Comparison and Analysis of the Methods for Measuring the Sustainability of Farmers' Livelihoods

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Abstract

The sustainability of farmers' livelihood is essential for studying farmers' welfare. This article defines the connotation of farmers' livelihood sustainability and sorts out the latest research trends on farmers' livelihood sustainability. On this basis, this paper further analyzes the theoretical framework of farmers' sustainable livelihoods, including three aspects: the dimensions of farmers' sustainable livelihoods measurement, the index system, and the types of measurement results. At the same time, this article discusses the measurement methods of rural households' sustainable livelihoods from two perspectives: descriptive measurement and inferential measurement. Finally, this article analyzes the sustainable decomposition methods of farmers' livelihoods from a subjective and objective perspective. The finding indicates that we can measure the sustainability of rural households' livelihoods more comprehensively and systematically. This study adopts a combination of descriptive and inferential measurement methods, which has the flexibility of the two methods with the advantages of easy quantification.

Keywords: Sustainable livelihood; Farmer's livelihood; Livelihood measurement

Introduction

Livelihood is "a means (method) of life". This interpretation far exceeds the concept of income because livelihood shifts the focus to the means needed to achieve life, not just the income or the attainable net output measured by consumption (Su et al., 2016). Scholars who study poverty and rural development believe that the concept of livelihood has rich meanings. The term livelihood has a richer connotation and a greater extension than "work", "income," and "occupation" and can more completely describe the survival of the poor. The complexity of the state is more conducive to understanding the strategies adopted by the poor for survival and safety (Su et al., 2009). In scientific research, the concept of livelihood has undergone continuous development and enrichment. The inconsistency of research interests and goals has led to different scholars' understanding of the concept of livelihood, and the definitions given are not wholly the same.

There are numerous livelihood definitions: Livelihoods as "livelihoods include assets (natural, material, human, financial, and social capital), actions, and access to these assets (adjusted by institutions and social relations), all of which determine this has helped individuals or farmers to obtain the resources needed for survival" (Ellis, 2000). research on

the sustainability of livelihoods defines livelihoods as "livelihoods are composed of the abilities, assets (including material resources and social resources) and actions needed for life" (Su et al., 2009). A generally accepted concept of livelihood is: a livelihood "includes abilities, assets, and activities required for a way of life." This definition directly focuses on the connection between the assets that people have and their choices in pursuing the income level that people need to increase their survival (Tan, 2021).

The concept of sustainable livelihoods was first seen in the "Our Common Future" report published by the World Commission on Environment and Development in 1987. It was conceptualized for the first time in the Human Development Report issued by the United Nations Development Program in 1990 (Tang, 2015). Since then, the issue of sustainable livelihoods has gradually attracted the scientific community's attention. Scholars have conducted much research on the impact of environmental fragility and unsustainable development on humanity. In the early 1990s, some institutions recognized the importance of sustainable livelihoods theory and incorporated the Sustainable Livelihood Approach (SLA) into their guidelines for action. At this stage, the research and development of the Sustainable Livelihood Approach （SLA） framework achieved Great progress. In 1994, the international organization CARE introduced "household livelihoods security" as the basic principle of its development work. In 1995, the Institute for Development (IDS) proposed an analysis framework for sustainable rural livelihoods. In 1999, the Department for International Development (DFID) established the SLA. Since the beginning of the 21st century, this theory has been widely used in a series of empirical studies, and the focus of attention has also changed and deepened.

The research on sustainable livelihoods is divided into theoretical Research and empirical Research. There are few theoretical studies on sustainable livelihoods, and more studies are being conducted for empirical analysis. Most of the research hotspots on sustainable livelihoods of farmers focus on land-lost farmers and sustainable livelihoods, returning farmland to forests and sustainable livelihoods for farmers, ex-situ poverty alleviation and relocation and sustainable livelihoods, urbanization and sustainable livelihoods, rural tourism and sustainable livelihoods for farmers, Targeted poverty alleviation and sustainable livelihoods (Songsraboon et al., 2021). The future research hotspots of sustainable livelihoods include rural revitalization and sustainable livelihoods and research on the sustainable livelihoods of a large number of semi-urbanized farmers in the process of urbanization.

The issue of sustainable livelihoods for land-lost farmers is a hot issue that has been studied. Cheng (2008) reflected on the concept and policy of China's urban village reconstruction and analyzed the important role played by urban villages in promoting the accumulation of land-lost farmers' livelihood assets and promoting the process of rural urbanization and pointed out that the urban village reconstruction must adhere to a scientific approach. The concept of urban development cannot destroy the village's original economic and social operating mechanism
in the city.

Effectiveness. The study of sustainable livelihoods from returning farmland to forests and rural tourism has also become the focus of academic circles. Liu et al. (2007) and others investigated the formulation and implementation of social insurance measures for land-expropriated farmers in Chengdu, and studied the advantages and advantages of the social security system for land-lost farmers in substituting land and solving basic survival and security issues. Ning (2017) studied the relationship between the sustainable livelihood capital of farmers and targeted poverty alleviation by constructing a sustainable livelihood

capital evaluation system for farmers and proposed corresponding poverty alleviation measures. Li et al. (2019) and others took Xia fu Village in Dan Xiaoshan, Guangdong as an example, through combing and summarizing the village's tourism poverty alleviation and the rural households' livelihood structure, and proposed a model that conforms to the sustainable livelihoods of local farmers from the perspective of tourism poverty alleviation. Kong (2018) discussed the impact of the implementation of the policy of returning farmland to forests on the sustainable livelihoods of farmers, understood the main impacts caused by the implementation of the policy, and made relevant recommendations based on this.

Research Objective

In order to lay a good groundwork for livelihood mechanisms in rural revitalization, this study undertakes an in-depth literature review, which aims to (1) examine the dimensions of sustainable livelihood measurement, (2) comparison and analysis of methods of livelihood sustainability measurement, and (3) decomposition method of livelihood sustainability.

Research Method

The literature review serves as a good knowledge groundwork for further empirical Research (Tan, 2016; 2019). This study reviews the existing literature from both China and outside. The literature review is only limited to dimensions of sustainable livelihood measurement, index system for sustainable livelihood measurement, and types of sustainable livelihood measurement, supporting configuring theoretical frameworks for sustainable livelihoods. As noted in Tan (2018) and Tan and Julian (2022), a good set of measurements should facilitate organizations and rural communities to engage in learning that can benefit process reengineering, quality management, and customer value innovation. In addition, literature review efforts are made relating to comparative methods used to measure livelihood sustainability.

The theoretical framework for sustainable livelihoods

Dimensions of sustainable livelihood measurement

The research idea of sustainable livelihoods originated from Chambers' research work in the mid-1980s. In addition to the research on income poverty also gave dialectical considerations to the deep-seated causes of poverty, such as the limiting factors of livelihood development. The poverty of development capabilities and opportunities, etc. With the deepening of Research, Chambers & Conway (1992) clearly stated the idea of sustainable livelihoods, namely: livelihood is a way of earning a livelihood, which is based on capacity, assets (including reserves, resources, claims, and enjoyment rights). Moreover, based on activities. Only when a kind of livelihood can cope with and recover under pressure and shock; can it maintain and even strengthen its capabilities and assets at present and in the future, without damaging the natural resource base, can this kind of livelihood be sustainable. Chambers and Conway divided the sustainability of livelihoods into social and environmental measures, which emphasized the external impact of livelihoods on global natural resources to achieve environmental sustainability and emphasized the internal capacity of livelihoods to maintain sustainability and enhancement of the carrying capacity. Social sustainability. (Nash & Jonathan, 2000) believe that when people make choices and use opportunities and resources without hindering others' current or future livelihood opportunities, stable livelihoods are obtained. They divided the sustainability of livelihoods into two measures on the time scale of present and future generations, and on the social scale into two measures of self and others, and emphasized that both themselves and others, both present and future generations have the opportunity to make a living, and livelihoods are available.

Sustainability can be achieved. Ashley & Carney (1999) also believe that when people can respond to coercion and shocks, and recover, maintain and increase assets, maintain and improve capabilities, and provide opportunities for the survival of the next generation; in the long and short term, locally and globally, the livelihood of others brings a net benefit, so the livelihood is sustainable (Damnoen et al., 2021). Ashley and Carney's measurement of the sustainability of livelihoods, in addition to themselves and others, the present and the future, also added a new measurement range that should include local and global.

Since the beginning of the 21st century, new progress has made good understanding in sustainable livelihoods. Harriet (2009) proposed from the perspective of social policy choices that policy formulation must consider the livelihoods of current and next generations and rationally allocate needs and expectations between generations. Carmen & Frederick (2009) proposed the significance of farmers' economic cooperation organizations for sustainable livelihoods from global cooperation. It further enriches the time and space dimensions of sustainable livelihood measurement.

Index system for sustainable livelihood measurement

At present, sustainable livelihoods provide a new perspective for observing and studying rural development and its relationship with resources and the environment. In practical application research, the main way to express one's thoughts is to make it operable by establishing a sustainable livelihood analysis framework. The SLA framework established by DFID is the most widely used sustainable livelihood analysis framework.

The sustainability analysis framework consists of five parts: vulnerability background, livelihood capital, structural and institutional changes, livelihood strategy, and livelihood output. The vulnerable environment includes shocks caused by natural disasters, economic depression trends, trends, seasonal and cyclical price changes, production, and employment fluctuations in resources, politics, and economy. According to the rural vulnerability analysis method commonly used by the World Food Program, there are generally three categories of vulnerability analysis indicators, and each category contains several specific indicators. The three categories of indicators are:

(1) Risk factors, especially the food security risks faced, the risk of insufficient food faced by the region or population; the higher the risk, the higher the vulnerability of the region or population.

(2) The ability to resist risks is the ability of the region or the population to cope with risks. The stronger the ability to resist risks, the lower the area's vulnerability or population.

(3) The social service system reflects a specific area's overall social development level. The higher the level of development, the more conducive the area or the population is to resist various risks. Combining the above three factors can more comprehensively reflect the degree of vulnerability of a region or group of people to objectively obtain the most vulnerable groups, find out the direct causes of vulnerability, and take corresponding measures.

The livelihood capital indicator system of the sustainable livelihood analysis framework is generally composed of five indicator systems: natural capital indicators, financial capital indicators, physical capital indicators, human capital indicators, and social capital indicators. Researchers can choose appropriate indicators to construct an indicator system to study the livelihood status of farmers according to the actual situation of the research object. For example, Ma et al. (2021) found that satisfaction has been widely used as an essential parameter for subjective evaluation of the quality of life, so they improved the SLA framework based on relevant literature and listed satisfaction as equal to the original

five types of livelihood capital. The sixth type of capital is to construct a livelihood evaluation index system to analyze the livelihood status of relocated rural households for poverty alleviation. The sustainable livelihood approach is driven by policies, technology, and investment, emphasizing the impact of the external environment and interventions on sustainable livelihoods. The sustainable livelihood approach has also established a set of indicator systems as follows:

(1) Resources invested in sustainable livelihood policies and planning;

(2) The output of physical products and services from sustainable livelihood policies and planning;

(3) The extent to which the output as mentioned above is enjoyed;

(4) The extent to which people's lives have been improved;

(5) Use inputs to obtain the output as mentioned above, achievement and influence path. To monitor the sustainability and safety of livelihoods.

Types of sustainable livelihood measurements

The sustainable livelihood analysis framework enumerates six possible livelihood outcomes: income increase, welfare improvement, food safety improvement, living standard improvement, vulnerability reduction, ecological environment improvement, and sustainable use of natural resources. Livelihood outcomes fully reflect the ultimate goal of sustainable livelihood development.

The measurement objects are different, and the results obtained are also different. The current livelihood sustainability measurement is mainly for the livelihood capital of the farmers, the livelihood strategy, and the relationship between the two. Yang et al. (2009) conducted an empirical analysis on the current status of livelihood capital of farmers in the reservoir area of the South-to-North Water Transfer Project (Middle Route) based on the framework of sustainable livelihood analysis. The results show that the overall livelihood capital of farmers in the reservoir area is fragile, and the degree of social integration of livelihood capital is low. Li et al. (2009) and others use the framework of sustainable livelihood analysis to study the livelihood status of rural households in poverty-stricken mountainous areas in western China and analyze whether they fall into poverty and the environmental impact of livelihood strategies to examine the livelihood consequences. Li et al. (2012) analyzed the poor population in Tibet's farming and pastoral areas.

Zhou et al. (2020), based on the survey data of relocated farmers in Hunan, used a Logistic regression model to analyze the impact of livelihood capital on the choice of livelihood strategy. The study found that the overall livelihood capital of the poor population in agricultural and pastoral areas is fragile, and the livelihood capital is mutually causal, showing a non-linear relationship. Due to the limitation of livelihood capital, the livelihood strategies that farmers and herders can choose are limited, leading to an aggravation of poverty and ecological environment problems. The findings indicate that natural capital, financial capital, human capital, and social capital significantly affect the choice of labor-oriented, agricultural-oriented, and non-agricultural-oriented livelihood strategies. They have transformed livelihood strategies for relocated farmers from agriculture-oriented to labor-oriented. Have a significant impact.

Comparison and Analysis of Methods of Livelihood Sustainability Measurement

Since the natural environment is relatively inevitable and immutable, and the policy environment is challenging to change quickly, the measurement of livelihood sustainability mainly focuses on three aspects of livelihood capital, livelihood strategies, and livelihood

results. The measurement methods for these three aspects are mainly described. There are two types of measurement methods: descriptive and speculative measurement methods.

Descriptive measures of livelihood sustainability

Descriptive livelihood sustainability measurement methods mostly use participatory rural appraisal (PRA), including direct observation, random interviews, household surveys, community meetings, questionnaire surveys, semi-structured interviews, and other methods.

Direct observation method refers to a method in which investigators visit the site to count, measure, measure, and register the survey items of the investigating unit in order to obtain first-hand information. For example, to know the output of crops in time, the investigators personally went to the field to perform actual cutting, threshing, drying, weighing, etc. In another example, investigators went to the workshop to observe, count, and measure Wait for work to understand the year-end product balance of industrial enterprises. The direct observation method can guarantee the accuracy of the survey data collected. However, it requires a lot of workforces, material resources, financial resources, and time. Some social and economic phenomena cannot be measured by direct observation methods, such as the survey of historical data and the family of workers.

Semi-structured interviews mean specific topics and assumptions in advance, but the actual questions are not specific. Its advantages and disadvantages are between structured and unstructured interviews. However, its low degree of quantification makes it challenging to quantify the results, so it is often used as an auxiliary survey method. For example, in Meng (2013)'S Study on the Relationship between Sustainable Livelihood Assets and Livelihood Strategies of Farmers and Herdsmen-Taking Wushen Banner, Ordos City, a combination of questionnaire surveys and semi-structured interviews was used.

A questionnaire survey questionnaire refers to a form used for statistics and surveys to express questions in asking questions. The questionnaire method is a method for researchers to use this controlled measurement to measure the researched problem to collect reliable information. Most of the questionnaires are sent by mail, individual distribution, or collective distribution in the questionnaire method. The investigator fills in the answers according to the form asked. Generally speaking, the questionnaire is more detailed, complete and more accessible to control than the interview form. The main advantages of the questionnaire method are standardization and low cost. Because the questionnaire method uses a well-designed questionnaire tool to conduct surveys, the design of the questionnaire requires standardization and measurement. For the measurement and survey of livelihood capital and livelihood results, most studies use questionnaire survey methods, such as Li & Liang (2010)'s Research on the impact of returning farmland to forests on farmers' livelihoods-sustainable livelihood analysis on the perspective of family structure. The livelihood capital used a questionnaire survey.

Community meetings refer to understanding villagers' cognitive level, output level, and irrigation conditions through community meetings. For example, in Zhang (2005)'s survey of livelihoods and cultivated land use patterns in mountain farming and pastoral areas in the eastern part of the Qinghai-Tibet Plateau, community meetings were used to investigate and record land-use types, planting systems, topography, irrigation conditions, chemical fertilizers, farm manure (dry manure, Manure removal, plant ash, etc.) and input of pesticides, seeds, film and other elements, yield level, etc.

Measures of inferential livelihood sustainability

Inferential statistics is a statistical method that studies how to use sample data to infer overall characteristics. For example, to understand the demographic characteristics of a region, it is impossible to measure the characteristics of each person one by one. The quality of products is often destructive, and it is impossible to measure each product. This requires extracting some individuals or samples for measurement and then inferring the overall characteristics of the Research-based on the obtained sample data. This is the problem to be solved by inference statistics. In the measurement of the sustainability of livelihoods, the inferential methods used include regression analysis, such as Liang (2010)'s study on the impact of the policy of returning farmland to forests on farmers' livelihoods-in the analysis of sustainable livelihoods based on the perspective of family structure,) The regression of farmers' incomes further explores the impact of family structure and the policy of returning farmland to forests on farmers' incomes and uses Uchida's method to establish an estimation model.

Comparative analysis of sustainable livelihood measurement methods

For the descriptive measurement method of sustainable livelihood measurement, statistical values are mainly used to describe the relationship between the relevant characteristics of the sample or the variables. For example, it can answer questions such as: What is the average age of the sample? What is the degree of difference in age between units in the sample? What is the correlation between age and income in the sample? In measuring livelihood capital, livelihood strategies, and livelihood results, many studies have adopted descriptive measurement methods. Most of these methods are easy to obtain, direct, and flexible, but at the same time, they are insufficient in terms of quantification.

The inferential measurement method of sustainable livelihood measurement is mainly based on the principle of mathematical statistics, using sample statistical values to infer the overall statistical value or to infer the significance of the relationship between variables. The questions it answers are different from descriptive analysis, such as: According to the average age of the sample, what is the average age of the population? According to the correlation between age and income in the sample, how likely is the population's correlation between age and income? Two experiments were carried out before and after, and two different results were obtained. Is the difference between the two results meaningful? Using theoretical methods to measure livelihood sustainability indicators has the characteristics of easy quantification and further analysis.

Although descriptive and inferential are closely related, they each have their own suitable tools. There is no better method. They need to be selected according to the content of the research and objective conditions. In order to measure the sustainability of rural households' livelihoods more comprehensively and systematically, it is advisable to adopt a combination of descriptive and inferential measurement methods, combining the flexibility of the two measurement methods with the advantages of easy quantification.

Decomposition method of livelihood sustainability

The methods for determining the weight of the index system are divided into two categories: subjective assignment and objective assignment. The subjective assignment method is to determine the weight of evaluation indicators based on the experience of the evaluator. It is suitable for evaluation and analysis when the number of indicators is small. If the number of indicators is large, it is difficult to grasp many indicators fully. Relying on the subjective judgment will increase or decrease some indicators. The degree of importance makes it difficult for the empirical results to reflect the objective reality. This method has solid explanatory nature and can effectively avoid the contradiction between attribute weight

and practical meaning, and has been widely used. The objective methods can make use of TOPSIS (Tan, 2020), neural networks (Tan and Julian, 2022), and structural equation modeling (Tan et al., 2022).

Commonly used subjective assignment methods include the analytic hierarchy process (AHP method), Delphi method, etc. The Delphi method, also known as the expert scoring method, uses communication to send the problems to be solved to each expert separately, solicit opinions, and then collect and summarize the opinions of all experts and sort out comprehensive opinions. Each expert revised his original opinions based on the comprehensive opinions and then summarized them. Subsequently, the comprehensive opinions and forecast questions were returned to the experts, and opinions were solicited again. Such multiple iterations will gradually obtain a more consistent decision-making method for predicting results. Helmer and Gordon pioneered the Delphi method in the 1940s. In 1946, the American RAND Corporation used this method for the first time in order to avoid the defects of succumbing to authority or blindly obeying the majority in collective discussions. This method was used to make qualitative predictions, and later this method was quickly and widely adopted. As a subjective and qualitative method, the Delphi method can be used in the field of forecasting and can be widely used in the establishment of various evaluation index systems and the process of determining specific indexes.

In the Research of Cui (2018), the Delphi method was mainly used to select evaluation indicators, combined with the goals, status quo, and characteristics of rural tourism development in the Qinba mountainous area, and finally, 20 secondary indicators and 44tertiary indicators of the indicator layer were determined. Su et al. (2009) used the SLA sustainability analysis framework to establish a sustainable livelihood indicator system. The livelihood status of farmers in the Ganzhou District of Zhangye City is analyzed. Use stationery survey face-to-face bookmakers to determine the weights of measurement indicators, apply AHP theory to data processing, and finally get the relative influence weight value. After scoring the assets, the binomial logistic regression model analyzes the relationship between livelihood strategies and livelihood capital. Ma et al. (2021), based on the improved sustainable livelihood framework, comparative analysis of the livelihood status of rural households before and after relocation, using the AHP-entropy weight assignment method to calculate the index weights, and using the more subjective AHP method to neutralize the more objective entropy Weight assignment method to obtain objective index weight values.

The objective assignment method is to determine the index weight according to the degree of variation of each index or the interrelationship between the indexes. In most cases, the objective weight assignment method can reduce the arbitrariness of the assignment, and the accuracy of the determined weights is high. However, the determined attribute weights are often contrary to the actual situation, the interpretability is poor, and it is difficult to define the results obtained clearly. Explain. Commonly used objective weighting methods include the principal component analysis method, entropy method, dispersion method, etc. The entropy method refers to a mathematical method used to judge the degree of dispersion of an index. In information theory, entropy is a measure of uncertainty. The greater the amount of information, the smaller the uncertainty, and the smaller the entropy; the smaller the amount of information, the greater the uncertainty, and the greater the entropy.

According to entropy characteristics, we can judge the degree of dispersion of an index by calculating the entropy value. The greater the degree of dispersion of the index, the greater the influence on the comprehensive evaluation. According to the degree of variation of various indicators, the tool of information entropy can be used to calculate the weight of each indicator to provide a basis for comprehensive evaluation of multiple indicators. (Wang,

2021) studied the sustainability of livelihoods of relocated households in Tibet for poverty alleviation, using the entropy method to determine the index weights. The quantitative evaluation of livelihood capital in the research of (He et al., 2014), referring to the quantitative study of livelihood capital carried out by scholars and the analysis method of farmers' vulnerability, adjusted the indicator system based on the particularity of the livelihoods of farmers in the northern foot of the Qinling Mountains, and adopted entropy. The value method determines the index weight. Principal component analysis, also known as principal component analysis, uses the idea of dimensionality reduction to convert multiple indicators into a few comprehensive indicators (ie, principal components), where each principal component can reflect most of the information of the original variable and contains information Do not repeat each other. This method simplifies the complex factors, and at the same time, obtains more scientific and practical data information. For evaluation and analysis with many indicators, the use of principal component analysi.e. can more conveniently and effectively construct an indicator evaluation system. Yuan (2018) studied the impact of ecological compensation and livelihood capital on the sustainable livelihoods of residents. They used principal component analysis to measure fundamental indicators' weights and divided the first principal component coefficient by corresponding characteristic roots. The unit feature vector obtained afterward is used as the weight of each dimension index, and finally, the sub-indices are synthesized.

Discussion

Research on the sustainability of livelihoods has two types, empirical Research and theoretical Research. However, from the perspective of current research, most scholars have conducted substantive research, adjusted and modified the developed SLA framework, and applied it to research on sustainable measurement and analysis of farmers' livelihoods. The current methods for sustainable livelihoods include sampling surveys, participatory rural evaluation, and transect research. Measurement methods include descriptive analysis and theoretical methods. However, current research cannot fully reflect the concept and concept of sustainable livelihoods. The connotation and subjectivity of the research results are strong, and the guidance for regional sustainable development is not enough. Most research methods and technical means are based on the evaluation of phenomena and the analysis of results. The lack of in-depth research on the mechanism and process limits the theoretical development of sustainable livelihoods.

In order to determine the weight of the index system, the existing research literature mainly adopts the relative index method, analytic hierarchy process, entropy method, factor analysis method and principal component analysis method, etc. These methods are also often used to quantify the quality of economic growth. The relative index method is a statistical method that transforms a series of indicators into a comparable index form and then performs simple or weighted summation to evaluate, ignoring the high correlation between the sub-indices; level analysis. The method carries out weight assignment based on the researcher's subjective understanding of the importance of each index, and its assignment is highly subjective and lacks objectivity. Although the entropy method belongs to the objective weighting method, it cannot reflect the relationship between the relevant indicators. The factor analysis and principal component analysis methods are both objective weighting methods. Among them, factor analysis focuses on the comprehensive evaluation of the clarity of the causes in its application. It cannot accurately describe the specific changes of each dimension and can only get the dynamics of the public factors. At the same time, the principal component analysis focuses on the comprehensive evaluation of the influence of information contribution. The quantification of the quality status of economic growth in the

existing relevant research literature is generally achieved through a comprehensive evaluation index system, which mainly adopts the relative index method, analytic hierarchy process, entropy method, and factor analysis method.

The issue of sustainable livelihoods for land-lost farmers is a hot issue that has been studied. Current research hotspots on sustainable livelihoods of farmers mostly focus on land-lost farmers and sustainable livelihoods, returning farmland to forests and sustainable livelihoods for farmers, ex-situ poverty alleviation and relocation and sustainable livelihoods, urbanization and sustainable livelihoods, rural tourism and sustainable livelihoods for farmers, and targeted poverty alleviation and sustainable livelihoods. The future research hotspots of sustainable livelihoods include rural revitalization and sustainable livelihoods and research on the sustainable livelihoods of many semi-urbanized farmers in the process of urbanization.

Conclusion

As an essential perspective for studying the welfare of farmers, the research on the sustainability of farmers' livelihoods is of great significance to solving the problem of rural poverty. After the concept of sustainable livelihoods of farmers was put forward, the research on sustainable livelihoods began to develop continuously, and the understanding of it was also deepened in practice and exploration. Entering the 21st century, researchers have put forward suggestions from a new perspective. In the early 1990s, some organizations began exploring and putting forward the Sustainable Livelihood Approach (SLA). Subsequently, the measurement of the sustainability of livelihoods was mainly realized by the sustainable analysis framework, among which the most The classic and commonly used method is the sustainable livelihood framework established by the Department for International Development (DFID), which enumerates income increase, welfare improvement, food safety improvement, living standards improvement, vulnerability reduction and ecological environmental improvement and the sustainable use of natural resources have six possible livelihood outcomes.

The sustainable measurement methods of farmers' livelihoods mainly include descriptive and speculative measurement methods. Descriptive livelihood sustainability measurement methods include direct observation, random interviews, household surveys, community meetings, questionnaire surveys, semi-structured interviews, and other methods. Inferential statistics is a statistical method that studies how to use sample data to infer overall characteristics. Descriptive and inferential analysis have their own suitable tools, and there is no better method. They need to be selected according to the content of the research and the objective conditions. In order to measure the sustainability of rural households' livelihoods more comprehensively and systematically, it is advisable to adopt a combination of descriptive and inferential measurement methods, combining the flexibility of the two measurement methods with the advantages of easy quantification. In the study of sustainable livelihoods of farmers, the methods for determining the weight of the index system are divided into two categories: subjective assignment and objective assignment. Commonly used subjective assignment methods include analytic hierarchy process (AHP method), Delphi method (Delphi method), etc. Commonly used objective weighting methods include principal component analysis, entropy, dispersion, etc.

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