

Study on Farmers' Willingness and Behavior of Farmland Utilization and Protection—A Case Study of Farmer Household Survey in Heilongjiang Province

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Abstract: As the most fundamental means of agricultural production, cultivated land is the resource guarantee of food security. However, the main body of cultivated land utilization and protection, the farmer, is the direct main body of effective utilization and protection of cultivated land. Through the investigation and analysis of farmers' willingness to use and protect farmland, it is found that: the increase of farmers' willingness to use and protect farmland should be implemented to the younger generation of farmers, or to improve farmers' organized cooperatives; farmers' farmland use and protection behavior benefits from the lectures provided by the village for farmers on the importance of propaganda and protection of black land and farmland protection, as well as government policies Satisfaction of subsidies. However, the technology of soil testing and formula fertilization, rotation and the use of organic fertilizer will also be subject to farmers' part-time employment, cooperative organizations and self-awareness. As the main body of cultivated land utilization and protection, farmers are also the beneficiaries of cultivated land utilization. Whether they benefit or not does not have a direct impact on cultivated land utilization and protection. Instead, to ensure the effective utilization and protection of cultivated land, it is necessary to increase the publicity efforts of the government, policy subsidies and norms, and the guidance of green production behavior of organizational construction.

1. Introduction and Related Research Review

In the research process of global agricultural sustainable development, the sustainable utilization of cultivated land is the key, and the quality of cultivated land is the basic guarantee in improving the quality of agricultural products. As the main body of production and management, farmers are the first person to protect and utilize cultivated land quality.

The research on Farmers' cultivated land quality protection and utilization behavior at home and abroad is mainly analyzed from the aspects of concept cognition, behavior performance and

influencing factors, focusing on the influence of farmers' characteristics, cultivated land factors, economic factors and policies. The research perspectives are as follows: first, from the regional perspective, for example, Li Cuizhen et al. (2008) explained the use of farmland by farmers in metropolitan areas [1]. Liu Hongbin et al. (2012) took the suburbs of big cities as an example to analyze the impact of external environment and personal characteristics, resource endowment and other internal factors on land use behavior[2], and Yao Guanrong et al. (2014) studied From the perspective of the agricultural investment function of Liangfu County [3] ,there are some problems in the research of cultivated land protection in each county, such as the farmland protection function analysis of Liangfu county and Liulu County[4], such as the analysis of farmland protection policy by the government Tian et al. (2008) found that there are great differences in land use behaviors of different types of farmers[5]. Wang Xi et al. (2013) used grouping comparison method and variance analysis method to think that there are great differences in the enthusiasm and participation willingness of different types of farmers for cultivated land protection[6]; Yang Zhihai et al. (2013) used the multi-level logistic model to analyze the intergenerational differences in various factors affecting farmers' decision-making on cultivated land quality protection[7]; Third, from the perspective of policy analysis, Romy Greiner et al. (2011) believed that the formulation of policy programs can stimulate farmers' motivation to protect cultivated land, thus enhancing farmers' awareness of cultivated land protection[8]; M Kassie et al. (2015) analyzed that social capital and network influence would affect the impact of small-scale farmers to adopt multiple sustainable intensive mode[9]; Li Lanyan and Chen Yinjun (2017) believed that agricultural subsidies, government publicity, and agricultural technology services and other factors affected farmers' cultivated land protection behavior. The more satisfied farmers were with the agricultural machinery subsidy policy, the more willing they were to adopt conservation tillage[10]; Long Yun et al. (2017)) It is believed that the farmland transfer system will change farmers' production and management decisions, and their cultivated land quality protection behavior will also change, which will have an impact on the quality of cultivated land and the level of ecological environment [11].

At present, there are many researches on cultivated land protection and behavior, especially on behavior influencing factors[12-17], which provide corresponding research basis for this study. However, in the process of modern agricultural development and scale expansion, the protection and utilization of black land in the new era and new environmental challenges, how to solve the contradiction between the pursuit of farmers' economic interests and the quality of agricultural products of cultivated land ecological environment protection has become an important starting point of this study. Therefore, through the field survey of typical areas of black land in China, this study will investigate the status of farmers' awareness of cultivated land protection, cultivated land use behavior and behavior motivation, in order to clarify the influencing factors of farmers' cultivated land use protection behavior and willingness, and then provide corresponding policy reference for improving the quality of agricultural products and protecting and using black land.

2. Model Design and Variable Selection

In order to further analyze the influencing factors of farmers' willingness and behavior of cultivated land use and protection, the binary logistic model is used for empirical analysis. Whether the farmers have the willingness and behavior of cultivated land use and protection is regarded as the

explained variable y , the value of which is 1 and 0, and P is the behavior of farmers. The model is

as follows:
$$y = \ln \left[\frac{P(y \leq j)}{1 - P(y \leq j)} \right] = a_{0j} - \sum_{k=1}^K a_k x_k$$

In the formula, Y represents farmers' willingness and behavior of cultivated land use and protection; a_{0i} is a constant term, X_K is an explanatory variable, which represents the influencing factors of farmers' willingness and behavior of cultivated land use and protection; A_K is the partial regression coefficient of logistic regression, indicating the influence of variable X_K on Y or logit (P).

On the basis of previous research and actual investigation, this study defines farmers' willingness of cultivated land use and protection into five aspects: first, whether farmers have taken the initiative to improve cultivated land; second, whether farmers are willing to invest in soil improvement and water conservancy construction of contracted land; third, whether to use soil testing formula technology; fourth, whether to carry out crop rotation The fifth is whether to use organic fertilizer regularly to improve soil fertility. The influencing factors of cultivated land use and protection behavior of farmers can be divided into three dimensions. It includes gender, age, education level, cultivated land area, whether they work or not, whether they are village cadres; the second is farmers' perception of cultivated land. It includes whether farmers' perception of the quality of cultivated land is lower than before, whether the use of chemical fertilizers and pesticides has an impact on the quality of cultivated land, whether the quality of cultivated land will affect the quality of agricultural products, whether they are satisfied with the current cultivated land protection policy, whether their income from farming has increased in recent years; the third is policy publicity and external conditions. It includes whether to join cooperatives, whether the village provides lectures on the importance of black land protection and cultivated land protection for farmers, and whether the local relevant departments advocate green agriculture, ecological agriculture and other development models. The specific variable description is shown in table.

Table1. variable description

| types of variables | Variable project | variable name | variable assignment |
|---------------------|--|---|---|
| explained variable | Farmers' behavioral intention to use and protect cultivated land | Whether to take proactive measures to protect farmland (Y_1) | Yes =1, no =0 |
| | | Are you willing to invest in farmland protection (Y_2) | Yes =1, no =0 |
| | Farmers' behavior of farmland utilization and protection | Whether to use the soil testing formula fertilization technique (Y_3) | |
| | | Rotation or not (Y_4) | Yes =1, no =0 |
| | | Regular use of organic fertilizer (Y_5) | Yes =1, no =0 |
| explaining variable | sample characteristics | Gender (X_1) | Yes =1, no =0 |
| | | Age (X_2) | Male =1, female =0 (years old) |
| | | Education level (X_3) | Junior high school and below =0, senior high school/technical secondary school =1, junior college =2, |

| | | |
|---------------------|---|------------------------------------|
| | | undergraduate and above =3 (ha) |
| | Cultivated area (X_4) | |
| | Whether to work (X_5) | Yes =1, no =0 |
| | Is it a village cadre (X_6) | Yes =1, no =0 |
| Farmers awareness | Whether cultivated land quality declines (X_7) | Yes =1, no =0 |
| | Does the use of chemical fertilizers and pesticides have any impact (X_8) | |
| | Whether cultivated land quality affects product quality (X_9) | Yes =1, no =0 |
| | Satisfaction with existing protection policies (X_{10}) | Yes =1, no =0 |
| | | Yes =1, no =0 |
| external conditions | Whether the income has increased in recent years (X_{11}) | Yes =1, no =0 |
| | Whether to join a Co-operative (X_{12}) | Yes =1, no =0 |
| | Whether there is a Lecture on Farmland Protection (X_{13}) | |
| | Whether relevant departments advocate green agriculture, etc. (X_{14}) | Yes =1, no =0 |
| | | Yes =1, no =0 |

3. Data Sources

Heilongjiang Province is an important commodity grain base in China. According to the national cultivated land statistics in 2017, the national agricultural production land is 134881.2 thousand hectares, of which Heilongjiang Province accounts for the largest proportion of cultivated land, with 15845.7 thousand hectares. Since 2013, the cultivated land area has decreased linearly. According to regional differentiation, cultivated land is mainly concentrated in Songnen Plain, Sanjiang Plain, Zhangguangcailing, Laoyeling, Xiaoxing'an Mountains and Daxing'an Mountains. The per capita cultivated land area of Heilongjiang Province is 0.31 hectares. Heilongjiang Province is mainly composed of mountains and plains. Generally speaking, the northwest and Southeast have higher terrain, while the northeast and southwest are lower. There are 2.495 million hectares of cultivated land with perfect irrigation facilities in the province, accounting for only 15.6%. The cultivated land in Heilongjiang Province is mainly dry land, accounting for 79.7%, followed by paddy field, accounting for 20.1%, and the rest is irrigated land. In recent years, the disaster area and disaster area of Heilongjiang crops have decreased. In 2016, the total disaster area was 4224 thousand hectares, in 2017, the disaster area was 1551 thousand hectares; in 2016, the disaster area was 2664 thousand hectares; in 2017, the disaster area was 424 thousand hectares. Mainly drought, especially in 2016.

The investigation scope of this study mainly takes Raohe farm in Shuangyashan City of Heilongjiang Province, Datonghe township of Raohe County, 597 farm of Baoqing County, Haojia village of Shibali township of Baoqing County, Baoquanling farm of Luobei County of Hegang City, Shuanghe farm of Gannan County of Qiqihar City, Xing rural area of Gannan County, Yinlonghe farm of Wudalianchi City, Erlongshan farm of Wudalianchi city. The main objects of

investigation are farmers engaged in agricultural production. The questionnaire used one-to-one interviews, and 200 valid questionnaires were collected.

4. Investigation Results and Analysis

According to the survey data of cultivated land protection, 35% of the farmers take the initiative to protect the cultivated land, and 65% do not take the initiative to protect the cultivated land. 25.6% of the farmers are willing to invest in the contracted land, and 74.4% are not willing to invest in the contracted land. In terms of whether or not to use soil testing and formula fertilization technology, 45% of farmers use soil testing and formula fertilization technology, and 55% of farmers do not use soil testing and formula fertilization technology. According to the survey on whether or not to use organic fertilizer regularly, 51.5% of farmers can use organic fertilizer regularly, while 48.5% do not use organic fertilizer regularly. In terms of the quality of cultivated land, 36% of the farmers think that the quality of their own cultivated land is declining, and 64% of the farmers think that the quality of their own cultivated land has not decreased. 90.5% of the farmers think that the use of chemical fertilizers and pesticides has an impact, while 9.5% of the farmers think that the use of chemical fertilizers and pesticides has no impact. 8.5% of farmers think that the quality of cultivated land does not affect the quality of agricultural products, and most of them think that the quality of cultivated land has an impact on the quality of agricultural products, accounting for 91.5%. According to the survey of participating in the lectures, 13% of the farmers participated in the relevant lectures, and 87% of the farmers did not. According to the survey on whether the farmers are satisfied with the protection policies, 7.5% of the farmers are satisfied with the protection policies, and most of the farmers are not satisfied with the protection policies, accounting for 92.5% of the total. According to the survey of the ways of straw disposal, 43% of the farmers used the mechanical returning method, 55% of the farmers still used the traditional burning method, only 2% of the farmers chose to sell their straw. According to the investigation on whether the local departments advocate green ecological agriculture, only 6% of the local relevant departments have not carried out the work of advocating green ecological agriculture, and 94% of the local relevant departments advocate green ecological agriculture.

Furthermore, SPSS statistical software was used to carry out logistic regression on the influencing factors of farmers' cultivated land protection behavior. Through the model chi square test table observation, the significance of the test results was less than 0.05, indicating that the model passed the test and had statistical significance. According to the fitting degree test of the final model, the model fits well.

From the analysis of the influencing factors of farmers' willingness to take measures to improve the cultivated land, there is a significant correlation between the education level and the cultivated land quality perceived by farmers. The higher the education level is, the less measures will be taken to protect the cultivated land. The more positive the farmers' Cognition of the quality of cultivated land affects the quality of agricultural products, the less likely they will be Taking active measures shows that the higher the cultural level of farmers, the lower the cultivated land protection behavior.

From the analysis of the influencing factors of whether farmers are willing to invest in soil improvement and water conservancy construction, the age of farmers and whether they participate in cooperatives are the main significant influencing factors. The older the farmers are, the less

willing they are to invest, and the more willing they are to invest in the soil Investment in improvement and water conservancy construction.

From the influence factors of whether farmers use soil testing and formula fertilization technology, the education level, the farmers' perception of the decline of cultivated land quality, and whether the village provides lectures on the importance of black land protection and cultivated land protection for farmers, the three factors are significantly related. It shows that the higher the education level, the less likely they will carry out soil testing and formula fertilization The decline is also not conducive to the adoption of soil testing and formula fertilization, and the lectures on farmland protection are the positive factors of adopting soil testing and formula fertilization.

In terms of the influencing factors of whether farmers rotate to improve the soil fertility, whether they go out to work, whether they are satisfied with the current protection policies, whether they join cooperatives and whether there are lectures on cultivated land protection are significant factors. The more satisfied with the current farmland subsidy protection policy, the more likely to adopt rotation technology, and joining the cooperative society to reduce the use of rotation, the lectures on farmland protection will positively promote the emergence of rotation behavior.

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5 Conclusions and Policy Recommendations

Based on the above investigation and empirical analysis, it is found that farmers' willingness to protect cultivated land mainly depends on the price of agricultural products and the benefits obtained, which indicates that cultivated land is an important source of farmers' income as agricultural means of production. From the perspective of quantitative analysis, farmers' willingness to invest in cultivated land use and protection should rely on the younger generation and join cooperatives; farmers' cultivated land use and protection behavior benefits from the lectures on the importance of black land protection and cultivated land protection provided by the village, as well as the satisfaction of government policy subsidies. However, the technology of soil testing and formulated fertilization, crop rotation and organic fertilizer use behavior are also subject to the farmers' concurrent business, cooperative organization and self-awareness.

From this point of view, as the main body of cultivated land protection, farmers are also the beneficiaries of cultivated land use. Whether they benefit or not has no direct impact on the protection of cultivated land use. It is necessary to increase government propaganda and policy subsidies to ensure the protection of cultivated land use. Therefore, this paper puts forward some specific policy suggestions.

The first is to increase the publicity of black land protection. Through lectures and technical training, farmers can feel the importance and urgency of protecting cultivated land.

The second is to improve the accuracy of farmland protection subsidies. Farmland productivity subsidy and farmers' satisfaction with the subsidy will enhance farmers' willingness and behavior of

protecting cultivated land. Therefore, the government's policy guidance will urge farmers to strengthen scientific and reasonable farmland fertility protection.

The third is to strengthen the green guidance of farmers' organizational construction. In the new era, farmers' participation in cooperatives has improved the organization degree of agricultural industrialization. We should promote the green production orientation through cooperatives and other organizations, publicize and encourage the implementation of green organic fertilizer, reasonable rotation and other ways to strengthen the protection of cultivated land use.

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