

Can Land Circulation Improve Farmers' Income? A Survey of Five China's Western Provinces

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Article History

Received: 15 April, 2022

Accepted: 22 July, 2022

Published: 25 July, 2022

Citation

Qi, X.M., & Yang, Y.H. (2022). Can land circulation improve farmer's income? A survey of five China's western provinces. *Journal of Land Science*, 1(1), 1-9. <https://doi.org/10.56388/land220722>

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Abstract: This article Based on the field survey of 15000 farmers in Gansu, Ningxia, Inner Mongolia, Shaanxi and Qinghai provinces, we used mediator model, analyzed the impact of farmers' livelihood strategies on land circulation and income growth. The research results showed that the farmers' dependence on land gradually weakened, the willingness of farmland transfer decline, the willingness of farmland transfer to rise; Farmer's livelihood strategy directly affected income growth, while indirectly income growth by land circulation. Therefore, further promotion on agricultural science and technology achievements transformation and talent support for rural development should be strengthened, the agricultural support system which increases farmers' income should be promoted, farmers' agricultural labor remuneration and scale economic benefit should be encouraged by new styles of agricultural businesses. We should continue to strengthen the progress of the land property rights system, promote the transfer of rural surplus labor through skills training, employment and encourage startups, so that farmers will be both participants and beneficiaries from the farmland transfer.

Keywords: livelihood strategy; land circulation; mediator model; income growth

1. Introduction

For a long time, land has been the most stable guarantee of sustainable livelihood for the Chinese farmers. It connotes both the economic and non-economic value. After the reform and opening-up, with the rapid development of urbanization and industrialization and the improvement of urban-rural relationship in China, the limitation of income from land and the accessibility of non-agricultural working opportunity [1] enabled the mobility of rural labor force gradually frequent between the urban and the rural. Meanwhile, the rural labor force shifted from agriculture to the non-farm sector. At present, despite the decrease of the urban-rural income ratio, it still remains at a high level, the speed is slowing, though. In addition, the economy has turned to high-quality development from the high-speed one, making the transfer speed of the rural surplus labor slow down, so is the growth of income from wage and salary. The market demand of agricultural products has weakened and the income from agricultural operation and property shows an unstable growth. Furthermore, the traditional drive for the continuous income increase of peasant households has been gradually declined, making the momentum insufficient [2]. It is thus clear that the continuous income increase of peasant households is still a high-profile problem. Based on this, with the survey data of 5 provinces in western China, the article discussed the impact for livelihood strategy and farmland transfer on the income increase of peasant households by making use of the mediating effect model, expecting to provide policy suggestions to the advancement of their income increase.

According to data from the National Bureau of Statistics: "in 2004, the rural contracted land circulation area was 58 million mu (about 386,666 hectares) and it will be more than 530 million mu (about 3,533,3333 hectares) for such land circulation by 2018." That is, the increase of farmland transfer is about 10 times. Thus, it has become the focus for the farmland transfer and peasant household income in the academic world. From the presentation of academic achievements, the experts and scholars have studied and discussed the land circulation, income increase and strategy of peasant households from different perspectives. For instance, according to some scholars, the farmland transfer can increase the peasant household income. The general income and income per capita of households have been significantly increased due to the land circulation [3]. Besides, the land rent has

tremendously promoted the income increase [4] and the income increase effect of land transfer is distinct, while, the land transferred out has implicit impact on the income [5]. However, the farmland transfer has a more significant impact on the income from wage and salary, operation and the transferable income [6]. Many factors contribute to the land circulation, among which, the oppression and innovation of livelihood and pressures from community [7] are the major one. The higher the level of de-agriculturalization, the stronger the willingness to transfer land for the peasant household [8]. Furthermore, de-agriculturalization has obvious differences for the influence on land circulation. The peasant household with higher de-agriculturalization has stronger willingness for the farmland transfer [9,10].

Many beneficial conclusions have been drawn from the above literature in terms of the exploration of the relationship among livelihood strategy, land circulation and income increase, providing a better foundation for this study. However, the study should be further conducted in two aspects: first, the existing studies isolate the inner link among livelihood strategy, land circulation and income increase. The current literature analyzes either the impact for the livelihood strategy on the farmland transfer and income or the income increase effect due to land circulation, however, they fail to incorporate them into the framework of “strategy-circulation-income increase” for analysis. Second, the empirical studies among livelihood strategy, farmland transfer and income increase are not covered.

1.1 the livelihood strategy types

Chambers and Conway (1983) regarded livelihood as a way to make a living. The peasant household actively or passively alters their livelihood strategy so as to improve their living standard. Therefore, livelihood strategy has been defined as the combined option for the activities taken by the household and its members. The purpose is to maintain, safeguard, and improve their livelihood. Ellis thought that the livelihood strategy should be classified as the activities that are based on natural resources and non-natural resources [3]. Family capital provides diverse and effective resources for production and livelihood of farmers, and thus profoundly determines farmers' behavior in the decision-making process [11]. The Sustainable Livelihood Approach (SLA) (Figure 1) has been used to understand household livelihoods and to plan community development programs. This approach considers five types of household's assets and uses multiple indicators to assess exposure level to livelihood. Policies (Farmers can voluntarily transfer their land) affect households' livelihood strategy, and the livelihood strategy in turn impacts on the outcome of household livelihood (economic income) [12]. So Affected by the natural resource endowment of households and the agricultural and non-agricultural income difference, the imbalance between people and land has been growing, thus, the intensification and diversification have become the alternative for the livelihood of peasant households [13]. They have gradually shifted from traditional agriculture to the non-agricultural field, shaping the diversified livelihood methods of full-time farmers, part-time farming and non-farming. By referring to research achievements of scholars like Xu Heng [14] and combining the actual conditions of rural areas in western China, the article defined the full-time farmers as the household whose agricultural operation time occupies more than 80% and the part-time farmers with a time of 20%~80%. As far as the non-farmers are concerned, they are the one with less than 20% of time occupation. In other words, the livelihood strategy can be divided into three types, which are full-time farmers, part-time farmers and non-farmers, for a better livelihood outcome .

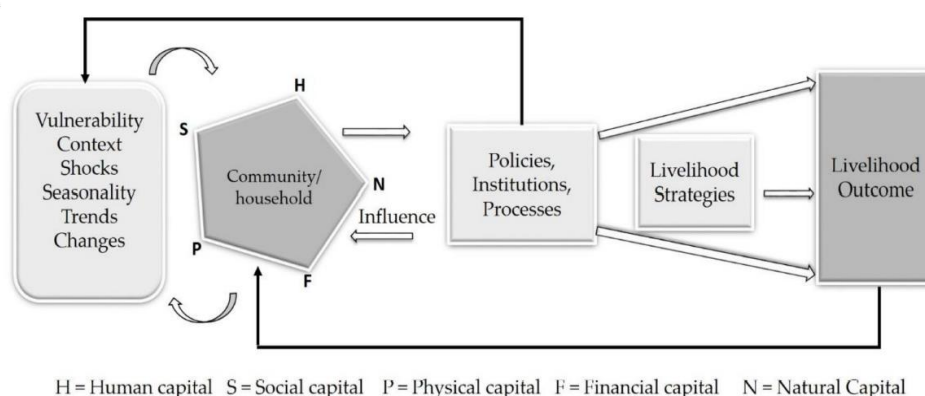


Figure 1. The asset pentagon lies at the core of sustainable livelihood approach, within livelihood strategy the context.

1.2 The impact for the farmland transfer on income

Land is one of the major livelihood assets of peasant households. Therefore, the utilization and disposal of farmland can make a difference to the household income. According to the prospect theory, the decision-making behavior of peasant households can be affected by the external environment and their cognition of risks, that is, people tend to avoid risks in the event that risks are uncertain [15]. The income of full-time farmers is mainly from the agricultural operation, which has relatively high dependence on land. Given the circumstances of relatively fixed income of agricultural operation and unstable employment of non-farmers due to poor professional ability, the full-time farmers are disgusted with risks, as a result, they opt for the land circulation within the scope of labor ability. However, the part-time farmers have achieved the livelihood exploration or transformation from farmers to non-farmers. With more non-agricultural labor force and relatively high employment stability, they prefer to transfer the land out under the circumstances of high opportunity cost of agricultural operation and large amount

of investment in labor force. It is thus clear that the full-time farmers with farming as their main livelihood source have high demand for land security, on the contrary, the non-farmers have less dependence on land. The part-time farmers are in the middle. They choose to make a living either on agricultural operation or non-farming employment with the change of life cycle and livelihood opportunity.

Generally speaking, agricultural income mainly lies on the scale of the operation of land. The farmers transform into scale operation when more land is available, achieving the scale management and intensification of agricultural operation to different extents. It can be conducive to fully utilizing the production factors like labor and capital and lowering down the transaction cost and production cost, further increasing the household income [5,16]. In terms of farmers who transfer the land out, their household resources have been re-configured and the income has been changed as well, as a result, the income structure changes. On the one hand, the scale of land operation shrinks after the land has been transferred out. Instead of agricultural operation, the income has changed to land rentals, improving the income from property; on the other hand, the separation of some labor force and land improves the employment structure of peasant household, increasing the time investment in non-farming and giving full play of the comparative advantage as non-farming employment [17]. It promotes the labor force transfer of non-farming employment and brings in the increase of income from wages.

1.3 The impact for the livelihood strategy on income growth

On the whole, the participation of farmland transfer for farmers can effectively advance the growth of household income. However, different directions of transfer have diverse influences on the growth path of such income. Among others, the outflow of farmland has a significant impact on the non-farming income and the inflow can make a big difference for the income from farming. Among farmers with different livelihood strategies, the outflow of farmland has far less facilitation to the non-farming income than that of the inflow to the farming income [18]. Farmers with different types of livelihood strategies have significant differences in the desire for farmland transfer. Among which, the part-time farmers are more likely to transfer the land out. The proportion of farmland transfer and the part-time farming level demonstrates a U-shape relationship [19]. The change of livelihood strategy will change the structure of household income. The families with different livelihood strategies have relatively big discrepancies in terms of income and the livelihood strategy has a diversified impact on the income growth of different farmers. The income from farming is the main source for the full-time farmers who are more dependent on self-sufficient production. The marginal productivity of labor is relatively low. The family members are mainly elderly or those who have voluntarily given up non-farm employment due to lack of skills. The income from farming is susceptible to multiple effects, including climate, technological advancement, policy and market of agricultural products, therefore, the household income level is relatively low [19]. The income source for part-time farmers is from agricultural production and non-farming activities. They focus on the non-farming operation; therefore, the employment is relatively stable, consequently, the income is high. Compared with full-time farmers, part-time farmers have more diversified income sources, thus, the income level is high [19]. The non-farmers are the one who have dropped out from agricultural production and regard the non-farmers as the major source of livelihood. The current studies indicate that the marginal benefit of farming is generally lower than that of the marginal salary of non-farming. Farming has less and less impact on income growth, thus, such growth mainly depends on the increase of non-farming income [1,21,22]. As a result, compared with farmers who are dependent on other livelihood types, the non-farmers have higher income.

2. Materials and Methods (Data and Methods)

2.1 Description of the Study Area

The study was carried out in Gansu, Ningxia, Inner Mongolia, Shaanxi and Qinghai provinces, in western district of China, where the economy is less developed (Figure 2). According to data from the National Bureau of Statistics of China (Chinese Statistics Press:2020), the total natural area of Gansu, Ningxia, Inner Mongolia, Shaanxi and Qinghai district is 2,631,700km² with a population of approximately 101,724,596, among which, 50.24% of the population are farmers in this district during 2018-2020. Agricultural production includes wheat, rice and crop; pork, mutton and beef. After China's reform and opening-up in 1978, with the rapid development of urbanization and industrialization and the improvement of income from land and the accessibility of working outside. They choose to make a living either on agricultural operation or non-farming employment with the change of life cycle and livelihood opportunity. Therefore, we choose this area to conduct the research on the impact for livelihood strategy and farmland transfer on the income increase of peasant households.

2.2 Data Collection

The data are from the field research conducted by the rural household loan availability research group in 5 provinces including Inner Mongolia, Gansu, Ningxia, Shaanxi and Qinghai. The combination of stratified sampling and simple random



Figure 2. The study areas: five provinces.

sampling has been adopted for the research. 2-3 counties were randomly selected from each region and 3-5 natural villages were randomly selected in each county based on the prefectural farmland transfer. 50-100 families in each natural village were selected and 15,000 copies of questionnaires were distributed in total. 11,527 valid samples were obtained by eliminating the farmers with missing value and the one with land outflow and inflow at the same time. Among which, the stratified sampling was based on the household livelihood strategy (the duration engaging in the actual agricultural operation). It can be specifically divided into full-time farmers, part-time farmers and non-farmers.

2.3 Data Analysis

The affecting factors of farmland transfer can be determined by the research achievements of pertinent scholars and the features of questionnaires. Based on the theoretical analysis in previous sections, the household livelihood strategy has been selected as the core independent variable and the farmland transfer behavior has been taken as the mediating variable. The other control variables affecting the income of farmers, such as characteristics of head of household, family and social capital, and the regional features of villages, have been introduced into the model (Table 1). The income of farmers has multiple-dimension, including the operating income, property income, income from salary and transferable income. Different research topics determine the difference of the definition of household income index. Per capita net income of rural households has been selected as the explained variable in this paper.

Table 1. Descriptive statistics of variables.

Variable Type	Variable	Variable definition and unit	mean	standard deviation
Dependent variable	Household income	net income/Yuan	13106.510	41444.030
Core variable	livelihood strategy	pure farmer =1, part-time farmer =2, non-farmer =3	2.044	0.854
intermediate variable	Farmland inflow	Transfer or not, yes=1, no=0	0.209	0.407
	Farmland outflow	Transfer or not, yes =1, no=0	0.089	0.284
Other variables	Household age	actual Age of Household/year	52.208	11.286
	square of age	square of Household actual age/Year	2853.017	1170.478
	Degree of education	Years of education	5.422	4.291
	Population	family population Number	4.472	1.902
	Labor Force Number	Family Labor Force Number (18-75 rang)	3.254	1.304
	Degree of Labor Force education	Average Years of Family Labor education /Year	1.594	1.808
	Value of agricultural machinery	Total value of agricultural equipment /Yuan	5019.797	23939.950
	Distance	Distance from village to nearest town market town /Km	13.603	53.015
	Natural Resources	Per capita cultivated land area/Mu	1.659	1.693

Mu: a Chinese unit of area(equal to 1/15 of a hectare or 1/6 an acre)

Rural area is the site of the livelihood field. The livelihood strategy is a coexistence phenomenon of full-time farmers, part-time farmers and non-farmers in the gradual process from the traditional small peasant household of homogeneity to heterogeneous farmers affected by many factors like social economic culture [8]. Based on the proportion of the duration engaged in agricultural operation for farmers in 2018, the type of livelihood strategy can be classified into three types, which are, full-time farmers, part-time farmers and non-farmers. From the distribution of samples, the features of livelihood strategy are obvious. With only 11.19%, full-time farmers have made the least proportion, the part-time farmers account for 49.54% and the proportion of non-farmers is 39.27%. As can be seen, the sampled farmers gradually tend to become multiple-occupation and de-agriculturalization. The farmers who engage in purely farming are shrinking in numbers. In order to study the livelihood capital configuration of farmers, the outflow and inflow of farmland have been selected as the mediating variable. Among the sampled farmers, 11,527 transferred the land, 7,170 of which are inflow and 4,357 of which are outflow. From the perspective of farmland transfer of farmers with different livelihood strategy types, it shows that the full-time farmers and part-time farmers are relatively dependent on land, while the non-farmers gradually liberate themselves from land and switch to the non-farming industries.

In addition to the above variables, the paper also regulates the characteristics of head of household, family features and the regional features of a village. The head of household is crucial to decision-making. The degree of education, age and squared age have been selected as the characteristics of head of household. The degree of education reflects the major indicator of possessed cultural capital of a peasant household, which represents the knowledge reserve and the ability for new knowledge acquisition. The age stands for farmer's experience in living and production and the physical strength (People at age 18-75 have been selected as the study objects in this paper). The household scale and number of labor force have a certain impact on farmland transfer and household income. The number of labor forces is the income source and the quality of labor force (labor capital) is

the measuring indicator of household income. In general, the household with a healthy body, higher education and certain skills has more employment opportunities, thus, the income obtained is higher as well. The number of family members, quantity of labor force, household quality and value of agricultural machines has been selected as the household characteristics. Income has been affected by different natural environments and infrastructures. The quality of household social capital mainly refers to the quantity and quality of family members who have decent jobs. Expert method has been adopted as the realistic appraisal. It manifests that support can be obtained through social networks so as to improve the possibility and accessibility of income.

2.4 Research Methods

The livelihood strategy of peasant households can affect the re-configuration of household land resources. The farmland transfer can make a difference in farmer's income. Then, it can be inferred that farmland transfer is the mediating factor. And the livelihood strategy may affect the income growth through farmland transfer. In an effort to verify the mediating effect for the livelihood strategy to income growth, by using the practices of Wen et al. as reference [22], the mediating effect model has been adopted for verification. The model is shown as below:

$$Y_i = a_0 + a_1LD_i + a_2X_i + \varepsilon_1 \quad (1)$$

$$T_i = b_0 + b_1LD_i + b_2X_i + \varepsilon_2 \quad (2)$$

$$Y_i = c_0 + c_1LD_i + c_2T_i + c_3X_i + \varepsilon_3 \quad (3)$$

In the formula standing for the peasant household, Y_i refers to the household income, LD_i signifies the livelihood strategy, T_i is the decision-making of land circulation, including two variables: outflow and inflow, X_i means other control variables, including characteristics of head of household, family features, village and regional features. a_0, b_0 and c_0 are the constant term, $a_1, a_2, b_1, b_2, c_1, c_2$ and c_3 are the coefficient to be estimated, and $\varepsilon_1, \varepsilon_2$ and ε_3 are the error term. a_1 of equation (1) shows the impact for the livelihood strategy on land circulation; b_1 in equation (2) is the influence for the livelihood strategy to the farmland transfer and c_1 in equation (3) is the direct effect of household income growth for the livelihood strategy after the land circulation has been controlled. The mediating effect equals the coefficient product of $b_1 c_2$, which is the indirect effect to the income for the livelihood strategy through the farmland transfer. c_2 is the impact for the land circulation on income.

We use Causal Steps Approach, Sobel test, MCMC method and Bootstrap method to verify the mediating effect. The Causal Steps Approach is the indirect test to the coefficient product, while, Sobel, Bootstrap and MCMC are the direct test of such results. So Causal Steps Approach has been firstly adopted to test the mediating effect.

The steps for Causal Steps Approach to determine the mediating effect are shown as below:

Step 1, test the significance of coefficient a_1 , if that is the case, then, test b_1 and c_2 ;

Step 2, determine the significance of b_1 and c_2 , if both of them are of high significance, then, the indirect effect is significant;

Step 3, determine whether the indirect effect is mediating effect or masking effect. The significance of coefficient c_1 should be further tested. If it is of significance, then, it means that there is a direct effect. If $b_1 c_2$ has the same sign as c_1 , it means partial mediating effect exists, otherwise, indicating the existence of masking effect.

In the event that one of b_1 and c_2 is less significant, then, Sobel, MCMC and Bootstrap method should be further adopted to test the significance of coefficient product [23]. When coefficient a_1, b_1 and c_1 are all significant, the results of Causal steps are better than that of Bootstrap [23], therefore, Causal steps method has been firstly adopted to test the mediating effect in this paper.

2.5 Robustness test

Endogenous problems may lead to deviation in estimating the impact of livelihood differentiation and farmland transfer on household income growth. There are two main factors that lead to endogenous problems: first, there is a mutual influence between farmers' livelihood strategies and farmland transfer; on the one hand, after farmers' livelihood strategies, they will reconfigure household livelihood resources, resulting in different farmland transfer behaviors; Natural capital, on the other hand, the change will change the configuration of farm workers, if farmers turn into farmland, labor payrolls will be restricted, their family to pure farmers differentiation, on the contrary, if the farmers turned out, release the family agricultural labor force, improve the employment ratio [24], the livelihood of farmers differentiation of farm households. Second, reverse the relationship between livelihood strategies and household income. Livelihood strategies drive households to change the allocation of household factors, thus affecting household income. The appearance of farmers' livelihood strategy is occupational differentiation, while the underlying reason is the change of family income structure. The change of farmers' income may also reverse the influence of farmers' career choice, forming different livelihood strategies, and finally forming livelihood differentiation. In this regard, based on the practice of Huang et al. [25], selected the empirical data of such strategy so as to ensure that the livelihood strategy proceeds to the decision-making of farmland transfer and household income, expecting to effectively solve the potential endogenous problems in the model and objectively reflect the reality.

3. Results

As the decision-making of farmland transfer is a binary discrete variable, while the household income is a continuous variable, therefore, the probit model has been adopted to evaluate the influence for livelihood strategy on such circumstances. OLS regression model has been utilized to appraise the income growth. It is necessary to point out that the logarithm of the value of agricultural machineries, per capita net income and arable land per capita has been taken so as to alleviate the heteroscedasticity. As the value of agricultural machinery may be 0, $\log(x+1)$ has been adopted as the solution. In the process

of verifying the model results, dummy variables have been taken for the farmers with different livelihood types, which have been incorporated into the regression model. The results are shown in Table 2.

3.1 The relation among livelihood strategy, farmland transfer and the income growth

According to the results of model 1 in Table 2, the livelihood strategy has a significant positive impact on the income, indicating that the improvement of the livelihood strategy level can promote the growth of household income. With the increase of 1 unit of livelihood strategy, the household income will grow by 4.5%. Model 2-3 and 7-8 demonstrate the estimated results of how such strategy impacts the farmland transfer. According to the results, the livelihood strategy has an obvious negative impact on the inflow of land, while it has distinct influence on the outflow of land. In addition, compared with full-time farmers, the part-time farmers prefer the farmland transfer, however, there is no overt discrepancy. The possible reason behind this is that the laborers of part-time households are more advantageous in terms of physical power and quantity. Consequently, facing the relatively stable farming income and the unstable non-farming employment, they have stronger desire for the inflow of land. The willingness for the land circulation of part-time farmers and non-farmers are weaker than that of full-time farmers, illustrating the negative correlation between the level of livelihood strategy and inflow of farmland, besides, there is a positive correlation to the outflow of such land. The peasant household can further be divided into livelihood types, which can be substituted into model 6 (Table 3). Compared with full-time farmers, the part-time farmers have a higher level of income, despite the indistinct difference. As a contrast, the income growth of part-time farmers is significantly higher than that of full-time farmers, illustrating that the income growth from salary can promote the effective increase of income for the household labor force under the given circumstance.

Table 2. The regression estimation results of farmers' livelihood strategy, land circulation and Income growth.

Variable	Model 1 Household income	Model 2 Farmland inflow	Model 3 Farmland outflow	Model 4 Household income	Model 5 Household income
Livelihood strategy	0.045*** (0.015)	-0.042*** (0.007)	0.035*** (0.005)	0.037*** (0.018)	0.036*** (0.016)
Farmland inflow				0.128*** (0.042)	
Farmland outflow					0.180*** (0.046)
Age of house owner	0.014 (0.008)	0.021*** (0.004)	-0.003 (0.003)	0.011 (0.008)	0.015* (0.007)
Household labor force	0.128*** (0.014)	-0.006 (0.007)	-0.003 (0.005)	0.129*** (0.014)	0.129*** (0.014)
Degree of education	0.028*** (0.009)	-0.006 (0.004)	0.003 (0.003)	0.029*** (0.009)	0.027*** (0.009)
Level of mechanization	0.017*** (0.003)	0.012*** (0.001)	-0.003** (0.001)	0.015*** (0.003)	0.017*** (0.003)
Infrastructures of village	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000* (0.000)
Natural resources of villages	-0.083*** (0.014)	-0.002 (0.006)	0.004 (0.005)	-0.083*** (0.014)	-0.083*** (0.014)
Distance	0.128*** (0.013)	-0.006 (0.008)	-0.003 (0.006)	0.131*** (0.016)	0.131*** (0.016)
Constant term	8.451*** (0.213)			8.257*** (0.212)	8.236*** (0.212)
LR chi2(12)		207.41	76.30		
Prob>chi2		0.000	0.000		
R ²	0.096			0.0987	0.0991
Prob>F	0.000			0.000	0.000
Sample size	11527	11527	11527	11527	11527

Note: ***, ** and * respectively express the level of significance of 1%, 5% and 10%. The bracket shows the standard error. The variables of model 2 and 3 are the marginal effect of the probit model.

According to the estimated results of the impact for other control variables on the income, the age of house owner and household income present an “inverse U shape” curve, demonstrating the multiple factors. For instance, the experiences in planting, market dynamic and cultivation and accumulation of skills present positive correlation. When the farmers reach a certain age, their physical ability declines and the knowledge acquired is gradually obsolete. The infrastructure has a significant positive effect on household income; the better the infrastructure, the more conducive to income growth. For example, the perfection of facilities like rural roads, water conservancy facilities, irrigation facilities, signal and network coverage contribute to the income increase. The arable land per capita has an obvious negative effect on income growth. The possible reason is that

the more the land, the more labor force required, as a result, they could not go out to work. However, the comparative benefit of agricultural operation is relatively low, which is not conducive to the relative improvement of household income, thus forming the “Resource Curse” effect similar to “labor force-arable land”. The quantity of family members has a distinct negative impact as well. The families with more members have relatively more older people and children to be nursed, consequently, the daily expenditure is higher, which is against the income growth. The quantity of labors, degree of education and the value of agricultural machinery have a magnificent positive impact on the income, indicating that quantity and quality of household human capital can be conducive to the increase of income. The level of mechanization of production tools can effectively improve the household income. The social capital condition has an obvious positive impact on the household income, illustrating that the accumulation of family social capital can increase the household income.

Table 3. The regression estimation results of farmers’ livelihood strategy, land circulation and Income growth.

Variable	Model 6 Household income	Model 7 Farmland inflow	Model 8 Farmland outflow	Model 9 Household income	Model 10 Household income
(Compared with full-time farmers)					
Part-time farmers	0.052 (0.054)	0.010 (0.028)	0.002 (0.014)	0.051 (0.054)	0.052 (0.054)
Non-farmers	0.130*** (0.051)	-0.107*** (0.025)	0.058*** (0.014)	0.144*** (0.051)	0.120** (0.051)
Farmland inflow				0.121*** (0.032)	
Farmland outflow					0.178*** (0.046)
Control variable	Controlled	Controlled	Controlled	Controlled	Controlled
LR chi2(12)		216.82	82.02		
Prob>chi2		0.000	0.000		
R2	0.097			0.100	0.100
Prob>F	0.000			0.000	0.000
Sample size	11527	11527	11527	11527	11527

Note: ***, ** and * respectively express the level of significance of 1%, 5% and 10%. The bracket shows the standard error. The variables of model 7 and 8 are the marginal effect of the probit model. Regression control variables of each column are the same as what it shows in Table 1.

3.2 The mediating effect test of farmland transfer

According to the setting of the model, the mediating effect test has been further conducted. Table 2 shows the results of such test for model 1, 2 and 4. The results of the model 1 show that the livelihood strategy has a positive impact on the household income, the level of significance is 1%, meaning that the livelihood strategy has an obvious positive effect in terms of the growth of household income. According to model 2, the level of significance for the livelihood strategy to the inflow of farmland is -0.42%, showing a distinct negative effect. It means that with the improvement of livelihood strategy level, the dependence on land gradually declines, and so is the willingness of the inflow of farmland. The results of model 4 demonstrate that the impact for the livelihood strategy and inflow of farmland on the household income growth is respectively 0.37% and 0.18%, which is the prominent facilitation. According to the ordinal test method, the three parameters, a_1 , b_1 and c_2 , which are corresponding to the model, are significant. It can be explained that the direct effect of livelihood strategy should be significant, however, the coefficient symbol of $b_1 c_2$ and c_1 is negative, presenting that the mediating effect of inflow of farmland does not exist, which is actually masking effect. That is, the inflow of farmland is not the mediating effect mechanism for the livelihood strategy to promote household income growth. Restricted by the quantity of labor force and transaction cost, the inflow of farmland fails to form the advantage of scaled labor force, technology and production materials, besides, the comparative benefit of farming is low and natural disasters are high, consequently, the impact for farming on the income growth declines, leading to the difficulty in increasing of income through inflow of farmland.

Table 2 shows the results of the mediating effect test for the outflow of farmland of model 1, 3 and 5. The test results of model 1 indicate that livelihood strategy has positive impact on the outflow of farmland with a 1% level of significance, meaning that the livelihood strategy has obvious positive effect in terms of the farmland outflow. The level of significance for the livelihood strategy for model 3 is 1%, which is a positive impact for the action of outflow of farmland. According to results of model 5, the coefficient of livelihood strategy and outflow of farmland is 1%, promoting the increase of household income. It is thus clear that, a_1 , b_1 and c_2 are all significant and the coefficient symbol for $b_1 c_2$ and c_1 is same, demonstrating the existence of mediating effect for the outflow of farmland, which is the partial mediating effect. In other words, the livelihood strategy can directly affect the income growth and partially promote such growth through the farmland outflow. It also illustrates that the livelihood strategy can advance such behavior and increase the income from property and salary, bringing about the family income increase.

4. Discussion

Based on the research data of 15,000 households in 5 provinces of China including Gansu, Ningxia, Inner Mongolia, Shaanxi and Qinghai in 2019, the impact for the household livelihood strategy on the land circulation and household income growth has been studied. Such a strategy will make the land of the household re-allocate, as a result, the land circulation can make a difference in the household income. The research results indicate that the dependence on land for farmers is weakening gradually and the willingness for inflow of farmland declines, while the desire to outflow the farmland increases. The livelihood strategy can directly affect the income growth and the outflow of farmland can indirectly advance the income growth. In the research, the mediating effect of farmland transfer has been tested. According to the results, the mediating effect of inflow of farmland does not exist, however, the mediating effect of outflow of farmland is existent. The livelihood strategy can increase the household income through the facilitation of outflow of farmland, making the income grow. These conclusions have provided further reference for us to design and implement the intervention policy on household income growth.

Land transfer promotes the processes of non-agriculturalization and urbanization of the rural population, creates good spatial support and human resources for urbanization, and provides momentum for sustainable urbanization. Land transfer is also a development trend in China's agricultural modernization process, which will inevitably affect the livelihood capital and livelihood strategies of farmers. Formulating and solving the livelihood security issues of farmers is an urgent issue [26]. Particularly in an environment that does not provide safety guarantees for these land-lost farmers, speeding up land circulation can increase labor productivity. However, these farmers may not find a way out of their livelihood, which will bring about consequences and is risky [27]. Although the data were collected from the western areas, the environment, approach of agricultural operation, social and economic development level, traditional culture and government policy are different among regions. These differences have shaped various livelihood strategies and willingness of land circulation, thus, affecting the improvement of household income through conduction mode. As a result, efforts should be made in the following aspects in the research regarding the household income increase. First, mediator model, cooperative regulation model and other methods should be adopted to test the intermediate variables affecting the household income so that to make the research results more precise. Second, more and more field survey data should be acquired and all of these factors should be incorporated into the variables of household income growth, making the conclusions more scientific and persuasive.

5. Conclusions

In terms of the features of current livelihood strategy and land circulation, starting from the household livelihood strategy, the paper adopts the microscopic survey data to establish the mediating effect model and conduct the empirical test for the relation among livelihood strategy, land circulation and household income growth. According to the research results, compared with full-time farmers, part-time farmers and non-farmers have a more distinct income increase effect. The different strategies make the level of dependence on land vary. In general, the farmer's dependence on land shows a weakening tendency. The willingness for the inflow of farmland declines and the desire for the outflow of farmland increases. From the perspective of mediating the effect of farmland transfer, the livelihood strategy will directly promote the income increase and affect such increase through the outflow of farmland in an indirect way.

Innovation: Firstly, compared with previous separated the three key variables studies, this study integrated the three into the same framework for an overall analysis. Secondly, The relationship among the "livelihood strategies and land circulation, land circulation and farmers income growth" has not yet reached a consensus. This paper proposes that heterogeneous farmers have different income growth after participating in land circulation, and conduct us empirical research to test them. Third, China's economy and society has made great achievements since 1978, but the problem of unbalance between urban and rural areas is still serious, so the farmers which live in western rural areas are more urgent for income increase, that is the innovation of this paper.

In order to promote peasants' income from land circulation, the study provides the following recommendations, which may be of interest to researchers who are working in remote rural areas in other regions:

First, in national and local adaptation planning, priority should be given to support the western regions where people are more eager for development opportunities.

Second, the agricultural scientific achievements, commercialization and talents should be further promoted. The agricultural labor remuneration and scale economy should be improved and the support system for agriculture should be refined so as to assist the pure farmers, part-time farmers of farmland outflow to expand the avenues for income growth.

Third, the rural surplus labor migration should be further advanced through skill training, employment, recruitment connection and support system for entrepreneurship.

Fourth, the land property right system should be strengthened so as to promote the income growth from property, making the household become both the participants and benefactors of farmland transfer.

Finally, we reiterate that we should use the framework of "strategy-circulation-income increase" and empirical studies among livelihood strategy, farmland transfer and income increase. These research findings can be used to optimize the existing regulations and bring more attention to the specific dimension of livelihood strategy and land circulation, which are of important impacts on farmer's income. To achieve that goal, researchers need to have a deep understanding of local situations so as to cope with them in more suitable ways.

Author Contributions: Conceptualization, Q.X. M. and Y.Y.H.; methodology, Q.X. M. and Y.Y.H.; validation, Q.X. M. and Y.Y.H.; formal analysis, Q.X. M. and Y.Y.H.; investigation, Q.X. M. and Y.Y.H.; resources, Q.X. M. and Y.Y.H.; data duration, Q.X. M. and Y.Y.H.; writing—original draft preparation, Q.X. M. and Y.Y.H.; writing—review and editing, Q.X. M. and Y.Y.H.; visualization, Q.X. M. and Y.Y.H.; supervision Y.Y.H.; project administration, Q.X. M. and Y.Y.H.; Both authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the National Social Science Foundation of China.

Conflicts of Interest: The authors declare no conflict of interest.

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