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An Empirical Study of Farmers' Perception and Behavior on Farmland Abandonment in Yunnan Province

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Abstract In this study, using the PRA method, we conduct a questionnaire survey on 525 farmers in 10 typical villages in Yunnan Province, and study the farmers' farmland abandonment behavior as well as their perception. Studies have shown that there are some common problems for the villages in the inner suburbs and the villages in the outer suburbs such as small scale of rural land, dispersed plots and land fragmentation, and the scale and fragmentation problems are more prominent in the villages in the inner suburbs while the dispersed plot problems are more obvious in the villages in the outer suburbs; the levels of farmland abandonment vary in different sample villages, the farmland abandonment is more prevalent in the villages in the outer suburbs, the abandonment behavior involves more farmers, and farmers tend to abandon small plots of farmland; the proportion of the abandoned farmland perceived by the farmers in the villages in the inner and outer suburbs (especially in the inner suburbs) is significantly lower than the actual proportion, and farmers' perception greatly deviates from the actual reality; some farmers have wrong perception of farmland abandonment behavior, and even if there are farmers with correct perception, they also abandon farmland.

Key words Farmland abandonment, Farmers, Perception, Behavior, PRA

1 Introduction

The farmland abandonment can lead to food shortages and other issues, thus threatening the survival and development of mankind. However, due to various reasons, the phenomenon of farmland abandonment has gradually increased in recent years. The academia has done studies on farmland abandonment from spatial pattern^[1], influencing factors^[2], driving forces^[3], problems and measures^[4]. Some scholars explore the role of land transfer in easing farmland abandonment^[5], and some study the soil infiltration and impact resilience in different abandonment years^[6]. In the research perspective, there are researches based on macro data at home and abroad, and also empirical studies based on micro-perspective. However, the study based on the perspective of farmers' perception is relatively rare. Therefore, by selecting 10 typical villages in Yunnan Province, we use the PRA method to carry out a questionnaire survey on farmers, and explore farmers' perception of farmland abandonment, in order to provide decision support for alleviating farmland abandonment.

2 Methods and data

By using stratified sampling method, we select a major grain-producing county (city) from northwest, northeast, center, southwest and southeast of Yunnan, respectively, and then select a village in the inner suburbs and a village in the outer suburbs from each county as typical sample village, respectively. During July-August 2015, about 50 farmers were randomly selected in each typical village, and the PRA (Participatory Rural Appraisal) method was used to do a questionnaire survey on farmers. This method can collect large amounts of information in a relaxed atmosphere and is

not constrained by sites^[7]. The questionnaire covers four parts: farmers' family members; farmland use; farming and transfer willingness; farmland protection perception. The questionnaire survey used "one-to-one" interview method, and each farmer was surveyed for about 1 h. A total of 538 questionnaires were received, including 525 valid questionnaires, with effective rate of 97.6%.

3 Survey results and analysis

3.1 Farmland resource endowment

3.1.1 Rural household contracted land scale. The farmland resource endowment affects farmers' decisions to use farmland to a certain degree. According to the survey, there is a great difference in rural household cultivated land. From Table 1, it is found that in terms of farmland area per household, the farmland area per household in the villages in the outer suburbs is larger than in the villages in the inner suburbs. Overall, the farmland area per household in the villages in the outer suburbs (0.55 ha) is greater than in the villages in the inner suburbs (0.15 ha), a difference of 3.5 times; in terms of per capita farmland area, the per capita farmland area in the villages in the outer suburbs is greater than in the villages in the inner suburbs. In general, the per capita farmland area in the villages in the outer suburbs (0.11 ha) is greater than in the villages in the inner suburbs (0.03 ha), a difference of 3.3 times. This shows that the contracted land area is relatively small for the villages in the outer and inner suburbs, and it is more prominent in the villages in the inner suburbs. The overall coefficient of variation in the villages in the outer suburbs (0.4) is also significantly less than in the villages in the inner suburbs (0.7). This indicates that there is greater variation in the farmers' contracted land for the villages in the inner suburbs. It can be seen that the contracted land area per household is relatively less for the villages in the inner suburbs, but the coefficient of variation of area is larger, and the internal differentiation of contracted land area is more prominent.

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3.1.2 Number of rural household contracted plots. The number of plots per household in the villages in the outer suburbs (6.4) is greater than in the villages in the inner suburbs (2.7), a difference of 2.4 times. The average contracted plot area in the villages in the outer suburbs (0.09 ha) is greater than in the villages in the inner suburbs (0.06 ha), a difference of 1.5 times. This shows that there is farmland fragmentation for the villages in the outer and inner suburbs, especially in the inner suburbs. Overall,

Table 1 Rural household contracted land resource endowment

Location	Area//ha				Number of plots				Per capita area//ha	Average plot area//ha	Distance between plots//km
	Mean	Max.	Min.	C. V.	Mean	Max.	Min.	C. V.			
The villages in the inner suburbs	0.15	0.60	0.02	0.7	2.7	10.0	1.0	0.6	0.03	0.06	0.05
The villages in the outer suburbs	0.55	1.33	0.09	0.4	6.4	17.0	1.0	0.5	0.11	0.09	0.11

3.1.3 Farming distance between contracted plots. The average farming distance between contracted plots in the villages in the outer suburbs (1.6 km) is significantly longer than in the villages in the inner suburbs (0.8 km). Some farmers address the problem of too great farming distance by transferring the contracted land through the exchange of land and other ways, but the transfer willingness is difficult to be unified so as to cause limited scale of circulation, and it is difficult to a great extent to weaken the problem of too great farming distance in the villages in the outer suburbs. It can be seen that the villages in the inner and outer suburbs have advantages and disadvantages in farmland resource endowment: both the contracted land scale and farmland area per capita or per household in the villages in the inner suburbs is obviously smaller than in the villages in the outer suburbs, while due to many scattered plots, the average plot distance in the villages in the outer suburbs is much greater than in the villages in the inner suburbs.

Table 2 Farmland abandonment in the typical villages

Location	Contracted land				Abandoned land				Abandonment proportion		
	Number of households	Area	Number of plots	Average plot area	Number of households	Area	Number of plots	Average plot area	Number of households	Area	Number of plots
The villages in the inner suburbs	263	40.9	703	0.06	13	0.6	15	0.04	4.9	1.5	2.1
The villages in the outer suburbs	262	144.5	1689	0.09	69	10.3	152	0.07	26.3	7.1	9.0
Total	525	185.4	2392	0.08	82	10.9	167	0.07	15.6	5.9	7.0

3.2.2 Proportion of abandonment area. Table 2 shows that in the 10 sample villages, the largest proportion of abandonment reaches 23.1%, followed by 9.8%; the proportion of farmland abandonment is 1.5% in the villages in the inner suburbs and 7.1% in the villages in the outer suburbs, a difference of 4.6 times; the overall proportion of farmland abandonment reaches 5.9%. Thus, it can be found that the farmland abandonment phenomenon is more prominent in the villages in the outer suburbs.

3.2.3 Proportion of abandoned plots. Table 2 shows that in the 10 sample villages, the largest proportion of abandoned plots reaches 24.9%, followed by 13.2%. The proportion of abandoned plots is 2.1% in the villages in the inner suburbs and 9.0% in the villages in the outer suburbs, a difference of 4.2 times; in all the rural contracted plots, 7.0% of them are abandoned. It can be seen that the abandoned plots are more prominent in the villages in the outer suburbs.

the coefficient of variation of number of plots in the villages in the outer suburbs (0.5) is smaller than in the villages in the inner suburbs (0.6). This shows that there is greater variation in the number of rural household contracted plots for the villages in the inner suburbs. It can be seen that the number of contracted plots per household is smaller in the villages in the inner suburbs, but the coefficient of variation of number of plots is larger and the internal differentiation of number of plots is more prominent.

At the same time, there is farmland fragmentation problem for the villages in the outer and inner suburbs, especially in the inner suburbs.

3.2 Farmland abandonment behavior

3.2.1 Proportion of farmers abandoning land. For the 10 typical villages, there is farmland abandonment behavior in 9 villages. The highest proportion of farmers abandoning land reaches as high as 69.6%. According to the survey results in Table 2, the proportion of farmers abandoning land in the villages in the inner and outer suburbs reaches 4.9% and 26.3%, respectively, a difference of 5.3 times; in the villages surveyed, 15.6% of farmers abandon farmland. It can be seen that there is farmland abandonment behavior in most of the villages surveyed, and a large proportion of farmers in some villages abandon farmland, and the farmland abandonment behavior in the villages in the outer suburbs is more prevalent than in the villages in the inner suburbs farmers.

3.2.4 General characteristics of farmland abandonment. In general, the villages in the outer suburbs have commoner abandonment phenomenon, and the abandonment behavior involves more farmers. According to the survey, the average area of abandoned plot in the sample village is smaller than the average area of contracted plot. On the whole, the average area of abandoned plot in the villages in the inner and outer suburbs is 0.01 ha and 0.02 ha less than the average area of contracted plot, respectively. This shows that the farmers prefer the small plots in abandonment decision. The sample villages have a large proportion of farmers who abandon land, but the proportion of abandonment area or the proportion of abandoned plots decreases due to relatively small area of abandoned plots.

3.3 Perception of farmland abandonment

3.3.1 Perception of proportion of abandoned farmland area. In order to grasp the accuracy of farmers' perception of farmland abandonment in the village, this paper designs the question "Do you

feel how much farmland was abandoned in the village last year" for survey, and compares the answers with the actual survey results. From Table 3, it is found that the proportion of abandoned farmland area in the villages in the inner and outer suburbs is significantly smaller than the surveyed proportion of abandoned farmland area. The proportion of abandoned farmland area perceived by the farmers in the villages in the inner suburbs is only 39.2% of the surveyed proportion of abandoned farmland area, while the propor-

tion is only 76.6% for the villages in the outer suburbs. On the whole, the proportion of abandoned farmland area perceived by all farmers is only nearly half (51.5%) of the surveyed proportion of abandoned farmland area. This shows that farmers' perception greatly deviates from the actual reality, especially in the villages in the inner suburbs. This reflects that farmers are not concerned about the phenomenon of farmland abandonment, and are indifferent to the farmland abandonment behavior.

Table 3 Farmers' perception of farmland abandonment

Location	Proportion of abandoned farmland area//%		Good		Bad		Uncertain		Subtotal	
	Perceived proportion	Actual proportion	Number of farmers	Proportion	Number of farmers	Proportion	Number of farmers	Proportion	Number of farmers	Proportion
The villages in the inner suburbs	0.6	1.5	39	14.8	170	64.6	54	20.5	263	100.0
The villages in the outer suburbs	5.5	7.1	26	9.9	164	62.6	72	27.5	262	100.0
Total	3.0	5.9	65	12.4	334	63.6	126	24.0	525	100.0

3.3.2 Perception of farmland abandonment behavior. To further grasp farmers' perception of farmland abandonment behavior, we set the question "Do you think whether the effect of abandonment on farmland is good or bad" for survey. The findings in Table 3 show that on the whole, more than 60% of farmers in the villages in the outer and inner suburbs believe that farmland abandonment behavior is "bad"; only 10% of farmers believe that farmland abandonment behavior is "good"; more than 20% of farmers are "uncertain" about the farmland abandonment behavior. This suggests that most of the farmers in the villages in the outer and inner suburbs believe that farmland abandonment behavior is "bad", but a small number of them hold that the abandonment has good or uncertain effect on farmland; for the 82 farmers who have farmland abandonment behavior, 17.1% of them think the farmland abandonment is "good" and 35.4% of them are "uncertain" about the farmland abandonment behavior. Meanwhile, for the 334 farmers who believe that the farmland abandonment is "bad", there are still 11.7% of them with farmland abandonment behavior, which suggests that some farmers have the right perception of farmland abandonment, but they still abandon land.

4 Conclusions and policy recommendations

Using the PRA method, we conduct a questionnaire survey on 525 farmers in 10 typical villages in Yunnan Province, and study the farmers' farmland abandonment behavior as well as their perception. Studies have shown that there are some common problems for the villages in the inner suburbs and the villages in the outer suburbs such as small scale of rural land, dispersed plots and land fragmentation, and the scale and fragmentation problems are more prominent in the villages in the inner suburbs while the dispersed plot problems are more obvious in the villages in the outer suburbs; the levels of farmland abandonment vary in different sample villages, the farmland abandonment is more prevalent in the villages in the outer suburbs, the abandonment behavior involves more farmers, and farmers tend to abandon small plots of farmland; the proportion of the abandoned farmland perceived by the farmers in the villages in the inner and outer suburbs (especially in the inner suburbs) is significantly lower than the actual proportion, and

farmers' perception greatly deviates from the actual reality; some farmers have wrong perception of farmland abandonment behavior and even if there are farmers with correct perception, they also abandon farmland. From changing farmers' perception and increasing farmland benefit, it is necessary to adopt the corresponding policies and measures to avoid the farmland abandonment behavior. (i) It is necessary to step up publicity of national policy and farmland abandonment harm in order to make farmers pay attention to farmland and avoid abandonment. (ii) It is necessary to introduce relevant policies, reduce the cost of agricultural production and increase agricultural subsidies to improve the comparative income of agriculture, make farmers pay close attention to farmland and enhance the enthusiasm of farmers for operating. (iii) It is necessary to actively guide and promote the orderly transfer of farmland, expand the operation scale and improve farming efficiency by farmland transfer.

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