

# Evaluate the Effectiveness of the Agricultural Machinery Purchase Subsidy Policy for Poverty Alleviation in Guizhou, China

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**Abstract.** Southwest China's weak economic development has been the focus of China's rural revitalization strategy; exploring the impact of implementing an agricultural machinery purchase subsidy policy can impetus the economic development of Southwest China. Since its introduction in 2004, the policy of subsidizing the purchase of agricultural machinery has been mainly used to support the purchase of advanced and applicable agricultural machinery. The implementation of this policy has promoted China's socioeconomic development and, until now, has been an indispensable supportive policy in the rural revitalization strategy. As the province with the most poverty-reducing people in the country, Guizhou's achievements cannot be attributed to the conscientious implementation of the central government's decisions and deployments. However, Guizhou's practice of subsidizing the purchase of agricultural machinery also requires improvement. The Smith Model is the theoretical framework for this research. This paper lists the problem Guizhou's agricultural machinery purchase subsidy policy needs to fix with stakeholder analysis. It then uses the Smith Model to look into the reasons for the "irrational agricultural machinery structure" gap in Guizhou's application of the agricultural machinery purchase subsidy policy and makes suggestions for how to make things better. This study's main contribution is to enrich existing literature by analyzing Guizhou's policy implication in addressing the problem of insufficient production of agricultural machinery and providing a direction for the future implementation of Guizhou's agricultural machinery purchase subsidy policy.

**Keywords:** rural revitalization, agricultural machinery purchase subsidy, Smith Model, stakeholder analysis, Guizhou

## 1. Introduction

In recent years, Guizhou's implementation of an agricultural machinery purchase subsidy policy has increased the efficiency of agricultural production in poverty alleviation. However, the structure of agricultural equipment in Guizhou needs to be adjusted and optimized.

The central government has implemented an agricultural machinery purchase subsidy policy since 2004 [1]. By the end of 2020, the central financial authorities had put in a cumulative total of 239.2 billion yuan and supported more than 38 million farmers and agribusinesses in the purchase of more than 48 million units of different types of agricultural machinery [2]. From 2014 to 2020, Guizhou's total agricultural machinery power increased by 22.1% [3][4], significantly alleviating absolute poverty.

Agricultural and financial departments at all levels throughout the country have actively cooperated in recent years to implement the agricultural machinery purchase subsidy policy effectively and in strict accordance with the requirements. From the literature, some scholars have studied the shortcomings in China's implementation in general. The policy still suffers from an oversupply of subsidized places, insufficient subsidies for machinery with suitability, and low awareness of after-sales service [5]. Similarly, China's agricultural machinery purchase subsidy policy depends on the support of local governments; in addition, the scope of subsidies suffers from a deficiency; that is, tractor equipment subsidies are challenging to implement in China's agricultural machinery and equipment [6]. Inadequate supervision of the performance of subsidized agricultural machinery is another major problem in subsidizing the purchase of agricultural machinery, as enterprises producing agricultural machinery tend to place more emphasis on economic benefits rather than product quality [7].

Other scholars analyzed the shortcomings of Guizhou's practice. At present, Guizhou only has a universal subsidy policy for purchasing agricultural machinery [8]. Even though these funds are aimed at some essential and much-needed areas of agricultural machinery, there are not any policy measures that are specific to Guizhou's industries, and the special funds are still being used,

which means that the mechanization of Guizhou's mountainous industries has stopped [8]. Based on this point, the rate of mechanization in agriculture in Guizhou is not very high, and most of the agricultural machinery used there is still tiny, low-value machinery for home use [9]. Most of the literature defines the problems commonly encountered in China during the implementation of subsidies for the purchase of agricultural machinery, and very little of the literature examines reasons for the emergence of the policy gap of irrational equipment structures, let alone based on the reality in Guizhou. This paper uses the Smith Model to analyze the reasons for the emergence of a policy gap in the form of poorly structured agricultural equipment in Guizhou in the context of poverty alleviation and proposes recommendations for improvement.

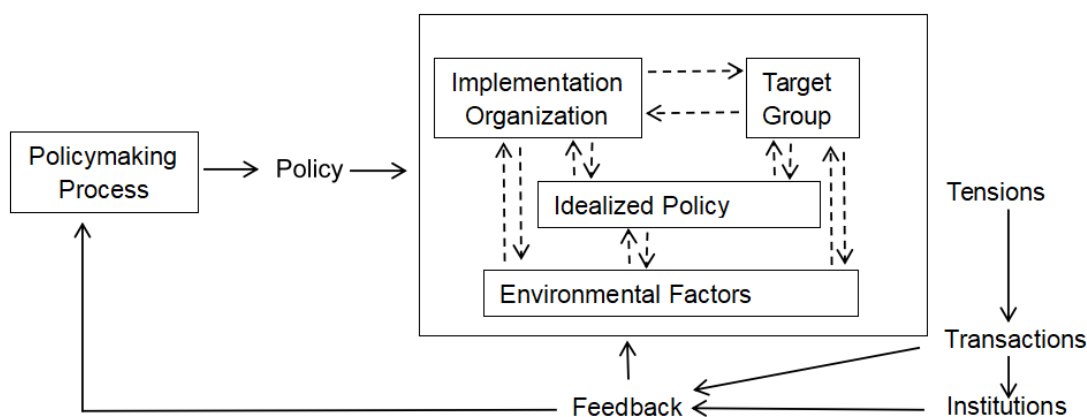
Solving Guizhou's mechanization challenges is urgent for the consolidation of poverty alleviation. The central government has always regarded poverty alleviation as a long-term endeavor. The most important thing now is consolidating and expanding the results of the fight against poverty and building up China's strength in agriculture in the new era [10]. Due to its complex topography, low mechanization and sloppy farming practices have continued to dominate Guizhou's agriculture. Guizhou's mountains and hills account for 92.5% of the total area [11]. Besides, Guizhou's production and marketing connection policies implemented in 2017 have enabled farmers and new agricultural business entities to gain revenue while increasing their demand for mechanized production. The booming development of agricultural mechanization in Guizhou is significant for implementing an excellent rural revitalization strategy and promoting regional economic growth.

## 2. Problem Identification: Lack of Mechanized Agricultural Production in Poverty Alleviation

Guizhou faces the challenge of insufficient mechanized agricultural production in the context of poverty alleviation. Lack of mechanized agricultural production usually means lower agricultural productivity, which reduces the profits of farmers and agricultural businesses and hinders achieving the broader goal of poverty alleviation. In 2014, the national comprehensive mechanization level of crop cultivation, planting, and harvesting reached 61%, and the total power of agricultural machinery reached 1080.57 million kilowatts [12]. At the same time, Guizhou's comprehensive mechanization level was only 22.17% [13], ranking at a low level in the country, while the total power of agricultural machinery was 24.58 million kilowatts, which accounted for only 2.27% of the national level [3]. Guizhou's agricultural mechanization lags considerably behind the national average, indicating that when the poverty alleviation approach began, the lack of mechanized agricultural production in Guizhou was apparent. In contrast, advanced agricultural mechanization can provide technical support for achieving poverty alleviation [14]. For the Guizhou government, addressing the problem of insufficient mechanized agricultural production is necessary.

## 3. Theory of the Policy Implementation Process: Smith Model

The Smith Model is an early and relatively well-researched theoretical model in policy implementation. Several factors would affect and constrain policies in the concrete implementation process, primarily consisting of four parts: the idealized policy, the implementing organization, the target group, and environmental factors, which interact with one another [15]. The entire policy implementation process is shown in Figure 1.



**Figure 1.** A model of the policy implementation process [15]

Smith broadened the horizon of policy implementation research by viewing the four critical influences in the policy implementation process as an integrated system of influences and considering that each of these factors is also closely related [16]. It is essential to look at the roles of different factors in the policy implementation process in Guizhou to accurately figure out why structural gaps appeared during the policy implementation to subsidize the purchase of agricultural machinery.

In this part, the Smith Model is utilized to discover the causes of the cited problem aforementioned. The whole process of policy implementation is briefly described as the interaction of these four variables generating a state of tension that is then harmonized and eased through a series of treatments. If the problem of insufficient agricultural mechanization arises in the practice of poverty alleviation in Guizhou, feedback and policy adjustments should be made promptly. Due to the geographic factors in Guizhou's particular karst landscape, the implementation of agricultural machinery operation is complex; farmers will prefer to operate small, low-value agricultural machinery for home use, while the local government needs more motivation to research and develop large-scale machinery. Therefore, to solve the problem of agricultural mechanization in Guizhou, the central policy must be implemented based on the actual situation in Guizhou. Unlike other models, Smith's policy implementation process model stresses how important it is to make policies and how important it is to have implementing agencies, target groups, and the policy environment. It also pays more attention to how these four elements affect each other in a two-way fashion, which is very important for studying how Guizhou's agricultural machinery purchase subsidy policy was implemented. Later, the article chooses Smith's policy implementation process model as the theoretical framework to analyze the reasons for the deviation from implementing Guizhou's agricultural machinery purchase subsidy policy.

Environmental factors, such as political factors, market factors, cultural practices, history, and so forth, influence and constrain the implementation of any policy [17]. The following section will review the policy using policy environment analysis and examine the case at macro, meso, and micro levels.

#### 4. Examine the Case: Policy Environment Analysis

Since 2014, Guizhou province has implemented the agricultural machinery purchase subsidy method of "full-price purchase, fixed-rate subsidy, county-level settlement, and direct subsidy to the card" [18]. According to Guizhou's implementation plan for agricultural machinery purchase subsidies from 2021 to 2023, the province's agricultural machinery purchase subsidy directory currently has 15 categories, 38 subcategories, and 121 items [19], basically covering the province's grain and oil production and characteristics of the advantageous industries of the whole industrial chain of mechanization of agriculture needs, while the type of subsidized machinery in Guizhou province in 2015 only includes 11 categories, 34 subcategories, and 104 items [20]. With increased subsidies for machine purchases, the types and items of subsidized machines set in Guizhou province have increased.

Both domestic and global environments are conducive to implementing Guizhou's agricultural machinery purchase subsidy policy. Over the years, the Central Ministry of Agriculture and Rural Development and the Central Ministry of Finance have continued to promote reform and innovation in implementing agricultural mechanization policies [21]. The Food and Agriculture Organization of the United Nations is also committed to supporting countries and governments in developing and implementing national policies, regulations, and laws for the sustainable building of agricultural mechanization [22]. Guizhou has precisely implemented the agricultural machinery purchase subsidy policy to comply with the Central government's guidelines and cater to the world's demand for sustainable development.

In Guizhou, subsidies for purchasing agricultural machinery have enhanced people's well-being, providing a suitable environment for implementing this policy. The central agricultural machinery purchase subsidy is intentionally tilted to the southwest region to support the mechanization of agriculture with mountainous characteristics in the southwest region, expanding the effect of poverty alleviation. The buy-in and participation of stakeholders, such as farmers, agribusinesses, and rural communities, are critical to implementing policies. Implementing subsidies for purchasing agricultural machinery has brought convenience and benefits to farmers and agribusinesses, which has helped ensure that the subsidies meet their needs and are used effectively. As for farmers' use of farm machinery in Guizhou, more than 80% of farmers believed that the advantages of mechanization over traditional production methods were mainly in terms of saving time and energy [9]. Stakeholder analysis is also mentioned in the subsequent section. Based on the analysis of the policy environment, Guizhou should continuously improve its agricultural machinery purchase subsidy policy and promote agricultural mechanization as a sustainable business.

#### 5. Policy Evaluation

The agricultural machinery purchase subsidy policy in Guizhou aims to handle the problem of inadequate agricultural mechanization in the context of poverty alleviation by granting benefits, and policy interventions should promote rural economic development by rationalizing the structure of agricultural machinery. Although it increased integrated mechanization, the structure of agricultural machinery and equipment in Guizhou is still unreasonable. The central performance in Guizhou is that there is more power machinery and less supporting machinery; there is more small-scale machinery and less large-scale machinery. In 2022, there are only 2,593 large and medium-sized tractors with matching implements in Guizhou province, accounting for 15.5% of the number of tractors of the same model, while the number of small tractors has exceeded 100,000 units [23]. In Guizhou province, machinery suitable for plowing large areas of mountainous terrain is lacking, and supporting machinery to power machinery support is insufficient, reducing the productivity of power machinery.

### 5.1. The Policy Gap Examination Using Stakeholder Analysis at Macro, Meso, and Micro Levels

This section involves four stakeholders: the central government, local governments, agricultural machinery manufacturers, and farmers. The purpose of stakeholder analysis is to present the role of stakeholders in developing policy contexts to a forward-looking overview of policy directions for longer-term and broader concerns [24]. All four stakeholders affect how agricultural machinery purchase subsidy policies are implemented. They are also spread out to look at the current gaps in understanding the unfair structure of agricultural machinery at the macro, meso, and micro levels.

The macro level consists mainly of the practices of the central and Guizhou governments. By following the central government's guidance on implementing subsidies for purchasing agricultural machinery, Guizhou has adjusted its policy implementation plan, including the scope of subsidized implementation and the strength of subsidized funds, every three years after 2014. The types of machinery that can be adapted during regional agricultural development will also change. In order to more closely match the central government's goal of poverty alleviation, the Guizhou government needs to maintain the continuity of the agricultural machinery purchase subsidy policy and adjust it at any time, according to the farmers' feedback and the effect on poverty alleviation. The Guizhou government will exclude some high-cost but hard-to-accept agricultural machines from the scope of subsidies. If the latest changes do not match the needs of farmers or agribusinesses, this situation makes using funds less effective. Also, suppose the central government cuts subsidies for special agricultural machinery, and the Guizhou government does not have enough money. In that case, it can only subsidize considerable power and small machinery first or put off the subsidy, making the structure of agricultural machinery illogical.

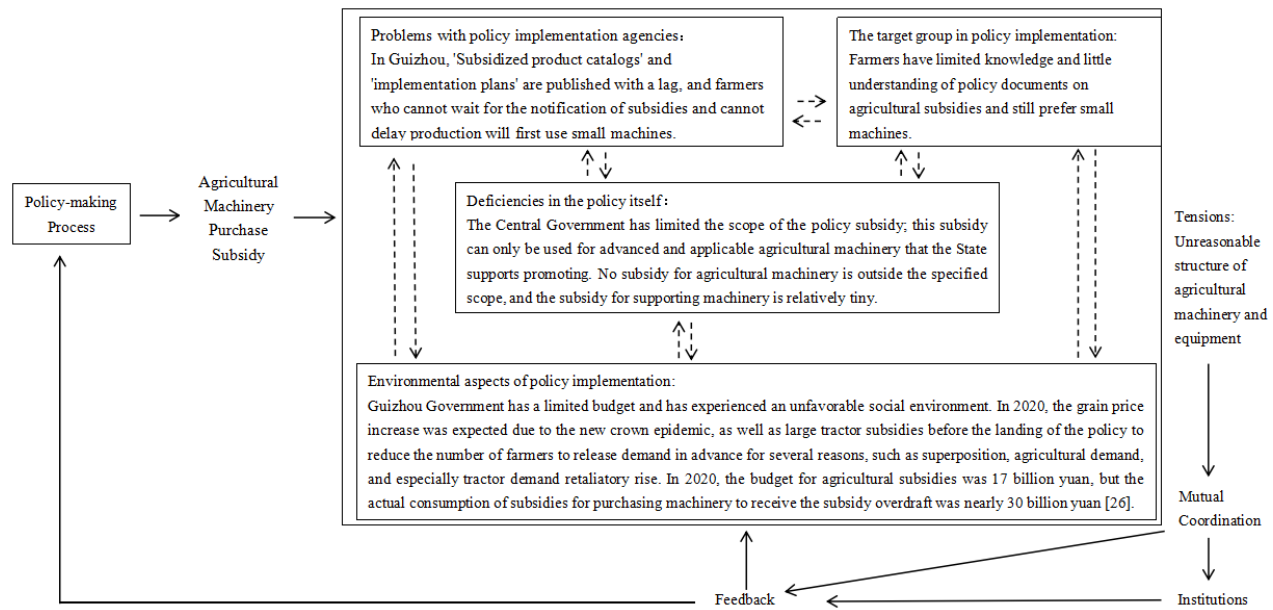
The meso level deals with the impact of the implementation of the agricultural machinery purchase subsidy policy by the Guizhou government on agricultural machinery manufacturers. In Guizhou, the most significant change in farm machinery policy in 2014 was the subsidy from how farmers purchased machines at a differential price to how they purchased machines at a total price. The full-price purchase of subsidies reduces the financial pressure on agricultural machinery manufacturing enterprises to a large extent. In 2014, the Guizhou Provincial Department of Agriculture and Rural Affairs and the Guizhou Provincial Department of Finance jointly implemented the agricultural machinery subsidy policy because the Department of Finance controls the budget and its regulation. The full-price, self-declared subsidy increases the regulatory pressure on the executive branch. The tendency of agricultural machinery manufacturers to produce machines that can apply for subsidies and the uneven quality of machinery from different manufacturers can also lead to an unbalanced equipment structure.

At the micro level, implementing the agricultural machinery purchase subsidy policy in Guizhou has brought farmers benefits. Guizhou considers the actual situation when implementing the policy of subsidizing agricultural machinery. Individual subsidies for the purchase of machinery have reduced the burden on farmers, promoted increased agricultural production and farmer's income, and helped the implementation of the strategy of poverty alleviation. In 2022, Guizhou province added 34,900 units of subsidized agricultural machinery and benefited 30,500 farmers, up 89% and 70.6% year-on-year [25]. However, less than half of the farmers have participated in training on agricultural machinery, and most of them rely on their practice to master the operation and maintenance of agricultural machinery [9]; therefore, farmers currently use mostly small-scale household agricultural machinery, which is easy to operate and more uncomplicated to maintain.

The analysis at the macro, meso, and micro levels illustrates that Guizhou's implementation of the agricultural machinery purchase subsidy policy is significant for the state, the province, the agricultural machinery producers, and the farmers and that the responses of these stakeholders to the policy harm the structure of agricultural machinery. In order to develop mountain-adapted agricultural machinery and consolidate the results of poverty alleviation, Guizhou needs to adjust the structure of agricultural machinery and equipment.

### 5.2. Analysis of Reasons for Gaps Using the Smith Model

The two interacting processes in the Smith Model are policy formulation and implementation. The four factors in the policy implementation process undergo interactive movements. The state of their mutual movement is processed from the original tension and finally tends to harmonize with each other. The policy effect produced in this process will continue to improve and modify the old policy content through feedback. Deficiencies of the policy itself, problems with the policy implementation agencies, problems with the target groups in policy implementation, and problems with the policy implementation environment all contribute to the gap between Guizhou's irrational agricultural machinery structure and the policy implementation goals. In Figure 2, the Smith Model analysis describes the relationships by which specific issues arising from the operation of this subsidy can impact the structure of farm equipment.



**Figure 2.** Using the Smith Model to analyze the reasons for gaps

## 6. Proposal: Learn Lessons from Japan and South Korea

Guizhou's agricultural machinery subsidy policy currently relies mainly on finances from the central government to solve the problem of insufficient mechanized agricultural production, and it is not easy to balance the structure of agricultural machinery and equipment and fully realize the mechanization of agricultural production by relying solely on the power of the government. Japan, South Korea, and Southwest China are all East Asian countries with relatively small areas of arable land, typical of the small farmer type. However, Japan and South Korea have primarily mechanized agriculture in the last century. In both countries, the issue of agricultural mechanization was addressed with the help of a third party, which helped the government have a variety of machinery adapted to the development of agriculture.

### 6.1. The Case of Japan

There are similarities between Japan and Southwest China regarding agricultural development conditions. With mountains and hills being about 80 percent of the country's surface area, Japan has a limited and fragmented area of land suitable for cultivation and is a typical country with a large number of people and a small amount of land [27]. Moreover, the scale of single-family farming in Japan is small, and currently, about 80% of Japanese farmers operate on less than three hectares of land [28]. Guizhou faces difficulties in developing large-scale agriculture because of the small area of arable land due to terrain limitations.

The Japanese government's main action is financing farmers' machinery purchases. Financial institutions such as banks and Japan Agricultural Cooperation indirectly provide farmers or agricultural producers loans to purchase agricultural machinery. After rice-based agricultural production reached a higher level of mechanization, the traditional government subsidies for the purchase of machinery gradually decreased and are now only present in a small number of regions and segments, ultimately leading to the formation of a support policy that is predominately based on policy-based finance at this point [29].

Policy-based finance is the core of Japan's agricultural mechanization support policy. The policy finance model can alleviate the pressure of government budgetary constraints due to the external environment and is significant in boosting the ownership of agriculturally applicable machinery in economically underdeveloped regions where local governments have weak financial resources. Additionally, banks with a higher level of credit dominate the Japanese model. In recent years, the maximum number of years of loans for the purchase of agricultural machinery has been extended. Farmers can apply for three years to repay interest without repaying the principal, which allows farmers to compensate for the shortcomings of various equipment in support of agricultural production to provide funds. In Japan, not only is the government involved in agricultural machinery purchase subsidy policy, but market-based financial institutions are also involved, which provides sufficient financial security for the restructuring of agricultural machinery and equipment.

## 6.2. The Case of South Korea

South Korea's agricultural resources are so scarce that it has one of the world's few areas of arable land per capita. However, over the past 45 years, South Korea has made remarkable agricultural mechanization progress faster than any other country [30]. It is the first Asian country, after Japan, to mechanize fine-growth agriculture.

The Korean government focuses on subsidizing agricultural machinery co-utilization organizations. In the mid-1970s, various types of specialized farmers' cooperatives began to emerge, and the Republic of Korea began to provide farmers' cooperatives with tractors, rice transplanters, and combine harvesters, prompting farmers to use them jointly to improve the efficiency of agricultural machinery [31]. In addition, South Korea gives high subsidies to agricultural machinery cooperatives, agricultural machinery groups, and large-scale farmers and lower subsidies to small-scale farmers. For the purchase of farm machinery, such cooperatives receive a 40 percent subsidy and a 60 percent loan; in contrast, individual farmers only receive a 1 percent subsidy and a 60 percent loan, which means that the individual farmer will be responsible for the remaining 39 percent [31].

The South Korean model has primarily optimized the structure of agricultural machinery and equipment because the differential subsidy policy is conducive to increasing the utilization rate of agricultural machinery, and there is a greater demand for large-scale farms or agricultural cooperatives to use large-scale machinery. At present, implementing an agricultural machinery purchase subsidy policy in Guizhou province is the object of undifferentiated subsidies. Ordinary farmers have an excellent opportunity to obtain subsidy funds for the purchase of machinery as long as they apply, and the efficiency of the agricultural machinery's usage by ordinary farmers is much lower than that of professional cooperatives and large-scale grain farmers.

## 6.3. Models Could Be Adopted in Guizhou

Similarities exist between the Japanese and South Korean models, where third-party agencies are essential in implementing subsidies for purchasing agricultural machinery. Guizhou should also develop agricultural mechanization with the help of a third party. Guizhou is a region with a relatively large rural population. For instance, It can take advantage of rural credit cooperatives to implement credit subsidies for the purchase of agricultural machinery by farmers, with the amount of the loan mainly in small amounts, and appropriately extend the repayment time of small and microfinance for farmers by allowing them to repay the interest before the principal within a few years after the loan is made. Guizhou should also consider making the screening process for subsidized items more scientific and reasonable. They should also ensure that, within the limits of the subsidies set by the central government, more subsidies are given to professional agricultural machinery cooperatives and large-scale family farms while fewer are given to small farmers. These incentives will change the structure of agricultural machinery and equipment.

# 7. Conclusions and Prospects

## 7.1. Conclusions

This study starts with the problems that need to be solved in implementing the agricultural machinery purchase subsidy policy in Guizhou province. Based on the Smith Model, it explores the gaps encountered in the implementation process, expanding the research perspective on implementing agricultural subsidy policies from the existing literature. According to research, issues with the agricultural machinery subsidy policy itself, issues with how the various departments implement it, issues with the farmers, and any potential social or environmental issues that may arise during the process are the leading causes of the gap in the irrational structure of agricultural machinery and equipment in Guizhou province.

Guizhou needs to fully develop its local advantages to solve the problem of insufficient agricultural mechanization, such as using rural commercial banks to subsidize and looking for agricultural cooperatives to work with farmers to use agricultural machinery to develop agriculture with mountain characteristics. The Japanese and Korean models of subsidizing agricultural machinery have something to learn from, but there are still difficulties in ensuring error-free implementation. For example, the modernization of agriculture in Japan has developed to a high level, and farmers have a solid ability to repay loans, but it is challenging to realize the coverage of loans for the purchase of agricultural machinery in Southwest China; South Korea's funding sources to support agricultural mechanization development are mainly multinational banks and international inter-fund organizations, and the government needs to be very attractive to persuade these international organizations to be willing to grant loans here.

## 7.2. Prospects

The Guizhou Government noted that by 2025, the province's total agricultural machinery power will have stabilized at more than 31 million kilowatts; the structure of agricultural machinery will typically be reasonable; the existing 500 mu or more of dams will cover the agricultural land; and the critical specialty crops will be in continuous planting areas. Due to the research perspective and methodology limitations, there are still areas not covered in this study, such as whether the current implementation of agricultural machinery subsidies in Guizhou province can meet the agricultural mechanization development

2025 target, which needs to be improved in future work and research. Although the problems in implementing agricultural machinery policy subsidies in Guizhou province are typical in the country, this can only illustrate some of the problems that may be encountered in implementing agricultural machinery policy subsidies. Therefore, subsequent research should be based on a broader range of areas and regions and examine the national applicability of the problems encountered by Guizhou in implementing agricultural machinery policy subsidies.

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