



# Comparative Study on Poverty Reduction Strategies in the Context of Ecological Sustainability Taking Tongzi County and Humbo Region as Examples

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**Abstract.** The strategy of poverty reduction has long been an important issue in development research. Given that most underdeveloped regions are trapped in a dilemma where ecological destruction and poverty are mutually dependent, this paper chooses to compare the poverty reduction strategies of Tongzi County, China and Humbo, Ethiopia, in the context of ecological sustainability, in order to explore the methodology of poverty reduction in practice and to provide theoretical support for international poverty governance. After this study, it is found that the similarities between the two research objects are manifested similarities in prioritization ecological governance, sustainability and local job creation, but differences in terms of sources of income for participants, impact on local crop cultivation structure and levels of project autonomy. While the similarities and differences are manifested in the sources of income, the structure of crop planting and the degree of autonomy. It is hoped that this paper can provide some reference and assistance in poverty management in less developed areas of developing and developed countries with different economic bases, natural conditions and implementation capacities globally.

**Keywords:** Ecological Sustainability, Poverty Reduction Strategies, Poverty Alleviation industries, Development Practice.

## 1 Introduction

Poverty and its attendant challenges of hunger, disease, social conflict and a host of other problems are serious obstacles to humanity's quest for a better life. Research based on data from the UN's Sustainable Development Goals Report 2020 and the World Bank's Poverty and Shared Prosperity found that poverty is often concentrated in environmentally fragile areas, but over-exploitation and unplanned use of resources have led to the destruction of ecosystems, causing many people in poor areas to fall into the trap of "the poorer they are, the more they destroy the environment, and then the more they destroy the environment, the poorer they become" [1]. Given the complex relationship between poverty and the ecological environment, a poverty reduction strategy

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that integrates ecological sustainability with poverty alleviation and development may be a better way to reduce poverty and ecosystem damage among rural people.

This paper selects Tongzi County, China and Humbo, Ethiopia as the subjects of this study to conduct a comparative study of poverty reduction strategies in the context of ecological sustainability. In the current international development context, China and Ethiopia are both developing countries that have only been free from colonial rule for a few decades, and their development is to a certain extent constrained by history and the order of international relations. Although the two countries are on two different continents, they have certain similarities in the foundations of development and the problems they encounter in their development. For example, they are both landlocked, most of their areas are high altitude mountainous terrain, both have a good natural base but both have suffered serious ecological damage and environmental degradation due to unsustainable development, and both are relatively backward areas of the country that are more dependent on the primary industry, so These two regions are of high reference value as the subject of this study. Therefore, what is to be done to alleviate poverty? Why in the context of ecological sustainability? How can poverty be reduced in the context of ecological sustainability? In the face of the above questions, it is essential to engage in theoretical discussions and to explore them in practice.

## 2 Literature Review

Poverty is an economic phenomenon that exists during economic development. Traditionally, poverty refers to the scarcity of material conditions, but as research has progressed, the concept of poverty has been restructured as a social problem in which a particular group of people lack the ability to obtain and enjoy a normal life. Originally, poverty was usually confined to a certain region, but with the development of the world economic order, the impact of poverty has become a trans-regional issue, breaking through geographical limitations.

Poverty and ecological degradation are causally linked and there is a vicious circle between them [2]. According to the World Bank 1992, poor households who cut down trees excessively for firewood to meet short-term needs, thereby damaging the natural environment [3]. Similarly, ecological degradation affects the poor in turn, as Slingenberg et al. show that the world's poor are likely to bear the direct costs of biodiversity loss [4]. This is because when ecosystem functioning is impaired, this inevitably leads to a reduction in livelihood options for the population and an increase in the vulnerability of the poor in the area. Overall, the poor suffer disproportionately from more frequent and severe storms, floods, droughts, health impacts of toxic pollution and insecurity of access to productive resources such as arable land, fresh water and sustainable energy.

Poverty management based on an agricultural perspective aims to improve both the environmental aspects of agriculture and the contribution of ecological indicators, so that the environmental and environmental benefits of agriculture are a 'win-win' situation. According to Guan' study, the primary sector of the industrial structure is inher-

ently flawed by the "Rely on Destiny", which makes agriculture and its related industries inseparable from the land and other conditions of nature, and the sustainable development of the industry is highly dependent on the ecological and environmental resources of the place of production [5]. Xiao et al. used a linear regression model to investigate the need to objectively resolve the contradiction between agricultural economic development and rural ecological environmental protection based on the dual objectives of optimal agricultural economic efficiency and reduction of agricultural surface pollutants, advocating the protection of agricultural ecosystems [6]. According to Wang's research, sustainable development is a comprehensive concept that pursues integrated political, economic, social, cultural and ecological development, with the bottom line of not compromising the "maximum carrying capacity of the land environment" and providing a healthy and green living environment for future generations [7].

However, it is important to note that there is still a lack of data and analysis of specific poverty reduction projects, especially in the light of the economic and demographic boom that has taken place since the turn of the century, and that there are still a large number of cases of poverty reduction approaches and outcomes that have not received sufficient attention. This paper will build on previous research and provide some comparative case studies of poverty reduction in Tongzi, China, and Humbo, Ethiopia.

### **3 Overview of Poverty Reduction Strategies in China and Ethiopia**

Based on the current dual needs of poverty reduction and ecological sustainability in relation to modern development issues, this paper selects Tongzi County in Zunyi, Guizhou Province, China, and the Humbo, Southern Nations Nationalities and Peoples Region, Ethiopia as the subject of study, which have great similarities in terms of economic base, industrial structure, locational factors, landscape features, hydrological conditions and ecological environment. And while the poverty reduction strategies in these two areas go in very different directions, both can be seen as meaningful attempts to explore poverty reduction strategies in an ecologically sustainable context.

#### **3.1 Poverty Reduction Strategies in Tongzi County, China**

Due to geographical conditions and topographical factors (the east is mostly a coastal plain, the west is inland and high altitude), China has developed a relatively large east-west difference in development. In this context, the State Council of China has proposed a strategy of East-West Collaboration, whereby the developed eastern provinces help the less developed western provinces or regions to develop their economies. This paper analyzes the typical cases of the collaboration between Guangdong Province and Guizhou Province in the East-West Collaboration Strategy.

Agriculture in Guizhou province was originally based on the cultivation of traditional food crops, but the economic benefits of traditional farming under non-mechanized, large-scale conditions were minimal, and farmers in individual areas even failed

to make ends meet. In such circumstances, many farmers choose to work in the cities to earn money, leaving large areas of good land in a state of neglect. In order to solve this dilemma, the government has adopted a scientific approach to introduce pilot planting of cash crops suitable for the assisted areas, with a view to promoting them on a large scale and driving regional development.

Since 1998, Guizhou Province has continuously adjusted the layout of crop planting structure. 2006 proposed to expand the sown area of crops and strive to create special crops with advantages. 2010 again classified the adjustment of crop planting structure as one of the key tasks in Guizhou Province. 2012 introduced the Opinions of Guizhou Provincial People's Government on Accelerating the Development of Vegetable Industry, focusing on the development of vegetable industry and adjusting the in 2013, it was proposed that the proportion of cash crops should be increased to drive the development of agriculture in Guizhou [8].

Based on the relevant policies, Guizhou Province has identified the cultivation of Square Bamboo Shoot and its related industries as a specific project for the implementation of the "One County, One Industry" policy in Tongzi County. Farmers who choose to switch to Square Bamboo Shoot are provided with technical assistance from government agricultural experts and subsidized funds before and after planting the crop, as well as policy support in terms of agricultural technology (biotechnology, chemical technology, mechanical technology), product acquisition and marketing. In 2018, the output value of the Square Bamboo Shoot industry in Tongzi County exceeded RMB 450 million, and Tongzi County was successfully removed from the standard of "national poverty-stricken county" in the same year. By now, Tongzi County has the largest concentrated and most complete Square Bamboo Shoot forest known in the world, successfully achieving a win-win situation for both economic development and ecological construction.

### **3.2 Poverty Reduction Strategies in Humbo Region, Ethiopia**

The Kyoto Protocol (KP), signed in 1997, established the United Nations Convention on Climate Change (UNFCCC) and introduced a new form of market system that allowed for "common but differentiated responsibilities" among participants, which was a mechanism to help resolve the North-South climate change and development debate [9, 10]. Ethiopia is a signatory to the Kyoto Protocol and a party to the Convention.

In 2006 the World Bank Carbon Fund-led Humbo Community Forestry Natural Regeneration Project in the Southern Nations Nationalities and Peoples Region of Ethiopia came into being under the Clean Development Mechanism (CDM). the Humbo region project involves the regeneration of 2,728 hectares of degraded native forest, helping communities affected by environmental degradation such as biodiversity loss, soil erosion and flooding to restore local agricultural, forestry ecosystems. At the same time, carbon emissions are sequestered to generate carbon sinks and the sale of carbon credits will eventually provide an additional source of income, giving communities the opportunity to benefit from the carbon market and thus alleviate poverty.

The Humbo CDM project was registered under the Kyoto Protocol's Clean Development Mechanism in December 2009. The project is planned to cover 2,728 hectares

of land with the overall objective of removing carbon from the atmosphere, establishing native biodiversity forests and reducing poverty in the Humbo region through the proceeds generated by carbon trading.

As the first ever CDM forestry project in Africa, the project helps communities affected by environmental degradation (including biodiversity loss, soil erosion and flooding) to have the opportunity to benefit from the carbon market, reducing poverty while maintaining local ecosystems, bringing social, economic and ecological benefits and contributing to poverty reduction. It also provides early experience of the Clean Development Mechanism in addressing the challenges of poverty reduction and environmental restoration.

## 4 Comparative Analysis of Poverty Reduction Policies in China and Ethiopia

### 4.1 Similarities

**Ecological Governance.** The Square Bamboo Shoot project in Tongzi County, China, and the CDM forest in Humbo, Ethiopia, are both important attempts to reduce ecological poverty. Both are projects where the original vegetation type is planted in its original location, unlike, for example, the avocado industry in Mexico, which severely depletes the local groundwater resources, or the cocoa industry in Cote d'Ivoire and the oil palm industry in Malaysia, which destroy large amounts of the original forest. They all have ecological building and restoration as important objectives in the projects.

Although Guizhou Province in China has fertile soil resources as well as abundant precipitation, geological formations, groundwater resources, soil acidity, alkalization and destruction of vegetation have led to the degradation of the natural ecological environment and serious soil erosion, culminating in a situation of good natural conditions but very fragile. The importance of ecological management was taken into account at the beginning of the selection of the pillar industries in Tongzi County, Zunyi city. Bamboo is an excellent evergreen plant with a large, intertwined root system, good soil and water retention capacity and excellent reproductive capacity; Square Bamboo is native to Tongzi County and is planted in areas previously cultivated, expanding the forest cover without causing any imbalance in the ecological chain.

The ecological resource conditions of the Southern Nations Nationalities and Peoples Region, Ethiopia have similar characteristics to those of Guizhou, with the same good natural conditions of soil fertility, precipitation, amount of sunshine, temperature, etc., but have been severely damaged by irrational use, leading to severe degradation of the ecosystem. In other words, there is a false boom in agriculture, with all the obvious conditions being ideal for cultivation, but the hidden disadvantages, such as the lack of water circulation in the event of drought and heavy rainfall, make agricultural activities in the area less resilient to risk. This technique is based on the natural regeneration and management of the original tree stumps in the ground to restore the native vegetation of the site. The main function of the restored forest ecosystem is to create an organic anti-erosion mechanism, which effectively improves the percolation capacity

of the soil in the area and has a significant impact on the prevention of landslides and debris flows. Overall the project has achieved restorative ecological management at a relatively low cost.

**Project Sustainability.** The sustainability of the project is an important part of China's poverty alleviation work assessment. As a pillar industry of Tongzi County, the Square Bamboo Shoot industry has to be considered firstly in terms of the sustainability of the crop production and secondly in terms of the sustainability of the supporting industries in the industry chain. The government of Tongzi County has established comprehensive regulations and technical standards for the planting and harvesting of Square Bamboo Shoot, and to a certain extent regulates the area and location of planting. In 2017, every village (the smallest administrative unit in China) was covered by the Square Bamboo Shoot industry in Tongzi County, and fresh Square Bamboo Shoot was available all year round [11]. At the same time, the whole industry chain is being actively built up to reduce the adverse effects of adverse market fluctuations on the purchase and processing of bamboo shoots.

For the Humbo region of Ethiopia, the central economic factor in the establishment of the CDM forestry project was to meet the World Bank Carbon Foundation's requirement to address carbon emissions in order to meet carbon neutrality targets. However, given the current level of industrial production and the proportion of clean energy used globally, it will still be a long time before carbon neutrality is achieved on a global scale. At the same time, the cost of GHG abatement in developed countries is much higher than in developing countries. For developed countries, it is costly, even at the expense of GDP, to retrofit energy-intensive industries with new technology and equipment, or to achieve this through extensive reforestation activities. And even after the carbon neutral demand has been met, the demand for the decomposition of carbonaceous gases in the original developed countries will not disappear. The first phase of the CDM forestry project in the Humbo area is designed to last for 30 years, and in the longer term the project is likely to be renewed and continue to operate.

**Job Opportunities Created by the Project.** In Tongzi County, Zunyi City, Guizhou Province, China, after identifying Square Bamboo Shoot as the mainstay of the local farmers' poverty alleviation industry, efforts have been made to change the original production model. In its original state, only a few farmers harvested wild bamboo shoots in a haphazard manner and sold the primary produce of Square Bamboo Shoot directly to scattered vendors without further processing. This model greatly limited the number of local people working in the Square Bamboo Shoot industry and their income levels. The local government has created the Square Bamboo Shoot industry support project to extend the industry chain, with a total investment of about 370 million yuan, and built the China Bamboo Shoot Trading Centre, which covers an area of 105.55 mu. According to public data from the official website of Tongzi County Government, in 2017, Tongzi County achieved an output value of 400 million yuan in the bamboo industry, and the per capita income of bamboo farmers reached 2,000 yuan (approximately US\$291.2).<sup>11</sup> In 2021, the comprehensive output value of the Square Bamboo

Shoot industry in Tongzi County exceeded 765 million yuan, driving a total of more than 200,000 local residents (approximately 42%) into the industry and increasing their income, with 200,000 of them entering the industry. In total, more than 200,000 residents (about 42%) will be able to enter the industry and increase their income, with more than 20,000 of them achieving sustainable poverty alleviation due to the development of the Square Bamboo industry.

The development of forestry projects in the Humbo region of Ethiopia has provided a large number of local jobs, and the project, while training local people in project-related skills, has directly created about 9,000 man-hours of zero-hour or permanent work for local communities, an opportunity that could provide local employment for thousands of people with surplus agricultural labor [12, 13]. Jobs to control and protect forest areas from humans and animals, for example, pay a working allowance of 35 ETB (approximately US\$1.80) per day for temporary labor, while permanent jobs pay each warden approximately US\$75 per year, which is equivalent to 93% of the average annual household income in the Humbo area. Prior to the creation of this project, only a small number of non-agricultural jobs were available to the surplus agricultural labor force in the cities that left the area, which would have greatly eased the employment of the local workforce.

## 4.2 Differences

**Sources of Income.** The income approach model for workers in the Square Bamboo Shoot industry in Tongzi County, China, is mainly: market behavior + government underwriting/subsidy. Such a model can play the regulatory role of the market and mobilize the motivation of the practitioners while safeguarding the basic security interests of the grassroots practitioners (farmers and processing workers), and the expected future income of the practitioners will provide the possibility of continuous improvement within the scope of controllable market risks. The government underwrites the purchase price to ensure that growers do not suffer severe losses in years of poor market performance or poor yields. In addition to this, the local government has developed a strategy to actively build a tourism industry based on the agricultural industry through municipal planning, making the most of Square Bamboo's value as a vegetated landscape. This project has maximized the added value of the Square Bamboo Shoot beyond its food value, thereby optimizing the proportion of local revenue and enhancing the income sources of local laborers.

The Humbo CDM forestry project is designed for a 30-year period with a fixed carbon price of \$4.40 per tonne of CO<sub>2</sub>. World Vision Australia covered the first investment cost of the project and stated in the project design document that the proceeds from carbon sales would be used to cover the operating costs of the seven cooperatives. World Vision Ethiopia signed an initial Emission Reduction Purchase Agreement (ERPA) with the World Bank BioCarbon Foundation in 2009. The agreement was for the sale of 165,000 tonnes of certified carbon emission reductions over the first 10 years. Between 2009 and 2012, World Vision Ethiopia received US\$320,000 from carbon sales to sequester 73,338 tonnes of CO<sub>2</sub> [13]. A framework diagram of the project's benefit sharing mechanism is shown in Figure 1.

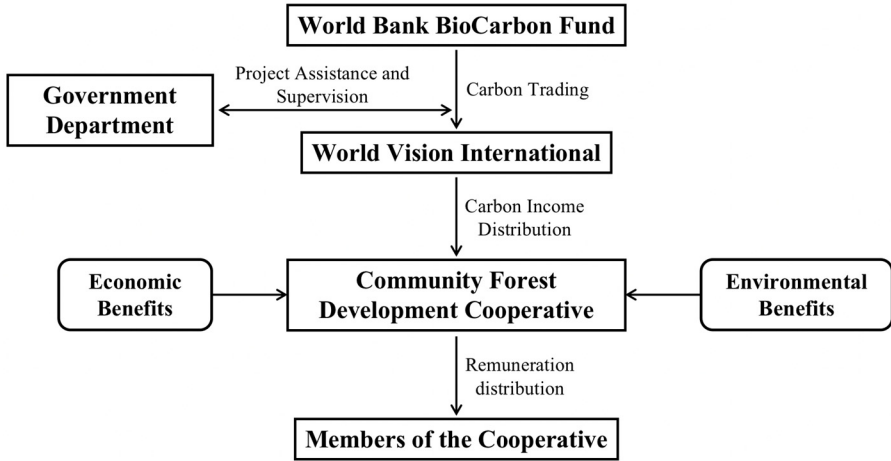


Fig. 1. Humbo CDM project benefit distribution mechanism (Photo credit: Original).

The amount of funding received from the sale of certified carbon emission reductions (CERs), which has been the main source of funding for the project since 2009, leads to the conclusion that without this source it would not be feasible to realize the project, it would not be possible to finance the development of the project and thus the grassroots participants of the project would not receive any income.

**Impact on Local Crop Cultivation Structure.** Because of China's land ownership policy, growers who choose to grow Square Bamboo Shoot can only do so on the land they have contracted, and almost the majority of growers in Tongzi County have switched to Square Bamboo Shoot because of the high profits it brings. As a result, the land previously available for other crops (such as vegetables, fruits and food crops) has been reduced, resulting in a very homogeneous crop mix in Tongzi County. According to official figures from the Tongzi County People's Government, there are 887.53 square kilometres of arable land in the county, and the Square Bamboo Shoot will cover 666.66 square kilometres in 2021, approximately 75.11% of the total arable land in the area, and this figure is still rising slightly. The main reason for not planting Square Bamboo on the remaining arable land is that it is a wetland field where bamboo plants cannot be grown.

The forestry project in the Humbo Region, Ethiopia opted for the Farmer Managed Natural Regeneration (FMNR) method of forest reforestation, the basic principle of which is the natural regeneration and management of the trunks of underground tree stumps. The FMNR forest development technique accounts for 91% of the total area of the reforestation project in Humbo, so the area of the site selected for this planting method is the original area of destroyed forest. The classification of the area and the type of crops previously grown have not changed as a result of the project, so not only does it not affect the cultivation of other crops in the area, but the environmental benefits have effectively improved the land and water resources for the cultivation of other



crops, so there are no other supply and demand imbalances in Humbo as a result of the project. Although there is still a lack of capacity and low production in the local agricultural industry, there is a shortage of crops that is not due to the structure of the industry.

**Degree of Project Autonomy.** Although the Square Bamboo Shoot project in Tongzi County, China, and the CDM forestry project in Humbo, Ethiopia, are both allopatric poverty reduction support projects, one major difference between the two is that the Tongzi County project is a domestic support project, while the Humbo project is an international support project. This difference is a direct consequence of the different levels of autonomy between the two projects, which can be seen in terms of both project survival and conditionality.

*Autonomous Survivability.* Although both Square Bamboo and CDM forests have significantly expanded the local forest cover, their existence is based on the basic premise that the projects are viable and the local participants are profitable. The continuation of these two projects beyond 2024, when Guangdong's assistance to Guizhou Province comes to an end, and the World Bank's carbon purchase programme for Ethiopia expires in 2036, will be a decisive factor in the sustainability of ecological governance in these two regions. If the projects collapse, the land that has been treated will inevitably be used for other short-term profitable industries and will then fall back into ecologically destructive poverty, so the autonomous survivability of the projects will be an important evaluation criterion.

The strategy of allopatric support in China is to send government staff, industrial practitioners, skilled people/institutions from universities and research institutions from the place where the poverty alleviation work is carried out to relocate to the assisted place for a period, and to help build the local industry, technology and talent pool of the assisted place for a certain period before these people/institutions relocated from other places leave. It is in this context that the Square Bamboo Shoot industry in Tongzi County has been constructed. The project's autonomous survivability on its own is one of the most important criteria in their performance evaluation, so much of the work in the assistance phase of the project is unlikely to pay off in the short term but will help the project in the future. For example, whether the local technicians are able to ensure the long-term sustainable picking and maintenance of Square Bamboo forest, whether local policies are conducive to investment in the industry, and whether local operators have access to channels and opportunities to showcase and sell the products.

The CDM forestry project in the Humbo region of Ethiopia is funded by the World Bank's BioCarbon Fund. Although the project has invested in technical training for local community members working on the project, helping them to acquire specialist skills such as nursery, bush pruning and weeding, these staff do not have the capacity to further participate in the project and expand the added commercial value of the forest. The only way for local people to earn income from the forest is completely restricted by the agreement of the carbon purchase scheme, so the project is arguably not at all capable of autonomous survivability on its own after leaving the support.

*Additional Conditions Attached to the Project.* From colonial times to the modern era of globalization, because aid for poverty reduction usually requires a significant human and material commitment on the part of the donor, it is unlikely that any aid will emerge for no reason, especially in today's democratic context where no organization or institution can spend hundreds of millions of dollars for no reason at all. Conditionality is a common technique used in aid projects to ensure that the objectives of the project are implemented as planned. At a macro level, conditionality can be divided into economic and political conditionality.

The Square Bamboo Shoot project in Tongzi County, China, is a domestic aid project, and is planned under national policy in terms of funding, investment orientation and exchange of technical resources. The institutional characteristics of China dictate that the project's donor, the Guangdong Province government, does not need to consider financial returns or political privileges, so the motivation for the project's establishment is very simple: to improve the living standards of residents and to help build local pillar industries and ecological management, among other work objectives. In summary, the aid is untied.

The CDM forestry project in the Humbo region of Ethiopia is international aid, and its sources of funding, sources of technology and project motivation are complex. The birth of this project has experienced the game of multi-interest groups, and the additional conditions that obviously benefit someone party can be found in the details of the implementation. For example, the revised design document for the project mentions that World Vision was given the advantageous conditions of "developing stronger land rights" through negotiations with the Ethiopian government [14]. Following this, local government officials offered to grant rights to the project's managers and to provide legal assistance to the local cooperatives formed by World Vision, as well as help with the development of by-laws and policies. The government later legalized the public land use rights of those cooperatives, i.e. empowered to allow groups to control and manage existing forests, they could prevent human and animal access, and could carry out activities such as nursery development and planting. The presence of such a content of heavily political favoritism within a sovereign state in the modern era makes it difficult not to wonder whether the project comes with many strings attached.

## 5 Conclusion

In this paper, Tongzi County, Zunyi City, Guizhou Province, China, and Humbo, Southern Nations Nationalities and Peoples Region, Ethiopia were selected as the subjects of the study. Through a comparative research method, the different poverty reduction strategies between Tongzi County's Square Bamboo Shoot industry and the Humbo region's CDM forestry industry were analyzed based on an ecologically sustainable development context. The study reveals that the two regions have similarities in prioritization ecological governance, sustainability and local job creation, but differences in terms of sources of income for participants, impact on local crop cultivation structure and levels of project autonomy.

The two projects represent typical development strategies in the cause of human poverty reduction today, and they are both based on a profound understanding of the characteristics of local poverty and the rules of poverty management to establish the road to poverty reduction. These valuable experiences gained in the practice of poverty reduction should belong to people all over the world, and can provide a certain degree of reference and help for poverty management in less developed regions of developing and developed countries with different economic bases, natural conditions and implementation capabilities worldwide.

There are, of course, many shortcomings in this study. From a longitudinal perspective, both research subjects in this paper have been established for a relatively short period of time, and there is a lack of observations and relevant data for a longer period. It is hoped that more researchers in this field will conduct more studies in this direction with richer research subjects or more detailed complaints, so as to provide theoretical and practical support for the cause of human poverty reduction.

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