

## Article

# Farmers' Livelihood Capital and Its Impact on Sustainable Livelihood Strategies: Evidence from the Poverty-Stricken Areas of Southwest China

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**Abstract:** Evaluating the influence of livelihood capital on livelihood strategies remains an unexplored strategy intended to cultivate the level of livelihood capital, enhance livelihood strategies, combine the achievements regarding a reduction in poverty, and attain everlasting poverty mitigation, along with endorsing sustainable livelihoods. Based on the survey data of 508 farmers within poverty-stricken areas of Southwest China, the entropy method was primarily used for measuring the level of farmers' livelihood capital. Moreover, the logistic regression model was used to empirically analyze the impact of livelihood capital on the choice and transformation of livelihood strategies. The results showed the following: (1) The five categories of livelihood capital values were generally not high. The value of physical capital was the highest (0.4279), while the value of financial capital was the lowest (0.2018). (2) Physical capital, alongside natural capital, has a positive influence on the pure agriculture livelihood strategy, while human, social, and financial capital have a positive impact on the non-agriculture livelihood strategy. Excluding financial capital, the remaining types of capital have a positive impact on the part-time agriculture livelihood strategy. (3) Decisive factors are used to promote transformation from pure agriculture to part-time agriculture, mostly comprising social network support and family labor force, among other indicators. The important factors used to promote transformation from pure agriculture to non-agriculture are mainly labor education level and social network support, among other indicators. Finally, on the basis of the above findings, policy sanctions are proposed from the observations of livelihood capital and livelihood strategies.

**Keywords:** livelihood capital; livelihood strategy; farmers; logistic regression analysis

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## 1. Introduction

Livelihood refers to a systematic procedure of making a living on the basis of skills, resources, and feasible activities. With a view to resolving the problem of the sustainability of farmers' livelihoods, the livelihood safety and quality of farmers in poor areas is considered a primary issue, as well as a key research hotspot for experts and scholars [1]. As China is a developing country, and according to the consideration of a common poverty phenomenon in rural areas, the government has industrialized medium- and long-term poverty alleviation projects and has articulated a series of poverty alleviation policies, which have accomplished remarkable results in reducing the population living in poverty [2]. Although China's poverty alleviation work has accomplished great achievements, in order to fundamentally help rural areas out of poverty and comprehensively promote rural revitalization [3], the government needs to not only offer policy support from all aspects, but also to fundamentally improve the livelihood ability of farmers themselves, enrich their livelihood strategies, and help them retain a sustainable way of living [4].

The term "three rural" refers to agriculture, rural areas, and farmers, and the so-called "three rural issues" refers to problems within each of these areas [5]. China is a large

agricultural country, meaning agriculture is the primary industry. The countryside is a place where workers engaged in agricultural production live together, and most farmers are people who have engaged in agricultural production for a long time. The “three rural issues” are also an important concern related to China’s development. The purpose of studying the three rural issues is to increase farmers’ income, agricultural development, and rural stability [6]. Along with complete success in the fight against poverty [7], the main focus of “three rural” work is primarily the implementation of rural revitalization tactics to promote the long-term development of rural areas [8]. Farmers’ desire for a better life is the driving force toward promoting this rural revival. Protecting the ultimate interests of farmers and endorsing their common prosperity are the starting point and footholds of promoting rural revitalization. Living a rich lifestyle means doing everything possible to raise farmers’ income, expand the level of sustainable livelihoods in rural areas, and empower hundreds of millions of farmers to embark on the path of common prosperity [9]. Hence, improving the livelihood quality of farmers is not only a crucial reason for combining and increasing the attainment of poverty alleviation, but also a crucial link to understanding rural revitalization in the future. The sustainable livelihood status of farmers is critical for improving the operational effectiveness of rural revitalization. Thus, the inclusive results of this research study are beneficial for improving the level of farmers’ sustainable living and the growth of farmers’ livelihood capital. They have significant practical implications for solving the “three rural” problems, thereby supporting rural revitalization and promoting urban alongside rural development.

Compared to the central and eastern regions, the economic development of Western China is relatively slow [10]. This raises a question regarding how to improve the sustainability of farmers’ livelihoods in the western region and accelerate their freedom from poverty by becoming rich, which has become the main scientific problem to be solved in the sustainable development of the western regions [11].

## 2. Literature Review

At present, the existing literature lacks studies on the relationship between farmers’ livelihood capital and their livelihood strategies. Investigating how farmers can achieve sustainable development, specifically starting from the livelihood capital owned by farmers and investigating which livelihood tactics should be adopted, is considered a well-intentioned issue of consideration. What is the current situation of the livelihood capital owned by farmers in Western China? What is the current livelihood strategy? How does livelihood capital affect the different types of livelihood strategies? What are the key factors to promote the transformation of livelihood strategies? Based on these parameters, this research paper’s aims were to explore the influencing factors of livelihood capital on the choice and transformation of livelihood strategies, therefore helping to consolidate the achievements of poverty reduction, enrich the poverty reduction practices, and realize the sustainable development of farmers.

Based on the evaluation of livelihood capital, the choice of livelihood strategy, and the impact of livelihood capital on livelihood strategies, this paper reviewed the relevant literature.

The research on farmers’ livelihood capital primarily emphasizes the following aspects: (1) The construction of a livelihood capital evaluation index system. Research on a livelihood capital evaluation index system is quite well-established. Most scholars principally depend on the sustainable livelihood framework theory established by the UK Department for International Development (DFID) to create a livelihood capital evaluation index system [12–14]. (2) The measurement of livelihood capital. The existing literature includes a lot of research on the index quantification and capital measurement of farmers’ livelihood capital. Liu et al. methodically evaluated the procedures for measuring farmers’ livelihood capital, and they compared subjective weighting and principal component weighting [15]. Erenstein et al. used principal component analysis to evaluate the livelihood capital of poor farmers in India [16]. Fang et al. used the AHP method to calculate and analyze the current situation of farmers’ livelihood capital [17]. (3) The empirical study of livelihood

capital. Oladele and Ward used the SLA framework to select the corresponding indicator elements of livelihood capital, and by constructing a logistic regression model of livelihood capital and farmers' life satisfaction, it was concluded that capital stocks in different regions are different [18]. Johnson empirically analyzed the main and moderating effects of risk expectations and livelihood capital on farmers' homestead withdrawal intentions and their intergenerational differences [19]. The research showed that livelihood capital has a positive impact on farmers' willingness to withdraw from homesteads and plays a moderating role in the relationship between risk expectations and willingness to withdraw from homesteads.

The total amount of farmers' livelihood capital directly or indirectly regulates their choice of livelihood strategy [20]. Livelihood strategies are the activities carried out by people to achieve their established livelihood objectives. Production choices and production activities belong to the category of livelihood strategies [21]. Research on livelihood strategies is also relatively mature. Presently, there are many studies on the classification forms and influencing factors of livelihood strategies [13,22,23]. These research studies are, correspondingly, one of the significant bases to comprehend the sustainable livelihood of farmers. There are various types of livelihood strategies, and there is no unified division standard at present. Some scholars have separated the types of strategies according to their local lifestyles, such as livestock breeding, agricultural planting, going out to work, and doing business [24]. According to the proportion of agricultural income within the total household income, some scholars have divided livelihood strategies into pure agriculture, part-time agriculture, and non-agriculture types [25]. Referring to the classification methods of the National Bureau of Statistics and the Chinese Academy of Social Sciences, this paper divided the livelihood strategies of farmers into three types: pure agriculture, part-time agriculture, and non-agriculture, according to the source of economic income. In addition, there is plenty of research on the influencing factors of sustainable livelihood strategies. For example, Alemayehu et al. separately studied the impact of local and non-local work on the choice of livelihood strategy and believed that different forms of work result in farmers choosing different types of livelihood strategies [26]. Scholars such as Manlosa et al. initially used the accumulation cataloguing methodology to classify livelihood strategies into three types, namely farming and breeding, business and industry, and an assorted category [27]. This method focuses on the impact of land transfer on these three livelihood strategies, lastly drawing valuable conclusions and making appropriate recommendations.

There are also abundant studies on the impact of livelihood capital on livelihood strategies. Ding et al. believed that livelihood capital has a substantial impact on livelihood strategies and pointed out that through the development of livelihood capital, the variation in livelihood strategies can be improved, so as to expand the sustainable livelihood ability [28]. Meng et al. took the farmers and herdsmen in Ordos, China, as the research object and analyzed the impact of their livelihood capital on their livelihood strategies [29]. It was found that natural capital such as pasture area and livestock quantity have a significant impact on the choice of livelihood strategies. Zinda and Zhang used a logistic regression model to analyze the relationship between farmers' livelihood capital and livelihood strategies based on a sustainable livelihood analysis framework [30]. The research showed that those farmers with a high human capital index tend to work in other places, and farmers with high physical capital and social capital indexes tend to work locally.

In summary, researchers have achieved rich results on livelihood capital and livelihood strategies, providing useful reference for this article. However, according to the literature review, most scholars have focused primarily on a province, a city, or even a county as the research area, rarely focusing on poor farmers as the research object, and there are very few studies on the poor areas in Southwest China. This paper took farmers in poor areas of Southwest China as the research object. Southwest China is one of the regions with the largest number of poor people and the highest incidence of poverty in China, and it is also the main target area in the period of decisive victory in poverty alleviation [31]. Therefore, taking the poor areas in Southwest China as the sample area

is very representative and typical. In addition, the literature on the relationship between livelihood capital and livelihood strategies lacks in-depth empirical research. Although some scholars have conducted research on the impact of livelihood capital on livelihood strategies, this research is not comprehensive and thorough. Such research has only analyzed the impact of livelihood capital on the choice of livelihood strategies, without further analyzing the key influencing factors of the transformation of farmers' livelihood strategies [32]. Thus, this paper intends to make up for this deficiency.

Based on this, this paper used the survey data of 508 households in the case area. First, the entropy method was used to measure and evaluate the livelihood capital level of farmers. Second, the logistic regression model was used to empirically analyze the impact of livelihood capital on the selection and transformation of livelihood strategies, so as to truly reflect the relationship between them in terms of farmers in poor areas. Moreover, we put forward countermeasures and suggestions according to the research conclusions, which have important reference significance for the formulation of poverty alleviation policies and the implementation of rural revitalization strategies in the future.

### 3. Materials and Methods

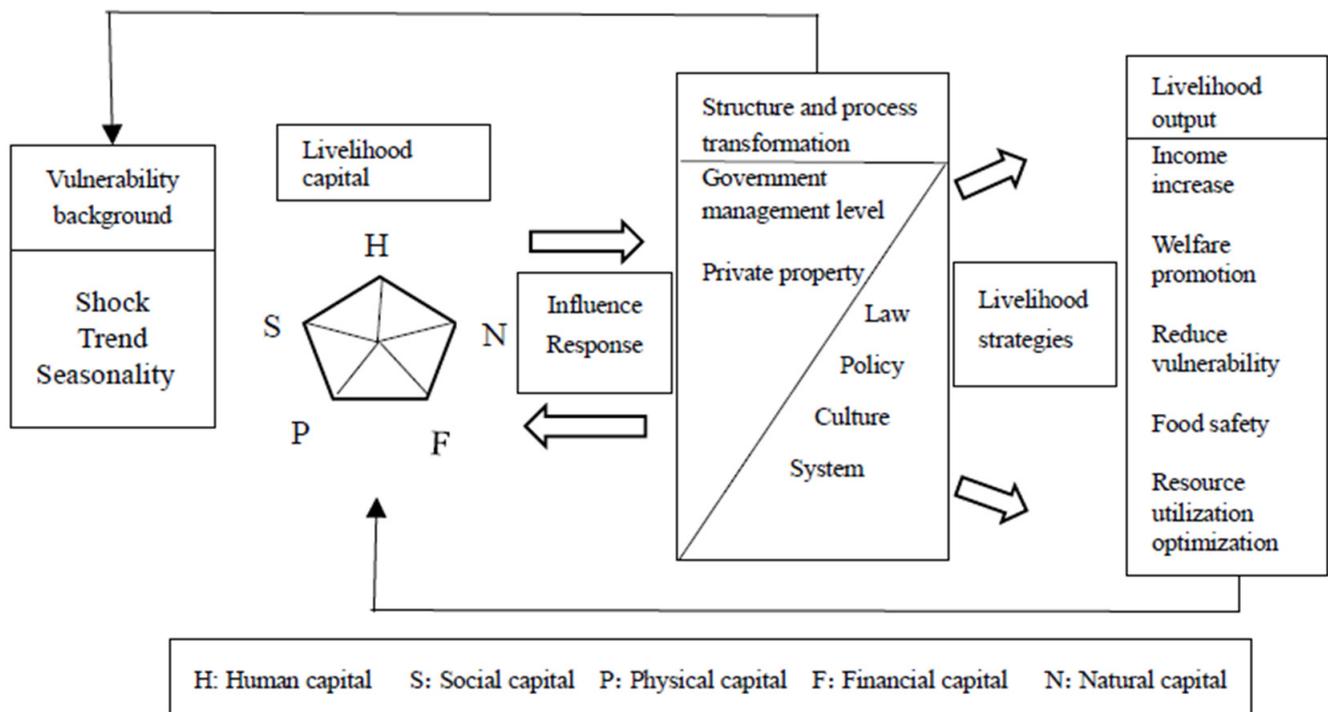
This section principally presents the theoretical basis, index system construction, study area, data sources, and research methods for this research article.

#### 3.1. Sustainable Livelihood Theory

The formation of sustainable livelihood theory has a long history. The earliest is the reflection on the national development model in the 1950s and 1960s, including the small-scale peasant production model and the Stalinist socialist model. These models ignore or belittle the interests and needs of farmers and the potential role of improving their livelihoods. After the 1970s, academic circles began reflecting on the above model, arguing that farmers potentially have the ability to maintain their own livelihood, and that there is need for external promotion from the government to invest in farmers; mobilize their enthusiasm; promote them to give full play to the spirit of diligence, responsibility, and wisdom; and finally achieve the purpose of improving agricultural development and their own living standards. Most scholars understand the concept of "sustainable livelihood" from the perspective of "livelihood" and understand livelihood as a way of making a living. This way of making a living is based on the ability, assets, and activities of individuals or families, and indicates that the way of living should be sustainable. Only by withstanding external risks and pressures and recovering can livelihoods be sustainable [33]. After the 1980s, the United Nations "World Conference on Environment and Development" first clarified the concept of sustainable livelihoods, defined as a collection of relevant assets, abilities, and income-generating activities owned and acquired by individuals or families in order to maintain their own development [34].

The Department for International Development (DFID) proposed a sustainable livelihood analysis framework [7,11,28], which consists of five parts: vulnerability background, livelihood capital, structure and system, livelihood strategy, and livelihood output, as shown in Figure 1. The sustainable livelihood of poor farmers can be explained according to the framework as follows: farmers combine their own capital in a fragile environment, realize one or more livelihood strategies under the influence of the structure and system, and finally achieve their livelihood goal. Vulnerability background indicates that human survival and development is impacted and disturbed through the external environment, including natural disasters, economic downturn, and political turmoil. Livelihood capital mainly refers to the natural, social, financial, physical, and human capital needed to maintain living or obtain development. Structure and system refer to the impact of the organizational structure, political system, policies, and measures on livelihood. Livelihood strategies involve the use of livelihood capital and the choice of lifestyle after livelihood capital combination. Livelihood strategies are always fluid, changing alongside internal and external circumstances. Livelihood output is also called livelihood outcome, including

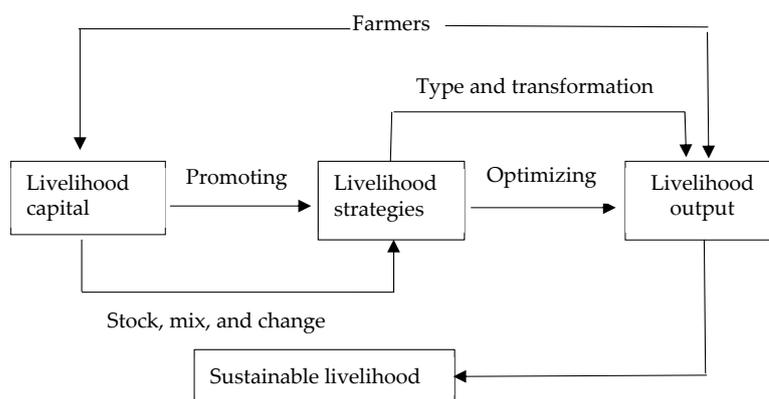
multiple outcomes such as increased income, a high level of welfare, good living conditions, and low vulnerability.



**Figure 1.** Schematic diagram of DFID's sustainable livelihood analysis framework. Source: created by the UK Department for International Development.

### 3.2. Theoretical Analysis Framework

Paying attention to the sustainable development of farmers in poverty-stricken areas and correctly understanding the endogenous development ability of poor farmers is the fundamental strategy to achieve real and permanent poverty alleviation. Livelihood capital is the resources owned by individuals or families for survival and development. Livelihood strategy refers to the scope and combination of individual or family activities and choices. Theoretically, a correct understanding of the impact of livelihood capital on livelihood strategies is the basis and premise of this paper. The analysis of the impact of farmers' livelihood capital on livelihood strategies is shown in Figure 2. The stock, composition, and changes of livelihood capital owned by farmers will affect the type and transformation of livelihood strategies. The greater the livelihood capital, the greater the capacity for self-development and the greater the ability to actively choose the type of livelihood strategy and the best way of livelihood and enhance the ability to resist risks. Therefore, the improvement of livelihood capital and the optimization of livelihood strategies are very important for farmers, as they are conducive to improving their sustainable livelihood capacity and achieving permanent poverty alleviation.



**Figure 2.** Schematic diagram of the impact of livelihood capital on livelihood strategies. Source: created by the authors.

### 3.3. Index System Construction

This research paper followed the principles of methodicalness, systematicness, completeness, and operability when constructing the index system [35]. On the basis of denoting the current research results [36–38], initially, the index set was preselected through the national agricultural modernization standards, DFID’s sustainable livelihood analysis framework, the existing livelihood capital index system research results, and the actual situation of farmers in the sample area. After this, the evaluation indexes were screened by the method of expert scoring, and finally, an evaluation index system of farmers’ livelihood capital was constructed, which included 5 first-level indexes and 16 second-level indexes (as shown in Table 1). The specific indicators are explained as follows:

**Table 1.** Evaluation indicator system of farmers’ livelihood capital.

Capital Type	Measurement Indicator	Indicator Interpretation and Assignment
Natural capital (N)	Per capita cultivated land area	Per capita actual cultivated land area
	Per capita forest land area	Per capita actual forest land area
	Geographical location	Distance to the township
Physical capital (P)	Livestock breeding	According to the market value of livestock and poultry, assign chickens, ducks, etc. = 0.25; pigs = 0.5; cattle = 1
	Housing structure	Civil house = 1; brick and tile house = 2; brick and concrete house = 3; concrete house = 4
	Per capita housing area	Per capita actual housing area
	Household fixed assets	Number of options of assets owned by farmers in the 18 listed fixed assets
Human capital (H)	The overall labor force of the family	Non-labor force = 1, half-labor force = 2, full-labor force = 3
	The education level of the adult labor force	Below primary school = 1, primary school = 2, junior high school = 3, high school = 4, college and above = 5
	The health status of the labor force	According to the health status of the farmers themselves, assign unhealthy = 1, general = 2, relatively healthy = 3, very healthy = 4
Social capital (S)	Relationships with relatives and friends	Very bad = 1, relatively bad = 2, general = 3, relatively good = 4, very good = 5
	Social network support	Receive one support = 1, two supports = 2, three supports = 3, four supports = 4
	Whether there are village (town and above) cadres	Yes = 1, no = 0

Table 1. Cont.

Capital Type	Measurement Indicator	Indicator Interpretation and Assignment
Financial capital (F)	Annual household income	Including family operating income, wage income, property income, and transfer income
	Access to credit opportunities	Usury = 1, bank or credit union = 2, relatives or friends = 3, government free aid = 4
	Diversity of income sources	The proportion of the number of types of income sources in the listed income sources

(1) Natural capital (N). Natural capital refers to the natural resources that farmers need to engage in livelihood activities [7,39]. Natural capital is one of the most important livelihood capitals of farmers in poor areas. Many farmers principally rely on farming for their livelihood. Agricultural planting itself is a kind of livelihood activity dependent on nature. Thus, the quality and stock of natural capital have a great impact on the sustainable development of farmers' livelihoods and also determine the degree of vulnerability of their livelihoods. Regarding the relevant research and the actual situation of the case study, "the per capita cultivated land area", "per capita forest land area", and "geographical location" were carefully selected as indicators to measure the livelihood capital of farmers [15,31].

(2) Physical capital (P). Physical capital refers to the means of production and living that farmers need to maintain their livelihoods [40]. Physical capital is mainly used to improve the production capacity of local farmers. The level of a family's physical capital can reflect their overall income level, as well as their ability to maintain their livelihood. "Housing structure", "per capita housing area", "livestock breeding", and "household fixed assets" were considered the four main physical capital indicators in this research paper. Amongst them, housing was considered an important indicator that was used to measure physical capital. Livestock breeding, especially large-scale livestock and poultry breeding, can also explain the family living standards of farmers to a certain extent [28].

(3) Human capital (H). All livelihood activities are attached to people in some way [17,29]. It can be perceived that human capital inhabits an important position among the five categories of livelihood capital. Human capital comprises knowledge and skills besides physical fitness and also plays an important role in the sustainable livelihood development of farmers. Combined with the actual local conditions, this research article chose three primary human capital indicators: "the overall labor force of the family", "the education level of the adult labor force", and "the health status of the labor force". The level of education directly affects the level of family income, income sources, and farmers' livelihood strategy choices. Good physical fitness is the most basic condition for creating wealth, so "the health status of the labor force" is considered a significant indicator for assessing human capital [39,41].

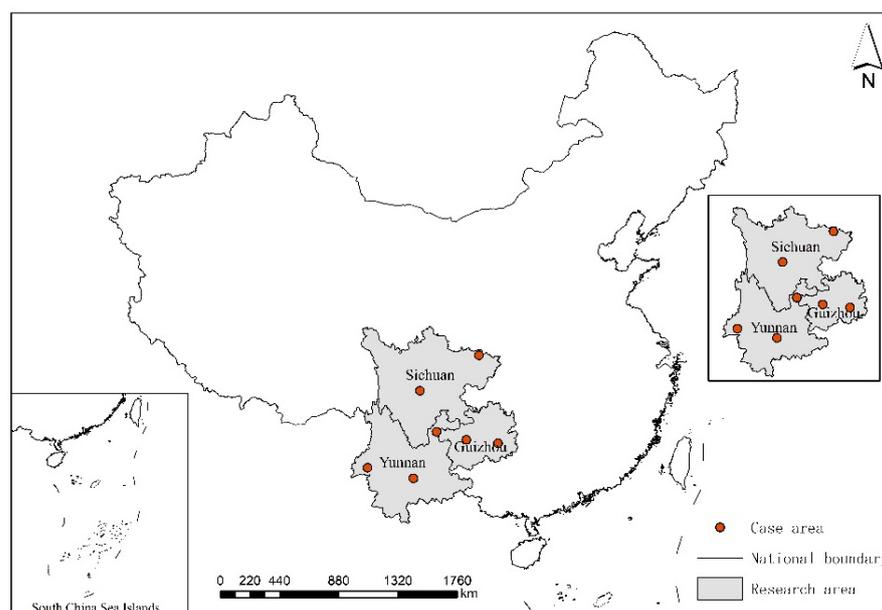
(4) Social capital (S). Social capital principally denotes social network resources [10,17]. This article selected three main indicators: "relationships with relatives and friends", "social network support", and "whether there are village (town and above) cadres" at home. Social network support refers to the contact between a group of individuals. Through these contacts, individuals can maintain their social identity and receive emotional support, material assistance and services, information, and new social contacts. Usually, the better the affiliation with relatives and friends, the more consistent the social network relationship. The level of social capital of farmers with village (town and above) cadres in their families is generally high, which is an important factor affecting their livelihood strategies [37].

(5) Financial capital (F). Financial capital refers to the aspects associated with household income besides access to credit [18]. The total amount of financial capital owned by a family, especially the amount of funds, directly determines the quality of life of the family and its ability to deal with risks. This research paper chose three main financial capital indicators: "annual household income", "access to credit opportunities", and "diversity of income sources". Amongst them, "annual household income" is considered a direct

indicator to measure family living conditions, which can be directly understood as the income level and individual differences of farmers; “access to credit opportunities” and “diversity of income sources” can be indirectly seen as the level of farmers’ income, which is an important factor for farmers when choosing their livelihood strategy [11,18,41].

### 3.4. Study Area

China’s poverty-stricken areas are mainly distributed in the western and southwestern regions. Among them, there are 88 poverty-stricken counties in Yunnan Province, ranking first in China. The characteristics of this province include a harsh natural environment; a lack of resources and a weak infrastructure; too low a level of basic social services such as education and health; a low level of fiscal revenue; and a serious shortage of public and basic investment [10,31]. Thus, it is of great theoretical, as well as practical, significance to study the impact of livelihood capital on the livelihood strategy choice of farmers in Southwest China. This research paper chose Yunnan, Guizhou, and Sichuan Provinces as the study areas, which are situated in Southwest China (Figure 3). Yunnan Province is located on the southwest border of China, with a total area of 390,000 km<sup>2</sup>, accounting for 4.11% of the national area, ranking eighth among the provincial administrative regions in China. Moreover, its total population is 45.96 million, accounting for 3.35% of the national population, ranking 12th. Guizhou Province is located in the southeast of Southwest China, with a total area of approximately 176,000 km<sup>2</sup>, accounting for 1.8% of the national land area. There are nine prefecture-level administrative divisions and 88 county-level administrative divisions. Guizhou is a multi-ethnic, co-resident province. For thousands of years, all ethnic groups have lived in harmony and have, together, created a colorful Guizhou culture. Sichuan Province covers a total area of 486,000 km<sup>2</sup>, accounting for 5.06% of the national area. The permanent resident population is 83.67 million, accounting for 5.92% of the national population. Sichuan has a dense river network and a developed water system, with Minjiang River, Tuojiang River, Yalong River, and Jialing River running through it. Sichuan has a dense population, a pleasant climate, rapid economic development, and dense traffic trunk lines. At present, it is the “Western Comprehensive Transportation Hub” and “Western Economic Development Highland”. This research article chose case sites based on the principles of high stock and quality of farmers’ livelihood capital and diversified livelihood strategies. The selected cases were Longling, Xiping, and Ludian counties in Yunnan Province; Leishan and Zhijin counties in Guizhou Province; and Luding and Nanjiang counties in Sichuan Province.



**Figure 3.** The geographical location of the study area.

### 3.5. Data Sources

The research data in this article came from the field survey of farmers conducted by the research team in Southwest China in the second half of 2020. Both questionnaires and interviews with farmers were employed. In this research study, simple random sampling was used to conduct “one-to-one” sampling surveys on farmers in the survey area. The survey process comprised the following steps:

First, sample counties that were suitable for this study were selected, and the livelihoods of farmers in the poor areas of the sample counties were investigated and analyzed. Afterward, a few sample towns in each individual sample county were chosen, and administrative village sampling was carried out in the sample towns. Lastly, the sample village farmers were interviewed, and questionnaires were issued. The survey involved the livelihood data of farmers in 13 towns situated within seven poor counties. After sorting out and removing the invalid questionnaires, 508 valid questionnaires were finally obtained (see Table 2). The statistical data of the basic characteristics of the samples are shown in Table 3.

**Table 2.** Sample location distribution.

Province	Region	Sample Site	Number of Samples
Yunnan Province	Longling county, Baoshan city	Mengnuo town	41
		Longshan town	34
	Xinping county, Yuxi city	Yangwu town	32
		Shuitang town	36
	Ludian county, Zhaotong city	Wenping Zhen	48
Guizhou Province	Leishan county	Danjiang town	33
		Yongle town	38
	Zhijin county, Bijie city	Longchang town Santang town	50 37
Sichuan Province	Luding county, Ganzi prefecture	Xinglong town	45
		Luqiao town	32
	Nanjiang county, Bazhong city	Shahe town Dahe town	48 34
Total	-	-	508

**Table 3.** Basic characteristics of the survey samples.

Category	Proportion
Age of the head of the household	Under 30 years old (2.8%); 31~45 years old (28.4%); 46~59 years old (44.1%); over 60 years old (24.7%)
Education level of the head of the household	Below primary school (20.9%); primary school (45.6%); junior middle school (27.8%); high school and above (5.7%)
Family size	Less than 4 persons (23.4%); 4~5 persons (44.1%); more than 5 persons (32.5%)
Source of livelihood	Planting (95.1%); breeding (70.2%); doing business (32.4%); migrant work (64.8%)
Annual household income	Less than 20,000 yuan (20.4%); 20,000~50,000 yuan (30.3%); 50,000~80,000 yuan (34.2%); more than 80,000 yuan (15.1%)

Moreover, to understand the local characteristics and information regarding farmers' family members, this survey also focused on investigating and interviewing farmers on their livelihood capital in addition to their livelihood strategies. Furthermore, for better understanding of the livelihood of local farmers, the investigation teams also established dialogue forums at each sample point, and a total of more than 20 in-depth interview records were assembled, providing more comprehensive information for this research study. After each detailed survey, the research group held a positive meeting and had a conversation about the survey, summarizing the problems and difficulties encountered in the survey process and solving them at this time. The combination of questionnaire surveys and field investigations definitely confirmed the authenticity and reliability of the survey data.

### 3.6. Research Methods

This research paper primarily evaluated the level of farmers' livelihood capital and empirically investigated the impact of livelihood capital on farmers' livelihood strategies. When calculating the livelihood capital, the entropy method was used, and SPSSAU software was used for data analysis. When empirically analyzing the impact of livelihood capital on the choice and transformation of sustainable livelihood strategies, the logistic regression model was used, and STATA software was used for data analysis. The livelihood capital measurement method and empirical model settings were as follows.

#### 3.6.1. Livelihood Capital Measurement Method

The weight is an indispensable part of the comprehensive evaluation method, and the application of any method requires the calculation of the weight. In this paper, the entropy method was used to calculate the weight of each index. The entropy method is an objective weighting method. It is a method to determine the index weight according to the impact of the change of evaluation index on the whole system, and the greater the change of the index, the greater the weight. In order to avoid as much as possible the influence of some subjective factors in the process of determining the weight, this paper adopted the entropy method to calculate the weight of each index. Since the dimensions and orders of magnitude of various indicators of livelihood capital were not unified, in order to eliminate the impact of the difference in dimension and order of magnitude, it was necessary to homogenize the heterogeneous indicators and standardize the indicators, so as to solve the problem of the homogenization of the values of various heterogeneous indicators. In this paper, the extreme value method was used to standardize the data, as shown in Formula (1) [42]:

$$Z_{ij} = (X_{ij} - X_{jmin}) / (X_{jmax} - X_{jmin}) \quad (1)$$

where  $i$  represents the number of farmers,  $j$  represents the number of indicators,  $X_{ij}$  is the original value of the  $j$ th indicator of the  $i$ th farmer,  $X_{jmax}$  is the maximum value of the  $j$ th indicator,  $X_{jmin}$  is the minimum value of the  $j$ th indicator, and  $Z_{ij}$  is the standardized value of the  $j$ th indicator of the  $i$ th farmer. The closer the normalized value is to 1, the higher the relative level of the indicator.

Secondly, the entropy method was used to calculate the weight of each index, and the steps were as follows:

The proportion of the  $i$ th farmer index value under the  $j$ th index was calculated:  $P_{ij} = Z_{ij} / \sum_{i=1}^n Z_{ij}$ .

The entropy value of the  $j$ th index was calculated:  $e_j = -1 / \ln n \sum_{i=1}^n P_{ij} \ln P_{ij}$ .

The weight of the  $j$ th index was calculated:  $W_j = (1 - e_j) / \sum_{j=1}^n (1 - e_j)$ .

The weight values of the various indicators obtained in this paper are shown in Table 4.

Finally, the livelihood capital  $LC$  of the farmers based on the standardized processing data and the weight of each indicator was calculated:  $LC = \sum_{j=1}^n W_j Z_{ij}$ .

**Table 4.** Evaluation results of the livelihood capital.

Capital Type	Measurement Indicator	Weight	Index Value	Calculation Formula	Mean Value
Natural capital (N)	Per capita cultivated land area	0.4337	0.4653	$N = 0.4653 \times 0.4337 + 0.1124 \times 0.2621 + 0.5671 \times 0.3042$	0.4038
	Per capita forest land area	0.2621	0.1124		
	Geographical location	0.3042	0.5671		
Physical capital (P)	Number of livestock and poultry	0.1131	0.5324	$P = 0.5324 \times 0.1131 + 0.4122 \times 0.2718 + 0.3467 \times 0.4524 + 0.6078 \times 0.1627$	0.4279
	Housing structure	0.2718	0.4122		
	Per capita housing area	0.4524	0.3467		
	Household fixed assets	0.1627	0.6078		
Human capital (H)	The overall labor force of the family	0.4233	0.4674	$H = 0.4674 \times 0.4233 + 0.1772 \times 0.3561 + 0.3421 \times 0.2206$	0.3364
	The education level of the adult labor force	0.3561	0.1772		
	The health status of the labor force	0.2206	0.3421		
Social capital (S)	Relationships with relatives and friends	0.3714	0.2445	$S = 0.2445 \times 0.3714 + 0.1168 \times 0.2041 + 0.2426 \times 0.4245$	0.2139
	Social network support	0.2041	0.1168		
	Whether there are village (town and above) cadres	0.4245	0.2426		
Financial capital (F)	Annual household income	0.4123	0.2014	$F = 0.2014 \times 0.4123 + 0.2112 \times 0.2346 + 0.1875 \times 0.3531$	0.2018
	Access to credit opportunities	0.2346	0.2112		
	Diversity of income sources	0.3531	0.1875		

Data source: research data calculation.

### 3.6.2. Variable Selection and Model Setting of the Impact of Livelihood Capital on Livelihood Strategies

#### Variable Selection

This research article considered Southwest China as an example of the impact of farmers' livelihood capital on their livelihood strategies, so the farmers' livelihood strategy was the dependent variable (Y). According to the classification methods of the National Bureau of Statistics and the Chinese Academy of Social Sciences, this paper divided the farmers into three types according to the source of economic income: pure agriculture, part-time agriculture, and non-agriculture [43]. The pure agricultural type denotes farmers whose total agricultural income accounts for more than 90% of the total household income, while non-agricultural income does not exist in the household income. The non-agricultural type denotes farmers whose non-agricultural income accounts for more than 90% of total household income. Those farmers between the pure agricultural and non-agricultural types are part-time farmers [44]. Therefore, the dependent variables in this paper were the three livelihood strategies of pure agriculture, part-time agriculture, and non-agriculture.

The livelihood capital of farmers was an independent variable (X), namely natural capital (N), physical capital (P), human capital (H), social capital (S), and financial capital (F). As for the index setting of each livelihood capital, these were clearly determined in a previous paper, and the origin of and reasons for the index settings are not repeated here. The specific indicators of the five types of livelihood capital were shown in Table 1. This section continues to use the standardized data of each index for empirical analysis.

#### Model Setting

The impact of livelihood capital on livelihood strategies has received extensive attention in academia, and there are many qualitative studies available on the relationship between them [45]. Moreover, many scholars have used certain models and methods to conduct empirical research on the relationship between the two from different per-

spectives [46–48]. At present, the logistic regression model is widely used to analyze the relationship between the two [49]. Therefore, this research paper learned from previous research methods and used the logistic regression model to empirically analyze the impact of livelihood capital on the livelihood strategies of farmers in Southwest China.

First, the logistic regression model was used to analyze the influencing factors of farmers' different types of livelihood strategies. When analyzing certain types of livelihood strategies, a value of 1 was assigned to the pertinent type of livelihood strategy, while a value of 0 was assigned to the remaining two types of livelihood strategies [50]. For example, when analyzing the influencing factors of the choice of the pure agriculture livelihood strategy, the pure agriculture livelihood strategy was assigned 1, while the other two livelihood strategies were assigned 0. Based on this method, logistic regression models of the part-time and non-agriculture strategies were constructed, and the details are shown in the Formulas (2)–(4).

$$\text{Ln} (P_{y1}/1 - P_{y1}) = a_{10} + a_{11}X_1 + \dots + a_{1m}X_i \quad (2)$$

$$\text{Ln} (P_{y2}/1 - P_{y2}) = a_{20} + a_{21}X_1 + \dots + a_{2m}X_i \quad (3)$$

$$\text{Ln} (P_{y3}/1 - P_{y3}) = a_{30} + a_{31}X_1 + \dots + a_{3m}X_i \quad (4)$$

In Formula (2), if the type of livelihood strategy was pure agriculture, then  $P_{y1} = 1$ ; otherwise, it was 0.  $X_i$  is the explanatory variable, namely the five major livelihood capitals;  $a_{10} \dots a_{1m}$  are the estimated coefficients of the explanatory variables. In Formula (3), if the type of livelihood strategy was part-time agriculture, then  $P_{y2} = 1$ ; otherwise, it was 0.  $X_i$  is the explanatory variable, namely the five major livelihood capitals;  $a_{20} \dots a_{2m}$  are the estimated coefficients of the explanatory variables. In Formula (4), if the type of livelihood strategy was non-agriculture, then  $P_{y3} = 1$ ; otherwise, it was 0.  $X_i$  is the explanatory variable, namely the five major livelihood capitals;  $a_{30} \dots a_{3m}$  are the estimated coefficients of the explanatory variables. The influencing factors and degree of farmers' livelihood capital on different types of livelihood strategies were studied by logistic regression model.

Meanwhile, in order to reveal the law of transformation of farmers' livelihood strategies from pure agriculture to part-time and non-agriculture, this paper assigned the livelihood strategies of pure agriculture, part-time agriculture, and non-agriculture to 1, 2, and 3, respectively, and took the livelihood strategy of pure agriculture as a reference to analyze the changes in livelihood capital in the process of transformation from pure agriculture to part-time and non-agriculture. Therefore, this research paper constructed a polynomial logistic regression model, as shown in Formulas (5) and (6).

$$\text{Ln} (P_{y2}/P_{y1}) = a_{210} + a_{211}X_1 + \dots + a_{21m}X_i \quad (5)$$

$$\text{Ln} (P_{y3}/P_{y1}) = a_{310} + a_{311}X_1 + \dots + a_{31m}X_i \quad (6)$$

If the type of livelihood strategy was pure agriculture, then  $P_{y1} = 1$ ; if the type of livelihood strategy was part-time agriculture, then  $P_{y2} = 1$ ; if the type of livelihood strategy was non-agriculture, then  $P_{y3} = 1$ ;  $a_{210} \dots a_{21m}$  and  $a_{310} \dots a_{31m}$  are the estimation coefficients.

## 4. Results

Based on the research methods and data sources mentioned above, the final results for this research paper were obtained. This section mainly analyzes the evaluation results pertaining to livelihood capital, the impact of livelihood capital on livelihood strategies, and the main factors of livelihood strategy transformation from pure agriculture to part-time and non-agriculture.

### 4.1. Evaluation Results of the Farmers' Livelihood Capital

The calculated results of the livelihood capital of farmers in the poor areas of Southwest China are shown in Table 4. It can be clearly seen from Table 4 that the asset values of

physical, natural, human, social, and financial capital were 0.4279, 0.4038, 0.3364, 0.2139, and 0.2018, respectively. The average values of the five kinds of livelihood capital were generally not high.

Among them, physical capital was the highest, with a value of 0.4279. Physical capital is a necessary condition for family life, and home ownership is a guarantee for family life. It was found in the survey that the housing conditions of farmers in some poverty-stricken areas were relatively poor, making it difficult to meet their normal production and living needs. The reason for the relatively high physical capital may be an increase in the means of life and production owned by farmers, since the types of fixed assets owned by farmers have increased significantly. Most of the farmers had multiple fixed assets such as televisions, washing machines, and electric vehicles. In addition, with the implementation of the poverty alleviation policy, the government has transformed many farmers' houses, and the housing conditions have been improved. At the same time, raising livestock is also an important factor in the increase in physical assets [51]. Especially for slightly older farmers, raising livestock is their daily way of living, and the quantity and quality of livestock have a direct impact on the income of farmers.

Natural capital was relatively high, with an asset value of 0.4038. The areas of cultivated and forest land comprise an important indicator of natural capital. For farmers, especially in poor areas, land is an important means of production to achieve the goal of living. As shown in Table 4, the index value of per capita cultivated land area was 0.4653, while the index value of per capita forest land area was 0.1124. Meanwhile, the farmers did not own many land resources. In addition, it was determined that even though the farmers in this study had more forest land, the available forest land resources were very small due to incomplete infrastructure, such as transportation and irrigation. According to the responses of the local farmers, there was a phenomenon of unfair land distribution in the village, which was also one of the reasons for the low per capita land resources of farmers. Although the number of family members is constantly changing, land has not been re-divided, and there is a mismatch between the number of family members and the amount of land owned, which has caused dissatisfaction for some farmers. In addition to land resources, geographical location is also critical for farmers, and the distance from the village to the township is an important factor affecting farmers' livelihood activities. Generally, the natural capital of farmers is highly vulnerable [52].

Human capital was at a medium level, with a value of 0.3364. Human capital is one of the important factors affecting poverty, and its quantity and quality also determine whether farmers can reasonably use other livelihood assets. According to Table 4, the overall labor force index value of the farmers was relatively high, with a value of 0.4674, which indicates that the overall labor force of the farmers was sufficient. However, the education level of the farmers' labor force was generally low, and the index value was only 0.1772. According to the survey, more than 80% of the farmers had a primary school or junior high school diploma, while very few people had a high school education or above, and a low level of education was one of the important factors inhibiting the improvement of human capital. In addition, the health status of the labor force is also an important factor affecting human capital. Generally, it will take a certain time for sick farmers to recover their labor production capacity again [15,31,53]. Therefore, on the whole, the human capital level of the farmers was not outstanding.

Social capital was low, with a value of 0.2139. The reason why the social capital value of the farmers was relatively low may be that the farmers do not know enough about the construction of social relationship networks and do not pay enough attention to the utilization of social network resources [18,54]. It can be seen from Table 4 that the values of various indicators of social capital were relatively low. The index values of "the relationship with relatives and friends" and "the social network support" were 0.2445 and 0.1168, respectively, indicating that the relationship between farmers and their relatives and friends was not particularly good, and there were few contacts at ordinary times. As soon as the farmers encounter difficulties, there are less opportunities to obtain

social network support. The index value of “whether there are village (town and above) cadres” in the family was only 0.2426, which shows that the level of social groups contacted by farmers was not high. On the whole, the vulnerability of farmers’ social capital was relatively high.

Financial capital was the lowest, with a value of 0.2018. It can be seen from Table 4 that the financial capital of the farmers was relatively fragile, and the values of various indicators were relatively low. From the interview with the farmers, we know that the income source channels of the farmers were relatively small, mainly farming. The younger children choose to migrate for work, but the income is not high, so it is difficult to meet the needs of the farmers’ daily funds. In addition, farmers have few opportunities to obtain credit. When funds are scarce, they mainly borrow money from relatives and friends. Due to the low credit ability of farmers, a lack of loan collateral, and complicated loan procedures, few farmers choose financial loans [7,19,55]. Therefore, the financial capital of farmers in poor areas is normally low because of their low family income, limited access to credit opportunities, and fewer channels of income sources.

#### 4.2. The Impact of Livelihood Capital on Livelihood Strategies

The previous research paper primarily estimated and evaluated the livelihood capital of farmers [28,44]. Through the field survey, it was found that farmers’ income mainly comes from planting, breeding, working, business, entrepreneurship, and so on. According to the source of economic income, farmers can be divided into three types: pure agriculture, part-time agriculture, and non-agriculture. Through interviews with farmers, it was found that there were differences in the livelihood capital owned according to different livelihood strategies. Therefore, this research article assumed that there is a certain relationship between livelihood capital and livelihood strategies. In order to confirm the mathematical relationship between the two, Southwest China was considered as an example model, based on the survey data and using the binary logistic regression method to empirically analyze the impact of farmers’ livelihood capital on their livelihood strategies. The results are shown in Tables 5–7.

**Table 5.** Binary logistic regression analysis of the impact of livelihood capital on the pure agriculture livelihood strategy.

Livelihood Capital	B	S.E.	Sig.	EXP(B)
Natural capital	0.421	0.135	0.001	1.523
Physical capital	0.547	0.193	0.020	1.728
Human capital	−1.214	0.261	0.020	0.297
Social capital	−0.648	0.212	0.060	0.523
Financial capital	−0.813	0.274	0.190	0.443
Constant term	−1.114	0.157	0.211	0.328
Goodness of fit			0.821	

Note: B, regression coefficient; S.E., standard error; Sig., significance; EXP(B), the exponent of B.

**Table 6.** Binary logistic regression analysis of the impact of livelihood capital on the part-time agriculture livelihood strategy.

Livelihood Capital	B	S.E.	Sig.	EXP(B)
Natural capital	0.305	0.133	0.030	1.357
Physical capital	0.378	0.187	0.020	1.459
Human capital	0.253	0.148	0.000	1.288
Social capital	0.288	0.132	0.001	1.334
Financial capital	−1.035	0.235	0.060	0.355
Constant term	−0.679	0.129	0.171	0.507
Goodness of fit			0.772	

Note: B, regression coefficient; S.E., standard error; Sig., significance; EXP(B), the exponent of B.

**Table 7.** Binary logistic regression analysis of the impact of livelihood capital on the non-agriculture livelihood strategy.

Livelihood Capital	B	S.E.	Sig.	EXP(B)
Natural capital	−1.734	0.202	0.080	0.177
Physical capital	−2.213	0.224	0.040	0.109
Human capital	0.772	0.253	0.000	2.164
Social capital	0.476	0.164	0.020	1.609
Financial capital	1.814	0.287	0.001	6.135
Constant term	−2.152	0.231	0.232	0.116
Goodness of fit		0.784		

Note: B, regression coefficient; S.E., standard error; Sig., significance; EXP(B), the exponent of B.

It can be clearly seen from Table 5 that the main types of livelihood capital that have a positive impact on the pure agriculture livelihood strategy are physical and natural capital. The higher the physical capital and natural capital of farmers, the more likely they are to have carefully chosen the pure agriculture livelihood strategy. This might be because the pure agriculture livelihood strategy is primarily based on agricultural cultivation and breeding, which is highly dependent on natural capital and physical capital [56]. For example, the larger the areas of forest and cultivated land, the more likely farmers are to choose agricultural planting to obtain income. Likewise, the more livestock the household has according to their agricultural physical capital, the greater the probability of engaging in pure agriculture. In addition, the contribution of physical capital (1.728) was greater than that of natural capital (1.523). It can be seen that the number of poultry, the housing structures and land area, and the household fixed assets have a greater impact on the choice of the pure agriculture livelihood strategy. According to Table 5, the types of livelihood capital that have a negative impact on the pure agriculture livelihood strategy are primarily human and social, in addition to financial capital. The foremost motive is that the more abundant the household labor force and the higher the education level of the farmers, the more employment opportunities they choose. Thus, farmers choose a livelihood strategy suitable for their own development and develop into non-agricultural industries. Similarly, the higher the social capital and the richer the financial capital of the farmers, the better their social network support and the stronger the economic strength of their families, thus promoting farmers toward progressing into industries other than agriculture.

It can be clearly perceived from Table 6 that apart from financial capital, the other four kinds of livelihood capital have a positive impact on the part-time agriculture livelihood strategy. It may be that along with improvement in agricultural production technology, agricultural cultivation and livestock breeding no longer require as large a labor force as before; therefore, part of the surplus labor force are liberated from agricultural production and choose livelihood activities other than agriculture [57]. Similarly, the higher the human capital and social capital, the more opportunities for farmers to understand the external market information, which is more likely to promote the transformation of these farmers to non-agricultural industries [58]. From the perspective of the contribution of livelihood capital to the part-time agriculture livelihood strategy, the contribution of these four positive factors to the livelihood strategy has little difference. It is clearly shown that when farmers choose the part-time agriculture livelihood strategy, in addition to considering physical and natural capital, they also need to consider the accumulation of social and human capital, such as the education level of the labor force and social network support. According to the results of Table 6, financial capital is negatively correlated with the part-time agriculture livelihood strategy. A possible reason is that the higher the financial capital, the stronger the economic strength of farmers [59]. The more credit opportunities farmers obtain, the more channels of income sources they have and the more capital they have to engage in other non-agriculture livelihood activities. Thus, the higher the financial capital owned by farmers, the lower the probability of choosing part-time agriculture livelihood activities.

It can be seen from the data in Table 7 that the livelihood capitals that have a positive impact on the non-agriculture livelihood strategy mainly include human, social, and

financial capital. The key reason is that the higher the education level of farmers, the richer the family labor force and the greater the knowledge and skills that they master. Hence, they are more likely to get rid of their previous pure agriculture livelihood strategy and engage in non-agriculture livelihood activities with more income [23,26]. Likewise, the better the relationship with relatives and friends, the more social network support they obtain; the more friends they have in the government, the wider their connections and the more opportunities and social information they can obtain from the outside world, which can better promote the transformation of farmers from agriculture to non-agriculture livelihood strategies. Normally, the greater the financial capital, the more numerous the means of livelihood pursued by farmers. In this case, the stronger the ability to promote the transformation of farmers' livelihood strategies, the more likely farmers are to develop into non-agricultural industries [21,28,58]. Among the three positive factors, the contribution of financial capital to the non-agriculture livelihood strategy was the highest, with a value of 6.135, far higher than that of human and social capital. It can be seen that when farmers choose the non-agriculture livelihood strategy, the annual household income, the access to credit opportunities, and the diversification of income sources have the greatest impact on their choice of the non-agriculture livelihood strategy. According to Table 7, physical and natural capital are negatively correlated with the non-agriculture livelihood strategy. A possible reason is that the more cultivated and forest land area, the more livestock and poultry, and the more abundant the agricultural means of production, the more inclined farmers are toward increasing their stock of natural and physical capital, thus promoting farmers to achieve better development in agricultural production [5,32,52]. Therefore, the higher the physical and natural capital, the lower the probability of farmers choosing the non-agriculture livelihood strategy.

#### *4.3. Analysis of the Key Influencing Factors of the Transformation from Pure Agriculture to the Part-Time and Non-Agriculture Strategies*

Under the existing conditions of livelihood capital, increasing the diversity of livelihood strategies and promoting the transfer of farmers with family capacity and livelihood capital reserves from a single planting industry to the secondary and tertiary industries are important livelihood strategies for farmers in poor areas to reduce their livelihood vulnerability and improve their livelihood level [30,48]. The amount of farmers' livelihood capital and the type of livelihood strategy will affect their permanent poverty alleviation and sustainable livelihood ability [25,27]. With a change in livelihood capital, the type of livelihood strategy will also change from pure agriculture to part-time and non-agriculture. Based on the pure agriculture livelihood strategy as a reference, this paper investigated the influencing factors of the transformation from pure agriculture to part-time and non-agriculture, in order to determine the important influencing factors to optimize farmers' livelihood strategies and to increase their income sources, so as to promote an improvement in their sustainable livelihood ability. Tables 8 and 9 show the analysis outcomes of the influencing factors of the transformation from pure agriculture to part-time and non-agriculture.

It can clearly be seen from Table 8 that the per capita cultivated land area and geographical location in the natural capital indicators can promote the transformation from pure agriculture to the part-time agriculture livelihood strategy. However, the per capita cultivated land area index was not significant; thus, geographical location is the key influencing factor of the transformation from pure agriculture to part-time agriculture. When the other variables remain unchanged, the contribution of geographic location was 1.508. It may be that the closer the distance to the township and the better the geographical location, the more convenient it is for farmers to engage in some small businesses or other non-agricultural activities. The physical capital index that most affected the transformation of livelihood strategy was household fixed assets. When the other variables remained unchanged, the contribution was 2.147. The reason for the growth of agricultural production tools is that it will lead to the improvement of production efficiency, which will promote

the transformation of part of the surplus labor force to part-time agriculture livelihood activities. In terms of human capital, the overall labor force of the family and the education level of the adult labor force have a positive effect on the transformation of livelihood strategies, with contributions of 1.416 and 1.745, respectively. Regarding social capital, all indicators had a positive impact on the transformation of the part-time agriculture livelihood strategy. Nonetheless, the social network support index was the most significant; when the other variables remained unchanged, its contribution was 2.257. It can be seen that the more support farmers obtain from social networks, the more likely they are to understand the market situation, so the more likely they are to choose the part-time agriculture livelihood strategy. In terms of financial capital, annual household income, access to credit opportunities, and diversity of income sources all had a positive impact on the transformation of livelihood strategies. However, the annual household income was the most significant, which is the decisive factor for promoting the transformation of livelihood strategy to part-time employment. This is possibly because the higher the income, the more able farmers are to change their livelihood strategies.

**Table 8.** Polynomial logistic regression analysis of the transformation from pure agriculture to part-time agriculture.

Index	B	S.E.	Sig.	EXP(B)
Per capita cultivated land area	0.324	0.211	0.481	1.383
Per capita forest land area	−0.213	0.198	0.253	0.808
Geographical location	0.411	0.253	0.014	1.508
Number of livestock and poultry	−0.054	0.228	0.043	0.947
Housing structure	−0.124	0.324	0.165	0.883
Per capita housing area	−0.345	0.207	0.243	0.708
Household fixed assets	0.764	0.147	0.005	2.147
The overall labor force of the family	0.348	0.251	0.079	1.416
The education level of the adult labor force	0.557	0.324	0.001	1.745
The health status of the labor force	−0.124	0.346	0.502	0.883
Relationships with relatives and friends	0.425	0.279	0.728	1.529
Social network support	0.814	0.188	0.031	2.257
Whether there are village (town and above) cadres	0.007	0.341	0.847	1.007
Annual household income	1.211	0.404	0.004	3.357
Access to credit opportunities	0.674	0.259	0.416	1.962
Diversity of income sources	0.478	0.227	0.105	1.613

Reference type: Pure agriculture

Note: B, regression coefficient; S.E., standard error; Sig., significance; EXP(B), the exponent of B.

**Table 9.** Polynomial logistic regression analysis of the transformation from pure agriculture to non-agriculture.

Index	B	S.E.	Sig.	EXP(B)
Per capita cultivated land area	−0.287	0.281	0.081	0.751
Per capita forest land area	−0.455	0.325	0.213	0.634
Geographical location	0.216	0.416	0.107	1.241
Number of livestock and poultry	−0.043	0.258	0.013	0.958
Housing structure	−0.125	0.217	0.214	0.882
Per capita housing area	−0.114	0.172	0.506	0.892
Household fixed assets	0.423	0.223	0.247	1.527
The overall labor force of the family	0.346	0.279	0.003	1.413
The education level of the adult labor force	0.607	0.318	0.005	1.834
The health status of the labor force	0.201	0.173	0.347	1.222
Relationships with relatives and friends	0.414	0.223	0.002	1.513
Social network support	0.735	0.481	0.011	2.085
Whether there are village (town and above) cadres	0.108	0.256	0.245	1.114
Annual household income	0.682	0.241	0.012	1.978
Access to credit opportunities	1.214	0.329	0.008	3.367
Diversity of income sources	0.874	0.251	0.115	2.396

Reference type: Pure agriculture

Note: B, regression coefficient; S.E., standard error; Sig., significance; EXP(B), the exponent of B.

It can be clearly seen from Table 9 that in terms of natural capital, geographical location had a positive impact on the transformation of the livelihood strategy to non-agriculture, but it was not significant, probably because non-agriculture livelihood activities do not greatly depend on natural capital. Amongst the types of physical capital, only the household fixed assets index could promote the transformation of livelihood strategies, but the impact was not significant. Regarding human capital, the overall labor force of the family, the education level of the adult labor force, and the health status of labor force all had a positive impact on the transformation of livelihood strategies, but the impact of the health status indicator of the labor force was not significant. The index of the education level of the labor force was the most significant, with a contribution of 1.834 when the other variables remained unchanged. The main reason is that the higher the level of education and the more knowledge and skills they have, the lower the probability of farmers choosing the agriculture livelihood strategy and the more likely they are to transform to non-agriculture [39,41,49]. In terms of social capital, all indicators promoted the transformation of the livelihood strategy to non-agriculture, but the indicator of whether there were village (town and above) cadres was not significant. The main key factors that were used to promote the transformation of the livelihood strategy to non-agriculture were relationships with relatives and friends and social network support, with contributions of 1.513 and 2.085, respectively. It may be that the better the relationships with relatives and friends and the more social network support they receive, the more able farmers are to deal with the difficulties and risks encountered in social activities, and therefore it is more beneficial for farmers to engage in non-agriculture livelihood activities. Regarding financial capital, all indicators had a positive impact on the transformation of the livelihood strategy to non-agriculture. Amongst them, the index of access to credit opportunities was the most significant, and the contribution was 3.367 under the condition that the other variables remained unchanged. The stronger the economic strength, the more likely it is for farmers to change their livelihood strategy to non-agriculture.

## 5. Discussion

The research on livelihood capital and livelihood strategies is constantly evolving, both at home and abroad [10,28]. Based on the characteristics of farmers' sustainable livelihoods in Southwest China, this paper constructed a model of farmers' livelihood capital and livelihood strategies and conducted data analysis. However, due to differences in research areas and research methods, the results of the research are slightly different from other researchers' findings in terms of farmers' livelihoods.

Regarding the evaluation methods of livelihood capital, in recent years, new methods have been established and gradually implemented by the majority of scholars, such as regression analysis, the analytic hierarchy process, artificial neural networks, and fuzzy evaluation [60–63]. Each evaluation method has its advantages and disadvantages. Based on the real circumstances of the study area, this paper carefully chose the entropy methodology as the evaluation method of the livelihood capital of farmers in southwest poverty-stricken areas. The reason was that the entropy technique can imitate in depth the utility value of the index information entropy value and thus determine the weight. In addition, the entropy method is an objective weighting method, so the weights of the indicators derived from it are more considered, with moderately high reliability and accuracy [63]. Research by Kuang et al. showed that among the five types of livelihood capital, farmers' natural capital value is the highest and their social capital value is the lowest [7]. The research results of this paper showed that the value of physical capital is the highest, while the value of financial capital is the lowest. The reason for the higher physical capital is that the means of living and production owned by farmers have increased, and the types of fixed assets owned by households have also increased significantly. Most farmers have a number of fixed assets such as televisions, washing machines, and electric vehicles. In addition, with the implementation of poverty alleviation policies, the government has renovated the houses of many farmers, and housing conditions have been improved [64]. Meanwhile,

the low financial capital was mainly caused by the low family income, limited access to credit, fewer income sources, and other factors. This paper evaluated farmers' livelihood capital using a more objective method, and the evaluation results are basically consistent with other investigations in the field.

In this paper, the logistic regression model was used to conduct an empirical investigation of the relationship between livelihood capital and livelihood strategies. The results showed that different livelihood capital conditions determine the choice of livelihood strategy for a farmer. The results of this research are consistent with the research conclusions of other scholars in the academic field. For example, Meng et al. conducted a quantitative analysis on the livelihood capital and livelihood strategies of farmers and herdsmen in Ordos city [29]. The results showed that farmers with more human and financial capital take non-agricultural activities as their main livelihood strategy, while farmers with more natural capital take agricultural production as their main livelihood strategy. The difference in this study is that the livelihood strategies of farmers were divided into three types, namely pure agriculture, part-time agriculture, and non-agriculture, and the impact of different livelihood capital types on the three livelihood strategies was calculated. The research results are consistent with the other survey results in this field. In addition, most scholars have only studied the impact of livelihood capital on livelihood strategies and have not further studied the key influencing factors of the transformation of farmers' livelihood strategies [11,28]. With changes in livelihood capital, the type of livelihood strategy will also change to a certain extent. This paper individually analyzed the influencing factors of the transformation from pure agriculture to part-time and non-agriculture livelihood strategies. The results showed that the transformation of farmers' livelihood strategies is affected by many key factors. This study can help farmers quickly identify the influencing factors of different livelihood strategies so as to realize the optimization of their strategy, in order to better solve the sustainable livelihood problems of farmers in poor areas.

The possible innovations of this paper are as follows: ① Regarding the selection of research objects, most scholars mainly take a province, a city, or even a county as the research area. Furthermore, the research object has seldom been targeted at poor farmers. This paper mainly took farmers in poverty-stricken areas in Southwest China as the research object. Southwest China is a region with a large number of poor people and a high incidence of poverty in China, and it is also the main area for poverty alleviation. Therefore, it was very representative and typical to take the poverty-stricken areas in Southwest China as the sample area. ② This paper mainly adopted the more objective entropy method to quantitatively calculate the livelihood capital. The evaluation methods often used by scholars include the analytic hierarchy process and principal component analysis. The analytic hierarchy process has some subjectivity, and the results are not scientific and effective. The principal component analysis method can only reflect part of the original data, and cannot cover all the data, and the analysis results are not comprehensive enough. The entropy method makes up for the shortcomings of the above methods. ③ This paper focused on empirical research on the impact of livelihood capital on livelihood strategies and conducted a detailed analysis of the key influencing factors of livelihood strategy transformation. Most of the studies on livelihood strategies were from the perspective of sociology, mainly focusing on the current situation of livelihood, types of livelihood strategies, etc., and lacked in-depth empirical research. Although some scholars have made some research progress on the impact of livelihood capital on livelihood strategies, the research is not comprehensive. They only analyzed the impact of livelihood capital on the choice of livelihood strategies and did not further analyze the impact of livelihood capital on the transformation of livelihood strategies. This article has made up for this deficiency.

However, this study has certain limitations. The availability of data was one limitation, as this paper only discussed the livelihood of farmers in southwest poverty-stricken areas at a single point in time. However, the livelihood capital of farmers will change with time, and the choice of livelihood strategy also needs dynamic analysis. In future research, we will try to establish a dynamic monitoring system for farmers to compare the changes

in their livelihood capital and livelihood strategies at different time points, and we will analyze the livelihood issues of farmers in different periods.

## 6. Conclusions and Suggestions

### 6.1. Conclusions

On the basis of the relevant research results pertaining to livelihood capital and livelihood strategy, this research paper adopted poor areas in Southwest China as an example, constructed an evaluation index system of livelihood capital, evaluated the livelihood status of farmers with the help of field survey data, and then empirically studied the impact of farmers' livelihood capital on their choice of livelihood strategy. Based on previous theoretical analysis and empirical research, this research paper draws the following conclusions:

(1) From the perspective of livelihood capital, the five categories of livelihood capital were generally not high. Among them, the asset value of physical capital was the highest, at 0.4279; the financial capital value was the lowest, at 0.2018; the natural, human, and social capital values were between the two, at 0.4038, 0.3364, and 0.2139, respectively. This research showed that in the poor areas of Southwest China, a large number of farmers still lack livelihood resources, and there are still some constraints on their sustainable livelihoods. Whether the sustainable livelihood capacity of farmers can be improved is related to whether a rural revitalization strategy can be effectively implemented. However, the current low level of farmers' livelihood capital is not conducive to their stability and prosperity and the harmony and stability of the countryside.

(2) From the perspective of the influencing factors of livelihood strategy selection, the types of livelihood capital that had a positive impact on the pure agriculture livelihood strategy were mainly physical and natural capital. On the contrary, the kinds of livelihood capital that had a negative impact on the pure agriculture livelihood strategy were human, social, and financial capital. For the part-time agriculture livelihood strategy, except for financial capital, the other four types of livelihood capital were positively related to the strategy, and the contribution of these four positive factors to livelihood strategies was not much different. In addition, human, social, and financial capital were positively correlated with the non-agriculture livelihood strategy, while physical and natural capital were negatively correlated with the non-agriculture livelihood strategy. This research showed that the type of livelihood strategy that farmers choose depends on the type and stock of livelihood capital that they have.

(3) From the perspective of the key factors that affect the transformation of livelihood strategies, the key factors that promote the transformation of livelihood strategy from pure agriculture to part-time agriculture mainly include geographical location, household fixed assets, the overall labor force of the family, the education level of labor force, social network support, and annual household income. The key factors that promote the transformation of livelihood strategies from pure agriculture to non-agriculture are mainly the education level of the labor force, relationships with relatives and friends, social network support, and access to credit opportunities. This research showed that the types of livelihood strategies adopted by farmers are not invariable and will change with a change in livelihood capital. Therefore, farmers should choose the most suitable livelihood strategy according to their actual livelihood capital, so as to enhance their livelihood ability.

### 6.2. Suggestions

Combined with the abovementioned conclusions, the following suggestions are put forward from the perspectives of livelihood capital and livelihood strategies:

(1) Increase livelihood capital and expand livelihood capital stock. For natural capital, it is necessary to reasonably adjust the structure of agriculture and forestry, improve the quality of cultivated and forest land, and improve farmland irrigation facilities and road traffic. Moreover, the government should perfect the system of land distribution and circulation to improve the utilization efficiency of natural capital. For physical capital, the

quality of livestock should be improved, large-scale breeding and characteristic breeding should be carried out according to market demand, agricultural production materials and fixed assets should be increased, and labor productivity should be improved. At the same time, the government should strengthen infrastructure construction; improve conditions such as sanitation, diet, and housing structure; increase the per capita housing area; and solve the housing problems of farmers. For human capital, the cultural and physical qualities of farmers need to be improved. It is also suggested to improve the salary level of rural teachers and implement effective incentive policies. Strengthening the training of young people, helping them to master their skills, and cultivating their concept of self-reliance should also be achieved. At the same time, the physical examination rate of farmers should be increased, and free physical examinations should be implemented for farmers with poor health and poor family conditions to reduce the incidence of diseases or infectious diseases. For social capital, a good social communication network system should be constructed to promote the sharing of feelings and exchanges between farmers and their relatives and friends. Encouraging farmers to participate in some cooperatives, associations, and other related organizations should help to strengthen the contact between farmers and individuals with outside information. Meanwhile, the government should also provide some financial and material support. For financial capital, financial credit policies should be standardized, especially for low-income farmers in poor areas. Improving the micro-credit system, ensuring that every village has its own network, facilitating farmers' loans, and fundamentally solving the problem of farmers' fund shortage are key ways to achieve this.

(2) Optimize livelihood strategies and improve sustainable livelihood capacity. When choosing a livelihood strategy, farmers should comprehensively observe the surrounding environment and resources. In particular, they should choose the most suitable livelihood strategy according to the actual situation of their own livelihood capital, so as to employ the maximum utility of livelihood capital. For example, when the natural and physical capital of farmers are high, they can transfer onto a pure agriculture livelihood strategy and strive to become large farmers of agricultural planting and breeding. They can join some professional cooperatives and take advantage of market opportunities to seek business opportunities. When human, financial, and social capital are abundant, farmers can choose a part-time or non-agriculture livelihood strategy to transfer part of their labor force and expand their livelihood activities. Making full use of their own cultural level, credit funds, and social network relations are some options to actively seek ways to increase income and become rich, as well as increase employment opportunities for farmers. In addition, once a livelihood strategy has been selected, it is not fixed. With changes in local characteristics and household livelihood capital, the livelihood strategy should also be adjusted in time to achieve the sustainable livelihood strategy goals of farmers. For example, when the quality of farmers' cultivated land is poor but the local tourism resources are rich, farmers can change their single pure agriculture livelihood strategy, choose the integrated development strategy of agriculture and tourism, and enhance their livelihood ability.

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