

The Role of Fiscal Support in Promoting the Application of Green Technologies in Sustainable Agriculture in China

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Abstract. This paper aims to explore the relationship between fiscal support and the promotion of sustainable agriculture, with a specific focus on development in China. Also, this paper aims to explore and research challenges during the process of carrying out fiscal support. It also examines how fiscal support can be effectively utilized to encourage and incentivize the adoption of innovative green agriculture technologies in sustainable agriculture. This research is meaningful to the development of sustainable agriculture on the future and enlightening to the future research on cooperation among governments, farmers, and agricultural technology companies. This paper gathers information from China and the author conducts field visit to get the result in this paper. The author reviews the findings of the literature of fiscal support and sustainable agriculture. The author finds that the combination of subsidies, tax incentives, loan programs, and research funding is widely and effectively utilized in fiscal support of sustainable agriculture in China generally. However, there are challenges during the process of carrying out fiscal support and the author analyzed out several suggestions for them. The result of this research of this paper can foster the development of fiscal support and broaden this field.

Keywords: Fiscal Support, Sustainable Agriculture, Green Technologies.

1. Introduction

1.1. Research Background and Significance

In recent years, the Chinese government has recognized the critical role that green technologies play in promoting sustainable agriculture and environmental conservation. To encourage the adoption and development of green technologies in the agricultural sector, various fiscal support measures have been implemented. Generally, the result is moving to the positive side with fiscal support.

However, when the government takes measures of fiscal support, such as subsidies of green agriculture, tax incentives, low-interest loans and mutual fund of green agriculture, some problems and challenges come out like low targeting efficiency, unfair research funding allocation and lack of long-term stability. These issues are increasingly becoming serious obstacles to the development of fiscal support in sustainable agriculture

Under this background, this paper seeks to explore and analyze the multifaceted role of fiscal support in promoting the application of green technologies in sustainable agriculture within the context of China. Through a comprehensive review of existing literature and fiscal analysis, a general analysis of nowadays' development of fiscal support in sustainable agriculture, this paper aims to elucidate the effectiveness of fiscal interventions in driving the adoption of green technologies, disclosing the problems and challenges hiding behind the development of fiscal support in sustainable agriculture and presenting suggestions for nowadays' problems and challenges faced by fiscal support in sustainable agriculture. Through these works, this paper provides profound significance to the development of fiscal support in the agricultural sector. The result that this paper explores and analyzes can provide people with a more comprehensive and critical perspective of the role of fiscal support in promoting the application of green technologies in sustainable agriculture in China. Moreover, the analysis of nowadays' challenges of fiscal support in sustainable agriculture and suggestions this paper proposed can be a powerful help in solving low targeting efficiency, unfair research funding allocation and lack of long-term stability within the context of China.

1.2. Literature Review

Sustainable agriculture has garnered increasing attention globally as concerns about environmental degradation, climate change, and food security intensify. Within this context, the adoption of green technologies presents a promising avenue for enhancing the sustainability of agricultural practices. In China, where agriculture plays a crucial role in the economy and environmental challenges are pressing, the role of fiscal support in promoting the application of green technologies is of particular interest.

Chen, J.D. underscores the significance of fiscal support as a key driver for sustainable agriculture. Government subsidies, tax incentives, and financial assistance programs have been widely recognized as effective policy instruments for incentivizing the adoption of environmentally friendly practices and technologies in agriculture [1]. In China, fiscal policies have been integral to the country's agricultural development strategy, with a focus on enhancing resource efficiency, reducing pollution, and promoting sustainable land management practices.

Wang, S. emphasizes the crucial role of fiscal support in overcoming barriers to the adoption of green technologies in Chinese agriculture. Government subsidies for the purchase of eco-friendly equipment, tax incentives for adopting sustainable practices, and financial support for research and development initiatives have all been instrumental in incentivizing investment and innovation in the agricultural sector. Moreover, targeted fiscal policies have facilitated the scaling up of green technology initiatives, leading to broader diffusion and impact across agricultural landscapes [2].

Previous literatures provided this paper a broader perspective and research foundation, comprehensively analyzed the basic situation of financial support in sustainable agriculture.

However, literatures rarely analyze a specific part of fiscal support like subsidies, tax incentives, loan programs, and research funding. Also, they are rarely focus on the challenges when fiscal support is carried out. This paper is focus on 4 specific parts of fiscal support and 3 challenges when fiscal support carried out. Additionally, corresponding suggestions will be proposed.

1.3. Research Contents

This article will analyze and address this issue from three aspects: general analysis of fiscal support of the application of green technologies in sustainable agriculture in China, disclosure and analysis of the troublesome problems China is facing in fiscal support and suggestions for the problems. First, this paper will analyze the efforts and development overview of the Chinese government in fiscal support: subsidies, tax incentives, loan programs, and research funding. Then, this paper will reveal three problems in the development of fiscal support in sustainable agriculture respectively, and deeply analyze the background and reasons for the formation of these problems. Next, based on the situation in China, relevant solutions will be proposed. Finally, a summary of the entire discourse will be provided.

2. Different Ways of Fiscal Support

In recent years, subsidies, tax incentives, loan programs, and research funding have been used as fiscal support in promoting the application of green technologies in sustainable agriculture in China

2.1. Subsidies

One key aspect of fiscal support is the provision of subsidies for farmers who invest in green technologies. These subsidies may cover a portion of the costs associated with purchasing and implementing precision farming equipment, renewable energy systems, organic farming inputs, and other environmentally friendly technologies. By offsetting some of the initial investment costs, these subsidies make it more financially feasible for farmers to transition towards sustainable practices [3].

2.2. Tax Incentives and Credits

In addition to direct subsidies, the Chinese government has also established tax incentives and credits for businesses and individuals engaged in the production and utilization of green technologies

in agriculture [4]. For example, companies involved in manufacturing solar panels or wind turbines may benefit from tax breaks, while farmers utilizing biogas technology may receive tax credits for reducing carbon emissions. These fiscal incentives help create a more favorable economic environment for the development and adoption of green technologies in agriculture.

2.3. Loan Programs

Furthermore, government-backed loan programs specifically targeting green technology projects in agriculture provide additional financial support to farmers and agricultural enterprises. These low-interest loans or credit facilities enable farmers to access capital for investing in sustainable agricultural practices, such as upgrading irrigation systems, installing solar panels, or transitioning to organic farming methods [5]. By providing affordable financing options, these programs facilitate the integration of green technologies into mainstream agricultural operations.

2.4. Grant and Fund

Moreover, research and development grants and funding initiatives support innovation in green technologies for agriculture. Government agencies, academic institutions, and research organizations collaborate to provide grants for research projects focusing on developing new sustainable farming practices, improving crop resilience, and enhancing resource efficiency. By investing in research and innovation, the government aims to drive the advancement of green technologies in agriculture and ensure long-term sustainability in the sector [6].

Overall, the combination of subsidies, tax incentives, loan programs, and research funding demonstrates the Chinese government's commitment to promoting the adoption of green technologies in sustainable agriculture. Through strategic fiscal support measures, China aims to accelerate the transition towards environmentally friendly and resource-efficient agricultural practices, ultimately contributing to a more sustainable food system and ecosystem health.

However, there are also some challenges about targeting efficiency, research funding allocation and long-term stability.

3. Problems and Challenges

Overall, fiscal support in sustainable agriculture is progressing smoothly. However, there are still some challenges in Targeting Efficiency, Research Funding Allocation and Long-Term Stability.

3.1. Low Targeting Efficiency

Low Targeting Efficiency is a disaster to relevant farmers and green agricultural enterprises. Firstly, the diverse nature of agricultural enterprises and farmers across China contributes to the complexity of identifying and targeting the relevant beneficiaries. The agricultural sector encompasses a wide range of operations, from small-scale family farms to large commercial enterprises, each with unique needs and challenges. As a result, a one-size-fits-all approach to subsidy allocation is inadequate and may lead to misallocation or inefficiency.

Secondly, the accurate identification of those in genuine need of support is hindered by a lack of comprehensive data and information. In many cases, there is insufficient visibility into the specific financial circumstances, technological requirements, and environmental practices of individual farmers and agricultural enterprises. Without precise and up-to-date information, government agencies and policymakers may struggle to effectively target subsidies where they are most needed.

Furthermore, the potential for errors or misallocation arises from the inherent variability and dynamism of the agricultural sector. Fluctuations in market conditions, environmental factors, and evolving technological advancements all contribute to the challenge of accurately targeting subsidies [7]. Failure to adapt to these changes can result in subsidies being directed towards less impactful initiatives or failing to address emerging needs within the agricultural community.

Moreover, the administrative complexity involved in disbursing fiscal subsidies adds another layer of difficulty. Bureaucratic hurdles, paperwork, and approval processes can create delays and inefficiencies, leading to a disconnect between the intended allocation and the actual impact on the ground.

3.2. Unfair Research Funding Allocation

Unfair allocation is a barrier of the development of innovation of green agriculture. Research and development funding plays a pivotal role in driving innovation and the adoption of green technologies in agriculture. Adequate funding enables researchers to conduct essential studies, develop new technologies, and demonstrate their effectiveness in real-world settings. In China, government funding and support for agricultural research are crucial drivers of innovation and technological advancement in the sector.

Despite the importance of research funding, there are challenges associated with its fair allocation. One significant challenge is the unequal distribution of resources among different research areas or institutions. In China, certain regions or universities may receive more funding or preferential treatment, leading to disparities in research opportunities and outcomes. This can hinder the equitable development and adoption of green technologies in sustainable agriculture, particularly for smaller institutions or researchers with limited access to resources.

Unfair allocation of research funding can have adverse effects on innovation and the widespread adoption of green technologies in agriculture. When funding is concentrated in certain areas or institutions, it may result in a lack of diversity in research perspectives and approaches. This could limit the development of innovative solutions tailored to the specific needs and conditions of different regions or farming systems. Moreover, researchers who are unable to secure adequate funding may face barriers to conducting essential studies or scaling up promising technologies, thereby impeding their implementation in agricultural practice.

3.3. Lack of Long-Term Stability

Frequent change of regional leaders damages long-term fiscal support to developing green agriculture. First and foremost, continuity and stability in leadership are crucial for the successful implementation of long-term strategies, especially in sectors like green agriculture that require sustained investment and commitment. When regional leaders change frequently, it disrupts the continuity of policies and initiatives related to green agriculture. Each new leader may have different priorities, preferences, and agendas, leading to shifts in funding allocations and resource distribution. This inconsistency can hinder the progress of ongoing projects, create uncertainty among stakeholders, and ultimately impede the growth of green agriculture initiatives.

Moreover, developing green agriculture requires a coherent and coordinated approach that spans multiple years or even decades. Investments in research, infrastructure, technology, and human capital take time to yield significant results. Frequent changes in leadership can lead to short-term thinking and decision-making, where leaders prioritize immediate gains or quick fixes over long-term sustainability and development [8]. This shortsightedness can result in a lack of strategic planning, insufficient funding allocation, and a lack of commitment to the continuous improvement of green agriculture practices.

Additionally, building a sustainable green agriculture sector requires building partnerships, collaborations, and networks both within the region and beyond. When regional leaders change frequently, it disrupts these established relationships and collaborations. Organizations, institutions, and stakeholders involved in green agriculture projects may hesitate to engage fully or invest wholeheartedly in initiatives if they perceive a high degree of instability in leadership. This can hinder knowledge sharing, technology transfer, and capacity building efforts essential for the long-term success of green agriculture programs.

Furthermore, frequent changes in regional leadership can erode trust and credibility in the government's commitment to supporting green agriculture. Investors, donors, and international

partners may become wary of engaging in long-term partnerships or providing sustained funding if they perceive a lack of consistency and reliability in the region's leadership. This can lead to a decrease in external support, investment opportunities, and collaborative ventures that are vital for the growth and expansion of green agriculture initiatives.

4. Suggestions

4.1. Suggestions for Low Targeting Efficiency

First, utilize data analytics and remote sensing technologies to identify regions with the greatest potential for adopting green technologies. By analyzing factors such as soil quality, climate conditions, and agricultural practices, policymakers can target fiscal support more effectively to areas where it is most needed and likely to yield significant environmental and economic benefits [9].

Second, engage with farmers, agricultural cooperatives, research institutions, and industry stakeholders to understand their specific needs and challenges related to adopting green technologies. By incorporating their input into the design of fiscal support programs, policymakers can ensure that interventions are tailored to the realities of the agricultural sector and are more likely to be adopted and successful.

Next, establish robust monitoring and evaluation mechanisms to track the effectiveness and impact of fiscal support programs. By regularly assessing key performance indicators such as adoption rates, yield improvements, resource use efficiency, and environmental outcomes, policymakers can identify areas for improvement and make data-driven adjustments to optimize targeting efficiency [10].

Finally, ensure coherence and coordination across relevant policy domains, including agriculture, environment, energy, and finance. By aligning fiscal support programs with broader policy objectives related to sustainable development, climate change mitigation, and rural poverty alleviation, policymakers can maximize synergies and avoid conflicting incentives that may undermine targeting efficiency.

By implementing these suggestions, the targeting efficiency of fiscal support in promoting the application of green technologies in sustainable agriculture in China can be enhanced, thereby contributing to the transition towards a more environmentally sustainable system.

4.2. Suggestions for Unfair Research Funding Allocation

To begin, the allocation of research funding demands a meticulous approach to ensure that resources are directed toward projects with the greatest potential for advancing green agricultural technologies. This involves the identification of key areas of research that align with the broader goals of sustainable agriculture, environmental conservation, and resource efficiency. It is imperative that funding allocation takes into account not only immediate technological developments but also long-term impacts on ecological sustainability and agricultural resilience.

Moreover, efficient utilization of research funding necessitates rigorous oversight and monitoring to track the progress and impact of funded projects. This requires the establishment of clear performance indicators and evaluation criteria to gauge the effectiveness of research initiatives. By continuously monitoring the use of funding and the outcomes of research projects, it becomes possible to make informed decisions about resource reallocation and strategic adjustments to maximize the impact of the funding.

Furthermore, the allocation of research funding should prioritize interdisciplinary collaboration and knowledge exchange to foster holistic and innovative solutions in green agricultural technologies. Cross-cutting research initiatives that integrate expertise from various fields such as agronomy, environmental science, engineering, and economics can yield comprehensive and effective outcomes [11]. Therefore, funding allocation strategies should incentivize collaborative research efforts and the integration of diverse perspectives to address complex challenges in sustainable agriculture.

In addition, recognizing the dynamic nature of technological innovation, research funding allocation must allow for flexibility and adaptability to new developments and emerging priorities.

This entails the ability to reallocate resources swiftly in response to changing research trends, technological breakthroughs, and evolving environmental imperatives. A responsive and flexible funding framework enables the redirection of resources towards promising avenues of research, ensuring that funding remains aligned with the most pressing needs and opportunities in green agricultural technologies.

4.3. Suggestions for Lack of Long-Term Stability

To begin, advocate for the creation of long-term funding mechanisms specifically designated for green agriculture initiatives. These funds should be insulated from short-term political changes and ensure consistent financial support regardless of leadership transitions.

Moreover, enact legislation or policies that safeguard the continuity of fiscal support for green agriculture projects despite changes in regional leadership. This could include budgetary provisions or fiscal rules that prioritize sustainable agriculture investments.

Furthermore, strengthen institutions responsible for overseeing green agriculture programs to ensure continuity and stability in funding allocation and project implementation. This may involve bolstering administrative structures, improving financial management systems, and enhancing accountability mechanisms.

Next, involve a diverse range of stakeholders, including farmers, agricultural experts, environmentalists, and community representatives, in the decision-making process related to green agriculture funding. By incorporating their perspectives and expertise, policies can be crafted to better withstand changes in leadership.

Seek partnerships with international organizations, donor agencies, and foreign governments to supplement domestic fiscal support for green agriculture. International collaboration can provide additional resources and expertise while reducing dependence on fluctuating domestic funding [12].

Raise public awareness about the importance of green agriculture and the detrimental effects of inconsistent fiscal support. Educate citizens about the long-term benefits of sustainable farming practices and garner public support for stable funding mechanisms.

Establish mechanisms for monitoring and evaluating fiscal policies related to green agriculture to assess their effectiveness and identify areas for improvement. Regular evaluations can inform policymakers about the impact of funding decisions and guide adjustments to ensure long-term sustainability.

Additionally, building a sustainable green agriculture sector requires building partnerships, collaborations, and networks both within the region and beyond. When regional leaders change frequently, it disrupts these established relationships and collaborations. Organizations, institutions, and stakeholders involved in green agriculture projects may hesitate to engage fully or invest wholeheartedly in initiatives if they perceive a high degree of instability in leadership. This can hinder knowledge sharing, technology transfer, and capacity building efforts essential for the long-term success of green agriculture programs.

By implementing these suggestions, China can work towards safeguarding long-term fiscal support for developing green agriculture, thereby ensuring its continued growth and contribution to sustainable agriculture and environmental conservation.

5. Conclusion

In conclusion, this paper has delved into the critical role that fiscal support plays in advancing the application of green technologies within the realm of sustainable agriculture in China. Through an exhaustive examination of various strategies and mechanisms, it has become abundantly clear that sustained financial backing is indispensable for the successful implementation and scalability of initiatives aimed at integrating green technologies into agricultural practices. The establishment of robust and enduring funding mechanisms emerges as a foundational pillar in fostering the long-term viability of green agriculture projects. Additionally, legislative measures are imperative to ensure fiscal stability and provide a conducive environment for investment in sustainable agricultural

practices. Furthermore, enhancing institutional capacity and engaging stakeholders in decision-making processes are vital for ensuring the effective utilization of fiscal resources and fostering a collaborative approach to sustainable agriculture development. The flexible application of subsidies, tax incentives, loan programs, and research funding is the key to effectively driving the development of sustainable agriculture through fiscal support. Lastly, continuous monitoring and evaluation of fiscal support and their impact on sustainable agriculture are crucial for identifying areas of improvement and refining strategies to achieve desired outcomes. By implementing the recommendations outlined in this paper, low targeting efficiency, unfair research funding allocation and lack of long-term stability can be solved and China can pave the way for a more resilient, environmentally conscious, and sustainable agricultural sector. In essence, fiscal support serves as the linchpin for unlocking the full potential of green technologies in sustainable agriculture, and its effective deployment is paramount for steering China towards a greener and more prosperous agricultural landscape that ensures both national food security and global environmental sustainability.

However, this paper is lack of establishing mathematical models to quantify the extent of fiscal support in sustainable agriculture. For future research, this paper presents a broader perspective and conducts a profound analysis of the current status of fiscal support in sustainable agricultural development. It reveals some shortcomings of the current fiscal support and puts forward feasible recommendations. It provides a foundation and platform for future quantitative modeling research. In the future, researchers can start with one of the shortcomings of fiscal support revealed in this paper, conduct quantitative research, and provide more precise recommendations.

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