Spatial Agglomeration Degree and Influencing Factors of Main Agricultural Products in Guangdong Province of China

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Abstract   This paper introduces the calculation formula and measure standard of Gini coefficient, and then measures the spatial agglomeration degree of main agricultural products in Guangdong Province by Gini coefficient. It also analyzes the influencing factors of the agglomeration of main agricultural products in Guangdong Province, and puts forward related suggestions.
Key words   Guangdong Province; Main agricultural product; Spatial agglomeration degree; Influencing factor; China

Spatial agglomeration of agricultural product refers to the organic geographical combination of similar agricultural products in the field of agricultural production, taking a particular region as the basic support unit; thus distribution of agricultural production is relatively concentrated. Spatial agglomeration degree of agricultural product means the agglomeration degree of agricultural products in the geographical space under the influencing of economic benefits, cost savings, technology sharing and other factors, that is, the agglomeration degree of the production layout of agricultural products.

Characteristic of spatial agglomeration of agricultural products is increasingly significant in recent years. However, there are few researches on the agglomeration degree and influencing factor of agricultural products, which is not conducive to the guidance of future agriculture development, especially the optimization of agricultural production layout. Therefore, this paper uses Gini coefficient to measure the spatial agglomeration degree of agricultural products in Guangdong Province. It then further explores the factors influencing the spatial agglomeration of main agricultural products and their operation mechanism in order to provide reference for the future layout adjustment of agricultural production.

1 Research method

Gini coefficient is put forward by the Italian economist Gini according to the Lorenz Curve. Gini coefficient is a statistical index to quantitatively measure the difference degree of income distribution. When studying on the industrial cluster, American economists introduced Gini coefficient as an important index to measure the agglomeration degree of a given industrial agglomeration at the end of 1980s. Keebleetc uses both of Lorenz Curve and Gini coefficient to measure balance degree of industry in regional distribution. Krugman calculated the locational Gini coefficient of 3 digit industry in America[1]. Scholars in China have begun to use the Gini coefficient to study the equilibrium of industrial regional distribution in China in recent years. Gini coefficient is applied in the research of China industry, IT industry in Yangtze River Delta and the regional agglomeration degree of Shanghai manufacturing by Liang Qi, Wen Mei, Liu Bin, Chen Qi, Dai Zhi-peng et al[1−4]. Study on spatial agglomeration degree using Gini coefficient by Chinese scholars mainly focuses on industry and its sub-industries, and pays little attention to agriculture. Therefore, we use Gini coefficient to study on the difference degree of regional distribution of main agricultural products in Guangdong Province of China.

1.1 Calculation formula of Gini coefficient   Formula for calculating the Gini coefficient does not form a unified standard. Many scholars in China have proposed amendments for the application of Gini coefficient in China. We adopt the calculation formula of Gini coefficient used by Wen Mei to calculate the spatial agglomeration degree of agricultural products in Guangdong Province[2]. The formula is

$$G = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} |K_i - K_j|}{2n^2 \bar{u}_k},$$

where n is the number of statistical cities, K_i is the proportion of the scale of product K in city i to that of Guangdong Province, K_j is the proportion of the scale of product K in city j to that of Guangdong Province, and $\bar{u}_k$ is the mean value of the proportions of the scale of product K in cities to of Guangdong Province.

1.2 Measure standard of Gini coefficient   When calculating the agglomeration degree of agricultural products by Gini coefficient, value close to 0 indicates the equilibrium distribution of agricultural products; and the value close to 1 shows the disequilibrium distribution, that is, the high agglomeration degree. Considering the specificity of agricultural production layout, standards for measuring the difference degree of spatial distri-

bution of main agricultural products in Guangdong Province can be classified into 6 grades (Table 1).

Table 1   Measure standards of Gini coefficient for spatial distribution differences of main agricultural products

Range	Spatial distribution
<0.2	Absolute equilibrium
0.2 −0.3	Comparative equilibrium
0.3 −0.4	Relative equilibrium
0.4 −0.6	Relative agglomeration
0.6 −0.8	Comparative agglomeration
>0.8	Absolute agglomeration

2   Gini coefficient of the main agricultural products in Guangdong Province

We select several main agricultural products in Guangdong Province—paddy, sugarcane, vegetables, tea, longan and litchi. Gini coefficients of these six main agricultural products are calculated by using the crop acreage and yield data from the 2006 *Rural Statistical Yearbook of Guangdong Province* and the 2008 *Rural Statistical Yearbook of Guangdong Province*. And the Gini coefficients are used for measuring the spatial agglomeration degree of agricultural products (Table 2). Calculation result shows that Gini coefficients calculated by the two indices of sowing area and yield are similar. And agglomeration degrees are the same, indicating that it is viable and scientific to use these two indices to calculate the Gini coefficients of agricultural products. Gini coefficients of the 6 main agricultural products (except longan) in 2007 are higher than those in 2005, indicating that the spatial distribution of major agricultural products in Guangdong is increasingly concentrated and the degree of agglomeration is increasing. Gini coefficient of sugarcane is the biggest, which exceeds 0.86 in the two years; and its spatial distribution shows absolute agglomeration. Gini coefficients of tea, longan and litchi in the two years of 2007 and 2005 are all slightly larger than 0.60, showing that their spatial distribution is comparative agglomeration. Spatial distribution of paddy changes from relative equilibrium distribution in 2005 to relative agglomeration distribution in 2007. Vegetable shows relatively balanced spatial distribution with lower spatial agglomeration degree.

3   Influencing factors of the agglomeration of main agricultural products in Guangdong Province

3.1   Resources   Resources are the foundation factor influencing the agglomeration of agricultural products in the development course of modern agriculture, including land, climate, water and biological resources. The regional differences of the combination can determine the type of agricultural products, production scale and quality. For example, tea has higher agglomeration degree and mainly distributes in the mountainous area of eastern and northern Guangdong Province. This is because terrain has great impact on the tea quality. Mist covered mountainous area in eastern and northern Guangdong Province have diffuse light, great temperature difference between day

and night, high air humidity, and superior ecological environment, which are conducive to the growth of tea, and can produce high-quality tea. Longan and lichi have high agglomeration degree, mainly distributed in western Guangdong. These are because that the soil, light, heat and water resources in western Guangdong are of benefit to produce high − quality tropical fruits.

Table 2   Comparison of the Gini coefficient of main agricultural products in Guangdong Province in the years of 2005 and 2007

Agricultural product	Area index		Yield index	
	2005	2007	2005	2007
Paddy	0.379 2	0.413 3	0.383 3	0.420 8
Sugarcane	0.864 6	0.911 3	0.860 4	0.911 2
Vegetable	0.335 8	0.365 0	0.336 5	0.370 5
Tea	0.651 8	0.651 0	0.620 6	0.646 7
Longan	0.669 4	0.661 1	0.646 9	0.642 1
Litchi	0.616 8	0.644 0	0.629 4	0.662 2

3.2   Production habit   Production habit is another basic factor influencing the agglomeration degree of main agricultural products in Guangdong Province. Production habits in different areas are accumulated through a long period of time based on local resources, which determines what the peasant produce and how to produce it. For example, agglomeration production of tea is due to the superior resources in eastern and northern Guangdong Province; and peasants have the habit of tea production. Most areas of Guangdong Province are suitable for rice planting, and there is a tradition of rice planting ever since ancient times. Therefore, the rice is planted in low agglomeration degree. Production habit is a relatively stable element and is changeable. Production habit of peasants has been changed quietly with the development of economy, science and technology. The integration of modern technology and traditional production technology has enhanced the production skills of peasants, has shown certain impact on the production type, quantity and quality, and has affected the spatial agglomeration of agricultural product.

3.3   Market   Market is a core element to promote the agglomeration of main agricultural products in Guangdong Province. Unlike the production objective of traditional agriculture, its aim is to meet the needs of producers, and has significant characteristics of self-sufficiency. Modern agriculture is the commercialization of agriculture in a market economy. Its purpose of production is to meet market demand, to realize market exchange of agricultural products, and to obtain economic benefit. Therefore, the ultimate goal of agricultural production is to satisfy the market needs for type, quantity and quality of agricultural products so as to obtain market benefit of agricultural products. If the supply of agricultural products matches the market demand, market benefit of agricultural products is in good condition, which can enlarge the production scale of peasants, and improve the spatial agglomeration degree of agricultural products.

However, the market demand is changeable, which changes with the development of social economy and technology. This leads to the variation of the type of agricultural products in

different areas, and also changes the spatial distribution of agricultural products. Taking sugarcane production as an example, the Pearl River Delta Area was once an old sugarcane area in Guangdong Province with long history, good foundation and relatively high production level. It has obvious advantage in both natural resources and production habit. However, sugarcane production is mainly distributed in Zhanjiang City at present. This is because market demand of agricultural production has changed in the Pearl River Delta Area with the development of economy. And the comparative benefits of other crops are higher than the sugarcane in Pearl River Delta Area. Therefore, there is an outside moving of sugarcane production. Climatic condition of Zhanjiang City is very suitable for the development of sugarcane. Besides, Zhanjiang City has abundant land and the habit of sugarcane production. Sugarcane produced in this city not only meets the demand of market, but also can obtain higher market benefit than other dry crops. Therefore, sugarcane production has significant comparative advantage; and Zhanjiang City becomes the major area for sugarcane production.

3.4 Science and technology Science and technology have provided strong technical support for the spatial agglomeration of main agricultural products in Guangdong Province. They are the flow elements influencing the agglomeration of agricultural products during the development of modern agriculture. Impact of science and technology on agricultural development can be seen everywhere during the course of modern agricultural production. Biotechnology is widely used in breeding, sowing, seedling culture and other production processes, which improves varieties and habits of agricultural products, expands the scope of agricultural cultivation, and creates conditions for the industrial production. Computer, remote sensing and other information technology are widely applied in the monitoring, management and pest control during agricultural production, which reduces the risk of agricultural operation, and ensures the smooth development of agricultural production. Development of the advanced technologies of processing, transportation and sale in agricultural products has provided basic conditions for the agglomeration production of agricultural products from production to sale, and has solved the problem of sales of agricultural products[5]. For example, litchi has short mature stage and is neither storable nor transportable. It is easily to grow brown and decayed after harvest, thus its commercial value is lost. Therefore, the development of preservative technology, the storage technology and automobile transportation technology is an important condition for the improvement of fresh-keeping of litchi. Litchi can be stored for 5 –7 d at room temperature, and for 34 d at low temperature. But the storage period can reach 45 – 60 d by using sulfuring technology and compound chromatic agent[6]. Extension of preservation period of litchi will lead to the further development of litchi agglomeration production.

3.5 Circulation Circulation is another flow element promoting the spatial agglomeration of agricultural products. Agricultural products flow from peasants to consumers after production. Thus, exchange of agricultural products is achieved in order to obtain market benefit. Circulation of agricultural products

has resolved actual difficulties of the agglomeration production of agricultural products in modern agricultural economy. This is mainly reflected in two aspects. Firstly, the continuous development of science and technology promotes the transportation, preservation, refrigeration and other technologies, and makes long-distance transport of agricultural products possible. Some agricultural products can realize agglomeration production far away from the consumer market. Thus, the production layout of agricultural products is changed. Secondly, development of sale technology of e-commerce, as well as the establishment of wholesale markets and intermediary organizations, leads to the improvement of circulation system of agricultural products. Smooth flow of agricultural products has solved the problem of sales of agricultural products, and has eliminated difficulties of agglomeration production. Meanwhile, circulation of agricultural products requires the large-scale production of agricultural products.

4 Conclusion

It is found out that the spatial agglomeration characteristics of main agricultural products in Shandong Province are increasingly clear by calculating their Gini coefficients. Spatial agglomeration degree of sugarcane in the year 2007 is the maximum, and those of tea, longan, litchi and paddy are relatively high. The spatial agglomeration degree of vegetable is the minimum. Factors influencing spatial agglomeration degree are market, natural resources, traditional habits, circulation condition, and scientific and technological level. Among them, changes of market, circulation condition, and scientific and technological level have more and more significant impact on the spatial distribution of agricultural products.

Due to the effects of resources, market, circulation condition, science and technology on agricultural layout, we put forward several suggestions on the agricultural development in future in Guangdong Province taking the relative measures of domestic and international agricultural regulation as references. The aim is to improve the spatial agglomeration degree of main agricultural products, and to promote the development of agricultural cluster. ① Perfect the system of laws and regulations. Speed up the construction and improvement of laws and regulations related to farmland protection, industrialization management, safety standards for agricultural products, and agricultural intellectual property protection, in order to provide a legal basis for the integrated control of industrial agglomeration. ② Increase financial support. Make regional support policy; enhance the investment on agricultural infrastructure in backward areas; enhance the support for leading enterprises and professional associations; and further promote the development of agricultural industry cluster. ③ Strengthen the scientific and technological means. Improve the investment in science and technology system; strengthen the science and technology popularization; and ensure the quality and safety of agricultural products in agglomeration production. ④ Improve the circulation system. Accelerate the improvement of market intermediaries and the electronic information networks of agriculture in order to resolve the sales problem of agricultural products.

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江苏省农村环境治理问题的思考

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摘要 介绍了中国江苏省农村环境存在的一些问题:①水环境污染;②固体废弃物污染;③农用化学品污染;④工业企业污染。分析了江苏省农村环境问题产生的原因:一是对农村环境保护重视不够,环保人员严重缺乏,人员素质有待提升;二是农村环保投入严重不足,没有固定的污染治理资金来源和明确的投入引导政策及相关的财政补贴;三是农村环境综合整治没有形成合力,力量分散,资金使用效益受到影响;四是农村生产和生活方式的改变,使农业和农村生态系统的良性循环遭到破坏;五是乡镇企业对农村环境的污染,乡镇企业绝大部分没有防治污染的设施,工业"三废"严重超标。提出了江苏省农村环境治理的相关措施:一是完善基层政府政绩考核指标体系;二是建立多元化农村环保投入机制;三是加强农村环境管理队伍建设;四是提高农村公民的环保意识;五是完善农村环境保护法规;六是治理工业污染,包括严格控制工业废水的排放、提高污水处理标准;普遍实行环境容量总量控制制度和排污权交易制度、严格控制工业造成的大气污染;七是进行水环境综合治理;八是治理固体废弃物污染;九是治理土壤污染;十是运用先进科技治理污染;十一是构建生态农业系统。

关键词 农村;生态;环境治理

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广东省主要农产品的空间集聚度及其影响因素分析

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摘要 简要回顾了基尼系数在衡量产业区域分布差异程度方面的国内外文献,介绍了基尼系数的修正计算公式及衡量农产品集聚程度时的标准,分为 6 个等级:绝对均衡、比较均衡、相对均衡、相对集聚、比较集聚、绝对集聚。根据中国广东省 2005 和 2007 年主要农产品(稻谷、糖蔗、蔬菜、茶叶、龙眼和荔枝)的播种面积和产量数据,分别计算了广东省 6 大主要农产品的基尼系数值。结果表明:以播种面积和产量两个指标分别计算的基尼系数值相近,反映的集聚度相同;除龙眼外,广东省主要农产品空间布局相对集中,集聚度逐年增加。分析了广东省主要农产品集聚的影响因素:①资源,是影响农产品集聚生产的基础因素,各资源组合的地区差异,决定了农产品类型、规模和质量的差异;②生产习惯,一定程度上决定了农户生产什么及如何进行生产;③市场,是促使广东主要农产品集聚的核心因素,市场需求的变化将改变农产品生产的空间布局;④科技,为广东主要农产品的空间集聚提供了强有力的技术支撑;⑤流通,科技的发展使农产品的远距离运输成为可能,由此改变了农产品的生产布局,农产品的顺畅流通解决了农产品集聚生产的销路问题。提出了提高广东省主要农产品空间集聚度、促进农业产业集聚发展的相关建议。

关键词 广东省;主要农产品;集聚度;影响因素