Analysis of Patterns and Benefits of Cultivated Land Transfer in Rural Areas in the Loess Plateau——A Case Study of Yuanzhou District of Ningxia

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Abstract Cultivated land transfer is one of hotspots in research on agriculture, rural areas and farmers in China. Based on research achievements related to cultivated land transfer and the field survey of Yuanzhou District in the Loess Plateau, the primary patterns of cultivated land transfer in rural areas in the Loess Plateau were summarized according to the management subjects of cultivated land. According to the analyses of family income and expenses of a peasant household, the benefit of various patterns of cultivated land transfer to increase farmers' income was analyzed, and the social and ecological benefits of cultivated land transfer were assessed. The results showed that cultivated land transfer had developed rapidly in the Loess Plateau, and 42.5% of the investigated peasant households took part in cultivated land transfer. The benefit of cultivated land transfer to increase farmers' income was obvious after cultivated land transfer. There were significant differences between various patterns of cultivated land transfer in the increase of farmers' income. The pattern driven by agricultural cooperatives increased farmers' income most obviously, and the annual family earnings per peasant household reached 12072.99 yuan/a. The social and ecological benefits of cultivated land transfer conducted by peasant households spontaneously were very remarkable. The pattern led by leading enterprises promoted the large-scale operation of cultivated land greatly, but its benefit to increase farmers' income was limited. The comprehensive benefit of the pattern guided by the government was the most balanced. Geographic environment had decisive influences on the choose of patterns of cultivated land transfer in the Loess Plateau.

Key words Loess Plateau, Cultivated land transfer, Patterns, Benefit, Yuanzhou District of Ningxia

1 Introduction

In essence cultivated land transfer is the transfer of cultivated land management right. That is, based on the premise that the public ownership of rural land is maintained and the household contract management system is stabilized, cultivated land contract and management right or management and use right is transferred from its gainers to receivers voluntarily through transferring, interchanging, renting, buying a share, *etc.* according to law, and the receivers manage the cultivated land by themselves but do not change the basic purpose of rural land and keep the quality of the cultivated land[1-2]. Since the 21st century, with the aggravation of urbanization and increase of surplus labor power in rural areas, land has become an important factor limiting economic development in rural areas. In the *Decisions on Several Major Issues of Promoting Rural Reform and Development Made by the Central Committee of the Communist Party of China* approved in 2008, it is proposed that farmers are allowed to transfer land contract and management right through transferring, interchanging, renting, buying a share, *etc.* to develop various forms of moderate scale management. Thereupon cultivated land transfer developed rapidly in China's rural areas[3-4]. Meanwhile, research on cultivated land transfer has become a hotspot in research on China's agriculture, rural areas and farmers, and lots of scholars have discussed the patterns and benefits of cultivated land transfer widely and deeply[5-7]. The Loess Plateau has very fragile natural ecosystems, where soil and water loss, deterioration of ecological environment, farmers' poverty and other problems are very serious. Due to the particularity of geographic environment in the Loess Plateau, improvement of ecological environment is also a key goal of cultivated land transfer besides realizing agricultural sustainable development and effective transfer of farmers' livelihood[8-9]. In this study, patterns of cultivated land transfer in the Loess Plateau were summarized, and benefits of various patterns of cultivated land transfer were analyzed to provide scientific references for making decisions on the development of cultivated land transfer in future.

2 Data and methods

2.1 General situation of the study area Yuanzhou District in the west-central Loess Plateau was chosen as a representative of the Loess Plateau (Fig. 1). Yuanzhou District (105°57′ - 106°32′ E, 35°45′ - 36°31′ N) is about 85 km in length from north to south, around 51 km in width from east to west, and 2739.01 km^2 in area. Yuanzhou District, a semi-arid region, has typical loess hills. In the region, the altitude ranges from 1500 to 2933 m; annual average temperature is 6.8 ℃, and annual average precipita-

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tion is 300 – 550 mm. There is a variety of deep soil in Yuanzhou District, and dark loessial soil is distributed widely here. In the region, the catchment area is about 2050 km^2, and annual average runoff is 6.15×10^7 m^3, while the quantity of underground water supplied naturally is 1.36×10^8 m^3/a. Among main types of vegetation, the area of steppe vegetation, meadow vegetation, forest vegetation and shrubs is about 11.00×10^4, 4.84×10^4, 0.33×10^4, and 0.68×10^4 hm^2 respectively. According to the difference of geographic environment, Yuanzhou District can be divided into loess hills, Qingshui river valley plain, Liupan Mountains, and mountains on the west of the Qingshui River.

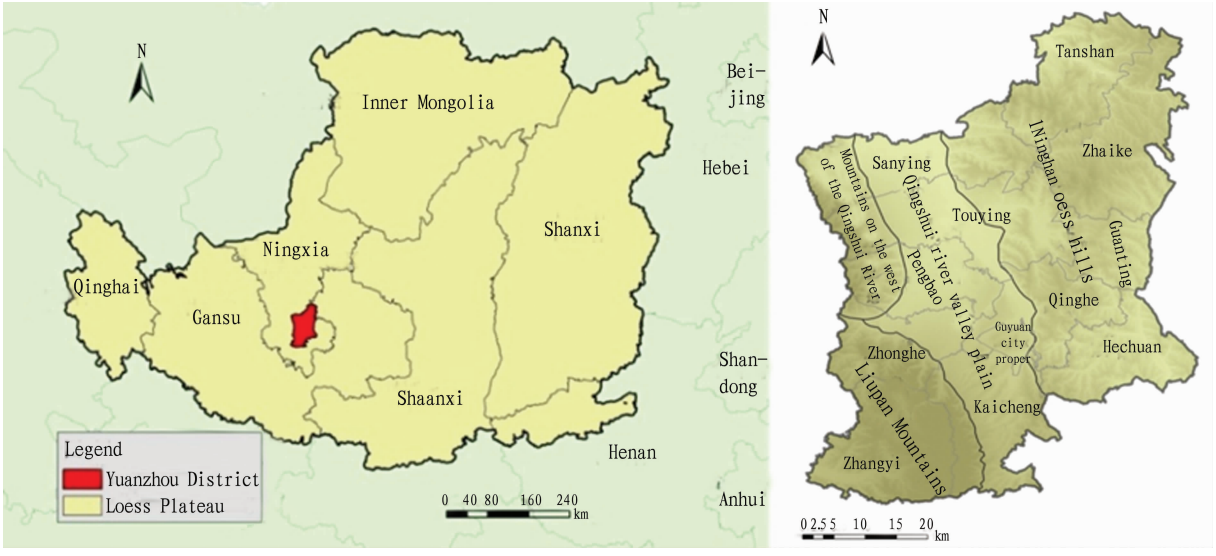


Fig. 1 Position and geographical division of Yuanzhou District

2.2 Research methods Questionnaires were designed to investigate the livelihood, cultivated land management ways, and cultivated land transfer of peasant households in each administrative village. In the questionnaire, household income closely related to cultivated land transfer was grouped into income from labor, property and policies. Income from labor included wages of peasant households working outside, income from household management of production, and income from a small business; income from property was income from cultivated land transfer and other forms of asset management; income from policies contained allowances for cultivated land, agricultural machinery and fertilizer, and returning the grain plots to forestry. Household expenses included expenses of daily life, production, transfer and special circumstances. Through an analysis of family income and expenses of peasant households, the earnings of a peasant household taking part in cultivated land transfer were calculated according to the follow-up formulas:

$$B = I - P \quad (1)$$

$$I = \sum_{i=1}^{n} \left(\sum_{k=1}^{10} x_{ik} \right) \quad (2)$$

$$P = \sum_{i=1}^{n} \left(\sum_{t=1}^{8} x_{it} \right) \quad (3)$$

In the above formulas, B is the family earnings of a peasant household; I is the family income of a peasant household; P is expenses of daily life and production of a peasant household; n is the number of peasant households; x_{ik} is the k^{th} income of the i^{th} peasant household; x_{it} is the t^{th} expense of the i^{th} peasant household. In this study, the household income was composed of ten aspects, including wages of peasant households working outside, income from agricultural management, income from a small business, allowances for returning the grain plots to forestry, agricultural machinery and fertilizer, and grain seeds, minimum government subsidy, pension, cultivated land transfer rental, and an allowance for land acquisition; household expenses contained eight aspects, including expense of food, water, electricity and coal, transport, communication, producer goods, human capital in production, water and electricity in production, and cultivated land rental.

2.3 Data sources Statistical data involved in this study were mainly from the *Statistical Yearbook Ningxia Hui Autonomous Region* (2011, 2012 and 2013), as well as the statistical yearbooks of various districts and counties in Guyuan City. Case analysis data were mainly from data collected from the questionnaires. A survey was conducted in 2012 through an interview. There were 419 questionnaires, including 21 questionnaires about the basic situation of the administrative villages, 205 questionnaires about the peasant households, and 193 questionnaires about peasant households working in the city; 97% of the questionnaires were valid. In Yuanzhou District, six towns and two townships including 21 administrative villages were surveyed, and each village was asked to fill in 10 questionnaires on average; 11% of administrative villages in Yuanzhou District were investigated.

3 Characteristics and patterns of cultivated land transfer in the study area

According to the results of the survey (Fig. 2), 42.5% of the investigated peasant households took part in cultivated land transfer, of which 59% of the peasant households transferred their cultivated land to other peasant households; 34% of the peasant households transferred cultivated land from other peasant households; 6% of

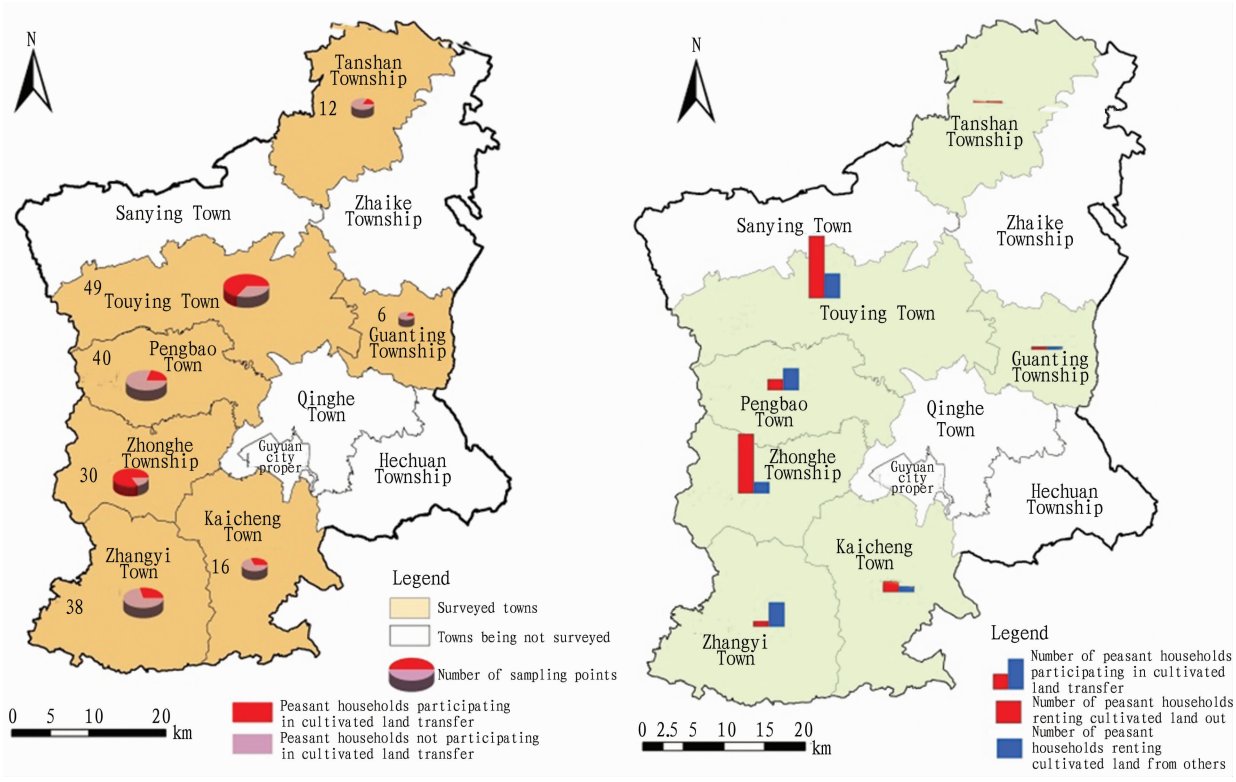
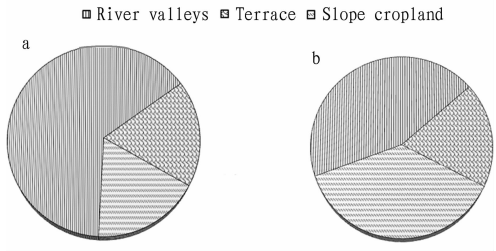


Fig. 2 Distribution of peasant households participating in cultivated land transfer in Yuanzhou District

the peasant households transferred their cultivated land to other peasant households and rented cultivated land from other peasant households. The total area of cultivated land of the surveyed peasant households was 215.4 hm^2, and the transferred cultivated land was 87.1 hm^2 in area, accounting for 40.4% of the total area. Seen from the geographical distribution of cultivated land transfer, there were big differences between various towns in cultivated land transfer. In Zhonghe Township where the degree of cultivated land transfer was the highest, 83% of the peasant households participated in cultivated land transfer; in Tanshan Township and Guanting Town where the degree of cultivated land transfer was the lowest, only 17% of the peasant households took part in cultivated land transfer. According to the analysis of cultivated land transfer in Yuanzhou District, cultivated land transfer was closely related to the constitution of cultivated land and agricultural basic conditions in rural areas. As shown in Fig. 3, the area of river valleys accounted for 63% of that of the transferred cultivated land, while the area of river valleys accounted for 17% of that of not transferred cultivated land. The area of the transferred river valleys accounted for 81% of that of the transferred cultivated land, 10% higher than the proportion of area of river valleys in the total area of the transferred cultivated land; the proportion of area of terrace and slope cropland in the total area of the transferred cultivated land was lower than 20%. Agricultural infrastructure had obvious effects on cultivated land transfer, especially irrigation conditions. Drought was the first question faced by the Loess Plateau in Ningxia, and irrigation conditions had great influences on the yield of food crops. According to the properties of operators managing cultivated land, there were four patterns of cultivated land transfer in Yuanzhou District (Table 1 and 2). The first pattern was conducted spontaneously by peasant households. That is, peasant households spontaneously transferred contracted cultivated land through interchanging, subcontracting, and transferring according to their life and production. The pattern had characteristics of small and simple transfer range, strong flexibility, and a large scale, and it had important impacts on the transfer of farmers' non-agricultural livelihood[10]. The second one was a pattern driven by agricultural cooperatives. That is, according to the adjustment of agricultural development ways, agricultural cooperatives integrated all collective cultivated land through renting and joint stock partnership to give play to cooperation advantages. Agricultural cooperatives were composed by village collectives, and information was highly open among participants in cultivated land transfer, so a large quantity of peasant households took part in cultivated land transfer. The third pattern took leading enterprises as the leading factor. That is, by using the advantages of technology and capital, agricultural enterprises having advanced production conditions integrated cultivated land contracted by peasant households through renting, joint-stock, and other ways, so as to realize the scale management of cultivated land and make peasant households benefit from cultivated land transfer. Through cultivated land transfer, cultivated land was integrated to develop intensive agriculture and scale agriculture and give play to production and market advantages[11]. In addition, leading enterprises could rent cultivated land to peasant households, which contributed to local transfer of surplus labor power in rural areas[12]. The fourth pattern was guided by the government. That is, by using policy information and resources, government departments helped and guided peasant

households or other departments to improve management ways of cultivated land. Reasonable guidance could effectively enhance the rationality of cultivated land use to realize the comprehensive benefit of integrating cultivated land, and this pattern was an auxiliary pattern of cultivated land transfer. Because of ecological fragility in the Loess Plateau, the pattern guided by the government was an important guarantee for realizing the sustainable development of agriculture. The four patterns of cultivated land transfer existed in each surveyed town and township of Yuanzhou District, but there were obvious differences between different towns in the patterns and scale of cultivated land transfer. Cultivated land transfer conducted by peasant households spontaneously was scattered in Yuanzhou District and appeared in each surveyed town, and the transfer scale was often small. Cultivated land transfer driven by agricultural cooperatives mainly appeared in Touying Town, Pengbao Town, and other towns in Qingshui river valley areas, and the transferred cultivated land was mainly used for intensive farming of greenhouse vegetable. Cultivated land transfer led by leading enterprises was mainly distributed in Zhonghe Township and other towns having a large area of river valleys, and the transferred cultivated land was managed through the pattern "enterprises + peasant households + bases". Cultivated land transfer guided by the government mainly appeared in Zhangyi Town and other towns where construction of small towns was prominent. The government did not participate in cultivated land transfer directly but led peasant households to manage cultivated land, thereby realizing cultivated land transfer indirectly.



Note: a. Peasant households participating in cultivated land transfer; b. Peasant households not participating in cultivated land transfer.

Fig. 3 Constitution of cultivated land of the surveyed peasant households in Yuanzhou District

Table 1 Characteristics of various patterns of cultivated land transfer in Yuanzhou District

Patterns of cultivated land transfer	Major participants	Main ways of cultivated land transfer	Changes in the management of cultivated land	Ways of peasant households participating in cultivated land transfer
Pattern conducted by peasant households spontaneously	Peasant households	Transferring, subcontracting and interchanging	Increasing slightly	Transferring cultivated land out or in
Pattern driven by agricultural cooperatives	Peasant households and agricultural cooperatives	Subcontracting, renting, and buying a share	Not changing or decreasing	Transferring cultivated land out or in
Pattern led by leading enterprises	Leading enterprises and peasant households	Renting, contracting after renting, buying a share, and joint land system	Enhancing greatly	Transferring cultivated land out
Pattern guided by the government	Local government and peasant households	Subcontracting, transferring, interchanging, and renting	Not changing or decreasing	Transferring cultivated land out or in

Table 2 Transferring situation of various patterns of cultivated land transfer in Yuanzhou District

Patterns of cultivated land transfer	Number of the surveyed peasant households	Total area of cultivated land of the surveyed peasant households // hm^2	Total area of transferred cultivated land // hm^2	Proportion of river valleys in cultivated land // %	Proportion of irrigable land in cultivated land // %	Area of cultivated land per peasant household // hm^2	Area of transferred cultivated land per peasant household // hm^2
Pattern conducted by peasant households spontaneously	15	21.27	6.70	22.57	1.57	1.42	0.45
Pattern driven by agricultural cooperatives	15	11.69	13.71	93.16	71.72	0.78	0.91
Pattern led by leading enterprises	40	42.82	27.02	69.64	12.49	1.01	0.68
Pattern guided by the government	13	11.33	8.00	31.51	12.73	0.87	0.62
Peasant households not participating in cultivated land transfer	112	127.64	–	34.71	15.06	1.14	–

4 Benefits of various patterns of cultivated land transfer

4.1 Benefit of cultivated land transfer to increase peasant households' income According to the results of family income and expenses of the surveyed peasant households, the annual family income of a peasant household participating in cultivated land transfer reached 31864.12 yuan, and their expenses of daily life and production were 23309.73 yuan, so their annual earnings were 8554.39 yuan; the annual family income of a peasant household not participating in cultivated land transfer was 24966.40 yuan,

and their expenses of daily life and production were 14787.54 yuan, so their annual earnings were 10 178.83 yuan. In a word, the annual earnings of a peasant household participating in cultivated land transfer were lower than that of a peasant household not participating in cultivated land transfer. Seen from the structure of their family income and expenses (Fig.4), except for income from policies, the income and expenses of a peasant household participating in cultivated land transfer were higher than that of a peasant household not participating in cultivated land transfer. If the effects of daily life expenses were not considered, the annual average income of peasant households participating in cultivated land transfer was up to 23823.92 yuan, higher than that of peasant households not participating in cultivated land transfer (21391.14 yuan). On the whole, cultivated land transfer brought obvious earnings to the surveyed peasant households. According to Table 3, different patterns of cultivated land transfer brought obvious earnings to the surveyed peasant households, but there were significant differences between various patterns. Seen from the pattern conducted by peasant households spontaneously, the annual average income of a peasant household working outside was 17457.14 yuan, which was the highest among the four patterns. The pattern was often conducted by limited peasant households spontaneously, so there was no obvious change in the management scale of cultivated land before and after being transferred, and there was no obvious difference between the income from direct cultivated land transfer and the expenses of renting cultivated land, being 1780.00 and 1060.00 yuan respectively. Seen form the pattern driven by agricultural cooperatives, after transferring cultivated land, peasant households managed the transferred cultivated land carefully and intensively, and increased the investment in production obviously; the income from direct cultivated land transfer and the expenses of renting cultivated land were 2070.00 and 2 412.50 yuan respectively. At the same time, due to the constraint of rural land, the expenses of daily life was low, but the total earnings were the highest. For the pattern led by leading enterprises, some or all cultivated land of peasant households were transferred to leading enterprises, so the income from cultivated land transfer was the highest among the four patterns, reaching 4137.43 yuan. However, the earnings of a peasant household participating in the pattern of cultivated land transfer were not high, because their income from agricultural production reduced greatly, but the cost of daily life and production increased obviously. The earnings of a peasant household participating in cultivated land transfer guided by the government were 7128.35 yuan on average, being at a moderate level among the four patterns. During the process of guiding cultivated land transfer, the government mainly popularized agricultural technology and products through agricultural production allowance, thereby reducing the production cost of peasant households.

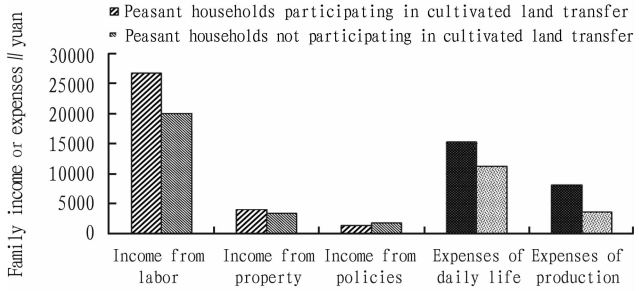


Fig.4 Family income and expenses of a surveyed peasant household in Yuanzhou District

Table 3 Earnings of peasant households participating in various patterns of cultivated land transfer in Yuanzhou District yuan/a

Patterns of cultivated land transfer	Annual family income per peasant household (I)				Annual family expenses per peasant household (P)			Annual family earnings per peasant household (B)
	Income from labor	Income from property	Income from policies	Total income	Expenses of daily life	Expenses of production	Total expenses	
Pattern conducted by peasant households spontaneously	30350.00	1780.00	2647.29	34777.29	19409.71	4195.72	23605.43	11171.86
Pattern driven by agricultural cooperatives	31685.71	2070.00	773.44	34529.15	13638.33	8817.83	22456.16	12072.99
Pattern led by leading enterprises	22328.91	4148.43	1127.70	27605.04	14930.72	8037.54	22968.26	4636.78
Pattern guided by the government	25512.50	300.00	1137.77	26950.27	11395.92	8426.00	19821.92	7128.35

4.2 Social and economic benefit of various patterns of cultivated land transfer Besides increasing farmers' income, cultivated land transfer also aims to produce social and economic benefit[13-16]. In respect of social benefit, cultivated land transfer can promote the transfer of rural surplus labor power from agriculture to non-agricultural industries, and the management ways of cultivated land can be optimized through cultivated land transfer. For the pattern conducted by peasant households spontaneously, labor power transferred from agriculture to non-agricultural industries, which was an important reason for peasant households participating in cultivated land transfer. Among the peasant households, 27.6% of labor force working outside after cultivated land transfer, and and their income from working outside was 17457.14 yuan/a, which are the highest among the four patterns. The social benefit of cultivated land transfer driven by agricultural cooperatives was shown as the optimization of management ways of cultivated land, and non-agricultural income of peasant households was not high. Led by leading enterprises, peasant households transferred cultivated land to leading enterprises, and agricultural labor force was transferred effected, so non-agricultural income of peasant households increased greatly, and the income of a peasant household from renting cultivated land was the highest, but the income from agricultural management reduced. For the pattern guided by the government, the government played important roles

in guidance and adjustment, and cultivated land was mainly managed by peasant households, so the social benefit was not obvious. The ecological benefit of cultivated land transfer in the Loess Plateau was shown as the response of peasant households participating in cultivated land transfer. The area of farmland changed to forests or grassland per peasant household was 0.88 hm^2 for the pattern conducted by peasant households spontaneously, which was the highest among the four patterns of cultivated land transfer. For the pattern driven by agricultural cooperatives, the management of cultivated land was intensive, and the management scale of cultivated land decreased, so the proportion of farmland changed to forests or grassland per peasant household was the maximum among the four patterns. For the pattern led by leading enterprises, most cultivated land was river valleys, and large-scale operation of cultivated land was conducted after cultivated land transfer, so the area and proportion of farmland changed to forests or grassland per peasant household were low, and its ecological benefit was not obvious. Led by leading enterprises, peasant households mainly optimized the management of cultivated land, but there was no great change in the management ways of cultivated land, proportion of crops, labor intensity, *etc.*, so its ecological benefit was low.

Table 4 Social and economic benefit of various patterns of cultivated land transfer in Yuanzhou District

Patterns of cultivated land transfer	Proportion of labor force working outside per peasant household//%	Income from working outside per peasant household//yuan/a	Rent of transferred cultivated land per peasant household//yuan/a	Subsidies of returning farmland to forests or grassland per peasant household//yuan/a	Area of farmland changed to forests or grassland per peasant household//hm^2	Proportion of area of farmland changed to forests or grassland per peasant household//%
Pattern conducted by peasant households spontaneously	27.06	17457.14	1780.00	1680.43	0.88	61.97
Pattern driven by agricultural cooperatives	17.33	10957.69	2070.00	179.29	0.59	75.64
Pattern led by leading enterprises	24.87	16562.50	4137.43	167.87	0.11	10.89
Pattern guided by the government	22.39	14166.67	300.00	281.67	0.18	20.69
Peasant households not participating in cultivated land transfer	23.20	12266.69	0	646.40	0.60	52.63

Table 5 Family population and structure of cultivated land of a peasant household participating in cultivated land transfer in various surveyed towns of Yuanzhou District

Town	Family population per peasant household	Number of days of working outside per peasant household//d/a	Area of cultivated land per peasant household//hm^2	Proportion of river valleys in cultivated land//%	Proportion of irrigable landin cultivated land//%
Touying Town	4.8	132	0.86	84.64	33.58
Zhonghe Township	5.3	176	1.04	74.51	16.14
Zhangyi Town	5.2	204	0.91	22.33	4.00
Pengbao Town	6.4	247	0.67	100.00	28.57
Kaicheng Town	4.2	114	0.80	30.00	0
Tanshan Township	6.0	–	2.33	0	0
Guanting Town	6.5	–	2.00	0	0

4.3 Regional differences and influencing factors of benefits of cultivated land transfer Among the seven towns involved in the survey, there were obvious differences between various towns in the patterns of cultivated land transfer. That is, cultivated land transfer was mainly driven by agricultural cooperatives in Touying Town and Pengbao Town, was led by leading enterprises in Zhonghe Township, was guided by the government in Zhangyi Town, and was conducted by peasant households spontaneously in Kaicheng Town, Tanshan Township and Guanting Town. To analyze regional differences of earnings of peasant households participating in cultivated land transfer, the annual family earnings of a peasant household participating in cultivated land transfer in various surveyed towns was calculated. The results show that there was a big differences between different towns in the earnings of peasant households participating in cultivated land transfer, and it was shown as follows: Touying Town > Zhonghe Township > Zhangyi Town > Pengbao Town > Kaicheng Town > Tanshan Township > Guanting Town. The economic benefit of cultivated land transfer was closely related to the proportion of slope cropland in cultivated land. There was an obvious difference between various towns in the structure of cultivated land, and the economic benefit was not obvious in Pengbao Town and Touying Town where river valleys were dominant, while it was the most significant in Tanshan Township and Guanting Town where slope cropland was dominant. Regional differences of benefits of cultivated land transfer were mainly affected by natural and geographic conditions of various regions. In towns where the benefits of cultivated land transfer were obvious, the proportion of river valleys or irrigable land was high, and conditions of cultivated land were good; towns with low benefits of cultivated land transfer were located in loess hills, and conditions

of cultivated land were poor. Family size had no obvious effects on the benefits of cultivated land transfer, and the average family population of a peasant household participating in cultivated land transfer was 5.1, slightly higher than that of a peasant household not participating in cultivated land transfer (4.9). However, the total income from working outside of a peasant household participating in cultivated land transfer was obviously higher than that of a peasant household not participating in cultivated land transfer. The family population and structure of cultivated land of a peasant household participating in cultivated land transfer in various surveyed towns were shown in Table 5.

5 Conclusions and discussions

Cultivated land transfer had developed rapidly in the Loess Plateau, 42.5% of the investigated peasant households took part in cultivated land transfer. Moreover, there were a variety of patterns of cultivated land transfer, and their regional differences were obvious. There were four patterns of cultivated land transfer in the Loess Plateau, that is, cultivated land transfer could be conducted by peasant households spontaneously, driven by agricultural cooperatives, led by leading enterprises, or guided by the government. The structure of cultivated land and the proportion of irrigable land in cultivated land affected the choice of patterns of cultivated land transfer greatly. Meanwhile, there were big differences between various patterns of cultivated land transfer in their benefits. That is, the pattern conducted by peasant households spontaneously promoted the transfer of surplus labor power greatly, so its social benefit was prominent; the pattern driven by agricultural cooperatives was of the greatest benefit to the increase of farmers' income, and the management ways of cultivated land were optimized greatly; the pattern led by leading enterprises promoted the large-scale operation of cultivated land, and the output of cultivated land increased; the comprehensive benefit of the pattern guided by the government was the most balanced, which was a supplement to other patterns of cultivated land transfer.

According to the geological conditions and management situation of cultivated land in various regions, the main pattern of cultivated land transfer in a region was chosen and was combined with other patterns. That is, cultivated land transfer was mainly led by leading enterprises in regions having a large area of river valleys; the pattern driven by agricultural cooperatives was given priority over other patterns in regions where the conditions of cultivated land were good and facility agriculture could be developed; cultivated land transfer was mainly conducted by peasant households spontaneously in regions where slope cropland was dominant, and it was combined with the pattern guided by the government; it is needed to speed up ecomigration and returning farmland to forests or grassland in regions that were not suitable for the survival of mankind.

In this study, the economic, social and ecological benefits of cultivated land transfer were analyzed quantitatively, but cultivated land transfer has important effects on the transfer of farmers' livelihood, control of ecological basins, *etc*. In future research, to summarize the patterns and benefits of cultivated land transfer in rural areas in the Loess Plateau more objectively, it is needed to analyze the comprehensive benefit of cultivated land transfer quantitatively through the expansion of survey scale and range of the study area.

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