Promoting the Empowerment of Science and Technology to Ensure Food Safety Production: A Case Study of Huizhou City

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Abstract The current situation of grain production in Huizhou City was analyzed firstly, and then the existing problems and challenges of grain safety production were pointed out, such as increases in the pressure to ensure grain safety production and the difficulty of stable development of grain production. Finally, several countermeasures and suggestions for the stable development of grain production were put forward.

Key words Food security, Huizhou City, Science and technology, Grain production capacity

1 Current situation of grain production in Huizhou City

The empowerment of science and technology should be promoted to support grain production. General Secretary of the Communist Party of China (CPC) Central Committee Xi Jinping pointed out that "the fundamental solution to the problem of eating is science and technology". Science and technology should be as an important support for improving overall grain production capacity. Huizhou City, Guangdong Province is a major grain-producing city, with the total grain sowing area of 112 100 ha and annual grain yield of 609 100 t in 2021, and the grain production was basically stable. In recent years, Huizhou City attaches great importance to grain production and takes grain production as an important work to ensure food security. It is necessary to implement favorable agricultural policies, promote the construction of high-standard farmland, promote good varieties and methods, and popularize the comprehensive mechanization of farming. Under the influence of frequent droughts and other adverse weather, Huizhou has achieved the increase in grain yield, and improved the comprehensive production capacity of grain. The quality of cultivated land has been steadily enhanced, and the demonstration and promotion of better varieties and methods and the ability of disaster prevention and reduction have been continuously improved, but there are still problems such as weak agricultural infrastructure, low grain industrialization level, and low income from grain growing, and the supporting and leading role of science and technology in the comprehensive production capacity of grain[1].

2 Main problems

2.1 Increase in the pressure to ensure grain safety production Under the current background of increasing farmers' income, the traditional planting industry, which mainly focuses on food crops, faces structural adjustment. The planting of food crops is greatly impacted by the planting of non-food cash crops, and the problem of food security is more prominent. Moreover, the planting of non-food cash crops has blind expansion under the influence of market supply and demand. The first influencing factor is low income from grain growing. In recent years, the cost of rice planting is high, and the benefit of rice planting is low, which greatly affects the enthusiasm of farmers to grow grain. The second factor is labor force. Labor shortage, young and strong labor shortage, and increase of rural migrant workers year by year have a certain impact on grain production. The third factor is the price of agricultural production materials. Since 2021, the price of agricultural production materials has risen considerably, so that the production cost for farmers has increased, and the price of some agricultural products has fluctuated. If the price of agricultural production materials continues to rise throughout the year, it may affect the willingness of farmers to produce and the price of agricultural products. Besides, the land transfer rate is difficult to improve. Developing new types of grain growers is faced with confusion. Due to the increase in the price of agricultural production materials, labor and land rents and agricultural production cost, the inability to rent in continuous plots and short lease period, and imperfect social services, *etc.*, the stability and sustainable development of grain production have been restricted.

2.2 Increase in the difficulty of stable development of grain production Due to the influence of cultivated land resources, meteorological disasters and low comparative benefits of grain production, especially the impact of drought in recent years, it is more difficult to steadily develop grain production. Firstly, the development of new agricultural operating entities is lagging behind. For instance, leading agricultural enterprises have weak scientific and technological innovation ability, low scale effect, and generally low operating efficiency, and there are fewer agricultural product processing enterprises, especially intensive processing enterprises. Secondly, the rural management force is seriously insufficient. Although the phased reform of the collective property rights system has been completed, the daily work of rural operation and management is still heavy. For example, the asset management of collective economic organizations, property rights transfer services, property verification and capital verification, contract supervision, contracted land management, homestead management,

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collective economic development and other rural operation and management work are concentrated in towns. Unsound grassroots rural management system, unstable team, force mismatch, and other problems are prominent.

3 Countermeasures and suggestions

3.1 Implementing favorable policies for agriculture Firstly, it is necessary to strengthen the publicity and implementation of policies to support agriculture and benefit farmers, such as subsidies for arable land, rice subsidies, and agricultural insurance, and mobilize the enthusiasm of grain farmers, fund for grain production and development and the prevention and control of diseases and insect pests of major crops, and give priority to supporting grain production and development. Secondly, it is needed to effectively build high-standard farmland, protect and improve the quality of farmland, make full use of abandoned land to develop agricultural production, and strictly prevent non-grain of farmland. Thirdly, it is necessary to increase support for major grain-producing counties (Huidong, Boluo, Longmen and other counties and districts) and towns, and improve policies on facility agricultural land. Fourthly, college graduates, educated young and middle-aged people and farmers returning to their hometowns should be encouraged and supported to engage in grain production.

3.2 Using cultivated land resources scientifically and rationally to strengthen the foundation for grain production It is necessary to strengthen the protection and quality construction of cultivated land and the material foundation for grain security. Arable land is the lifeblood and the main carrier of grain production. Firstly, the red line of arable land should be ensured. The red line of arable land is the dam of food security. To protect arable land is to protect food production and keep people's jobs. It is needed to resolutely curb the use of farmland for non-agricultural purposes, strictly control the non-grain use of farmland, and strictly control the conversion of cultivated land into other agricultural land in accordance with laws and regulations. Secondly, the quality of existing cultivated land should be enhanced. It is necessary to strengthen the upgrading of farmland infrastructure, combine newly-added construction with upgrading, give priority to building high-standard farmland in functional grain production zones and permanent basic farmland, and improve grain production and planting conditions. Thirdly, it is necessary to strengthen the construction of high-standard farmland, combine it with high-efficiency water-saving irrigation, popularization and application of agricultural machinery and agronomic technology, and construction of green and standardized production bases, improve the comprehensive grain production capacity of cultivated land, ensure basic grain self-sufficiency and absolute grain security, and build a solid material foundation for food security[2-3].

3.3 Innovating technology to ensure grain production capacity Science and technology can help improve the quality and efficiency of agricultural production and enhance the scientific and technological basis of food security. Arable land is limited, and scientific and technological progress is unlimited. Under the condition of stable cultivated land, in order to meet the growing food demand and ensure the sustainable and stable growth of grain output, it is needed to innovate technology to ensure the increase in grain output. Firstly, the promotion and application of excellent varieties should be increased. In the process of production and planting, emphasis should be placed on the promotion of excellent varieties to increase grain yield and improve the coverage rate of grain varieties. Combined with the market demand, high yield is taken as the target, so that varieties can be gradually promoted according to introduction, multi-point demonstration and other conditions, and high-quality rice and green organic rice should be selected reasonably to improve the output rate of paddy field. Secondly, soil testing formula and fertilization should be conducted scientifically. According to the formula of soil testing and relevant national regulations, the fertilization method should be optimized constantly to improve the utilization rate of chemical fertilizer. On the one hand, farm fertilizer should be applied, and the promotion of commodity organic fertilizer should be accelerated; on the other hand, chemical fertilizers should be applied scientifically to effectively restore the ecological environment, so as to protect the environment and improve the level of food production[4]. Thirdly, the pace of grain industrialization should be accelerated. It is necessary to vigorously develop food industrialization management organizations such as Banyongkang, Shunxilai and other rice industry enterprises and cooperatives, cultivate food industry brands, extend the industrial chain, improve the added value of food products, and increase the enthusiasm of farmers to grow grain. Fourthly, the capacity for disaster prevention and mitigation should be enhanced. It is needed to establish a sound monitoring, forecasting and early warning system, strengthen the monitoring of agricultural disasters, observe the situation of disasters in real time, and actively take disaster prevention measures.

3.4 Implementing the policy of "reserving grain in people's hands" to ensure agricultural technical talents Farmers are the main players in adjusting grain structure. To ensure that farmers are willing to adjust, are able to adjust, and are stable, it is necessary to prevent their income from shrinking, and only in this way can farmers' enthusiasm for growing grain be maintained. Firstly, the scientific, technological and cultural quality of grain farmers should be improved. Farmers are the main body of agricultural production, and their scientific and cultural quality directly determines the development level of agricultural productivity, which not only affects the increase in farmers' income, but also restricts the improvement in agricultural labor efficiency[5]. Secondly, community-level agricultural technology training should be strengthened. A combination of online and offline methods is adopted to conduct scientific and technological training, experiments and demonstrations, breed and promote superior local varieties, and guide farmers to carry out agricultural production activities in an orderly manner, so that farmers can acquire more production skills, and improve the efficiency of grain growing by increasing the content of science and technology. Thirdly, a new and diversified agricultural extension system should be built. At first, more researchers should be encouraged to participate directly

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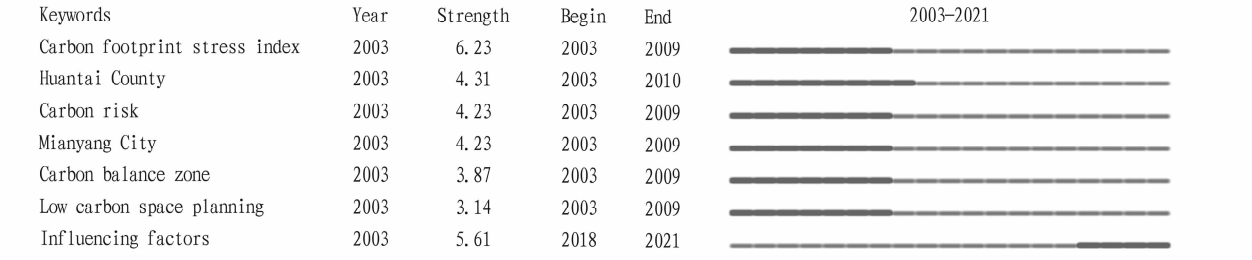

Fig. 4 Keywords with the strongest citation bursts in 2003 – 2021

4 Conclusions and discussion

With the aid of CiteSpace software, we analyzed the relevant literature in the field of land use and carbon emissions in terms of time, author network and keyword analysis, and presented the research topics and development overview of the literature in this field in China. We arrived at the following conclusions.

(i) In terms of time dimension, China's land use and carbon emission research started relatively late, and has experienced a period of stagnation for nearly five years. However, with the advancement of national policies and the popularization of low-carbon concepts, more and more scholars have begun to study this field. Since 2010, the number of publications in this field has entered a new stage, and a relatively complete research network has gradually formed.

(ii) The author analysis shows that Chinese scholars present a relatively close research status in this field, and mainly focus on group cooperation, with less independent research. What's worse, there are problems of little contact and cooperation between groups.

(iii) Keywords and burst words convey the research focus and dynamics of the field. Among them, key words such as carbon emission, land use, carbon footprint stress index, carbon footprint, land use change, and low-carbon development together constitute the main content and hot issues of research in this field.

On the whole, China's research on land use and carbon emissions started relatively late, and the intersection with other disciplines is weak. Compared with the perspective of "land use", more literature focuses on the exploration and research of "carbon emissions". At present, relevant research still lacks in-depth research at the micro level, and the main reason may be that the availability of relevant data is weak. However, the continuity of the research theme is relatively good, and the analysis is mostly combined with the actual land use status and regional conditions in China. More and more scholars have started to use empirical methods to measure carbon emissions in different regions, different land types, and different land use methods, and pay more attention to research in a macroscopic direction.

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in the popularization of agricultural technology. Scientific and technological personnel are encouraged to form a community of economic interests with farmers, especially large professional enterprises and leading enterprises, in the form of capital investment and technology equity participation, which not only arouses the enthusiasm of scientific and technological personnel, but also shortens the path for the transformation of scientific research results. Thus, a large number of scientific and technological personnel are encouraged to go deep into the grassroots to provide farmers with technology, management, marketing and other comprehensive services. Besides, the role of agricultural leading enterprises in the extension of agricultural technology should be given play to. Leading enterprises are encouraged to set up their own research and development institutions or join forces with other agricultural research institutions to improve their scientific and technological content, and solve farmers' technical problems by providing them with pre-production, in-production and post-production services. In addition, non-governmental institutions for spreading agricultural technology should be vigorously developed and supported. For example, in the extension of agricultural technology, the role of professional associations and large growers should be given full play to.

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