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# Regional Difference Analysis of Farmers' Land Use Behavior

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**Abstract** Based on the survey data and statistical information on farmers, we conduct comparative analysis of land use behavior of farmers in the Jiangnan Plain and the hilly areas of Xianning City in Hubei Province. We find that the utilization rate of agricultural land and level of agricultural labor output in the plain areas are higher than in the hilly areas; at the same time, the degree of mechanization of agricultural land utilization and farmers' land use scale are larger in the plain areas. But the crop type in the plain areas is single, and the decline rate of the growing area of food crops is higher in recent twenty years; meanwhile, the material input costs and opportunity cost of labor for the agricultural land utilization in the plain areas are greater than in the hilly areas.

**Key words** Farmers' land use behavior, Plain areas, Hilly areas, Regional differences

Farmers' land use behavior refers to farmers' response to the external signal in order to achieve their own goals in specific natural and socio-economic environment, that is, farmers' land use behavior is the behavioral choice made by farmers in land use, affected by farmers' objectives, farmers' ability and rural communities or the external environment<sup>[1–3]</sup>. The difference in the natural conditions between agricultural land and the difference in social or economic factors between farmers, will lead to different land use behaviors among farmers.

In this paper, we take four counties and cities of Xianning in the southern hilly areas and four counties and cities of the Jiangnan Plain in middle reaches of Yangtze River for examples, and use survey and statistical methods to conduct comparative analysis of land use behavior of farmers in the Jiangnan Plain and the hilly areas of Xianning City in Hubei Province, on the basis of analyzing the current situation of farmers' land use, in order to understand the changes in the agricultural labor allocation, agricultural land use patterns, agricultural land use structure, agricultural land use scale, and material input to agricultural land utilization in recent years. Clear understanding of differences in agricultural land utilization behavior between farmers in plain areas and hilly areas, is of great practical significance to improving the efficiency of national agricultural policy, effectively improving the utilization rate of agricultural land, and ensure food security.

## 1 Overview of the study area and data sources

**1.1 Overview of the study area** Xianning City is located in the hinterland of central China, and the southeast of Hubei Province. The land pattern is generally mountain, hill and plain, accounting for 35.4%, 36.6% and 13.4% of the total area. This

article takes Xian'an District, Tongcheng County, Chongyang County and Tongshan County in Xianning City as the areas for the study of farmers' land use behavior in hilly areas. The Jiangnan Plain is an alluvial plain in the south of Hubei Province, with a total area of over 30 000 square kilometers, and the altitude is mostly about 50 meters. This article takes Jianli County, Qianjiang City, Shishou City and Xiantao City as the areas for the study of farmers' land use behavior in plain areas.

**1.2 Data sources** This data come mainly from the questionnaire survey, and on the basis of overall survey of current land use in the study area, the research group uses the typical survey and random sampling method, we conduct data collection in the Jiangnan Plain (Jianli County, Qianjiang City, Shishou City, Xiantao City) and the hilly areas in Xianning City (Xian'an District, Tongshan County, Chongyang County, Tongcheng County) from June to August in 2011, according to the differences in terrain conditions and agricultural production. Each region selects two representative townships, each township selects two villages, and each village selects at least two groups for household survey. All questionnaires truly reflect the current farmers' current land use behavior and changes in the past 30 years. We get 618 copies of valid questionnaires on hilly areas in Xianning City and 620 copies of valid questionnaires on the Jiangnan Plain.

## 2 Analysis of differences in farmers' land use behavior

**2.1 Differences in the allocation of rural labor** From the principles of economics, when the farmers as the single economic unit carry out the allocation of labor for agricultural production, they usually choose to consider from two aspects; one is from the perspective of increasing agricultural land utilization benefit to allocate the labor with high agricultural yield, namely those able-bodied young labor forces with rich experience of agricultural production; the other is from the perspective of reducing the cost to allocate the labor with low agricultural labor opportunity cost,

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namely those poorly educated older labor forces with low non-farm income. Now from types of labor, labor age, gender and educational level, we analyze the differences in labor allocation between the hilly areas and plain areas.

**2.1.1 Differences in types of labor.** According to the work nature of existing rural labor, it can be divided into three categories: pure farming type (only farming), diversified working type (farming while working outside the home), and non-farming type (mainly working outside the home). According to the survey data, it is found that the proportion of pure farming type labor forces in the hilly areas is 6.3% lower than in the plain areas; the proportion of non-farming type labor forces in the hilly areas is 4% higher than in the plain areas; the proportion of diversified working type labor forces in the hilly areas is 2% higher than in the plain areas. The agricultural land utilization benefit in the plain areas is higher than in the hilly areas, so the labor forces in the hilly areas need to seek more non-farm income, which is also consistent with the sources of income of rural households surveyed; the proportion of wage income to total rural household income in the hilly areas is significantly higher than in the plain areas.

**Table 1 The ratio of agricultural labor of different ages**

The age of labor						Unit: %
	≤22	23 – 35	36 – 50	51 – 64	≥65	Subtotal
The Jiangnan Plain	1	5	35	44	15	100
The hilly areas in Xianning City	1	5	30	48	16	100

**2.1.3 Differences in the education level of labor forces.** The education level of labor forces reflects the ability to accept and learn new agricultural technology, new business ideas and ways [4]. As shown in Fig. 1, the education level of agricultural labor in the plain areas is slightly higher than in the hilly areas. The proportion of pure farming type labor forces with junior and senior high school education or more in the plain areas is higher than in the hilly areas, while the proportion of pure farming type labor forces with primary school education or below in the hilly areas is higher than in the plain areas.

In short, in terms of labor allocation, in comparison with the agricultural labor in the plain areas, there are fewer pure farming type labor forces but more female labor forces, more old labor forces and more low education level labor forces in the hilly areas. The agricultural output of agricultural labor force in the plain areas is higher than in the hilly areas, and at the same time, the opportunity cost of labor is also higher than in the hilly areas.

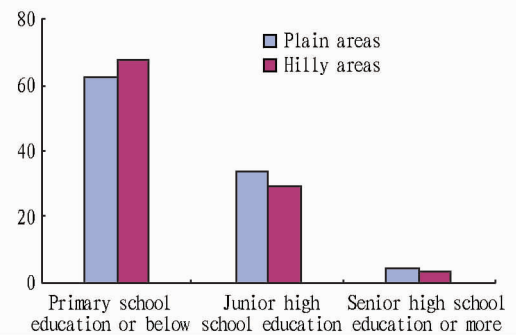
## 2.2 Differences in the agricultural land utilization pattern

From the farming methods, transfer of agricultural land, returning of agricultural land and abandoning of agricultural land, we analyze the differences in the agricultural land utilization pattern between the hilly areas and plain areas.

**2.2.1 Differences in farming methods.** For the farming methods of agricultural land, we have conducted a detailed survey from plowing, sowing, weeding, and insect killing. The results show that there is little difference in weeding and insect killing between plain areas and hilly areas, and weeding has changed from manual

**2.1.2 Differences in the labor gender and age.** The agricultural labor is onerous manual labor, posing certain requirements on the age and sex of the labor force. In general, men are better than women, and the young adults and teenagers are better than the elderly. In the 1 131 pure farming type labor forces surveyed in the Jiangnan Plain, there are 551 men and 580 women, and the ratio of male agricultural labor to female agricultural labor is 95:100; in the 910 pure farming type labor forces surveyed in the hilly areas of Xianning City, there 416 men and the ratio of male agricultural labor to female agricultural labor is 84:100. Overall, the number of women engaged in agricultural work is greater than that of men in the hilly areas.

The age configuration of agricultural labor forces is shown in Table 1. In the pure farming type labor forces in the hilly and plain areas, the old labor forces aged more than 65 years are much more than the young labor forces aged less than 22 years; the proportion of young able-bodied labor forces aged between 36 and 50 years in the plain areas is greater than in the hilly areas, and the proportion of old labor forces aged between 51 and 64 years is higher than in the plain areas.



**Fig. 1 The proportion of pure farming type labor forces with different education levels (%)**

weeding in the 1980s to the labor-saving weeding with herbicide; the insect killing methods almost experience no change, and the way of artificially spraying chemical pesticides has always been used.

Plowing and rice harvesting have used machinery to replace manual labor or livestock to a large extent, but the degree of mechanization in the plain areas is higher than in the hilly areas. As shown in Fig. 2, the utilization rate of machinery for plowing in the plain areas is 14% higher than that in the hilly areas, and the mechanical utilization rate for harvesting is as high as 13%; due to the differences in the terrain, some agricultural land in the hilly areas is not suitable for mechanical farming. In rice planting, the artificial cultivation method is used. 93% of the farmers in the plain areas use the method of transplanting rice seedlings, and

32% of the farmers in the hilly areas use the method of broadcasting. In general, broadcasting saves labor forces, but its benefit are less than that of transplanting rice seedlings, indicating that the farmers in the plain areas pay more attention to the benefit of agricultural land.

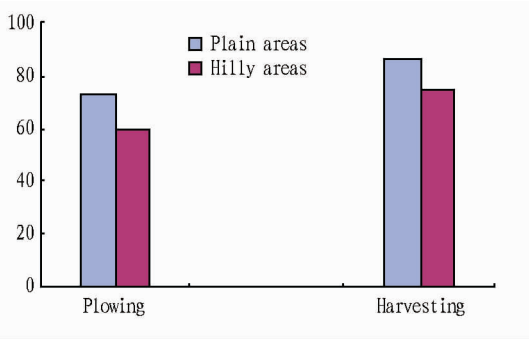


Fig.2 Mechanical utilization rate for farming (%)

**2.2.2 Differences in the transfer of agricultural land.** The activity of transfer market of agricultural land use right is mainly affected by the benefits of agricultural land utilization and agricultural labor resources. The higher the benefits of agricultural land utilization, the more active the transfer market of agricultural land, and the higher the prices of transfer; if the farmers have abundant agricultural labor resources, they are more willing to lease in the agricultural land; on the contrary, they will lease out the agricultural land.

Table 2 shows that the transfer market of agricultural land is more active in the Jiangnan Plain, and when the farmers lease out the agricultural land, they will charge appropriate land rent based on the conditions of agricultural land. Due to the low benefit of agricultural land in the hilly areas, there is a small proportion of pure farming type labor forces, and the majority of agricultural land, especially the poor quality agricultural land in the remote areas, is cultivated by other farmers. Meanwhile, farmers' willingness to transfer agricultural land also indicates that the farmers in the plain areas are more willing to lease in the agricultural land, while the farmers in the hilly areas are more willing to lease out the agricultural land.

Table 2 The ratio of transfer of agricultural land		%	
Region	The rural households having transferred	Willingness to transfer	
		Lease in	Lease out
The Jiangnan Plain	34	48	12
The hilly areas of Xianning City	27	22	32

**2.2.3 Differences in the degree of agricultural land abandonment.** The degree of agricultural land abandonment in the plain areas is lower than in the hilly areas. From the type of agricultural land abandoned, 91% of agricultural land abandoned in the plain areas is dry land, and the proportion of paddy field abandoned is low. The main reason for the abandonment is accidental disaster, or long distance, low level of irrigation and poor quality of agricultural land.

For the agricultural land that has been abandoned in the plain areas, 70% of farmers believe that there is possibility of rehabilitation. In the types of agricultural land abandoned in the hilly areas, 45% is paddy field, and 46% is upland slope. The reason for the abandonment of agricultural land is frequent disasters, long distance, poor quality of agricultural land, and low income. For the agricultural land that has been abandoned in the hilly areas, 67% of farmers believe that there is no possibility of rehabilitation.

**2.3 Differences in the agricultural land utilization scale** From the total area of agricultural land operated by a single family, we judge the agricultural land utilization scale in different regions. Fig.3 shows that the farmers with agricultural land operation area less than 0.67 hm<sup>2</sup> in the hilly areas are more than in the plain areas, while the farmers with agricultural land operation area more than 0.67 hm<sup>2</sup> in the plain areas are more than in the hilly areas. Specifically, the agricultural land operation area of 51% of farmers in the hilly areas is less than or equal to 0.33 hm<sup>2</sup>, and the agricultural land operation area of 33% of farmers is between 0.33 hm<sup>2</sup> and 0.67 hm<sup>2</sup>. In the plain areas, the proportion of these farmers with small-scale operation area is 14% and 28%, respectively.

Farmers' agricultural land operation scale depends primarily on the inherent endowment of agricultural land resources, then on the agricultural land utilization pattern, agricultural labor input and so on. Because of the topography differences, the per capita agricultural land area in the plain areas is greater than in the hilly areas; due to the differences in agricultural land utilization pattern, the area of agricultural land operated by single labor in the plain areas is also greater than in the hilly areas. By the above analysis, we know that in terms of labor allocation, the pure farming type labor forces in the plain areas are more and better than in the hilly areas.

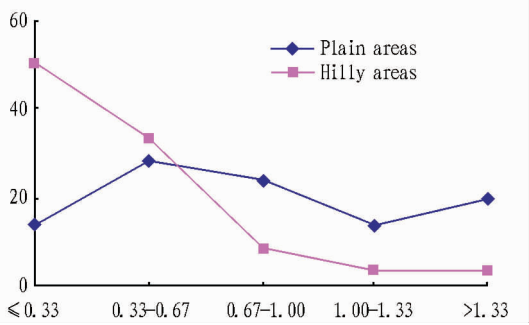


Fig.3 The farmer rate of planting different agricultural land area

**2.4 Differences in the farmland utilization structure** The farmland utilization structure depends primarily on temperature, precipitation, agricultural land suitability, farm infrastructure and other basic natural and social conditions; the secondary main influencing factor is farmers' land use behavior. There are little differences in the climatic conditions such as temperature and precipitation between the hilly areas in Xianning City and the Jiangnan Plain; the types of crops suitable for being cultivated in the

## 5 Conclusions

The vast rural areas of China are gradually setting up multi-level social security system to substitute for security function of homestead. The security system is designed as that government security is the primary base and village collective and family security acts as auxiliary part. We should follow the basic principle of acquisition of jus in re aliena when assessing original acquisition system of homestead use right. The collective economic organization should play the leading role in homestead allocation the use right of collective homestead to the farmers. Government should replace administrative approval with administrative registration for purpose of efficiency management, and adopt registration system to guarantee property right and enhance public notice functions<sup>[7]</sup>. In the derivative acquisition of homestead use right, it should keep consistent with the transition from valuing ownership to valuing usage in accordance with the *Property Law of the People's Republic of China*. This transition will enhance the usufructuary right and real right of pledge of the homestead. While increasing uncovered small amount loan to support agricultural development, it is feasible to moderately release mortgage finance of rural house and homestead for supporting farmers in agriculture-related industries development and house improvement.

The problems of high price of house in urban areas and one family owns several homesteads in rural areas are severe in China. To solve these problems, the most effective measure is to establish uniform real estate registration system both in urban and rural areas.

(From page 46)

and other natural and social factors, the farmers' land use behavior in the hilly areas and plain areas shows many differences. This article conducts study from labor allocation, agricultural land use patterns, utilization scale and utilization structure, and draws the following conclusions:

(i) In terms of the labor allocation, the agricultural labor forces are generally older than the non-agricultural labor forces, but their educational level is lower than that of the non-agricultural labor forces; in comparison with the plain areas, there are more old labor forces, less educated labor forces, less pure farming type labor forces and more female labor forces in the hilly areas. Overall, the agricultural output and opportunity costs of agricultural labor forces in the plain areas are higher than in the hilly areas.

(ii) In terms of agricultural land utilization patterns, the mechanical utilization rate, utilization rate of agricultural land and farmers' farming willingness in the plain areas are all higher than in the hilly areas, resulting in serious abandonment of agricultural land in the hilly areas.

(iii) Farmers' agricultural land utilization scale in the plain areas is larger than in the hilly areas, but there are more abundant crops in the hilly areas. The agricultural products harvested by the farmers in the plain areas are mainly used for market transaction, and they pursue maximization of agricultural land income; the farmers' purpose of agricultural land utilization in the hilly areas is mainly used to meet their own needs, and the farmers seek to maximize their own utility of consumption.

as. Full and accurate registration information can reflect distribution and concentration of real estate. This system provides the information of the quantity and value of the real estate owned by a person, household or entity of legal person for the state. Thus it lays a solid foundation for policies establishment for fair distribution of rural homestead and urban housing construction land and levying property tax.

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(iv) In the past 30 years, whether it is plain or hilly areas, the cropping index of agricultural land utilization has been reduced, and the growing area of food crops has been decreased rapidly. But due to the support of agricultural technology and rising opportunity cost of labor, the pesticide and fertilizer input is increased, and the use of pesticides in the plain areas is 2 times that in the hilly areas. Excessive use of pesticides and fertilizers has brought great crop and environmental pollution problems while increasing agricultural output.

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