RESEARCH ARTICLE

Agricultural Science and Technology Input-output Imbalance Constrains Development Problems and Results Transformation Countermeasures

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Abstract

This article focuses on the problem of imbalanced input-output in agricultural science and technology and analyzes its current situation, covering input, output, and imbalance manifestations. Elaborate on the constraining effects of this imbalance on rural economic development in three aspects: agricultural production, farmers' income, and rural social stability; Exploring the causes from multiple dimensions of input, output, and other factors. And targeted measures such as optimizing investment mechanisms, enhancing conversion capabilities, and reducing risks are proposed, aiming to provide reference for improving the input-output situation of agricultural science and technology and promoting rural economic development.

Keywords: agricultural technology, input output imbalance, rural economic development, transformation of scientific and technological achievements.

Academic Editor:
Jebbouri Abdelhamid

Submitted: 18 April 2025
Accepted: 27 April 2025
Published: 24 May 2025

Vol. 2, **No.** 2, 2025.
10.62762/JSSPA.2025.252426

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1 Introduction

Agriculture is one of the most vital industries in any economy, playing a fundamental role in ensuring food security and maintaining social stability [1]. In the context of rapid urbanization and industrialization, agriculture remains central to the socio-economic structure, influencing national development and rural livelihoods [12]. The importance of agricultural modernization has become increasingly evident, especially in the face of the growing global population and changing climate conditions [10]. As such, the efficient development and application of agricultural technology have become key drivers of agricultural productivity, enhancing the quality and quantity of outputs, and significantly improving the living standards of farmers [19]. In this regard, the application of advanced technologies in agriculture, ranging from new crop varieties to precision farming techniques, holds the potential to transform traditional agricultural practices and ensure sustainable development in rural areas [15].

However, despite these technological advancements, there exists a significant imbalance between the input and output of agricultural technology [18]. This imbalance has resulted in underutilization of scientific achievements and has limited the effectiveness of technological innovations in driving economic

Citation
Chen, R., & Lu, X. (2025). Agricultural Science and Technology Input-output Imbalance Constrains Development Problems and Results Transformation Countermeasures. *Journal of Social Systems and Policy Analysis*, 2(2), 55–64.

progress [11]. Although governments and enterprises have invested substantially in agricultural R&D, most investments fail to translate into practical, large-scale applications. In some cases, research outputs remain confined to laboratories, failing to meet the needs of farmers or to be commercially viable [14]. This gap between input and output significantly constrains the potential of agricultural technology to contribute to rural economic development and to elevate the standard of living for farmers. Moreover, inefficiencies in the allocation of resources and a lack of coordination between research, industry, and market demands have further exacerbated this imbalance.

Given the critical nature of this issue, it is essential to thoroughly analyze the current state of the imbalance in agricultural technology, examining both the causes and the effects on agricultural production, farmers' income, and rural social stability [17]. Understanding the root causes of the imbalance—ranging from insufficient funding, inefficient resource allocation, and gaps in technological knowledge dissemination to the disconnect between technological advancements and market demand—will provide the foundation for developing targeted solutions [5]. This paper explores these causes in detail and proposes practical measures to address the imbalance. By optimizing investment mechanisms, enhancing the capacity to convert scientific research into practical applications, and reducing risks related to both natural and market fluctuations, it is possible to significantly improve the effectiveness of agricultural technology. Ultimately, such efforts will support the broader goal of fostering sustainable rural development, improving agricultural productivity, and ensuring food security for future generations.

2 The Current Situation of Imbalanced Input-Output in Agricultural Technology

2.1 Capital Investment in Agricultural Technology

From the perspective of capital investment, although the government's emphasis on agricultural science and technology has been increasing year by year, and the financial allocations have also been continuously rising, compared with the actual needs of the development of agricultural science and technology, the funding gap remains substantial [13]. The research and development of agricultural science and technology features a long cycle, high risks, and slow returns, which results in a lack of enthusiasm for investment in the field of agricultural science and technology among social capital. Moreover, the credit support provided by financial institutions is relatively limited.

Limited funds are often scattered and allocated inefficiently [2]. In some regions and projects, there are phenomena of redundant construction and resource waste, failing to effectively create a capital aggregation effect. In order to bridge this funding gap, it is necessary to optimize the investment structure in agricultural science and technology and improve the efficiency of fund utilization. Apart from government allocations, it is crucial to attract more participation from social capital and financial institutions.Strengthening the cooperation among the government, enterprises, and social capital and establishing a diversified investment mechanism can more effectively support the development of agricultural science and technology and ensure the rational distribution of funds among different fields. Further strengthening the management and supervision of capital investment projects to reduce resource waste and ineffective investment is a necessary step to promote the sustainable development of agricultural science and technology.

2.2 Human Resource Investment in Agricultural Technology

Another major issue in the field of agricultural science and technology is the shortage of talents [16]. There is a shortage of professionals in agricultural science and technology research institutions and universities, especially a serious loss of high-end talents engaged in agricultural science and technology research [7]. Due to the arduous working environment and relatively low salary levels in agricultural science and technology, many outstanding scientific and technological talents tend to switch to other industries, which directly affects the vitality of agricultural technological innovation. In addition, the imperfection of the agricultural science and technology promotion system has also created a bottleneck in the allocation of human resources during the technology transformation process. The insufficient quantity and quality of grass roots agricultural science and technology promotion personnel have made it difficult for advanced agricultural technologies to be quickly popularized among the vast number of farmers.

In order to address the issue of talent shortage, the government and relevant enterprises should increase their investment in the cultivation of agricultural science and technology talents and encourage more outstanding talents to engage in agricultural science and technology research and promotion. By offering better salary packages, creating a more attractive working environment, and implementing talent introduction plans, more high-quality professionals can be attracted to enter the field of agricultural science and technology. At the same time, improving the capabilities of grass roots agricultural science and technology promotion personnel so that they can more effectively transform scientific research achievements into practical applications in agricultural production is crucial for enhancing the overall level of agricultural science and technology.

2.3 Current Situation of Agricultural Technology Output

Although China has achieved many important results in the field of agricultural science and technology in recent years. For example, new varieties such as super rice and genetically modified insect-resistant cotton have been successfully cultivated, and new technologies such as water-saving irrigation and precision agriculture have been promoted. However, overall, the conversion rate of agricultural scientific and technological achievements and the level of industrialization remain relatively low. Many agricultural scientific and technological achievements are still at the laboratory stage and have not been implemented on a large scale for industrial production and commercial applications. In terms of agricultural technology products, there are few types of high-quality, efficient, and safe agricultural products in the market, and most agricultural products have a low added value.

In addition, there are still many problems in the field of agricultural science and technology services. The level of agricultural informatization is relatively low, making it difficult for farmers to obtain timely and accurate market information. There is also a lack of a complete agricultural science and technology consultation and training service system. These issues have hindered the widespread application of agricultural scientific and technological achievements, resulting in farmers failing to promptly enjoy the benefits brought by the latest technologies.

2.4 Manifestation of Input-Output Imbalance

The imbalance between input and output in the field of agricultural science and technology is mainly reflected in the following aspects. Firstly, there is a mismatch between capital investment and technological output. A large amount of capital investment has failed to bring about corresponding high-quality scientific and technological achievements. Some scientific research projects have the problem of "emphasizing project approval while neglecting scientific research", resulting in a large quantity of scientific research achievements, but with relatively low quality. Secondly, there is a disconnection between scientific and technological achievements and market demands. Many scientific and technological achievements have not fully taken into account market demands and the actual needs of farmers, lacking market competitiveness, which makes it difficult for these achievements to be industrialized. Thirdly, there are also serious deficiencies in the promotion and application of agricultural technologies. Even if some scientific and technological achievements have high application value, due to the imperfect promotion system and the relatively low scientific and technological literacy of farmers, many scientific and technological achievements are difficult to be widely applied in production.

This imbalance between input and output not only wastes a large amount of resources but also severely restricts the development of agricultural technologies and the process of agricultural modernization. To address this issue, it is necessary to take effective measures to increase investment in agricultural science and technology, optimize the investment structure, and improve investment efficiency; strengthen the connection between agricultural technology research and development and market demands, improve the agricultural technology promotion system, and enhance the conversion rate of agricultural scientific and technological achievements and the level of industrialization, so as to achieve the sustainable development of agricultural science and technology.

3 Impact of Imbalanced Input-Output of Agricultural Technology on Rural Economic Development

3.1 Impact on agricultural production

The imbalance between agricultural technology input and output has profound effects on agricultural production. As highlighted in Table 1, production efficiency is significantly impacted due to insufficient technological investment, low levels of mechanization, and limited application of smart agricultural technologies. This results in stagnant output per unit area, which remains far below its potential despite technological advancements that could optimize yields. For example, while technological improvements could theoretically increase traditional

Table 1. Specific impacts on agricultural production.

Impact Dimension	Specific Manifestation	Data and Case Study
Production Efficiency	Due to insufficient technological investment, mechanization, and low levels of intelligence, the output per unit area remains stagnant.	Based on case studies from rural regions in China, it was observed that where technological investment in mechanization and automation was introduced, yields per hectare increased by approximately 20%, compared to regions with low investment where yields remained stagnant or showed minimal growth. In contrast, the theoretical yield could be increased to 1.2X after technological investment optimization, but the actual yield increase observed in some case studies is only 1.05X due to imbalances in technology adoption and regional factors.
Resource Utilization	Excessive use of fertilizers and pesticides, serious water resource waste, and increasing ecological environmental pressure.	Data from pilot projects in regions such as Jiangsu and Shandong indicate that the adoption of precision farming techniques led to a reduction of fertilizer use by up to 30%, significantly lowering environmental pressures. However, in areas with poor adoption of these technologies, reductions were limited to only 10%, underscoring the gap in resource optimization. These figures highlight the inefficiencies stemming from imbalances in technological input.
Risk Resistance Ability	Lack of advanced weather forecasting, pest prevention and control technology, and high crop disaster loss rate.	In regions like Xinjiang and Henan, where integrated pest management (IPM) and advanced weather forecasting systems were deployed, disaster loss rates reduced by up to 15%. In contrast, areas with limited access to these technologies saw loss rates as high as 30%. This demonstrates how technological investment can enhance risk resilience, yet regions with low technological input continue to experience high vulnerability to climatic and pest-related disasters.

farmland yields by 20% (1.2X), the actual yield only increases by 5% (1.05X) due to the imbalance in investment.

The imbalance in technology input also severely affects resource utilization [4]. Without adequate technological support, there is excessive use of fertilizers and pesticides, and serious water wastage occurs, putting additional pressure on the rural ecosystem. The agricultural sector faces escalating environmental costs, which undermines its sustainability. Additionally, risk resistance ability remains weak in the face of natural disasters. The absence of effective forecasting and pest control technologies leads to high disaster losses, which could otherwise be mitigated with appropriate technological applications.

These inefficiencies not only result in higher costs but also contribute to the degradation of the rural ecological environment, creating a vicious cycle. Farmers are increasingly vulnerable to market fluctuations and natural disasters, further diminishing their income stability and the attractiveness of agricultural production as a livelihood.

3.2 Impact on farmers' income

The imbalance between input and output significantly impacts farmers' income growth. As shown in Table 2, low agricultural product value-added and weak market competitiveness prevent farmers from benefiting from the full potential of modern agricultural technologies. While technological investment could theoretically increase agricultural product value-added by 40%, the increase is limited to just 15% in regions experiencing imbalance.

In addition, income structure remains narrowly focused on agricultural product sales, leaving farmers vulnerable to external shocks such as price fluctuations or adverse weather events. Although technological investment could facilitate the growth of rural e-commerce, tourism, and other income-generating channels, these alternative sources of income are hindered in regions where investment is imbalanced.

Furthermore, the income gap between rural areas has widened. Regions with insufficient technological resources experience slower income growth compared to those with better access to agricultural technology. This disparity contributes to growing economic inequality within rural communities, trapping some regions in a poverty cycle, where technological

Table 2. Impact on Farmers' Income.

Impact Dimension	Specific Manifestation	Data and Case Study
Income Growth	Low agricultural product value-added, weak market competitiveness, and slow growth in farmers' income	In a study of farmers in Hebei and Sichuan provinces, technological investment was found to increase the value-added of agricultural products by approximately 15% in regions with imbalanced technological input, as opposed to the 40% potential increase in regions with balanced investment. The slower income growth in imbalanced areas is attributed to the lower adoption of modern farming technologies such as precision agriculture, which limits value-added opportunities.
Income Structure	Relying solely on agricultural product sales and lacking diverse sources of income	Case studies from Shandong and Guangdong show that technological investment has played a key role in diversifying income sources for farmers. For example, rural e-commerce and tourism have provided new avenues for income in areas with better technological infrastructure. However, in imbalanced regions, where technological investment is low, the development of these alternative channels has been slow, with rural e-commerce growth rates lagging behind by nearly 20% compared to more technologically advanced areas.
Income Gap	Uneven distribution of technological resources, exacerbating the income gap within rural areas	Data from Jiangxi and Henan show that regions with balanced technological investment saw an 8% annual growth rate in farmers' income, while regions with imbalanced technology distribution experienced only 3% growth. The disparities are linked to differences in access to advanced technologies, which has caused income inequalities between rural areas that have different levels of technological development. This gap is particularly pronounced between larger commercial farms and smallholder farms.

underinvestment further limits opportunities for self-development.

3.3 Impact on rural social stability

The imbalance in agricultural technology input and output also has far-reaching implications for rural social stability. As illustrated in Table 3, low agricultural incomes have resulted in the massive outflow of rural labor, contributing to the phenomenon of rural hollowing. This has weakened the social fabric of rural communities, leading to a decline in community service functions and an increase in social conflicts.

In addition to population mobility, the income gap has contributed to increasing social contradictions, as unequal investment in rural infrastructure exacerbates the widening divide between rich and poor regions. This inequality is further compounded by lagging infrastructure development, leading to frustration and dissatisfaction among rural populations.

Culturally, the lack of sufficient technological investment has weakened community cohesion and led to a decline in traditional agricultural practices and cultural activities. This erosion of cultural heritage threatens rural identity and stability, making rural areas particularly vulnerable to external socio-economic pressures.

4 The Causes of Imbalance between Input and Output of Agricultural Science and Technology

4.1 Investment-Related Causes

The input-output imbalance stems from three investment-related factors: insufficient grassroots funding, talent shortages, and fragmented policies [6, 8]. For an extended period, agricultural technology funds have been predominantly allocated to large-scale scientific research projects and infrastructure construction. However, investment in grass roots agricultural technology promotion systems and the cultivation of agricultural technology talent has been insufficient. While large-scale scientific research projects have the potential to generate significant findings, these results are often difficult to translate into real-world productivity due to the long development timelines and the lack of a clear implementation framework. This inefficiency in transforming research into practical applications leads to the underutilization of valuable technological resources.

Table 3. Impact on Rural Social Stability.

Impact Dimension	Specific Manifestation	Data and Case Study
Population Mobility	Low agricultural income, massive rural labor outflow, and rural hollowing (desolation) intensify.	In Guangxi and Henan, regions with insufficient technological investment saw up to 20% population outflow in the last decade. However, regions with balanced technological investments, particularly in precision agriculture and agribusiness, experienced a significant reduction in outflow rates, with some areas maintaining population stability or even attracting labor back to rural areas. The disparities in migration patterns reflect the impact of agricultural modernization on rural population dynamics.
Social Contradictions	Income gap widening, infrastructure lagging behind, and social dissatisfaction triggered	Shandong and Jiangsu experienced widening income gaps due to uneven technological investments. In these areas, the imbalance in technology adoption resulted in underinvestment in rural infrastructure. For example, while some areas saw improvements in roads and digital infrastructure, others faced stagnation, increasing social tensions and dissatisfaction. The frequency of social conflicts in imbalanced regions rose by approximately 15%, according to local government reports.
Cultural Inheritance	Traditional agricultural culture impacted, rural community cohesion weakened	Zhejiang and Sichuan provide examples of rural areas where technological investment not only improved agricultural productivity but also helped preserve local cultural practices. In contrast, regions with minimal technological adoption, such as parts of Inner Mongolia, saw a decline in traditional agricultural festivals and community activities. This decline in rural cultural activities and a weakening of community cohesion was linked to increased migration and the erosion of rural traditions, which had previously played a central role in maintaining social fabric.

A crucial element in bridging the gap between research and practical application is the weakness of the grass roots agricultural technology promotion system. This weakness hampers the widespread dissemination of advanced agricultural technologies to farmers, limiting their adoption and application in agricultural practices. Additionally, the shortage of skilled agricultural technology professionals further stifles innovation. These professionals are essential for translating theoretical research into practice, but without a supportive environment, their potential is not fully realized.

Moreover, the lack of diversification in agricultural technology funding mechanisms contributes to the fragility of the sector. The sector is overly dependent on government financial appropriations, making it vulnerable to shifts in policy and financial constraints. This lack of alternative funding sources hinders the long-term sustainability and advancement of agricultural technology development. Therefore, there is an urgent need to establish a more diversified funding system, incorporating both public and private investment, to ensure that the sector can thrive even in the face of financial pressures.

4.2 Output-Related Causes

Another key factor contributing to the imbalance between input and output in agricultural technology is the disconnect between scientific research achievements and the actual needs of agricultural production. While many research projects focus on advancing theoretical knowledge, they often overlook the practical applicability and operability of these innovations in real-world agricultural contexts. As a result, many scientific achievements remain confined to academic environments and fail to translate into actual productivity improvements. This disconnect makes it challenging to integrate new technologies into existing agricultural practices and to see measurable improvements in productivity.

Furthermore, the promotion system for agricultural scientific and technological achievements is insufficient. The lack of effective technology transfer mechanisms and service platforms means that agricultural innovations do not reach farmers in a timely and accessible manner. Even when technology is available, its implementation is delayed or complicated by the absence of well-established networks for dissemination. This inefficient system leads to slow adoption rates and limits the practical impact of innovations on the agricultural sector.

The evaluation system for agricultural technology output also exacerbates the imbalance. Existing evaluation metrics tend to emphasize the quantity and technical complexity of research outputs rather than their practical applications or economic benefits. This focus on short-term academic achievements discourages researchers from considering the long-term implications of their work and its potential to foster sustainable agricultural practices. Furthermore, the lack of clear intellectual property protection mechanisms for agricultural technologies reduces the incentives for innovation. Without robust protections, researchers are less motivated to pursue groundbreaking work, as the ownership of their intellectual contributions remains uncertain. These factors undermine the efficiency and effectiveness of agricultural technology output, contributing to the persistent gap between research and practice.

4.3 Other Contributing Factors

In addition to investment and output-related causes, several external factors influence the imbalance between agricultural technology input and output. One of the most significant factors is the policy environment. Agricultural science and technology policies often lack systematic coordination, which hinders the effective allocation of resources. Policies are frequently fragmented and disconnected, leading to inefficiencies in resource distribution and complicating efforts to foster technological advancements. There is also a need for stronger policy alignment between local and national levels to create a cohesive and supportive framework for agricultural technology development.

The market mechanism for agricultural technologies is another area in need of improvement. The agricultural technology market remains underdeveloped, and there is a lack of effective technology trading platforms and market intermediaries. These market inefficiencies prevent agricultural technology achievements from being fully realized in the market, limiting their commercial potential and hindering broader adoption. Establishing more robust market mechanisms would enable agricultural technologies to reach a wider audience, enhancing their economic impact and helping them reach their full potential.

Finally, social and cultural factors play a significant role in the imbalance between agricultural technology input and output. Farmers' limited awareness and acceptance of new agricultural technologies significantly hinder their widespread adoption. Deeply ingrained traditional agricultural practices create resistance to technological innovation, making it difficult for new technologies and crop varieties to be embraced. This resistance, combined with insufficient training and outreach programs, further exacerbates the technological divide between advanced research and practical application in rural areas. Addressing these social and cultural barriers is essential to bridging the gap between agricultural technology input and output, ensuring that innovations can be adopted and effectively utilized by farmers.

5 Countermeasures for the Transformation of Agricultural Scientific and Technological Achievements

5.1 Optimize the mechanism for agricultural technology investment

Currently, China's agricultural technology investment predominantly relies on government financial appropriations, with relatively low participation from social capital. To achieve more balanced and sustainable growth, it is critical to actively build a diversified investment system. This system should be primarily driven by enterprise investment, with extensive participation from social capital, while government investment serves as a guiding force.

The government can play a pivotal role in encouraging enterprises and social capital to increase their investments in agricultural technology by establishing special funds for agricultural science and technology, providing financial subsidies, and offering tax incentives. For example, the government could create an Agricultural Technology Achievement Transformation Fund that supports agricultural technology projects with high market potential. Furthermore, a portion of the tax incentives could be provided to social capital investing in agricultural technology enterprises, motivating further investments.

To enhance the overall effectiveness of agricultural technology investment, attention should be given to optimizing the investment structure. A portion of agricultural funds should be directed towards basic agricultural research and applied basic research to provide solid theoretical foundations for technological innovation. Additionally, a larger focus should be placed on the transformation and promotion of scientific and technological achievements, improving their efficiency and practical application in agricultural production. For example, allocating a percentage of agricultural technology funds to build agricultural

Table 4. Proportion of each investment subject.

Investment Entity	Current Proportion	Optimization Target	Specific Measures
Government	60%	40%	1. Establish special funds for agricultural technology innovation and transformation. 2. Provide financial subsidies and tax incentives to stimulate private sector investment in agriculture. 3. Implement government-led public-private partnerships (PPPs) to encourage collaborative projects between public agencies and enterprises.
Enterprises	30%	45%	1. Guide enterprises to increase their R&D investment in agricultural technologies by offering tax credits and other financial incentives. 2.Establish industry-university-research cooperation mechanisms to foster innovation and technology transfer. 3. Encourage agricultural technology startups and SMEs through access to funding and advisory services, particularly in emerging technology areas like AI and IoT in agriculture.
Social Capital	10%	15%	1. Attract venture capital for agricultural technology projects by providing clear pathways for investment returns and exit strategies. 2. Promote agricultural technology crowdfunding platforms to engage small investors and communities in the funding process. 3. Introduce government-backed venture capital programs to lower the risk for investors, encouraging more social capital participation in agricultural innovations.

technology demonstration bases, provide training programs, and offer promotion services can facilitate the widespread adoption of agricultural innovations [3, 8].

To ensure the effective use of investment funds, it is necessary to strengthen management and supervision. A robust evaluation system should be put in place, monitoring the feasibility, implementation progress, and effectiveness of investment projects. This will ensure the rationality and efficiency of fund utilization and the successful transformation of investments into real-world agricultural advancements.

As illustrated in the Table 4, the government currently dominates agricultural technology investment, but the participation of enterprises and social capital remains limited. By optimizing the investment mechanism, reducing government's share, and increasing the proportion of enterprise and social capital investments, a more diversified and sustainable investment system can be established, which will foster long-term growth in agricultural technology.

5.2 Enhance the ability to transform agricultural scientific and technological achievements

Research institutions and universities play a critical role in developing agricultural scientific and technological achievements, but to maximize the impact of these innovations, it is crucial to integrate scientific research with agricultural production practices. This will improve the relevance and practical applicability of these achievements. Researchers should be encouraged to engage directly with the frontline of agricultural production, understanding the actual needs of farmers, and conducting targeted R&D that addresses real-world challenges.

One actionable strategy to promote this integration is to reform the scientific research evaluation system, incorporating the transformation and application of scientific and technological achievements as primary performance indicators. By doing so, researchers will be incentivized to prioritize practical implementation alongside theoretical advancements.

Additionally, establishing cooperative mechanisms between researchers and agricultural enterprises can further expedite the transformation process. Researchers should be encouraged to participate in the production and operational activities of agricultural enterprises through technology investments, part-time collaborations, or consulting roles, which will accelerate the process of turning scientific research into practical, market-ready solutions.

The creation and improvement of transformation platforms are also essential. These platforms can serve as key channels for the integration of agricultural technology into the production process. Physical platforms, such as agricultural science and technology parks and demonstration bases, should be expanded to provide spaces for showcasing and promoting technological innovations. Meanwhile, virtual platforms, like agricultural technology trading and information service platforms, can be developed to promote the exchange of knowledge and facilitate the match between technology supply and demand. For instance, a national agricultural technology achievement trading platform can be established to integrate various technology resources and provide convenient trading services for research institutions, enterprises, and farmers.

Furthermore, transforming agricultural technological achievements requires composite talents—individuals with expertise in both technology and market dynamics. Training programs designed to enhance the market awareness and transformation capabilities of agricultural technology personnel are crucial. Policies to attract college graduates and scientific talents to participate in the transformation of agricultural achievements should be formulated. A specialized training program for agricultural transformation talents can be launched, selecting exceptional talents to study and collaborate with renowned institutions both domestically and internationally. This will help cultivate a pool of highly skilled professionals with global perspectives and innovative capabilities [9].

5.3 Reduce Natural Environment and Market Risks

Agricultural production is highly dependent on natural environmental conditions, making it essential to strengthen agricultural infrastructure to improve resilience to natural disasters. Investment in irrigation systems, meteorological monitoring, and drought management infrastructure is critical for enhancing agricultural production conditions. Additionally, agricultural insurance schemes should be promoted to reduce the financial impact of natural disasters on farmers. Expanding insurance coverage, raising compensation standards, and increasing farmer participation in these programs will provide a safety net and help mitigate financial losses due to adverse weather events.

Market fluctuations pose another significant risk to the transformation of agricultural technologies. To mitigate market risks, governments should establish real-time agricultural market monitoring systems and issue early warnings for price fluctuations. Timely release of market supply and demand information will enable farmers to make more informed production decisions. Furthermore, the development of new agricultural business entities, such as agricultural product processing enterprises and farmer cooperatives, should be promoted to enhance agricultural industrialization and market competitiveness. For example, establishing a market price index system for agricultural products would help farmers access accurate pricing information and avoid market risks.

6 Conclusion

The imbalance between agricultural technology input and output remains a significant challenge in the field of agricultural development, with far-reaching consequences for rural economic growth. This paper has analysed the current situation of input-output imbalances, their impact on agricultural production, farmers' income, and rural social stability, and identified the underlying causes of these imbalances. Through targeted solutions such as optimizing agricultural technology investment mechanisms, enhancing the ability to transform scientific achievements into practical applications, and reducing both natural and market risks, it is possible to address these imbalances effectively. Ultimately, these measures will contribute to the sustainable development of agricultural technology, enhance rural economic development, and support the modernization of agriculture.

Data Availability Statement

Data will be made available on request.

Funding

This work was supported by the Zhong Kai College of Agricultural Engineering Graduate Student Science and Technology Innovation Fund under Grant KJCX2024031 and General Program of the National Social Science Foundation under Grant 21BSH104. The funding institutions had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

Ethical Approval and Consent to Participate

Not applicable.

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