"Non-grain" Characteristics of Cultivated Land in Taihu Lake Basin - Taking Village D in Jiangsu Province as an Example

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Abstract: Cultivated land is an important basis for food production, and food is also the basis for human survival and development. Therefore, the food problem of 1.4 billion people should be solved from the perspective of cultivated land protection. In the short run, although the "non-grain" behavior of cultivated land can help farmers improve their income, it will pose a certain threat to the national food security in the long run. Taking village D in Jiangsu Province as an example, this work used ArcGIS software to compare the two phases of land data based on the second national land survey data (2009) and land use status data (2018), identified the "non-grain" plot of cultivated land, studied its driving forces, and finally put forward relevant suggestions.

1. Introduction

In September 2020, the State Council issued a notice to resolutely stop the "non-agricultural" behavior of cultivated land, proposing six prohibitions. In November 2020, Secretary Xi Jinping made important instructions on the reform of rural land system and contracted management in rural areas. He stressed that the use of contracted land should be strengthened, and agricultural use should be adhered to. The non-grain conversion of grain land should be effectively curbed, and the non-agricultural of farmland should be strictly prohibited. The state pays increasingly attention to the protection of cultivated land, and yet the phenomenon of cultivated land loss has been happening.

Zhu Shan (2013) found that the "non-agricultural" of farmland circulation is emerging, and "non-grain" has become the mainstream through the field investigation of Lanzhou, Tianshui, Wuwei and Jinchang in Gansu Province [1]. Cheng Chuanxing (2014) found that the rate of cultivated land loss was highly correlated with grain import and export volume based on statistical data analysis, and urbanization development was the main reason for cultivated land loss [2]. Jin Jing (2010) explained the current situation of market failure and government failure by analyzing the market structure and allocation mode of farmland conversion in China, and put forward the framework of optimizing the current policy in view of these problems [3]. Liu Dan (2017) sorted out China's land transfer policies and explored the driving forces of non grain oriented behavior in the process of land transfer, and found that the return of non grain oriented behavior has a great impact on China's grain output, cultivated land quality and farmers' enthusiasm for growing grain [4].

2. Analysis on the Characteristics of "Non-grain" in Village D

2.1 Basic information of village D

Village D is located in the south of Jiangsu Province, with an area of 9.77 square kilometers and a polder area of 10,000 mu. It has 18 natural villages and 33 villagers' groups under its jurisdiction. There are 1238 peasant households with a population of 4280 people. The cultivated land area of village D was 8924 mu in 2009 and 4834 mu in 2018, which decreased by nearly half in nine years. Therefore, it is more appropriate to use village D as a case for the study of "non-grain" of cultivated land.

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2.2 Research methods and data sources

The land data comes from the second national land survey (2009) and land use data (2018). Socio-economic and agricultural data are derived from local statistical yearbooks, as well as from field surveys.

Due to the different working modes of land use data in the two phases, there are certain differences in land classification standards. First, the two phases of land use data are re-coded to facilitate the statistical transformation between cultivated land and other land use types. Second, the "union" tool in ArcGIS software is used to overlay the two phases of land use data, thus identifying land use changes.

2.3 Characteristics of land use change in village D

According to the land data comparison of the two phases, the area of 11 land use types changed from 2009 to 2018. The current area of cultivated land, residential land, special land and other land increased compared with 2009. The current area of garden land, forest land, commercial land, industrial and mining storage land, public management and public service land, transportation land, water area and water conservancy facilities land decreased compared with 2009. Although the area change involves many land types, there are great differences in area and quantity. For example, the area of cultivated land decreased by 4089.44 mu, while other land decreased by only 15.54 mu. The land area for water and water conservancy facilities increased by 3993.18 mu, while the land for transportation increased by only 5.17 mu. Among the 11 types of land, the area of cultivated land, water area and water conservancy facilities changed the most. Therefore, the following will be carried out to study the two types of land use changes.

Table 1. Changes of land area in village D

Land classes	Area/mu 2009	Area/mu 2018	Change area/mu
Cultivated land	8924.20	4834.76	-4089.44
Garden land	34.37	82.25	47.88
Forest land	0.00	244.13	244.13
Grass land	0.00	0.00	0.00
Commercial land	0.00	8.08	8.08
Industrial and mining storage land	0.00	115.12	115.12
Residential land	1063.41	785.20	-278.21
Public management and public service land	0.00	47.65	47.65
Special land use	51.15	33.13	-18.02
Transportation land	320.22	325.40	5.17
Water area and water conservancy facilities land	4242.60	8175.77	3933.18
Other land	23.79	8.25	-15.54

The cultivated land area of village D was 8923.20 mu in 2009 and 4834.76 mu in 2018, with a cumulative decrease of 4089.44 mu in nine years, accounting for 27.90% of the administrative area of village D. The conversion of cultivated land also includes other land types, and the specific conversion is shown in Table 2.

Table 2. Cultivated land conversion in village D

Land classes	Transfer out area/mu	Transfer IN area/mu	Change area/mu
Garden land	13.70	5.75	-7.95
Forest land	128.33	0.00	-128.33
Grass land	4.61	0.00	-4.61
Commercial land	0.28	0.00	-0.28
Industrial and mining storage land	13.60	20.29	6.69
Residential land	0.66	0.00	-0.66
Public management and public service land	7.80	1.78	-6.03
Special land use	56.89	3.94	-52.95
Transportation land	3993.64	96.50	-3897.13
Water area and water conservancy facilities land	7.15	8.98	1.83
Other land	4226.67	137.24	-4089.43

Note: the transferred out area in 2009 refers to the reduced cultivated land area; The transferred area in 2018 refers to the increased cultivated land area.

It can be seen from table 2 that the reduced cultivated land mainly turned into water area and water conservancy facilities land, with an area of 3897.13 mu, accounting for 95.30% of the total reduced cultivated land.

Water area and water conservancy facilities land are divided into 10 secondary land types, and their uses are quite different. In order to make clear the specific use of the newly increased water area land, it is necessary to further study the quantitative relationship between the two types of land. There are five secondary land types involved in the transformation of cultivated land and water area in D village, which are river surface, lake surface, pit and pond surface, ditch and hydraulic construction land in order. Its area is -58.29 mu, -34.44 mu, 3872.22 mu, 86.38 mu and 31.28 mu in turn. It is obvious that the change of cultivated land use in village D actually occurs between "cultivated land" and "water area". Cultivated land is mainly responsible for food production, and the difference of secondary land use is small. However, the difference of secondary land use in water area is large. It needs to discuss the secondary land use. Therefore, the land use change of village D occurs between "cultivated land" and "pond water surface". Combined with the actual situation of village D, "pond water surface" is actually "breeding water surface", which leads to the problem of "non-grain" cultivated land.

3. The Influence of Cultivated Land "Non-grain" on Food Security

In order to realize the development of agricultural modernization, land circulation is an important measure, which can not only optimize the allocation of land resources, but also timely adjust the structure of agricultural production. The original intention of land circulation is to promote the intensive use of land and the integration of capital, technology, labor and other production factors, thus realizing the large-scale operation of land [5]. In practice, some industrial and commercial capital transfers cultivated land on a large scale and changes to non grain crops. If these problems are allowed to develop, they will affect the national food security [6]. At present, although the non grain cultivated land has not posed a substantial risk to China's food security, this issue has to be paid attention to in the long run.

According to previous studies by scholars, every 1% increase in grain sown area increases grain yield by 0.88% [7]. It shows that cultivated land plays a fundamental role in food security. Land transfer can make some cultivated land into high-income cash crops, can also be transformed into sightseeing agriculture, and even converted to non-agricultural activities. These behaviors will undoubtedly bring some pressure to the local food production, and then threaten the food security of the whole country.

Although aquaculture still belongs to large-scale agriculture, the migrants tend to farm on a large scale. According to different varieties of aquaculture, the depth of aquaculture ponds is not the same. These behaviors will inevitably cause certain damage to the fertility of cultivated land, and it is difficult to restore the transformed land to the cultivated land that can grow food [8]. On the other hand, due to the extensive and high-intensity characteristics of the traditional agricultural management mode, the degradation of cultivated land fertility, the expansion of polluted area and the low content of organic matter will undoubtedly affect the overall quality of agricultural land.

4. Research on the Driving Force of Cultivated Land"Non-grain" in D village

Village D has transferred nearly 4000 mu of cultivated land in nine years, accounting for half of its cultivated land area. It can be seen that the phenomenon of cultivated land "non-grain" in village D is very obvious. Due to the transferred cultivated land is mainly used for aquaculture, this phenomenon is also common in Taihu lake basin. Therefore, it is of great significance to study the driving force of cultivated land "non-grain" in village D.

4.1 Location factor

D village is located in the polder area. The flat land provides a prerequisite for the villagers to excavate fish ponds, which lays a foundation for future large-scale operation. In order to turn cultivated land into ponds, the problem of water diversion and drainage should be solved first. In the west of village D, there is a river running through the north and south, and there are many rivers around it, which provides great convenience for the water diversion and drainage of ponds. Village D is adjacent to the river in the west and the highway in the left. Land and water transportation also offer strong support for the transportation and sales of products in village D.

4.2 Economic factors

One of the most important reasons for the loss of cultivated land in China is the low income from grain production. In an interview with the director of village D, we learned that the income of farmers from grain production is about 600 yuan per mu, not more than 1000 yuan at most. However, if the cultivated land is dug into ponds for breeding, the income is about 5000 yuan per mu. If it is good, the income can be more than 10000 yuan per mu. Although the government has agricultural subsidies, it is only 120 yuan per mu. However, the annual cost of pesticides and chemical fertilizers is far greater than the amount of subsidies. Although there are insurance services for grain planting and aquaculture, aquaculture has an absolute advantage in terms of income, and farmers are more willing to choose aquaculture industry.

According to the actual situation of village D, most villagers tend to choose to transfer the land to the collective, and the collective transfer the land to large farmers for large-scale breeding. This has three advantages. First, the average circulation area of each household is 52 mu according to the aquatic area statistics of village D in 2018. The average land circulation fee is 852 yuan per mu, and the farmers' land circulation fee will earn 44304 yuan. Second, large-scale farming will employ employees due to the large scale of farming, and most of the employees come from farmers who have lost farmland in the village, so that farmers will earn wages. Third, the breeding industry also needs certain technical support. If a fish in a pond gets sick, it will lead to the whole pond becoming sick and dying. Farmers transfer the land to large farmers to avoid this risk. To sum up, farmers can obtain two sources of income and avoid the risk of loss by transferring cultivated land to large households.
In such a balance of income, farmers, as rational economic man, will naturally choose breeding industry, and thus the cultivated land will be lost.

4.3 Policies

The rapid development of aquaculture in the past nine years is inseparable from policy support. Retail farming, the establishment of breeding association, the listing of provincial breeding standard demonstration area, the successful application of national breeding demonstration site, and the holding

of China breeding summit forum for many years all benefited from the support and promotion of the local government. On the other hand, the local government drafted "aquaculture insurance clauses" to further reduce the risk of aquaculture. The government will also hold training courses on new professional farmers' breeding technology from time to time to improve the breeding technology.

5. Conclusion and Countermeasures

By using GIS technology, this work analyzed the change characteristics of cultivated land in D village of Jiangsu Province from 2009 to 2018, and discussed the driving mechanism of cultivated land "non-grain". The study showed that the loss of cultivated land in the region accounted for 27.9% of the total area in the past nine years, and the existing cultivated land area was only 54.1% of that in 2009. This is mainly due to the high income of breeding industry, resulting in a large number of farmers choose to transfer cultivated land to engage in breeding industry. Secondly, the local unique geographical conditions also provide convenient conditions for the breeding industry, such as flat terrain, abundant rainfall, advanced irrigation and water conservancy facilities and convenient transportation. At the same time, the local policy has also played a great role in the rapid development of aquaculture industry.

Currently, there are some issues in rural land, such as unclear property rights and unclear definition of agricultural use of land, which are also the main reasons for the disorder of rural land circulation in China. Therefore, the system construction should be strengthened in the future, and the use of cultivated land transfer should be standardized and the clauses between different departments should be strengthened, thus curbing the tendency of "non-grain" cultivated land from the institutional perspective [9]. On the other hand, the government can also improve the enthusiasm of farmers to grow grain by improving the agricultural subsidy system and strengthening the subsidies. At the same time, it can also carry out agricultural science popularization activities by cooperating with scientific research institutions and enterprises, promote scientific and technological innovation in the agricultural field, and cultivate new grain operators. In an interview with the village director, he said that the conversion of cultivated land into breeding ponds did not change the use of cultivated land, nor would it cause harm to cultivated land. Therefore, the higher government should strengthen the education and training of grass-roots cadres on the use of cultivated land. Governments at all levels should clarify the basic grain area, stabilize grain output and optimize the planting structure on this basis. At the same time, they should also actively reclaim and open land to ensure sufficient reserve arable land resources.

References

[1] Zhu Shan. Analysis on the Trend of Non-grain and Non-agricultural Land Utilization in Rural Areas [J]. Rural Operation and Management, 2013 (01): 24-26.

[2] Cheng Chuanxing, Gao Shiliang, Zhang liangyue. Farmland Conversion and Food Security in China [J]. Economic Trends, 2014 (07): 87-96.

[3] Jin Jing, Qu Futian. Policy Regulation of Farmland Conversion in China: An Improved Design of Theoretical Analysis Framework [J]. China Population, Resources and Environment, 2010, 20 (11): 96-101.

[4] Liu Dan, Gong Qianwen. Influence of "De-grain" Behavior on National Food Security in Farmland Transfer and Countermeasures [J]. Agricultural Modernization Research, 2017, 38 (04): 673-680.

[5] Yue Shuai. Research on the "Non-grain" Problem in China's Rural land Circulation [D]. Party School of the CPC Central Committee, 2017.

[6] The General Office of the State Council Issued the Opinions on Preventing the "Non-grain Cultivated Land" from Stabilizing Grain Production, 2020.

[7] Xiao Haifeng, Wang Jiao. Analysis on the Influencing Factors of Comprehensive Grain Production Capacity in China [J]. Agricultural Technology and Economy, 2004 (06): 45-49.

[8] Kuang Yuanpei, Liu Yang. Differentiation and Analysis of Non-agricultural Non-grain in the Process of Agricultural Land Transfer [J]. Rural Economy, 2018, 426 (4): 1-6.

[9] Liao Fuzhou, Liao Jingyi, Yang Cheng. Problems and Countermeasures of "Non-grain" in Farmland Transfer [J]. Learning Forum, 2015, 31 (07): 37-40.