

## Article

# Empowerment and Poverty Reduction: Land Certification, Factor Allocation, and Multidimensional Relative Poverty

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## Abstract

Based on the 2021 Jiangxi rural survey data, this paper employs the Alkire–Foster (A-F) method to measure the multidimensional relative poverty index of farmers. Using linear regression and mediation effect models, we empirically analyze the impact and mechanism of land certification on farmers’ multidimensional relative poverty. The results indicate that land certification significantly reduces the overall level of multidimensional relative poverty among farmers. It has a notable positive effect on the allocation of credit, land, labor, and capital factors, effectively encouraging farmers to increase their agricultural investments, expand farmland transfers, and enhance agricultural labor input. Furthermore, farmland certification exerts an indirect effect on multidimensional relative poverty by inhibiting poverty through the allocation of these production factors. Specifically, credit, labor, and capital allocation play partial mediating roles, while land allocation serves as a complete mediator. Based on these findings, recommendations are put forward to further implement the “separation of three land rights” policy, adopt targeted measures for different types of poverty among farmers, and improve factor markets at the county level as soon as possible.

**Keywords:** rural revitalization; land certification; multidimensional relative poverty of farm households; factor allocation

## 1. Introduction

China’s poverty alleviation strategy has lifted 98.99 million rural impoverished individuals out of poverty [1], eradicating both absolute and regional overall poverty. However, poverty remains an issue, with relative poverty and multidimensional poverty still uneven [2,3]. Development within poverty-stricken regions remains uneven [4], with a fragile foundation among households that have escaped poverty, making them highly vulnerable to falling back into poverty due to risks [5]. Some of these households exhibit a dependency mindset, lacking the intrinsic motivation to improve their economic conditions [6]. Multidimensional poverty in rural China remains severe, manifesting as deprivations in education, health, infrastructure and living standards [7], as well as social capital and opportunities for farmers. Therefore, eliminating multidimensional relative poverty at the societal level is of great significance for properly addressing the contradiction between the people’s growing needs for a better life and unbalanced and inadequate development, implementing the 2030 Agenda for Sustainable Development, and achieving sustainable poverty reduction.



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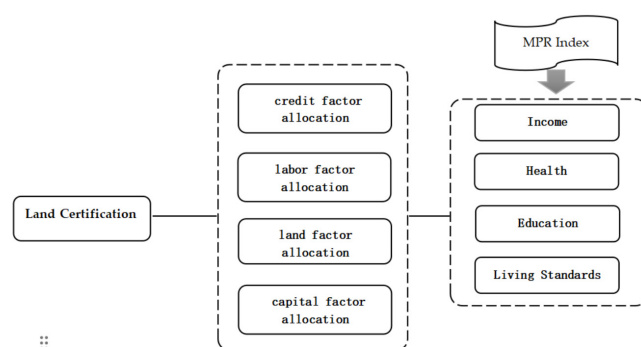
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Farmland is a significant asset for rural households. It has a pivotal impact on the health and welfare of the rural impoverished population [8]. Academics views farmland certification as a crucial means to enhance the stability and security of farmland property rights, providing essential property rights protection for activating rural factor markets and unleashing rural development vitality [9,10]. As a land system reform in the new era, farmland certification eliminates farmers' concerns about arbitrary land expropriation and strengthens their psychological expectation for long-term investments [11]. It clarifies property rights, reducing disputes arising from ambiguous ownership. On this basis, clear property rights endow farmers with complete rights over their contracted land, including possession, use, income generation, and transfer. This can activate the land leasing market, improve investment incentives and credit accessibility, enhance resource allocation efficiency, and transform land from a mere means of production into fluid capital assets.

Land certification has advanced the transformation of agricultural management practices and indirectly influenced the institutional arrangements and cultural environment that contribute to rural poverty [12]. It encourages non-agricultural employment, broadens farmers' income sources, promotes income growth [13,14], and thereby alleviates multidimensional relative poverty among rural households. Thus, land certification serves as a critical bridge connecting the land system with rural development. However, some scholars argue that the poverty reduction effects of land certification are not significant. They suggest that the theoretical mechanisms through which the new round of land certification policies affect farmland transfer, contractual arrangements, and investments are weak and lack clear logic [15]. Moreover, farmers' land tenure has not substantially increased. Additionally, land certification has not actively promoted the deepening of agricultural division of labor and fails to effectively advance large-scale farming operations and services of farmland in China [16]. Farmland possesses personalized property characteristics and endowing it with stable property rights may cause farmers to inflate their valuation of land, thereby increasing rental costs in farmland transfer transactions. Whether land certification has poverty reduction effects remains a contentious issue.

From the perspective of factor allocation, can land certification alleviate the MRP of farmers who have escaped absolute poverty? What is the underlying mechanism? These questions will be the key focuses of this paper. The marginal contributions of this paper are as follows: (1) Based on field survey data, we analyze whether property rights stability has a welfare-improving effect using an MRP that includes education, health, and living standards. (2) From the perspective of factor allocation, this paper explores the mechanism through which farmland certification affects MRP among farmers, focusing on four key factors: credit, land, labor, and capital, thereby providing clear evidence on how certification contributes to poverty reduction (Figure 1).



**Figure 1.** Analytical framework.

## 2. Literature Review and Research Hypotheses

### 2.1. Literature Review

#### 2.1.1. Multidimensional Relative Poverty: Measurement and Influencing Factors

Poverty is an economic phenomenon defined by insufficient financial resources to meet basic survival needs. In the process of social development, policymakers typically use income data to measure the extent of poverty among the population. The theory of multidimensional poverty, proposed by Sen [17], primarily assesses three core dimensions: health, education, and living standards. Research on multidimensional relative poverty mainly focuses on three aspects: first, the measurement methods and selection of dimensions for the MRP index. Scholars' approaches to measuring the multidimensional relative poverty index can be broadly divided into two categories: one category consists of marginal distribution methods that do not consider the relationships between different dimensions, such as the dashboard method and the composite index method; the other category consists of methods that consider the joint distribution of dimensions [18], including the Human Poverty Index (HPI), Venn diagrams, stochastic dominance methods, fuzzy set methods, and axiomatic methods. Regarding the selection of dimensions, the AF multidimensional relative poverty measurement method developed by scholars Alkire and Foster overcomes the shortcomings of other multidimensional relative poverty measurement and calculation methods, enabling more accurate identification of the impoverished population [19]. It has been adopted by the United Nations Development Programme (UNDP) and has become the mainstream method for measuring and assessing multidimensional relative poverty. Second, the target of multidimensional relative poverty measurement. Scholars have measured the extent of multidimensional relative poverty among different groups. For example, Palomäki et al. investigated that multidimensional relative poverty among the elderly in rural areas is more severe than overall multidimensional relative poverty in rural areas [20]. Moreover, the improvement in multidimensional relative poverty among the elderly is primarily due to a reduction in the number of impoverished people rather than an improvement in the depth of poverty. Lekobane et al. found that changes in the MRP index exhibit a U-shaped relationship with age, where the degree of MRP decreases with age, then rises again after reaching a certain threshold [21]. MRP also demonstrates gender disparities, with female-headed households facing deficits in long-term assets and being more susceptible to extreme chronic poverty [22]. In China, poverty exhibits significant regional disparities, with rural households in western regions being more prone to extreme and chronic poverty. Third, research on the factors influencing MRP. Some studies suggest that individual and household characteristics influence the MRP levels of residents. Compared to urban residents, rural residents exhibit higher livelihood vulnerability, and the factors affecting their MRP have long attracted academic attention. Guo et al. based on survey data of micro-level rural households in China, concluded that disparities in educational opportunities are a significant factor contributing to multidimensional poverty among rural households [23]. Social capital plays an important role in poverty reduction in developing countries [24]. Islam and Alam examined the impact of MRP among rural households and found that social networks, norms of reciprocity, and social trust negatively influence MRP [25]. Land is a critical asset for rural households, and the impact of land transfer-in and transfer-out on household poverty levels has also drawn scholarly attention. Land transfer has been shown to alleviate MRP among households in impoverished villages, with the "precautionary saving motive" triggered by land transfer-out being an important mechanism affecting MRP in poor rural households [26]. Land titling significantly increases the probability of rural labor engaging in agricultural employment and the number of household members involved in agricultural production, with agricultural investment and land transfer-in serving as key mechanisms [27]. Secure land tenure not only helps reduce

the incidence of childhood illness but also increases the likelihood of purchasing health insurance and children's school enrollment, as well as household expenditures on health and nutrition.

### 2.1.2. Background of China's Land System Reform

Following the onset of reform and opening-up in 1978, China introduced the Household Responsibility System. This system involved the equal distribution of land by village collectives, guided by the adjustment principle of "adding land for additional family members, and reducing land for fewer family members". To enhance the stability of land property rights, a 1984 policy extended the term of land contract management rights to 15 years. This was followed in 1993 by a further extension to 30 years for the second round of contracts, which shifted to the principle of "no land addition for new family members, and no land reduction for fewer family members". The enactment of the Rural Land Contracting Law in 2002 mandated the issuance of management rights certificates to contracting households. Nevertheless, inadequacies in the land management system, including incomplete certification and frequent subcontracting, led to a lack of clarity in land property rights.

The confirmation of rural land rights in China has undergone three stages: Small-scale village-level pilot projects (2009–2010), during which eight provincial-level units including Sichuan and Shandong initiated limited village-level trials; Nationwide pilot expansion (2011–2013), starting in March 2011, with representative counties selected across the country for pilot implementation, covering 50 counties and 710 townships; Steady advancement phase (2014–2019), beginning in 2014 with full-province pilots in Shandong, Anhui, and Sichuan, along with county-wide pilots in 27 counties. By 2018, the province-wide promotion of land rights confirmation had extended to 28 provinces. Using large-sample data from fixed observation points, Xu et al. note that, from 2013 to 2021, the process of land rights confirmation in China exhibited a steady and progressive trend [28].

While existing studies have extensively explored the measurement of MRP and its underlying causes, land, as the most critical asset for farming households, undeniably influences farmers' poverty and well-being through the stability of land rights. However, the mechanisms behind this relationship remain unclear. Following the new round of agricultural land certification, how enhanced land tenure security affects farmers' multidimensional poverty warrants in-depth investigation. This study adopts a factor allocation perspective to examine the impact of land rights on multidimensional poverty through the analytical chain of "land tenure security → factor allocation → multidimensional poverty of farmers".

### 2.2. Land Certification, Credit Factor Allocation and MRP

The adjustment in the allocation of agricultural production factors is a primary driver in alleviating relative poverty, and the confirmation of agricultural land rights plays a critical role in influencing how farmers allocate these production factors. Among these changes, farmland transfers significantly promote the expansion of agricultural production scale, enhance agricultural productivity, and increase farmers' income, thereby serving as an effective mechanism for reducing poverty risks [29].

The mechanism role of credit element allocation. Unclear land ownership can lead to instability in the transfer of farmland management rights, which is unfavorable for the disposal of collateral. However, the introduction of the land certification policy has laid the foundation for mortgage loans based on farmland management rights and promoted the transformation of financing models [30]. First, from the perspective of credit

supply in rural financial markets, land certification internalizes the external benefits of farmland and signals an increase in farmers' property assets. Farmers can use land contract management rights certificates to apply for loans from financial institutions, thereby stimulating their demand for mortgage loans based on farmland management rights [31]. Thus, land certification directly influences farmers' enthusiasm for obtaining loans. Second, from the perspective of credit suppliers, controlling credit risk is a fundamental requirement for banking operations [32], which enhances financial institutions' ability to assess farmers' creditworthiness.

The mechanism role of labor factor allocation. The subdivision of property rights is a prerequisite for the division of labor. When land property rights are unclear, long-term non-agricultural production by farmers may lead to land idleness and potential encroachment by others. To ensure the stability of land property rights, farmers often have to sacrifice off-farm employment opportunities and devote more time to agricultural production. This restricts the full transfer of rural surplus labor to non-agricultural sectors, effectively "binding" farmers to their land [33]. In contrast, land certification enhances the strength of farmland property rights and incentivizes rural labor to engage in non-agricultural employment [29]. It contributes to reducing agricultural labor intensity, increasing non-agricultural working hours for rural households, and improving household income and family welfare. Simultaneously, it "liberates" farmers from the land, granting them with more leisure time, enhancing their sense of well-being, and alleviating multidimensional relative poverty among rural households.

The mechanism role of land factor allocation. According to the Coase theorem, well-defined land property rights, free transfer of property rights, and sound institutional frameworks enhance the predictability of transactions and effectively reduce transaction costs. Research found that farmland certification can strengthen the perception of farmland, positively influencing the inflow of farmland [34]. Farmland transfer optimizes the allocation of farmland resources and achieves Pareto improvement through transaction benefit effects and marginal output equalization effects, thereby enhancing agricultural production efficiency. This, in turn, increases farm households' operational income, optimizes resource allocation, and alleviates multidimensional relative poverty among farmers in terms of education, employment, and other aspects. However, other studies indicate that as farmland transfer regulations are relaxed and property rights are increasingly strengthened, further "empowerment and capacity enhancement", particularly the implementation of land certification, may not contribute to promoting farmland transfer. Instead, the anticipation of certification significantly inhibits farmers' willingness to transfer land out, thereby suppressing farmland transfer [14].

The mechanism role of capital factor allocation. Secure land use rights can promote farmers' investment in land. Higher stability correlates with greater agricultural investment [35]. Land certification strengthens the exclusivity of land rights for farmers, reduces their investment in land rights protection, and effectively mitigates land abandonment [36], thereby incentivizing farmers to increase land input. The stability of property rights can reinforce farmers' investment expectations, particularly in agricultural machinery [37]. Without concerns about upfront fixed investments turning into sunk costs, farmers are encouraged to increase agricultural input, promote mechanization to replace labor, and consequently improve their health outcomes. Furthermore, land certification enhances the protection intensity of land rights, leading to adjustments in agricultural production structure and significantly increasing the likelihood of farmers cultivating cash crops, thereby raising their income levels.

3. Data Sources, Variable Selection, and Model Specification

3.1. Data Sources

The data used in this paper are obtained from a sample survey of rural households conducted by Jiangxi Agricultural University in eight counties of Jiangxi Province between July and August 2021. The survey covered information on household endowments and income, agricultural production and management status, and basic village characteristics. Jiangxi Province is a major agricultural region located in central China, characterized by its diverse topography including the Poyang Lake Plain, hilly areas, and the mountainous regions of southern Jiangxi. As one of China’s primary grain-producing zones and an ecological functional area, its agricultural production is predominantly focused on rice cultivation, accounting for 11.6% of the national rice output. Additionally, the province engages in industries such as citrus cultivation, pig farming, and aquaculture. Despite this, the overall economic level of rural residents in Jiangxi remains relatively low. In 2023, the per capita GDP was 71,216 yuan, which is below the national average of 91,746.1 yuan, making its MRP a representative case in the country. Therefore, this study selects rural residents in Jiangxi Province as the research subjects to explore the impact of farmland certification on multidimensional relative poverty among farmers. This approach offers certain reference value for studying relative poverty issues in rural China. Based on the research theme, 759 rural household data points were extracted as the initial sample. After data matching and the removal of 107 samples with missing or abnormal data, 652 valid samples were ultimately obtained.

3.2. Variable Selection

3.2.1. Multidimensional Relative Poverty Index

The focus of this paper is to examine the multidimensional relative poverty (MRP) index of rural households. The dependent variable is the MRP index of rural households, which is primarily measured using the A-F multidimensional poverty measurement method developed by Alkire and Foster [19]. Simultaneously, drawing on the deprivation indicators used in the Human Development Report published by the United Nations Development Programme, we selected four deprivation dimensions—income, health status, education level, and living standards—comprising seven indicators. Weighted values are assigned using a backpropagation neural network to construct the MRP indicator system for rural households, method is employed to assign weights. The process involves two specific steps: first, identification, where four deprivation indicators are used to determine the poverty status of each household; second, calculation, where the MPR index is computed. The indicator system is presented in Table 1.

Table 1. MPR Index Dimensions, Indicators, and Deprivation Cutoffs.

| Deprivation Domain  | Deprivation Indicator                 | Deprivation Threshold                                                                                                                                                         |
|---------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Income<br>(0.25)    | Per capita household income<br>(0.25) | Deprivation exists if per capita net household income is below 2300 yuan (2010 prices)                                                                                        |
|                     | Self-reported health<br>(0.125)       | Deprivation exists if self-reported health status is “relatively unhealthy” or “very unhealthy”; no deprivation if status is “very healthy”, “relatively healthy”, or “fair”. |
| Health<br>(0.25)    | Health Insurance<br>(0.125)           | Deprivation exists if the household head has no health insurance.                                                                                                             |
| Education<br>(0.25) | Education Level (0.25)                | Deprivation exists if the average highest education level of household members is below primary school.                                                                       |

Table 1. *Cont.*

| Deprivation Domain         | Deprivation Indicator      | Deprivation Threshold                                                                                                                                                                                |
|----------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Living Standards<br>(0.25) | Drinking Water<br>(0.083)  | Deprivation exists if the household's drinking water source is "river water, well water, rainwater, or spring water"; no deprivation if the source is "tap water, mineral water, or purified water". |
|                            | Sewage Disposal<br>(0.083) | Deprivation exists if the toilet type is "non-flush public toilet outdoors or other"; no deprivation if the toilet is "flush toilet".                                                                |
|                            | Housing<br>(0.084)         | Deprivation exists if the housing structure is "cave dwelling, mud-brick houses, or other"; no deprivation if the structure is "brick-concrete structures or reinforced concrete structures".        |

### 3.2.2. Land Certification

This paper aims to analyze the impact of land certification (certification) on MPR among farmers. Drawing on the research of Qin et al. [27], we select whether farmers hold a rural land contractual management right certificate as the indicator of land certification.

### 3.2.3. Mediating Variables

This paper employs the allocation of agricultural production factors among farmers as the mediating variable. Based on the preceding theoretical analysis and references to existing academic studies, whether a household has obtained a bank loan (loan), the proportion of household members engaged purely in agricultural activities (laborate), the area of land transferred in (landtrans), and agricultural input (captureinput) are selected as proxy variables for credit factor allocation, labor factor allocation, land factor allocation, and capital factor allocation, respectively, to verify the underlying mechanisms.

### 3.2.4. Control Variables

Building on available data indicators and referencing studies by Guo et al. [23], this paper selects age, gender, education level (education), and participation in agricultural technical training (training) to characterize individual attributes of farmers. Household characteristics are depicted by the number of household labor force members (laburnum) and whether the household has received agricultural subsidies (agrisubsidy). Regional characteristics are captured by the distance from the village to the county town (towndistance) and the level of agricultural mechanization in the village (mechanization). Descriptive statistics for all variables are presented in Table 2.

As shown in Table 2, MPR is a prominent issue in rural Jiangxi. The average MPR index among sampled households is 0.24, with over a quarter of rural residents experiencing such poverty, which poses significant challenges to rural stability and the implementation of the rural revitalization strategy. According to data from the 2018 China Health and Retirement Longitudinal Study, 67% of rural households have obtained land contract management right certificates. The certification of rural land rights in Jiangxi is relatively well-established, with a certification rate of 70%. Among the mediating variables, fewer households are engaged in land transfers, while approximately 28% of households transfer out their land, indicating a general preference for land transfer. The average number of migrant laborers is 0.56, while the average number of outgoing laborers is 1.95. The proportion of the population engaged solely in agriculture is 20%, suggesting that non-agricultural employment and mixed-income activities are common in Jiangxi. The average agricultural input is 216.89 yuan, indicating relatively low levels of agricultural investment. Regarding control variables, the average age of farmers is relatively high at 53 years old,

indicating an older demographic, and their education level is generally low, with most having only primary to junior high school education. The average number of household laborers exceeds five, and half of the sampled households receive agricultural subsidies. The level of agricultural mechanization in the villages is close to moderate, and most villages are located relatively close to towns.

Additionally, a cross-analysis of land tenure certification and MRP reveals that 196 households (30.06%) without certified land rights have an average MRP index of 0.37, while 456 households (69.94%) with certified land rights have an average rural economic relative poverty index of 0.18. This indicates a negative correlation between land rights certification and multidimensional relative poverty, suggesting that land rights certification may reduce the likelihood of households experiencing MRP.

**Table 2.** Variable Definitions and Descriptive Statistics.

| Variable Type         | Variable Name                                                                         | Variable Explanation                                                                                                                                            | Mean   | Std.   |
|-----------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|
| Dependent variable    | Multidimensional relative poverty (MRP)                                               | Multidimensional relative poverty index                                                                                                                         | 0.24   | 0.19   |
| Independent variables | Whether holding a rural land contractual management right certificate (certification) | 1 = Yes; 0 = No                                                                                                                                                 | 0.70   | 0.46   |
|                       | Agricultural productive credit accessibility (loan)                                   | Has the household obtained formal financial institution loans for agricultural production and operation?<br>1 = Yes; 0 = No                                     | 0.23   | 0.42   |
| Mediating variable    | Land transfer-in area (landtrans)                                                     | Mu                                                                                                                                                              | 0.09   | 0.29   |
|                       | proportion of household members engaged purely in agricultural activities (laborate)  | %                                                                                                                                                               | 0.20   | 0.30   |
|                       | Agricultural inputs (captureinput)                                                    | yuan                                                                                                                                                            | 216.89 | 238.96 |
|                       | Age                                                                                   | years                                                                                                                                                           | 53.06  | 15.28  |
|                       | Gender                                                                                | 0 = female; 1 = male                                                                                                                                            | 1.55   | 0.50   |
| Control variables     | Education level (education)                                                           | 1 = primary school and below; 2 = junior high school; 3 = high school/vocational school/technical school; 4 = associate degree; 5 = bachelor's degree and above | 1.76   | 0.94   |
|                       | Whether participated in agricultural technical training (training)                    | 1 = yes; 0 = no                                                                                                                                                 | 0.19   | 0.39   |
|                       | Number of household labor force members (laburnum)                                    | persons                                                                                                                                                         | 5.57   | 2.31   |
|                       | Whether received agricultural subsidies (agrisubsidy)                                 | 1 = Yes; 0 = No                                                                                                                                                 | 0.50   | 0.50   |
|                       | Distance from the village to the county town (towndistance)                           | km                                                                                                                                                              | 7.55   | 9.87   |
|                       | Level of agricultural mechanization in the village (mechanization)                    | 1 = low; 2 = medium; 3 = high                                                                                                                                   | 1.99   | 0.59   |
|                       |                                                                                       |                                                                                                                                                                 |        |        |

### 3.3. Model Specification

To explore the impact mechanism of land certification on farmers' MRP, drawing on the research of Dippel et al. and Wen et al. [38], the following mediating effect model is constructed:

$$Y = c_0 + c_1X + \sum_{n=1} c_{2n}D_{ni} + \varepsilon_1 \quad (1)$$

$$M = \alpha_0 + \alpha_1 X + \sum_{n=1} \alpha_{2n} D_{ni} + \varepsilon_2 \quad (2)$$

$$Y = b_0 + b_1 X + b_2 M + \sum_{n=1} c_{2n} D_{ni} + \varepsilon_3 \quad (3)$$

In Equations (1)–(3),  $Y$ ,  $X$ , and  $M$  represent farmers' MRP, whether farmland is certified, and the mediating variable, respectively.  $D_{ni}$  denotes control variables related to individual characteristics, household characteristics, and regional characteristics.  $\alpha_0$ ,  $b_0$ , and  $c_0$  are constant terms;  $\alpha_1$ ,  $b_1$ ,  $b_2$ ,  $c_1$ ,  $a_2$ ,  $b_{2n}$ ,  $c_{2n}$  are coefficients to be estimated;  $\varepsilon_1$ ,  $\varepsilon_2$ ,  $\varepsilon_3$  are error terms, following a normal distribution. Based on the theoretical analysis above, it is necessary to conduct mediating effect tests on credit factor allocation, land factor allocation, labor factor allocation, and capital factor allocation, respectively, and obtain the model results in the subsequent mechanism validation. The specific steps for model testing are as follows: First, test the significance of the regression coefficient  $c_1$ . If it is significant, proceed with further testing; otherwise, terminate the test. Second, test the significance of the regression coefficients  $\alpha_1$  and  $b_1$ . If both are significant, then test the regression coefficient  $b_1$ . If  $b_1$  is not significant, it indicates that  $M$  is a complete mediating effect. If  $b_1$  is significant, and  $\alpha_1$ ,  $b_2$  has the same sign as  $c_1$ , then  $M$  is a partial mediating effect. Finally, if at least one of the regression coefficients  $a_1$  and  $b_1$  is not significant, use the bootstrap method to directly test  $H_0: a_1 b_1 = 0$ . If it is significant and  $b_1$  is significant, with  $\alpha_1 b_1$  having the same sign as  $b_1$ , it indicates that  $M$  plays a partial mediating effect, where the proportion of the mediating effect to the total effect is  $\frac{\alpha_1 b_2}{c_1}$ .

It is important to note that existing research has demonstrated that farmland certification can largely be regarded as an exogenous policy variable. However, due to certain differences in farmers' multidimensional relative status, there may be variations in the progress of farmland certification, leading to potential reverse causality issues. Additionally, the model may omit variables that simultaneously affect both farmland certification and farmers' multidimensional relative poverty index, resulting in endogeneity problems. Based on existing studies, this paper uses the farmland certification rate of other households in the village as an instrumental variable for farmland certification at the household level. The rationale is that the farmland certification rate of other households in the village influences a given household's decision regarding farmland certification but does not directly affect the household's multidimensional relative poverty level, thereby satisfying the selection criteria for instrumental variables.

Furthermore, there is also an endogeneity issue between the allocation of production factors and farmers' multidimensional relative poverty. Drawing on previous literature, the average input of production factors among other households in the village is used as an instrumental variable. The reasoning is that the average allocation of production factors among other households in the village serves as a reference for a given household's production decisions but does not directly influence the household's multidimensional relative poverty level. This ensures that the instrumental variable is correlated with the endogenous explanatory variable while remaining uncorrelated with the error term. Finally, considering that the dependent variables in Equations (1)–(3) are continuous and the endogenous variables in this study are binary, the two-stage least squares (2SLS) method is employed for estimation.

## 4. Empirical Test Results and Analysis

### 4.1. Benchmark Regression

Models (1) and (2) in Table 3 report the estimated results of the impact of farmland certification on farmers' MRP index. The results of the Hausman test indicate endogeneity issues in the estimates presented in Table 3. Furthermore, the weak instrument variable

test and the under-identification test demonstrate that the instrumental variables used in this study are neither weak nor under-identified. According to the econometric results of Model 1, farmland certification has a significant negative impact on farmers' MRP index, suggesting that it can alleviate MRP among farmers. Thus, Hypothesis 1 is validated.

**Table 3.** Regression analysis results of farmland certification on farmers' MRP.

| Variables                       | (1)                   | (2)                   |
|---------------------------------|-----------------------|-----------------------|
| certification                   | −0.193 ***<br>(0.015) | −0.109 ***<br>(0.013) |
| gender                          |                       | 0.002<br>(0.012)      |
| age                             |                       | 0.001 *<br>(0.0004)   |
| education                       |                       | −0.100 ***<br>(0.007) |
| training                        |                       | −0.030 **<br>(0.014)  |
| laburnum                        |                       | −0.004 *<br>(0.002)   |
| agrisubsidy                     |                       | 0.009<br>(0.011)      |
| towndistance                    |                       | 0.002 ***<br>(0.001)  |
| mechanization                   |                       | −0.038 ***<br>(0.010) |
| constant                        | 0.371 ***<br>(0.012)  | 0.485 ***<br>(0.039)  |
| Identification deficiency test  | -                     | 860.536 ***           |
| Weak instrumental variable test | -                     | 13,613.801            |
| Hausman test                    | -                     | 57.481 **             |

Note: \*\*\*, \*\*, and \* denote significance at the 1%, 5%, and 10% statistical levels, respectively; robust standard errors are in parentheses.

From the econometric results of Model 2, it can be observed that among the control variables, as age increases, the degree of MRP among farmers rises. In contrast, education level and agricultural technical training have a negative impact on farmers' MRP, indicating that higher education levels and participation in agricultural technical training can reduce the incidence of MRP.

An increase in the number of working individuals in a household facilitates better division of labor in operations, enhances household income, and helps lift households out of poverty. The farther a village is from the county town, the weaker the economic influence of the county town, reducing income-increasing opportunities for farmers and making them more susceptible to MRP.

A higher level of agricultural mechanization in the village leads to a greater degree of mechanical substitution for labor, alleviating physical labor and increasing leisure time. Simultaneously, the use of machinery requires farmers to master agricultural machinery operation skills, which undoubtedly enhances their agricultural technical proficiency, thereby alleviating MRP across multiple dimensions.

#### 4.2. Mechanism Validation

To further explore the specific mechanism through which farmland certification affects farmers' MRP. From the perspective of factor allocation, this paper employs a mediating effect model to conduct an econometric analysis of how the allocation of agricultural production factors indirectly influences MRP. To identify the mediating mechanism, the impact

of the core explanatory variable on the mediating variables is first estimated (Table 4). The results of the Hausman test indicate that the estimates in Table 4 indeed face endogeneity issues. The weak instrument variable test and the under-identification test show that the instrument variables used in this paper do not suffer from being weak or under-identified.

**Table 4.** Regression analysis results of the impact of farmland certification on factor allocation.

| Variables                                | (1) Loan              | (2) Laborate             | (3) Landtrans        | (4) Captureinput      |
|------------------------------------------|-----------------------|--------------------------|----------------------|-----------------------|
| certification                            | 0.0001 **<br>(0.037)  | 0.012 *<br>(0.026)       | 0.937 ***<br>(2.890) | 0.108 ***<br>(0.085)  |
| gender                                   | 0.033<br>(0.035)      | −0.003<br>(0.025)        | 0.082<br>(4.610)     | −0.041<br>(0.067)     |
| age                                      | −0.003 ***<br>(0.001) | 0.001<br>(0.0008)        | −0.101<br>(0.092)    | −0.001 **<br>(0.003)  |
| education                                | 0.064 ***<br>(0.023)  | −0.015<br>(0.015)        | −3.747 **<br>(1.808) | 0.024 ***<br>(0.049)  |
| training                                 | 0.115 **<br>(0.048)   | 0.037<br>(0.030)         | 17.160 **<br>(7.232) | 0.054 **<br>(0.074)   |
| laburnum                                 | −0.00154<br>(0.00630) | −0.0369 ***<br>(0.00733) | 0.388<br>(0.601)     | −0.0121<br>(0.0120)   |
| agrisubsidy                              | 0.00827<br>(0.033)    | 0.0435 *<br>(0.026)      | 3.961<br>(4.046)     | 0.183<br>(0.068)      |
| towndistance                             | −0.0006<br>(0.002)    | −0.002 *<br>(0.001)      | −0.827 **<br>(0.418) | −0.017 ***<br>(0.006) |
| mechanization                            | 0.069 **<br>(0.031)   | −0.067 ***<br>(0.020)    | 1.852<br>(1.876)     | 0.010***<br>(0.051)   |
| constant                                 | 0.0916<br>(0.119)     | 0.488 ***<br>(0.087)     | 5.394<br>(8.210)     | 6.108 ***<br>(0.216)  |
| insufficient<br>recognition test<br>weak | 1340.468 ***          | 263.712 ***              | 1376.676 ***         | 336.814 ***           |
| instrumental<br>variables test           | 2020.026              | 410.937                  | 2069.598             | 2014.817              |
| hausman test                             | 69.955 ***            | 15.094 ***               | 67.149 ***           | 83.548 ***            |

Note: \*\*\*, \*\*, and \* represent significance at the 1%, 5%, and 10% statistical levels, respectively; robust standard errors are in parentheses.

The regression results indicate that the enhancement of farmland certification not only directly affects farmers' MRP but also exerts an indirect influence through mediating variables. First, farmland certification has a significant positive impact on the allocation of credit factors, labor factors, land factors, and capital factors. It can promote farmers' access to credit, increase the proportion of family members specializing in agriculture, enlarge the area of transferred-in land, and boost agricultural input. Thus, Hypothesis 2 is verified.

Second, as shown in Table 5, after incorporating the mediating variables, the impact of farmland certification on farmers' MRP remains significantly negative, thus verifying Hypothesis 3. Through further Sobel tests, it is found that the mediating effects of credit factor allocation, labor factor allocation, and capital factor allocation on farmers' MRP are still significant at the 5% level, with negative coefficients. This indicates that credit factor allocation, labor factor allocation, and capital factor allocation partially mediate the relationship between farmland certification and farmers' MRP. Specifically, farmland certification alleviates farmers' MRP by promoting farmers' access to credit, increasing the proportion of family members solely engaged in agriculture, and enhancing agricultural investment.

**Table 5.** Regression analysis results of farmland certification, factor allocation, and farmers' MRP.

| Variables                           | Step 1                | Step 2               |                      |                      |                      | Step 3                |                       |                      |                       |
|-------------------------------------|-----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|----------------------|-----------------------|
|                                     | MRP                   | Loan                 | Laborate             | Landtrans            | Captureinput         | MRP                   |                       |                      |                       |
| certification                       | −0.109 ***<br>(0.013) | 0.0001 **<br>(0.037) | 0.012 *<br>(0.026)   | 0.937 ***<br>(2.890) | 0.108 ***<br>(0.085) | −0.110 ***<br>(0.015) | −0.195 ***<br>(0.022) | −0.111<br>(0.015)    | −0.113 ***<br>(0.015) |
| loan                                |                       |                      |                      |                      |                      | −0.012<br>(0.013)     |                       |                      |                       |
| laborate                            |                       |                      |                      |                      |                      |                       | 0.0002<br>(0.0003)    |                      |                       |
| landtrans                           |                       |                      |                      |                      |                      |                       |                       | 0.024<br>(0.019)     |                       |
| captureinput                        |                       |                      |                      |                      |                      |                       |                       |                      | −0.00002<br>(0.000)   |
| control                             | Yes                   | Yes                  | Yes                  | Yes                  | Yes                  | Yes                   | Yes                   | Yes                  | Yes                   |
| constant                            | 0.485 ***<br>(0.039)  | 0.092<br>(0.119)     | 0.488 ***<br>(0.087) | 5.394<br>(8.210)     | 6.108 ***<br>(0.216) | 0.486 ***<br>(0.039)  | 0.483 ***<br>(0.063)  | 0.467 ***<br>(0.039) | 0.491 ***<br>(0.042)  |
| insufficient<br>recognition<br>test | 860.536 ***           | 1340.468<br>***      | 263.712 ***          | 1376.676 ***         | 336.814 ***          | 20.756 ***            | 29.180 *              | 10.542 ***           | 7.532 ***             |
| weak<br>instruments<br>test         | 13,613.801            | 2020.026             | 410.937              | 2069.598             | 2014.817             | 10.999                | 38.712                | 50.600               | 31.652                |

Note: \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% statistical levels, respectively; robust standard errors are in parentheses.

Third, although farmland certification has a significant positive impact on land factor allocation, after adding land factor allocation as a mediating variable, the overall impact of farmland certification on the farmers' MRP index is negative, but the model does not pass the significance test. The Sobel test results show that the mediating effect of land factor allocation on farmers' MRP is significant at the 5% statistical level, with a coefficient value of 0.012. Thus, it can be concluded that land factor allocation completely mediates the relationship between farmland certification and farmers' MRP index, meaning that stable land rights reduce farmers' MRP by promoting land transfer-in.

## 5. Discussion

The empirical analysis of this study confirms that, in the context of rural China, land certification significantly reduces farmers' MRP. This finding provides micro-level evidence from a transition economy for a core proposition of property rights theory: that clear and secure property rights serve as a cornerstone for improving economic performance and individual welfare [39,40]. Specifically, the legal certification conferred through land titling stabilizes farmers' land use rights and income rights, thereby establishing the foundational conditions for poverty reduction through asset building at the micro level.

Through an examination of channels such as credit, land, labor, and capital allocation, this study reveals the internal mechanisms through which property rights formalization affects poverty. Among these, the collateralization effect of property rights plays a particularly significant role in promoting credit access, which aligns closely with global discussions on empowering individuals to revitalize dormant assets [41]. However, the universality of this mechanism must be approached with caution. As Deininger and Jin have pointed out in other regional contexts, in areas where non-agricultural employment opportunities are abundant and the importance of land as a productive asset diminishes, the credit and income effects of property rights formalization may be weakened [42]. The context of this study, Jiangxi Province—a predominantly agricultural region—precisely highlights the contextual dependency of property rights effects: in areas where agriculture remains central to livelihoods and the value of land is yet to be fully realized, the poverty reduction effects of property rights formalization are more pronounced. This suggests that policy

outcomes are not uniform but rather interact closely with local industrial structures and stages of economic development.

Although this study provides mechanistic evidence for the causal relationship between land titling and poverty reduction, it is important to acknowledge several scientific limitations. First, methodologically, although we have controlled for observable variables to the greatest extent possible, unobserved factors—such as community leadership and farmers’ entrepreneurial spirit—may still influence households’ decisions to participate in land certification, potentially introducing selection bias into the estimates. Future research could strengthen causal inference by utilizing natural experiments or instrumental variable methods. Second, conceptually, while our measurement of “factor allocation” covers key dimensions, it does not fully capture qualitative aspects such as labor skills, the actual cost of credit, or dynamic adjustment processes. Furthermore, although the weighting of the MRP follows general standards, it may not sufficiently reflect local specificities.

The findings of this study are derived from a major agricultural province in China, and caution should be exercised when generalizing them directly to a global context. However, the logical chain of “property rights security → factor allocation → multidimensional Relative Poverty” revealed in this study holds significant reference value for developing regions undergoing or yet to undergo land titling. For example, formal land property rights in Burkina Faso have shown a significant positive effect on land productivity [43]. In Sub-Saharan African or South Asian countries, pervasive land tenure insecurity similarly constrains agricultural investment and credit market development [44]. Compared with these regions, China’s top-down systematic land titling campaign offers unique institutional insights. What distinguishes China, however, is its highly stable socio-political environment and strong grassroots implementation capacity, which are crucial contextual factors for effective policy execution. Thus, the broader implication of this study is that the effectiveness of land titling as a poverty reduction tool is highly dependent on complementary institutional environments and local resource endowment structures. Future cross-country and cross-regional comparative research will greatly enhance our understanding of the boundary conditions for property rights institutional reforms.

## 6. Conclusions and Policy Recommendations

### 6.1. Conclusions

Using rural revitalization survey data from Jiangxi Agricultural University in 2021, this paper calculates the multidimensional relative poverty index of rural households through the A-F method and explores the impact of farmland certification on this index from the perspective of factor allocation. The main conclusions are as follows: Farmland certification significantly reduces the multidimensional relative poverty level of rural households, and the results remain robust after accounting for endogeneity. Further mechanism analysis reveals that farmland certification has a significant positive impact on the allocation of credit, land, labor, and capital factors. It effectively promotes rural households to increase agricultural investment, expand farmland transfer-in, and enhance agricultural labor input. Finally, after incorporating mediating variables, farmland certification exhibits an indirect effect on the multidimensional relative poverty index. Specifically, farmland certification suppresses the multidimensional relative poverty index through the allocation of credit, land, labor, and capital factors. Among these, credit, labor, and capital factor allocations play partial mediating roles, while land factor allocation serves as a full mediator.

### 6.2. Policy Recommendations

First, further implement the “separation of three rights” policy for farmland. In practical rural land rights negotiations, strict control should be exercised over land rights

readjustments to ensure land rights stability and avoid the issue of “stabilizing empty rights”. Adhering to the principle of farmers’ voluntary participation, it is important to standardize the procedures and methods of farmland transfer, encourage farmland circulation, and create more accessible opportunities for farmers to benefit from land dividends. This will increase farmers’ property income, promote the subdivision of farmland management rights, improve agricultural economies of scale, and alleviate their relative poverty.

Second, provide unified guidance tailored to the diverse conditions of rural households, implement targeted measures, and adopt multiple approaches to alleviate multidimensional relative poverty. Education plays a critical role in promoting technological innovation and enhancing farmers’ ability to optimize personal resources and adapt to economic changes. Therefore, efforts should be intensified to provide professional skills training for farmers, such as the “One Village, One College Student” program, to boost comprehensive agricultural production efficiency. Additionally, cultivate new-type professional farmers suited for modern agricultural production, alleviate relative poverty through “hematopoietic” approaches, and strengthen the talent foundation for rural revitalization. Furthermore, enhance the level of agricultural mechanization at the village level to replace manual labor, improve farmers’ physical health, and enhance their sense of well-being.

Third, improve the rural factor market. Factor allocation plays a mediating role in the indirect effect of farmland certification policies on multidimensional relative poverty. In the context of consolidating poverty alleviation achievements and transitioning to rural revitalization, efforts should be intensified to develop factor markets at the county level, accelerate the flow of factors, and continuously improve markets for financial credit, land transactions, and human resources. It is important to promote roundabout investment and its organization, deepen agricultural division of labor, and actively encourage small-scale farmers to engage in the division of labor economy on a household basis.

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