-carbon agriculture has obvious advantages. Restricted by natural resources, capital and technology, it is difficult for China to change its coal-based energy consumption structure in the short term. Some industries with high energy consumption need to introduce advanced new energy technologies, update new energy production equipment, improve energy extraction, transportation and utilization management, improve energy efficiency of industries with high energy consumption, and reduce energy consumption intensity. Low-carbon agriculture means that in the process of agricultural production, processing, transportation, sales and agricultural waste treatment, it is necessary to make every effort to emit a small amount of greenhouse gases and obtain maximum economic benefits. In order to achieve the win-win goal of China's economic development level and reverse the change of carbon emissions, we must accelerate the upgrading of industrial structure, develop high-tech and third-party industries and promote the development of low-carbon industries in the future. It is necessary to guide residents' consumption concept, promote residents' rational consumption, advocate low carbon and low consumption, guide residents to use clean energy and improve energy consumption structure.

5. Acknowledgment

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