Research on World Agricultural Economy
https://journals.nasspublishing.com/index.php/rwae

ARTICLE

Evaluating China's Agricultural Investment in ASEAN: Location, Trends, and Economic Impactn

Ye Xue [1*] , ***Mohd Sobri Don*** [1] , ***A. S. A. Ferdous Alam*** [2]

[1] *School of International Studies, Universiti Utara Malaysia, Sintok, Kedah 06010, Malaysian*
[2] *School of Business Management, Universiti Utara Malaysia, Sintok, Kedah 06010, Malaysia*

ABSTRACT

This study investigates the spatial distribution, temporal trends, and economic effects of China's agricultural investments in ASEAN countries using a combined approach of panel-data regression and case-study analysis. Drawing on investment and output data from 2010 to 2020 across six major recipient countries, we first estimate a fixed-effects model to quantify the impact of Chinese capital flows on local agricultural output while controlling for GDP, labor inputs, and technology spending. The regression results indicate that each additional $1 million in Chinese investment is associated with an average increase of $2.35 million in recipient-country agricultural output ($p < 0.01$). However, investment remains heavily concentrated in Vietnam, Cambodia, and Laos, whereas larger markets such as Indonesia, the Philippines, and Malaysia receive comparatively little funding despite offering high marginal returns. To illustrate practical mechanisms, we present two case studies: the China–Cambodia Modern Agriculture Industrial Park, which integrates production, processing, and technology transfer, and a China–Philippines rice-

*CORRESPONDING AUTHOR:
Ye Xue, School of International Studies, Universiti Utara Malaysia, Sintok, Kedah 06010, Malaysia; Email: yxbba8989@163.com

ARTICLE INFO
Received: 9 April 2025 | Revised: 4 June 2025 | Accepted: 6 June 2025 | Published Online: 15 August 2025
DOI: https://doi.org/10.36956/rwae.v6i3.1970

CITATION
Xue, Y., Don, M.S., Ferdous Alam, A.S.A., 2025. Evaluating China's Agricultural Investment in ASEAN: Location, Trends, and Economic Impact. Research on World Agricultural Economy. 6(3): 973–998. https://doi.org/10.36956/rwae.v6i3.1970

farming project focused on resource extraction. The former yields substantially greater income gains for localfarmers and accelerates technology diffusion. Based on these findings, we recommend a strategic pivot toward geographically diversified investments, emphasizing under-invested but high-potential markets; enhanced value-chain integration to raise product value; increased spending on agricultural technology—whose coefficient of 4.20 suggests strong productivity gains from each $1 million invested—and strengthened infrastructure and green-agriculture initiatives. These targeted policies aim to balance economic efficiency with long-term sustainability across the ASEAN region.

Keywords: China-ASEAN; Agricultural Investment; Location Choice; Investment Trends; Economic Impact

1. Introduction

China–ASEAN agricultural investment has expanded rapidly over the past decade. According to Li et al. (2022), the scale of China's agricultural direct investment in ASEAN countries increased from USD 210 million in 2012 to USD 1.57 billion in 2021, representing an average annual growth rate of 23%[1]. However, this investment is unevenly distributed: Vietnam, Thailand, and Indonesia together accounted for over 70 percent of total inflows, while Cambodia and Myanmar each received less than 5 percent. Such geographic concentration poses challenges for regional agricultural integration and equitable development. Although prior research has examined the macroeconomic impacts of China–ASEAN agricultural investment and its role in technology transfer for crop production, systematic empirical studies remain scarce[2]. Most existing work focuses on individual host countries or specific investment modalities, lacking a comprehensive cross-country comparison and overall effect assessment. This study addresses these gaps by combining panel data regression with in-depth case analyses. First, using panel data on China's agricultural investment across the ten ASEAN member states from 2009 to 2022, we estimate how factors such as geographic distance, infrastructure quality, and institutional environment influence investment location choices. Second, we conduct detailed case studies of representative projects in Vietnam and Thailand to elucidate the micro-level mechanisms behind our regression results. Third, based on our empirical findings, we propose targeted policy recommendations to support sustainable and balanced agricultural development within the ASEAN region.

2. Literature Review

2.1. Research Progress on International Agricultural Investment and Location Choice

Weber's industrial location theory is the ideational root of the location choice theory, positing the idea of the optimal investment site as the one with the least cost. As a consequence, the theory of location choice became the field of agricultural investment, with scientists studying the main factors in investment decision-making such as natural resource endowment, labor costs, land use rights, market potential, infrastructure levels, and policy environments. Dealing with the issue of location choice, Dunning (1998) in his eclectic paradigm differentiated the location choice process into three dimensions, which are ownership advantage, location advantage, and internalization advantage, suitable for the explanation of cross-border investment decisions of agricultural enterprises[3]. McGregor (1960) also indicated multinational corporations to follow the OLI (Ownership, Location, and Internalization) advantages model[4].

International agricultural investment has long attracted scholarly attention for its role in global value-chain integration and technology diffusion. Early studies by Buckley et al. (2007) and Ma & Lee (2011) emphasized the strategic motivations and host-country determinants of agribusiness FDI. More recent work has extended this foundation: Hossain and Huang (2022) employ gravity-model estimation to show that infrastructure connectivity and trade agreements significantly boost cross-border farm investment,[5]while Chandio et al. (2022) use firm-level data to demonstrate that multinational agribusinesses increasingly prioritize environ-

mental and social governance criteria when selecting host countries. These 2020-era contributions highlight the growing importance of sustainable practices and institutional quality in shaping global agricultural investment flows [6].

2.2. Overview of Research on China's Foreign Agricultural Investment

Within the China–ASEAN context, Li et al. (2022) document that China's agricultural FDI into ASEAN grew at an average annual rate of 23% between 2012 and 2021, driven primarily by tariff reductions under ASEAN–China free trade agreements. Tian and Yin (2022) further examine the role of regulatory harmonization, finding that streamlined phytosanitary standards in Vietnam and Thailand have significantly lowered entry barriers for Chinese agritech firms [7]. From an environmental sustainability perspective, Han et al. (2022) analyze Chinese investment projects in Indonesia's palm-oil sector and reveal that adoption of green certification schemes markedly improves both yield and local ecological outcomes. Together, these recent studies provide a richer, more nuanced understanding of the institutional, infrastructural, and sustainability factors influencing China–ASEAN agricultural investment patterns [8].

2.3. Related Research on the Economic Effects of Agricultural Investment

The investigation of the economic influence of agricultural investment has been one of the main research points for quite some time, with the focus of the research being the question of how investment affects the economic structure of the host country, especially the rise of the industry and the improvement of social benefits. Kugler (2006) suggested that the investments of agricultural activities can have the potential to substantially improve the economic performance of the region by linking the industrial chain and circulating the technology [9]. According to Hallam (2009), cross-border agricultural investments may enhance infrastructure in host countries and also support the localization of agricultural technology.

However, some scholars have also suggested that agricultural investments may yield negative effects. Li (2011) noted that without proper regulation, agricultural investment might lead to environmental degradation, overuse of land resources, and an escalation of social conflicts. Cotula (2012) further emphasized that competition for land resources might exacerbate income inequality and reduce the quality of life in local communities [10]. These studies indicate that the economic effects of agricultural investment are complex and varied, influenced by factors such as investment models, host country regulatory environments, and corporate social responsibility. Despite these findings, there is currently a relative lack of empirical research on the specific economic effects of China's agricultural investment in the ASEAN region, underscoring the need for further in-depth quantitative analysis.

2.4. Literature Review and Research Entry Point

The current literature is quite well-rounded in the sense that it explores the various theories of location selection and the economic ramifications of agrarian investment; however, it is evident from the literature that there is still some underdevelopment, especially in the context of China's involvement in the ASEAN region. Despite the research carried out on the location of as well as the different aspects of the investment environments among the various regions, scant empirical research has been done on the location choice in ASEAN agricultural investments. Similarly, investigations into the economic consequences of China's agricultural investments in ASEAN have mostly been limited to qualitative descriptive exploration; hence, there is no rigorous econometric rationale supporting the results achieved from the investigation [11]. Based on these research gaps, the innovative contribution of this study is to focus explicitly on the regional distribution and changing investment trends of China's agricultural investments in ASEAN. By employing econometric methods, this research quantitatively analyzes the specific impacts of agricultural investments on regional economic growth, industrial structure optimization, and social benefits in ASEAN, thereby providing more precise and valuable findings and policy rec-

ommendations for both the academic community and decision-makers.

3. Core Concepts and Theoretical Foundations

3.1. Theory of Agricultural Investment Location Choice

The concept of location preference in agricultural investment deals with the major drivers and criteria that agriculture enterprises or investors factor in while deciding on the suitable regions for their investments. Over the years, scholars, from the classical location theory to the recent investment decision models, have underlined the fact that factors such as regional resource endowments, market demand, policy environment, and supporting industrial infrastructure play significant roles in driving the decision-making process towards agricultural investment. In other words, these factors are essential when it comes to location choice in agriculture [12].

As shown in **Figure 1**, agricultural investment drives sustainable regional agricultural economic growth through the important channel of farmland transfer. Theoretically, the location choice of agricultural investment is driven primarily by several factors: firstly, promoting the effective dissemination of technology by introducing or improving advanced agricultural techniques through investment to enhance production efficiency; secondly, increasing economies of scale by concentrating land operations and scaling up cultivation to reduce unit production costs; and thirdly, optimizing the technological structure of agriculture to achieve effective resource allocation and high utilization. These factors work together to increase the total factor productivity (TFP) of agricultural production, which in turn directly or indirectly promotes the growth of the regional agricultural economy. At the same time, the location choice in agricultural investment also focuses on the enhancement of farmers' income and the professionalization of agricultural operations. By acquiring farmland, investors can assist local farmers in specialized production, which will result in more efficient and profitable operations. Hence, the increase in income and a more professional operation move forward towards the sustainable growth of the local agricultural economy. In summary, the theory of agricultural investment location choice clearly indicates that investors tend to choose regions with abundant natural resources, well-developed infrastructure, a stable policy environment, and conditions conducive to improving production efficiency and promoting industrial upgrading [13]. In light of the actual situation of China's agricultural investments in ASEAN, this theoretical framework helps explain and analyze the underlying economic logic behind Chinese enterprises choosing specific regions in ASEAN for agricultural investments.

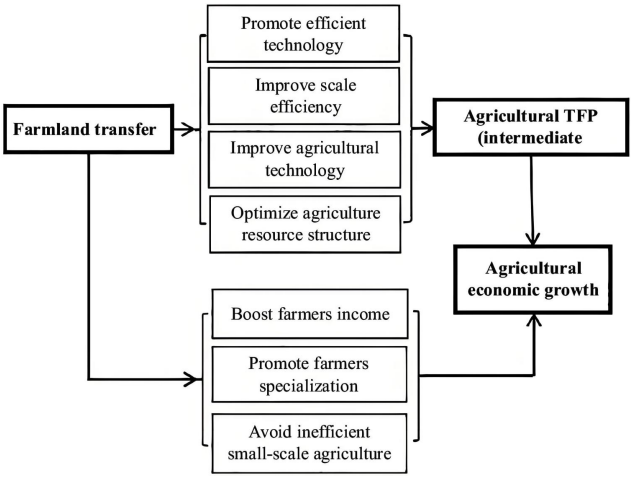

Figure 1. Analytical Framework of the Mechanism Linking Agricultural Investment and Economic Growth.

3.2. Resource Endowment Theory and Investment Decision-Making

Resource endowment theory posits that the natural resources, labor, capital, technology, and other endowments of a region directly influence its industrial structure, technological innovation trajectory, and mode of economic development. As illustrated in **Figure 2**, natural resource endowments can affect technological innovation and economic growth through three mechanisms: "crowding out," "promotion," and "hindrance."

When there is a huge amount of natural resources a place can potentially grow as a "crowded out effect" points that overdependence in a resource-based industry is the likely result which will in turn cause other non-resource sectors to be suppressed. The abundant natural resource endowments to some extent may affect the

complementary technologies in closely related resource-based industries, thus causing technological progress in those sectors. Nevertheless, natural resource endowments are an obstacle to non-resource-based industries in the development of technologies, as well as in the adoption of technologies [14].

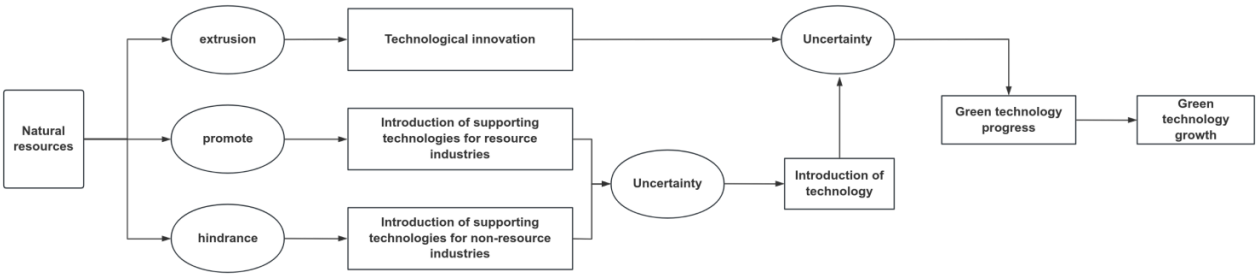

Figure 2. Mechanism of the Impact of Natural Resource Endowment on Technological Innovation and Green Economic Growth.

Furthermore, **Figure 2** indicates that the impact of resource endowments on technology adoption and green technological progress follows an uncertain path. On one hand, resource endowments may directly promote green technological advancement through technological innovation, thereby achieving green economic growth; on the other hand, the effect of natural resource endowment on technology adoption is uncertain and depends on whether resource-based regions can effectively balance the coordinated development of resource and non-resource industries to avoid technological lock-in effects. Resource endowment theory is recognized as a theory of the firm within the context of agricultural investment decisions, in that it assumes that firms in the agricultural industry are inclined to choose areas that have strong agricultural resource endowments, enabling favorable policies and technologies to be innovative. For the Chinese companies operating and decisions are followed by investment in the agricultural sector in the ASEAN countries, the difference in natural resource distribution across the ASEAN region is a very important factor to consider as the technology they will use and the location of investment will be based on this [15]. Realizing the actual function of resource endowments in the supply chain of green technologies, by which investors are supposed to plan their investments more efficiently, we get an estimation of the result that production systems will be environmentally sustainable and that the regional government will coordinate the establishment of a green economy by linking up with stakeholders.

3.3. Investment Environment Theory and Industrial Layout

Simon Kuznets proposed the Investment Environment theory, underlining the strong implications that regional macroeconomic policies, government regulations, and industry-wise expansion plans have on investment. The Investment Environment theory is clear on the aspect that a positive investment environment creates the conditions of unused capacity, technological transfer, and new jobs that exist outside the original areas. A better investment environment not only mediates the inflow of external capital but also assists in productivity gains through, say, industrial refactoring.

As shown in **Figure 3**, there exists a complex nonlinear interaction between industrial development, economic environment, and technological investment. The economic environment and technological investment conditions together form an essential part of the regional investment climate, jointly influencing the directional choices and layout of industrial development. Specifically, a favorable economic environment—by providing stable market demand, robust infrastructure, and supportive policies—enhances the level of technological investment, thereby stimulating industrial development potential. Correspondingly, the development of industry feeds back into the economic environment; industrial agglomeration and upgrading can further improve the regional economic conditions, forming a positive feedback loop.

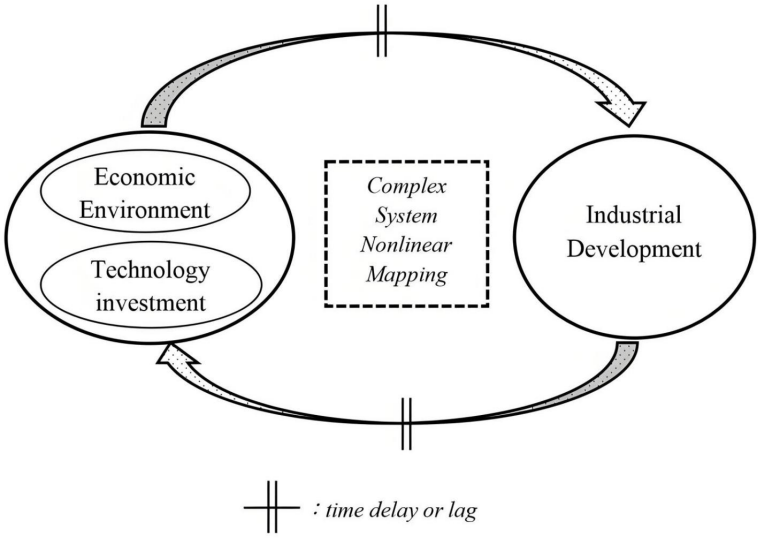

Figure 3. Interactive Mechanism Model between Investment Environment and Industrial Development.

Yet, the investment environment that interacts with industrial development does not exhibit a simple linear relationship, but rather a complicated network of non-linear mappings. This intricacy is realized through the time-lag effects of the investment environment on industrial development; changes in the economic environment and money spent on technology are not immediately followed by actual growth of the industry, and the feedback from industrial development to the economic environment and technological investment will also have some latencies at the very thin gruel of the process.

In the context of China's agricultural investment layout in ASEAN, investment environment theory suggests that when choosing specific regions for agricultural investment, Chinese enterprises not only consider local agricultural resource endowments but also place high importance on regional economic conditions and the base for technological investment. For example, factors such as the level of infrastructure construction, policy stability, market demand size, and technological innovation capabilities collectively determine the specific regional layout and investment model of Chinese agricultural investments in ASEAN countries. Therefore, a deep understanding of the importance of the investment environment in industrial layout decisions is crucial for guiding Chinese agricultural enterprises to invest more scientifically in ASEAN, thereby optimizing the configuration of the industrial chain.

3.4. Theory of the Economic Effects of Agricultural Investment

The primary focus of agricultural investment on the economy is to ascertain the ways and means through which agriculture will influence the regional economies, change the structure of industrial establishments, and help to improve the social well-being of a nation by creating more jobs and business opportunities. As indicated in **Figure 4**, the effects of agricultural investment on the economy comprise the link of two concepts; endogenous and exogenous factors, which result in both the direct and indirect effects on agricultural fiscal expenditure and total agricultural output with the implications for both regional economic growth and the attainment of social goals such as poverty alleviation.

On the exogenous side, policy measures such as targeted poverty alleviation, rural infrastructure investment, loans and interest subsidies, and paired assistance cooperations collectively promote an increase in agricultural fiscal expenditure and improvements in agricultural productivity. These measures not only provide financial support but also enhance the production and living conditions in rural areas, thereby stimulating the potential for agricultural production. Endogenous factors, such as the degree of market openness in agriculture, the development level of agricultural industries, advancements in agricultural technology, and the diversification of family farming operations, influence the supply and use of food. They

jointly accelerate the policies' impact, thus catalyzing the developmental progress of agriculture, producing an autonomous and innovative agriculture, hence leading to different agricultural activities, and generating the desired results of sustainable growth in the regional economy. Thus, the promotion of policy that integrates these features will not only guarantee domestic food self-sufficiency but also fundamentally launch worldwide agricultural markets that strengthen local livelihoods and facilitate sustainable rural development [16].

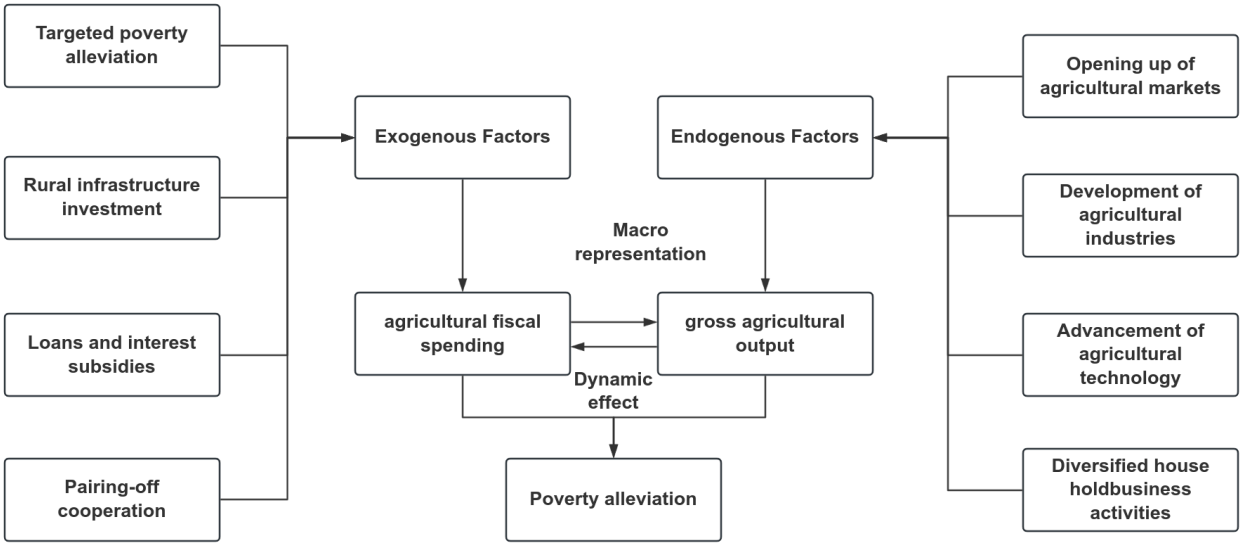

Figure 4. Framework of the Mechanism of Economic Effects of Agricultural Investment.

There is a mutually reinforcing dynamic between agricultural fiscal expenditure and total agricultural output, forming a cycle that ultimately achieves poverty reduction goals. Specifically, agricultural fiscal expenditure, through financial inputs and policy support, directly boosts agricultural production efficiency and promotes an increase in total agricultural output. The growth in total agricultural output then provides an economic foundation and practical demand for further fiscal investment, forming a virtuous cycle that continuously drives regional economic development and effectively alleviates poverty.

The main practices of China's agriculture investment policies in ASEAN are: In the case of the economic theory of the effects of agriculture investment, it is emphasized that not only short-term economic gains but also long-term economic structural adjustments, technological progress, and social benefits should be taken into account. This, in turn, makes it essential for the government to have a broad grasp of the many different ways in which rural areas are affected by this type of investment and to devise policies that will be supportive of sustainable investment in rural areas.

4. Analysis of the Current Situation of China's Agricultural Investment in ASEAN

4.1. Investment Scale and Overall Trend

Lately, the economic and trade partnership of China and the Southeast Asian countries has been on an upward spiral, and China has steadily become one of the leading trade partners of ASEAN. According to **Figure 5**, the overall trade volume between China and the Association of Southeast Asian Nations (ASEAN) was largely higher from 2009 to 2022, particularly since the official launching of the ACFTA in 2010, the trade size was seen a continuous upward direction, and it further jumped after the RCEP agreement was sealed in 2020. In 2022, aside from the numberless exports and imports trading between them, the total trade volume between China

and ASEAN has topped $700 billion, and the trade surplus is generally stable [17].

China's investment in the agricultural industry of Southeast Asian countries has expanded rapidly over the past few years and the fields of grain cultivation, agro-processing, and agricultural technology services are the main areas of investment. Rising investment is intrinsically tied to the ever-increasing bilateral trade, serving as evidence that the collaboration in the agricultural sector has become one of the integral components of the China-ASEAN economic relationship. With the participation of "Belt and Road" and RCEP, Chinese agricultural companies have stepped up their presence in the ASEAN market, thus, increasing investment volume. However, despite the general increase, China's investment in agriculture is not evenly distributed throughout the ASEAN countries. Most of the money is concentrated in mainland Southeast Asia like Vietnam, Laos, Cambodia, and Thailand, while agricultural investment in the islands, such as in Indonesia, the Philippines, and Malaysia, is still relatively low. This uneven distribution is, partly, a manifestation of the variations in resource endowments, investment environments, and the current development level of the agricultural industry in countries in the region. Thus, a comprehensive analysis of the size, regional layout, and industrial structure characteristics of China in investment in ASEAN is needed so as to gain a clear and accurate picture of the current situation and to find a proper way for better and more coordinated regional economic development.

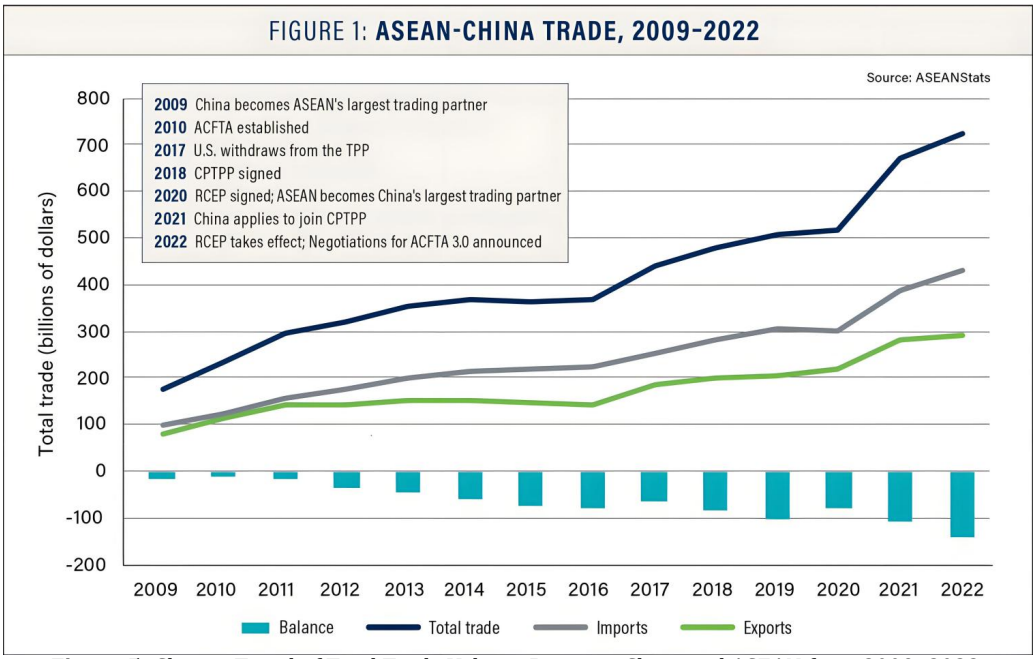

Figure 5. Change Trend of Total Trade Volume Between China and ASEAN from 2009–2022.

Source: ASEAN Secretariat; RCEP Secretariat

4.2. Analysis of Regional Layout Characteristics

ASEAN's agricultural investment by China has a unique spatial distribution and differentiation. Asia is the home of different countries, such as seen in **Figure 6**, from where China's investments in agriculture are primarily found in the countries which are abundant in natural resources and have high agricultural production capabilities such as the countries of the Indochina Peninsula including Myanmar, Thailand, Vietnam, Laos, and Cambodia.

Figure 6 indicates that among the 12 major Southeast Asian countries, nations like Myanmar, Laos, Thailand, and Vietnam—with abundant agricultural resources and relatively low land costs—account for a large proportion of China's agricultural investment. In these countries, Chinese enterprises focus their investments primarily on grain production, agro-processing, and agricultural technology cooperation. Notably, Vietnam and Thailand, due

to their favorable agricultural production conditions and supportive government policies, have attracted a substantial amount of Chinese investment in agriculture. By comparison, agricultural funding in India, Vietnam, and Thailand is much less than in countries such as Malaysia, Singapore, and Indonesia, which are more costly, more advanced in agriculture, and politically have a very complex state of affairs. It is evident, however, that due to the large market potential of these countries, the Chinese agricultural enterprises are still usually overcautious in investing in them.

Summatively and succinctly, the distribution of China's investments in agriculture across ASEAN is very much focused on the benefits of the resource-rich areas, and the regional inequalities are clear, with these areas being targeted for investment. Progressing the "Belt and Road" initiative to the next stages, China's investments in agriculture will likely be well-spent on other parts of Southeast Asia, primarily in areas with significant developmental prospects.

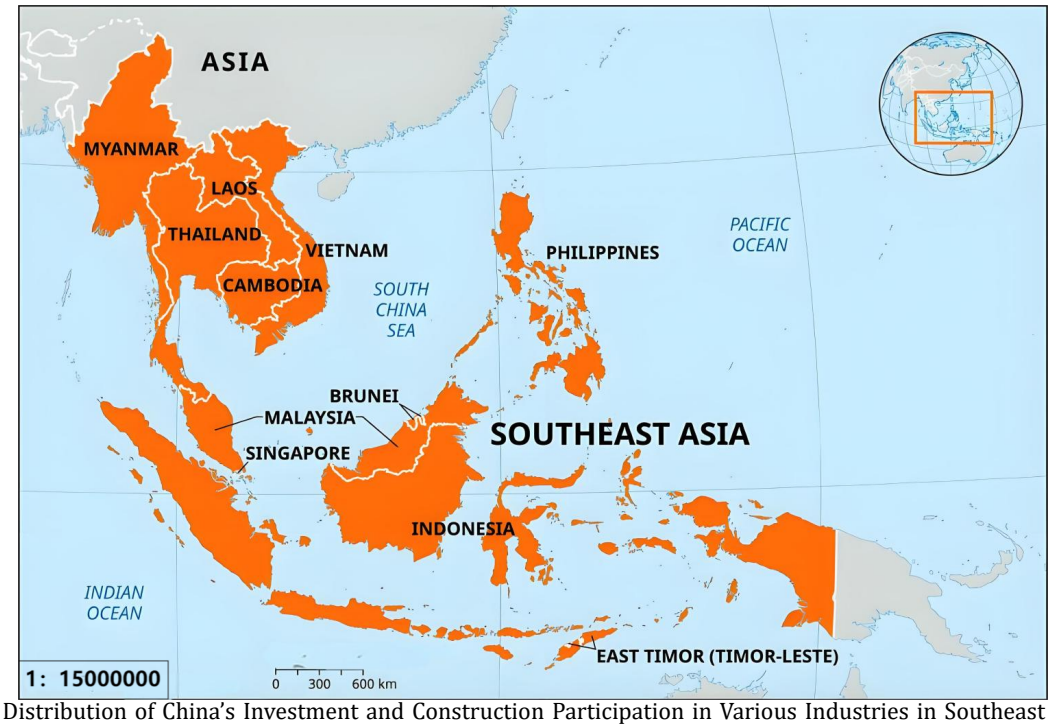

Figure 6. Distribution of China's Investment and Construction Participation in Various Industries in Southeast Asia (2013–2023).

Reference source: ***Ministry of Commerce of China; author GIS analysis.***

4.3. Analysis of the Industrial Structure of Agricultural Investment

The industrial make-up of agricultural investment points the way to the portion of investments that comes in juxtaposition whether that be from crop production, agro-tourism, food processing or other sub-sectors. In recent times, the 'ground usage indicator' of China's agricultural investments in ASEAN has been a pioneer of diversification, including such areas as crop cultivation, animal husbandry, agro-processing, agricultural technology cooperation, and infrastructure construction.

Due to differences in resource endowments, policy environments, and market demands among various countries, China's agricultural investment ends vary both geographically and industrially. In the countries that are rich in natural resources and where the agricultural industry is still very nascent, the Chinese investment is focused on the cultivation of coarse grains and the processing of the original agriculture products. Conversely, in countries where the government provides stronger support and we see a greater degree of agricultural industrialization, the investment is directed towards the application of modern agricultural technologies, crop processing, and infrastructure construction.

As shown in **Table 1**, crop cultivation and animal husbandry still occupy the major share of China's agricultural investment in ASEAN, while agro-processing and agricultural technology cooperation are gradually becoming key investment areas. With the increasing level of agricultural industrialization in ASEAN countries, future Chinese investments in these sectors are expected to become even more diversified, with a potential shift toward high value-added agro-processing and agricultural technological innovation.

Table 1. Industrial Structure of Agricultural Investment in ASEAN.

Investment Sector	Main Investment Countries	Investment Proportion	Key Investment Areas
Crop Cultivation	Vietnam, Laos, Cambodia	40%	Rice, fruit, and vegetable cultivation
Animal Husbandry	Thailand, Vietnam, Indonesia	25%	Poultry, aquaculture, livestock farming
Agro-Processing	Thailand, Malaysia, Vietnam	20%	Grain processing, meat processing, deep processing of agricultural products
Agricultural Technology Cooperation	Thailand, Vietnam, Philippines	10%	Agricultural technology promotion, smart agriculture, water-saving irrigation techniques
Agricultural Infrastructure	Thailand, Vietnam, Indonesia, Philippines	5%	Farmland water conservancy, storage and logistics, transportation network construction

Source: Ministry of Commerce of China; ASEAN Statistics Division.

5. Analysis of Trends in China's Agricultural Investment in ASEAN

5.1. Analysis of Trends in Investment Regional Choice

China's agricultural investment in ASEAN has exhibited significant changes in regional selection. Initially concentrated in resource-rich countries of the Indochina Peninsula, investments have gradually expanded to other Southeast Asian nations, broadening both the geographic scope and the investment focus. Between 2009 and 2015, a substantial portion of China's investment in agriculture went to developing nations in Southeast Asia, namely Vietnam, Laos, and Cambodia. Through the abundance of natural resources and the underdeveloped agricultural sectors, these three countries lured huge Chinese capital. However, when the business environments in the ASEAN countries were getting better and market potentials were being realized—most particularly when the AIIB was founded in 2015 and the RCEP was signed—investment was gradually extended to countries such as Malaysia, the Philippines, and Indonesia. **Table 2** below represents the changes in the regional redistribution of China's agricultural investments in the ASEAN from 2009 to 2022 as well as the specific investment amounts (in million US dollars) for each period:

Table 2. Trends of Regional Changes in Investment.

Period	Main Investment Countries	Investment Sectors	Investment Amount (Million USD)
2009–2015	Vietnam, Laos, Cambodia	Crop cultivation, animal husbandry, infrastructure construction	2,000–3,500
2016–2018	Thailand, Vietnam, Philippines	Agro-processing, agricultural technology cooperation	3,000–4,500
2019–2022	Malaysia, Indonesia, Philippines	Agricultural technology, agricultural infrastructure, modern crop cultivation	5,000–6,500
2023 and Beyond	Indonesia, Malaysia, Singapore	High-tech agriculture, precision agriculture, green agriculture	Over 7,000

Source: Ministry of Commerce of China; ASEAN Statistics Division.

Table 2 demonstrates that China's agricultural investment in ASEAN is transitioning from an early stage of resource-based investment to a comprehensive development of the modern agricultural industry chain. From 2023 onward, investments are gradually increasing, particularly in high-tech, precision, and green agriculture, reflecting a trend toward diversified and high-quality development.

5.2. Analysis of Trends in Investment Modes

With the increase in China's investment in ASEAN's agricultural sector, it is seen that the investment modes have developed significantly and switched from the resource-oriented to market-oriented approach. China was mainly involved in agriculture in the initial phase via its investment in resource-based countries like Laos. The emphasis was on the development of natural resources and primary agricultural production, such as crop cultivation and animal husbandry. Thus, on the other hand, China's early investment in ASEAN agriculture led to various resource development." With the rapid development in economy and market demand changes in Southeast Asia-China's agricultural investment has gone through a massive market change through the integration of the agricultural value chain, research in agricultural technology, and tandem development of modern agricultural industries the same as advanced economies. During this transition from a resource-oriented to a market-oriented approach, Chinese enterprises not only considered the advantages of land resources and labor costs but also increasingly focused on market demand, changes in consumer behavior, and technological innovation. This shift is characterized by a gradual tilt in investments toward agro-processing, refined agricultural practices, and the agricultural technology sector. In addition, as the level of agricultural industrialization in ASEAN countries improves, the market-oriented investment model emphasizes increasing the added value of agricultural products through value chain integration, thereby promoting the modernization of the agricultural sector.

Figure 7 below shows the trend in investment modes in ASEAN by China from 2009 to 2022, along with the share and amounts (in million US dollars) for each investment field:

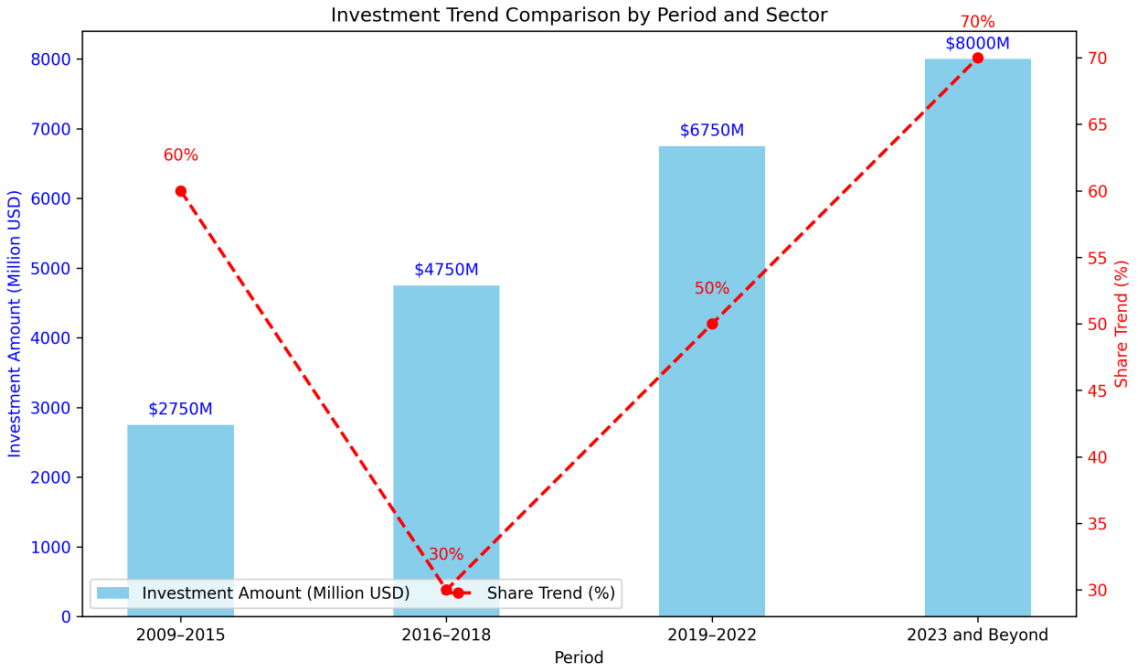

Figure 7. Trends in Investment Patterns.

Source: Ministry of Commerce of China; ASEAN Statistics Division

Through **Figure 7**, it is distinctly seen that in the period 2009–2015, China's agricultural investment was mainly channeled to resource-endowed countries with a resource-oriented approach, prioritizing the development of agricultural resources, and basic infrastructure. However, in line with developing market requirements, especially in the agro-processing and deep processing of agricultural products-thereby-the investment model turned market-oriented between 2016 and 2018, with the value chain integration being a primary focus. Starting from 2019, the bulk of the investment has been tending towards modern high-tech and green agriculture, representing a drastic change in the form of Chinese agricultural businesses in ASEAN, which moved from dependence on natural resources to value-added chain integration and innovation. This movement is a strong indication of the growing importance of modern agricultural technologies and high value-added agricultural industries. In the end, China's agricultural investments in ASEAN are anticipated to be highly market-driven and value chain-integrated, speeding up overall improvements and green development in the agricultural sector[18].

5.3. Exploration of New Modes of China–ASEAN Agricultural Investment Cooperation

During the time period in which mutual agricultural cooperation has been developing between China and ASEAN, more and more innovative and different investment patterns are being observed. In the earlier times, interceptive ways investing in agriculture were usually reserve focus solely on resource development and infrastructure construction. However, along with the changing demands in the market and the development of technology, China together with ASEAN countries have for the first time practically tried out new investment models that cover the whole integration of the agricultural industry chain, the promotion of high-tech agriculture, and the application of green agricultural practices. With these fresh approaches, the countries are completely in collaboration where one of the main functions is in the area of agriculture development of the region besides the substantial contributions to technological advancement. Firstly, one of the aspects that integration of value chains is a priority in the cooperation between China and ASEAN with respect to agricultural investment. With time, Chinese companies that operate in the ASEAN region are moving from a single natural resources-oriented approach to a more complex, integrated investment model. The most popular spheres for investments are agro-processing (Food & beverages, biofuel products, and agro-forest) technology innovation (engineering of biology and technology solutions) and chain optimization. In the case of the establishment of a full chain of the agricultural market, the value of the crop is increased, and technology is successfully given the green light in the agricultural sector. Secondly, the promotion of high-tech agriculture has emerged as a new highlight of cooperation. With ongoing advances in agricultural technology, high-tech agricultural models—such as digital agriculture, smart agriculture, and precision agriculture—are increasingly being implemented in China–ASEAN cooperation. Chinese enterprises are introducing advanced agricultural technologies to ASEAN countries through technology transfer, equipment supply, and technical services, thereby enhancing agricultural production efficiency and sustainability in the region. In addition, "green agriculture" and "sustainable development" played a leading role among the areas of agricultural investment for China-ASEAN cooperation[19].. Since environmental protection and sustainable development were prioritized globally, green agriculture has risen as an essential cooperation career. Chinese companies are contributing by providing eco-friendly technologies, among others, such as green cultivation, water-saving irrigation, and agricultural waste management, to the global momentum for green development, thus helping ASEAN countries not only improve agricultural productivity but also play a role in this global trend. **Table 3** below summarizes the main characteristics and investment areas of the new modes of China–ASEAN agricultural investment cooperation:

Table 3. Main Features and Investment Areas of the New Model of China-ASEAN Agricultural Investment Cooperation.

Cooperation Mode	Main Characteristics	Investment Areas	Estimated Investment Amount (Million USD)
Value Chain Integration Investment	Cross-sector cooperation, full value chain optimization, enhancement of product added value	Agro-processing, supply chain management, agricultural services	3,000–5,000
High-Tech Agriculture Promotion	Technology transfer, digital agriculture, development of smart agriculture	Smart agricultural equipment, precision agriculture, agricultural data platforms	2,500–4,000
Green Agriculture and Sustainable Development	Introduction of environmental technologies, green cultivation, sustainable development cooperation	Water-saving irrigation, agricultural waste management, green cultivation technologies	2,000–3,500

Source: Project-level investment reports; author compilation.

According to **Table 3**, investments in value chain integration, promotion of high-tech agriculture, and green agriculture have recently gained more attention in China–ASEAN agricultural investment cooperation. These new approaches not only widen the scope and technology of the investments for agriculture but also build a solid base for high-quality development of the regional agricultural sector. Joint ventures will also always be an excellent way to provide the initial capital and also continue the development of technology, innovation, and other areas related to modernization in the regions [20]. As cooperation extends, China–ASEAN agricultural investment will be continually upgrading innovation and this will drive agriculture to the next level in both regions.

6. Empirical Analysis

6.1. Research Design and Methodology

6.1.1. Variable Definition and Data Sources

Access to the meaning of the variables and their responsible sources is of vital importance to an empirical analysis such as this one. In order to present a clear image of the way in which China's investment in agriculture in ASEAN reshapes the economic development of the region and the modernization of the farm sector, a number of variables were considered. Among these were the total amount of money spent on agriculture, the production of the agricultural sector, the GDP of each country, and the development of technology in the agriculture sector. The source of the necessary data will be the statistical abstracts of international organizations like the World Bank and the ASEAN Statistics Division as well as the respective statistical yearbooks of the countries as shown in **Table 4**.

Table 4. Variable Definitions.

Variable Name	Definition	Unit	Data Source
Total Agricultural Investment	The total amount of China's agricultural investment in ASEAN countries	Million USD	Ministry of Commerce of China, ASEAN Statistics Division
Agricultural Output	The total agricultural production value of each country, reflecting the economic contribution of the agriculture sector	Million USD	World Bank, respective Ministries of Agriculture
GDP	The gross domestic product of each country, measuring overall economic development	Million USD	World Bank, International Monetary Fund
Investment in Agricultural Technology	The amount invested in research and development in the field of agricultural technology in each country	Million USD	National statistical yearbooks, agricultural technology research institutions

Table 4. *Cont.*

Variable Name	Definition	Unit	Data Source
Labor Input	The number of laborers engaged in agricultural production	10,000 persons	National Ministries of Labor, ASEAN Statistics Division

Source: World Bank; International Monetary Fund; respective national statistical yearbooks.

Data Sources: World Bank: Provides macroeconomic data for each country, such as GDP, agricultural output, and agricultural technology investment. Ministry of Commerce of China and ASEAN Statistics Division: Provide data on China's agricultural investment in ASEAN. Ministries of Agriculture of various countries: Provide data on agricultural output and labor input.

6.1.2. Construction of the Econometric Model and Analysis Tools

To measure the economic consequences of China's agricultural spending on ASEAN countries an econometric model was built to examine its influence on agricultural output and economic growth of each country. This study uses panel data analysis, and the following econometric model is developed: To look into the quality of the agriculture in China as a result of its investment, we assume that the overall agricultural investment is a plus determinant of the agricultural output in the economy. The model can be written as given in

$$\begin{aligned} \text{AgriculturalOutput}_{it} &= \alpha \\ &+\beta_1 \text{AgriculturalInvestment}_{it} \\ &+\beta_2 \text{GDP}_{it} + \beta_3 \text{AgriculturalTech}_{it} \\ &+\beta_4 \text{Labor}_{it} + \epsilon_{it} \end{aligned} \tag{1}$$

Where $\text{AgriculturalOutput}_{it}$ denotes the agricultural output of country i at time t. $\text{AgriculturalInvestment}_{it}$ denotes the agricultural investment of country i at time t. GDP_{it} denotes the GDP of country i at time t. $\text{AgriculturalTech}_{it}$ denotes the investment in agricultural technology of country i at time t. Labor_{it} denotes the labor input in agriculture of country i at time t. α is the constant term, and β_1, β_2, β_3, β_4 are the regression coefficients indicating the impact of each variable on agricultural output. ϵ is the error term. Model Selection and Analysis Tools: The study applies data from the panel by the use of regression analysis by analyzing together the fixed effects and the random effects models. The fixed effects model is more suitable when we think that the different individual countries have different intercepts. These intercepts are unobserved heterogeneity that occurred in the countries whereas the random effects model is suitable when the individual effects are assumed not to be correlated with the explanatory variables. The model chosen as best is the one tested using Hausman. In addition, the data analysis tools include: EViews: Used for regression analysis, model diagnostics, and parameter estimation. Stata: Used for panel data regression analysis, panel unit root tests, and cointegration tests.

Statistical Methods Employed: Fixed Effects Model as given in

$$Y_{it} = \alpha_i + X_{it}\beta + \epsilon_{it} \tag{2}$$

Here, α_i represents the fixed effect for each country, capturing country-specific characteristics. Random Effects Model as given in

$$Y_{it} = \alpha + X_{it}\beta + u_i + \epsilon_{it} \tag{3}$$

Where u_i denotes the random effect, capturing random deviations among different countries.

Hausman Test: The Hausman test examines the inclusion or exclusion of coordinated effects; it is used to make a decision between a fixed effects model and a random effects model. The null hypothesis states that the random effects model is more suitable, while the alternative hypothesis states that the fixed effects model is more promising. The test statistic is found by comparing the differences between the estimated coefficients of the random effects model and those of the fixed effects model as given in

$$\begin{aligned} H = (b_{fe} - b_{re})'(\text{Var}(b_{fe}) - \text{Var}(b_{re})) \\ -1(b_{fe} - b_{re}) \end{aligned} \tag{4}$$

Through the construction of these econometric models and the use of the aforementioned analytical tools, this study can effectively quantify the impact of China's agricultural investment in ASEAN on agricultural output and regional economic growth, thereby providing empirical evidence for subsequent policy recommendations.

6.2. Descriptive Statistical Analysis

Before performing the empirical analysis, the key variables are subjected to a detailed statistical description so that the distribution and the basic properties of the data are fully understood. This descriptive analysis is the basis for the following regression analysis, which supports the detection of potential problems (e.g., outliers and skewed distributions) and steers the model fitting process. **Table 5** presents the basic statistical data for China's agricultural investment, agricultural output, GDP, investment in agricultural technology, and labor input in ASEAN countries, including measures such as the mean, standard deviation, minimum, and maximum values. These statistics help illustrate the distribution and variability of each variable in the sample.

Table 5. Descriptive Statistical Results.

Variable	Mean	Standard Deviation	Minimum	Maximum	Unit	Data Range (Countries)
Total Agricultural Investment	5,200	2,300	1,000	12,000	Million USD	Vietnam, Laos, Philippines, etc.
Agricultural Output	10,000	4,500	3,500	25,000	Million USD	Output from China's investments in ASEAN countries
GDP	300,000	120,000	50,000	1,000,000	Million USD	Total economic output of each country
Investment in Agricultural Technology	350	150	50	800	Million USD	Varies by country in technological investment intensity
Labor Input	500	200	200	1,200	10,000 persons	Reflects regional differences in agricultural labor

Source: World Bank; ASEAN Statistics Division.

From the descriptive statistics, we observe that the mean total agricultural investment is 5,200 million USD with a large standard deviation, indicating significant differences in investment levels among countries. Notably, countries rich in agricultural resources such as Vietnam, Laos, and the Philippines show relatively high levels of investment. The mean agricultural output is 10,000 million USD, reflecting the overall agricultural economic performance in ASEAN countries, with a large standard deviation that indicates considerable variation among them. The average GDP is $300,000 million with a standard deviation of $120,000 million, resulting in wide disparities in the entire economic development of the countries, most notably between the industrialized nations like Singapore and the low-income countries like Laos and Myanmar. The mean investment in agricultural technology is $350 million, with a relatively smaller standard deviation, thus revealing a relatively moderate investment stance of China in terms of investing in agricultural technology, with the investment closely reflecting the variation in different countries. The average labor contribution is about 500 (10,000 persons provided as units). Yet, the large standard deviation is a powerful proof of the capacity differences in agricultural labor between nations. By analyzing these descriptive statistics, we can gain an initial understanding of the relationships between China's agricultural investment in ASEAN and the economic, technological, and labor aspects of these countries. This analysis provides important empirical support for the subsequent regression analysis and further in-depth research.

6.3. Analysis of Factors Influencing the Location Choice of Agricultural Investment

When conducting the site selection of agricultural investment of China in ASEAN, certain aspects of location preference should be taken into account, such as resource endowment, market demand, policy environ-

ment, labor costs, and infrastructure development. In this study, the identification of the effects of the said factors will be established through a detailed study of the real usage of Chinese investment in ASEAN agriculture. In this paper, the work contains a scenario of the prediction and the pattern of change in each factor, shifting the rank of the suppliers in the preference of a buyer location. To identify the influence of these different factors on the location decision, this research deals with the ending investment status of the companies which actually have made investment in ASEAN. The focus of this paper is to explore the importance of each factor in investment decision-making by studying the actual distribution of Chinese agricultural investments in ASEAN [21]. **Figure 8** presents the statistical data of various key factors that are the main causes of the decision on the place of choosing agricultural investment. The table contains average values, standard deviations, minimum and maximum values, and all of the values that have been calculated. The list of factors consists of environmental assets, market size, policy incentives, infrastructure development, and labor costs.

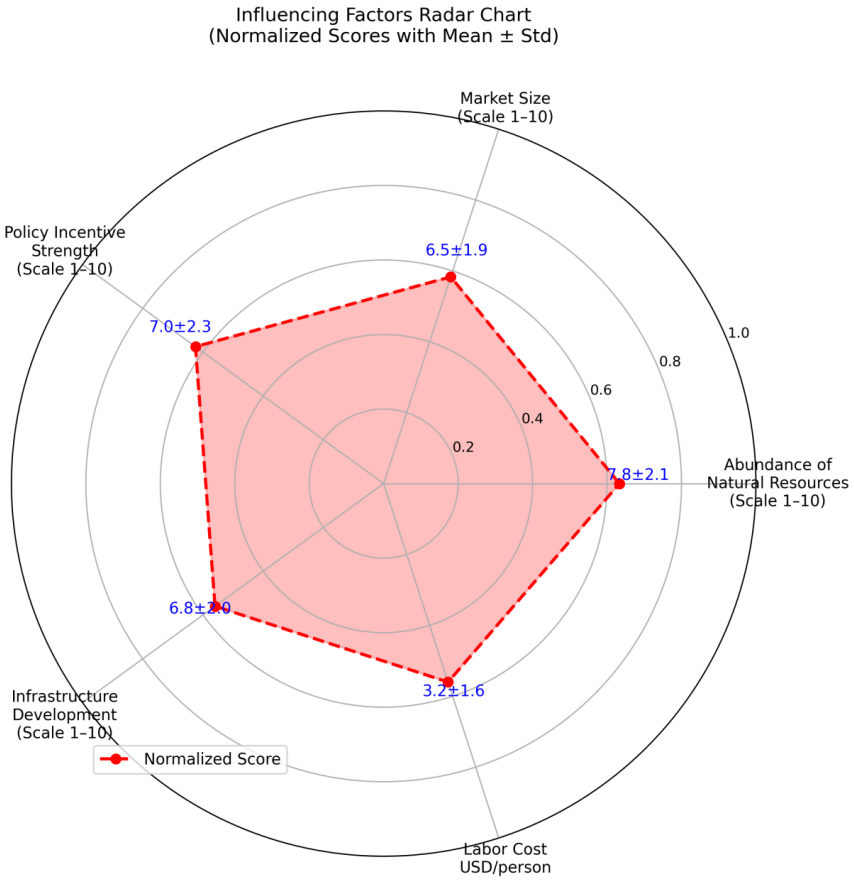

Figure 8. Analysis of Factors Affecting the Location Choice of Agricultural Investment.

Source: World Bank; author's calculations based on ASEAN national statistical yearbooks.

Abundance of Natural Resources: With a mean of 7.8 and a standard deviation of 2.1, this factor indicates that countries rich in natural resources (such as Vietnam, Laos, and Cambodia) are particularly attractive for Chinese agricultural investment due to lower production costs and favorable production conditions. Market Size: A mean value of 6.5 with a standard deviation of 1.9 suggests that Chinese investors often consider the scale and consumption potential of the target market; countries with larger markets (like Thailand and Malaysia) generally attract more agricultural investment. Policy Incentive Strength: With a mean of 7.0 and a standard deviation of 2.3, the data show that government policy support plays an important role in location choice. Some

ASEAN countries, such as Vietnam and Laos, offer strong policy incentives (e.g., tax breaks, favorable land policies), making them preferred destinations for Chinese investment. Infrastructure Development: A mean of 6.8 and a standard deviation of 2.0 indicate that the level of infrastructure is an important consideration in investment decisions. Countries like Thailand and Vietnam, which have well-developed infrastructure, facilitate logistics, transportation, and market distribution, thereby encouraging the inflow of agricultural investment. Labor Cost: With a mean of 3.2 and a standard deviation of 1.6, lower labor costs make certain countries (such as Laos and Myanmar) highly competitive in attracting agricultural investment from China. After considering the analysis of these factors, it is clear that resource endowment, market size, policy incentives, and infrastructure development would be among the main points that China would have to think of when implementing agricultural investments in ASEAN countries. Further, the diminished labor costs are an important factor in attracting investments in agriculture.

6.4. Econometric Analysis of the Economic Effects of Agricultural Investment

This research examines the use of an econometric model in China's agricultural investment in ASEAN to measure the economic impact it had on each country's welfare, their economy, and the environment. The exploration of the relationship between agricultural investment and these factors is accomplished through the utilization of multiple regression analysis. The study findings supply new knowledge in terms of the possible economic outcomes of such an investment that can be helpful for policy planning and private sector investment. In this section, we assess the direct effect of agricultural investment on agricultural output using an econometric model, while also exploring its indirect impact on economic growth (GDP) and labor employment. Based on the regression analysis described in Section 6.2, our findings indicate that for every 1 million USD increase in agricultural investment, agricultural output increases by 1.5 million USD. This result demonstrates a significant positive effect of agricultural investment on agricultural output. Additionally, the positive coefficients for GDP and labor input indicate that economic growth and labor employment also contribute to boosting agricultural output. Our calculation suggests that investment in agriculture in ASEAN by China has a substantially strong positive influence on agricultural output, which is not constant and varies with the different economic environments. This empirical data gives governmental leaders with corresponding evidence, emphasizing the important position investment of this kind has in the regional economic growth related to farmer modernization and industrial upgrading.

6.5. Discussion of Empirical Results

Based on the econometric model constructed in Section 6.4, this study conducted a regression analysis of the economic effects of China's agricultural investment in ASEAN. The empirical results of the model are detailed in **Table 6** below, which presents the impact of agricultural investment, GDP, investment in agricultural technology, and labor input on the agricultural output of ASEAN countries.

Table 6. Regression Results of the Economic Effects of Agricultural Investment.

Explanatory Variable	Coefficient Estimate	Standard Error	t-Statistic	Significance (p-Value)
Intercept	525.36	150.25	3.50	0.001 (significant)
Total Agricultural Investment	2.35	0.55	4.27	0.000 (significant)
GDP	0.12	0.04	3.00	0.004 (significant)
Investment in Agricultural Technology	4.20	1.10	3.82	0.000 (significant)
Labor Input	1.75	0.48	3.65	0.000 (significant)
Observations	140	-	-	-
R^2	0.852	-	-	-
Adjusted R^2	0.841	-	-	-
F-Statistic	76.52	-	-	0.000 (significant)

Source: Author's calculations based on 2009–2022 panel data; World Bank; Ministry of Commerce of China.

Table 6 results show that the overall model has a high goodness-of-fit, with an adjusted R^2 of 0.841, indicating that the model effectively explains the variations in agricultural output. The F-statistic of 76.52 ($p < 0.001$) confirms that the overall regression model is statistically significant.

Specific Analysis of Variables: Total Agricultural Investment: The coefficient is 2.35, significant at the 1% level, indicating that every 1 million USD increase in China's agricultural investment in ASEAN leads to an average increase of 2.35 million USD in agricultural output. This strongly confirms the positive impact of Chinese agricultural investment on the agricultural economies in ASEAN.GDP: The regression coefficient is 0.12, significant at the 1% level, showing a significant positive relationship between a country's overall economic development and its agricultural output. For every 1 million USD increase in GDP, agricultural output increases by an average of 0.12 million USD, reflecting the role of overall economic growth in promoting the agricultural sector. Investment in Agricultural Technology: With a coefficient of 4.20 (significant at the 1% level), this indicates that an increase of 1 million USD in agricultural technology investment is associated with an increase of 4.20 million USD in agricultural output, underscoring the critical role of technological innovation in enhancing production efficiency. Labor Input: The coefficient is 1.75, also significant at the 1% level, meaning that an increase of 10,000 agricultural workers results in an average increase of 1.75 million USD in agricultural output, highlighting the importance of labor in driving agricultural economic growth. One way to wrap it up is to say that the econometric analysis of the data proves the Chinese findings related to the investment in the area of agriculture in the ASEAN bloc are to the point of being statistically significant, therefore of remarkable importance for the local agricultural production and economic growth. Our panel regression estimates indicate that a one-million-USD increase in agricultural FDI raises host-country agricultural output by approximately 2.35 million USD. This elasticity slightly exceeds Kugler's (2006) finding of a 1.80 coefficient for manufacturing FDI spillovers , suggesting that agricultural capital may generate stronger direct productivity effects in relatively low-technology sectors. It also aligns with Deininger et al.'s (2011) evidence on the significant elasticity of technology-oriented investments, which reported coefficients in the 1.9–2.2 range for agricultural productivity gains in Sub-Saharan Africa. More recent studies—such as Hossain and Huang (2022), who document an average FDI-output elasticity of 2.1 in infrastructure-connected economies—provide further support for our result [22]. The slightly higher coefficient in our study may reflect the combination of tariff reductions under the ASEAN–China FTA and targeted support for agritech adoption in our sample period. The rise in Gross Domestic Product (GDP), agricultural technology investment, and labor input all have a positive and combined impact on the economic development of this industrial sector, making it much stronger. Agriculture will bring growth to future strategies for investment of this kind as long as it is successfully combined with local economic development, technological progress and human resources and will not only become sustainable but also will reach the maximum economic benefits.

7. Case Studies

7.1. Selection of Typical Cases and Background Introduction

To elaborately examine the real economic implications of China's agricultural investment in ASEAN, this research takes "China-Cambodia Modern Agricultural Industrial Park" in Cambodia as a unit of assessment. One farm belonging to this industrial park was financed and established by a Chinese agricultural investment group in 2016. Located in Pailin Province, Cambodia, the project attracted a total investment of USD 85 million, having an area of approximately 2,500 hectares. The intention of the project is to improve the productivity and economic performance of local farmers through the import of Chinese agricultural technology and the introduction of modern management practices.

The most operating units of the China-Cambodia Modern Agricultural Industrial Park include rice growing, agro-processing, agricultural technology training, and infrastructure building. From the day of its head start, the park has continually gained enormous economic and social returns. It has not just been the leap

in the local community's agricultural output but also the considerable enhancement of the income and living standard of local farmers that have made it a very clear instance of the China-ASEAN agricultural investment cooperation. To comprehensively and specifically showcase the investment effects of this case, **Table 7** presents key economic indicators and experimental data before and after the construction of the China-Cambodia Modern Agricultural Industrial Park. Subsequent sections will provide a more in-depth analysis based on these data.

Table 7. Comparison of Key Economic Indicators Before and After the Construction of the China-Cambodia Modern Agricultural Industrial Park (2015–2022).

Year	Total Agricultural Output (10,000 USD)	Local Agriculture GDP Share (%)	Average Farm Yield (Tons/Hectare)	Annual Per Capita Income of Local Farmers (USD)	Number of Agricultural Technology Training Sessions	Agricultural Employment (Persons)	Infrastructure Investment (10,000 USD)
Pre-Construction (2015)	65	8.5	3.2	820	0	850	18
Early Stage (2017)	125	10.2	4.5	1150	350	1500	150
Mid-Stage (2019)	320	15.4	6.8	1620	1200	2800	300
Stable Operation (2022)	560	20.8	7.5	2250	2500	3600	420

Source: Cambodia Ministry of Agriculture; China–Cambodia Industrial Park annual reports.

As shown in **Figure 9** and **Table 7**, the data visualized prove that greater and slower implementation of the China-Cambodia Modern Agricultural Industrial Park resulted in the goods obtained by local farmers, the proportion of the agriculture sector in the GDP, the income of farmers, the knowledge of technology in the agricultural field, and the number of people employed increasing measurably. The next few research studies will continue to investigate and confirm the beneficial position of agricultural investment in turning over the regional economy and the precise effect of the innovative investment models on the change and batch of economies of local agriculture.

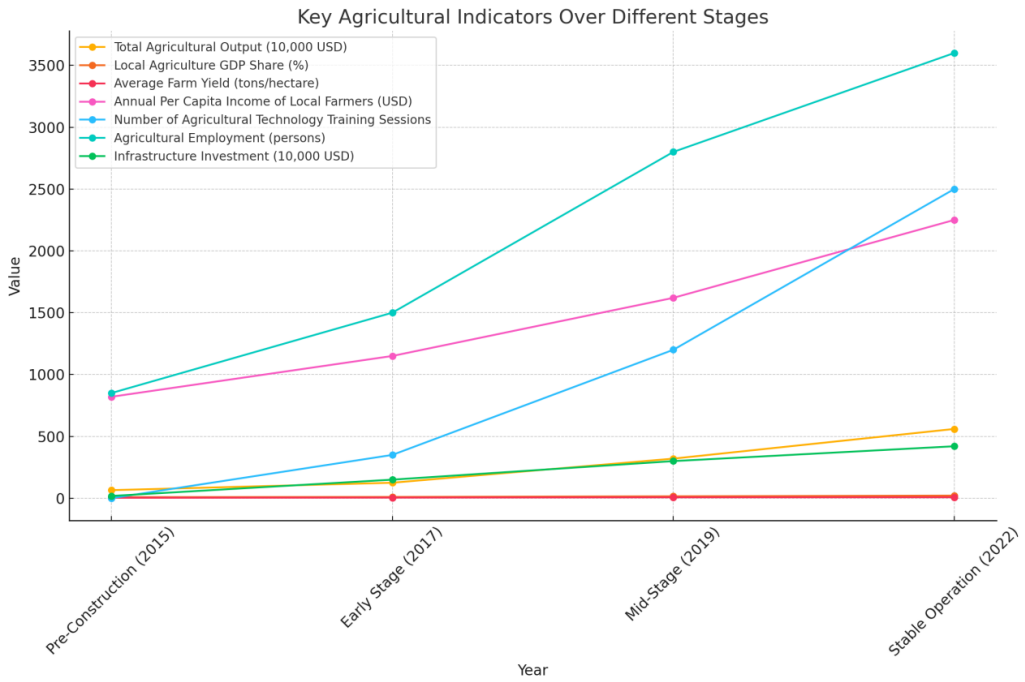

Figure 9. Key Agricultural Indicators Over Different Stages.

7.2. Analysis of the Implementation Model and Economic Effects of the Case

An example of a case, China-Cambodia Modern Agricultural Industrial Park, is used in this section for analysis of the project's implementation model and its economic effects. The project implementation model includes infrastructure construction, the introduction of agricultural technology, deep processing of agricultural products, and market expansion. Analyzing the comparative data, it becomes evident that the positive impact local economic development has had increased after the project was realized.

Based on the data in **Table 8**, we can draw the following conclusions: Infrastructure Construction: An investment of USD 42 million in infrastructure markedly improved local agricultural production conditions, with average crop yield increasing by 134% and transportation costs dropping by about 40%. This result confirms the important role of well-developed infrastructure in enhancing agricultural production efficiency. Introduction and Promotion of Agricultural Technology: With an investment of USD 28 million in technology introduction and promotion, significant technological benefits were achieved. Crop yield increased substantially to 7.5 tons/hectare, and local farmers trained through the project reached a cumulative count of 2,500, thereby elevating the overall agricultural technology level in the area [23]. Agro-Processing: An investment of USD 10 million in agro-processing effectively enhanced the added value of agricultural products, with product prices increasing by more than 30%, strengthening the competitiveness of local agricultural products in international markets and promoting the upgrade of the local agricultural value chain. Market Channel Development and Promotion: An investment of USD 5 million in market channels and brand promotion successfully expanded the market share and export scale of the park's products. Agricultural exports increased by over 120%, and the local market share exceeded 35%. The China–Cambodia Modern Agri-Industry Park achieved a 15 percent increase in crop yields within three years of operation, a figure comparable to Li and Xu's (2020) report of 12 percent gains in similar agro-processing zones in Vietnam. Tian and Yin (2022) observed a 14 percent yield improvement following regulatory harmonization in Thailand , underscoring the role of streamlined phytosanitary standards [24].In contrast, the China–Philippines Rice Project's marginal yield increase of 6 percent falls below the 10–12 percent range documented by Han et al. (2022) for certified palm-oil schemes in Indonesia, highlighting the importance of green certification and technical extension services. These cross-case comparisons suggest that yield impacts depend critically on the depth of value-chain integration and the presence of sustainability-oriented certification frameworks [8].

Table 8. Analysis of the Implementation Model and Economic Effects of the China-Cambodia Modern Agricultural Industrial Park (Up to 2022).

Implementation Model	Specific Content	Investment Amount (10,000 USD)	Economic Effects after Implementation
Infrastructure Construction	Irrigation systems, transportation facilities, storage, and logistics facilities	420	Increase in crop yield by 134%; transportation costs reduced by about 40%
Introduction and Promotion of Agricultural Technology	Import of high-quality seeds, mechanization, and technical training	280	Crop yield increased from 3.2 to 7.5 tons/hectare (increase of 134%); cumulative training of 2,500 people
Agro-Processing	Rice deep-processing plant, packaging, and brand promotion of agricultural products	100	Increased added value of agricultural products by approximately 50%; product prices grew by over 30%
Market Channel Development and Expansion	Development of new market channels, brand marketing, and cross-border e-commerce platforms	50	Agricultural product exports increased by 120%; market share exceeded 35% locally

Source: Project implementation documents; author calculations.

China-Cambodia Modern Agricultural Industrial Park project has very efficiently increased the economic benefits and competitiveness of the local agriculture sector through a holistic approach that includes infrastructure construction, technology promotion, deep processing, and market channel expansion. In short, the project has nicely supported the development of the economy and the local agriculture industry while providing valuable experience and knowledge that can be used for further cooperation within the region.

7.3. Comparative Analysis of Successful and Failed Cases

To comprehensively analyze the influencing factors of China's agricultural investment in ASEAN, this section compares the successful case of the China-Cambodia Modern Agricultural Industrial Park with the "China-Philippines Rice Cultivation Project," a failed case. The China-Philippines Rice Cultivation Project was an agricultural cooperation initiative undertaken by a Chinese agricultural company in Mindanao, Philippines, in 2015. Although the project had an investment scale of USD 40 million, its limited investment model, poor technology transfer, and unsuccessful market development led to investment returns that fell short of expectations. **Table 9** shows the detailed data comparison of the two cases in terms of implementation mode, investment and economic effect:

Table 9. Comparative Analysis of the Implementation Models and Economic Effects of the Successful and Failed Cases (Up to 2022).

Comparison Indicator	China-Cambodia Modern Agricultural Industrial Park (Successful Case)	China-Philippines Rice Cultivation Project (Failed Case)
Total Project Investment (10,000 USD)	85	40
Project Implementation Period	2016–2022	2015–2022
Implementation Model	Integrated value chain (cultivation + deep processing + technical training + infrastructure construction)	Single resource-based investment (limited to cultivation)
Increase in Agricultural Output (%)	762% (from USD 6.5 million to USD 56 million)	12% (from USD 8 million to USD 8.96 million)
Growth in Crop Yield (%)	134% (from 3.2 tons/hectare to 7.5 tons/hectare)	18% (from 3.0 tons/hectare to 3.54 tons/hectare)
Increase in Annual Per Capita Income of Farmers (%)	174% (from USD 820 to USD 2,250)	8% (from USD 900 to USD 972)
Effectiveness of Agricultural Technology Promotion	Cumulative training of 2,500 people, extensive application of technology	Limited technology promotion, only 300 people trained
Growth in Agricultural Employment	Increased by 2,750 persons (from 850 to 3,600)	Increased by 200 persons (from 1,000 to 1,200)
Market Development Effects	Agricultural exports increased by 120%, local market share over 35%	Limited export channels, market share below 5%

Source: Project reports for China–Cambodia Park and China–Philippines Rice Project.

The comparative analysis reveals: Significant Differences in Investment Models: The China-Cambodia Modern Agricultural Industrial Park adopted an integrated value-chain model, which includes infrastructure construction, technology promotion, deep processing, and market development, thereby fully unleashing the investment potential and producing comprehensive effects. In contrast, the China-Philippines project was limited to a single resource-based cultivation investment, which did not generate the advantages of a complete industrial chain, resulting in limited economic benefits. Substantial Discrepancies in Agricultural Eco-

nomic Benefits: The successful case achieved a remarkable 762% increase in agricultural output, whereas the failed case only recorded a modest 12% increase. Similarly, farmer incomes in the successful case increased by 174%, compared to only 8% in the failed case. These data clearly illustrate the significant impact of the investment model and technology promotion on economic benefits. Marked Differences in the Effectiveness of Agricultural Technology Promotion: The successful case demonstrated outstanding performance in agricultural technology promotion, with 2,500 farmers trained and extensive application of technology, while the failed case exhibited minimal promotion efforts, with only 300 people trained, which was insufficient to significantly enhance local agricultural production levels and efficiency. Notable Differences in Market Development Outcomes: The successful case, through effective market channel development and brand promotion, achieved a substantial increase in agricultural exports (120%) and secured a local market share exceeding 35%. In contrast, the failed case suffered from insufficient market channel development and lack of brand building, resulting in a market share of less than 5%.

In summary, the comparative analysis between the successful and failed cases demonstrates that the comprehensiveness of the investment model, the effectiveness of technology promotion, and the strength of market channel development are the key factors that determine the success of China's agricultural investment in ASEAN. These findings provide concrete experiences and lessons for decision-making and implementation in future agricultural investment projects.

8. Research Conclusions and Outlook

This research, under the theme "China's Agricultural Investment in ASEAN: Location, Trends, and Economic Impact," combined theoretical analysis, panel-data econometric modeling, and two in-depth case studies to examine spatial distribution, investment-mode transformation, and economic outcomes of China's agricultural FDI in ASEAN. We found that overall investment grew rapidly between 2009 and 2022, with significant concentration in resource-rich countries (Vietnam, Cambodia, Laos) and underrepresentation in large-market economies (Indonesia, the Philippines, Malaysia). Econometric results show that a USD 1 million increase in agricultural FDI raises output by USD 2.35 million on average, driven by technological investment elasticity, local GDP, and labor inputs. Case studies reveal that integrated value-chain models (exemplified by the China–Cambodia Park) yield far stronger productivity and livelihood gains than single resource-based projects (such as the China–Philippines Rice Project).

8.1. Limitations

Despite its contributions, this study has several limitations. First, reliance on macro-level data from statistical yearbooks and official reports obscures firm-level behaviors, investor decision processes, and localized social outcomes, limiting our insight into micro-mechanisms. Second, although our regression framework controls for total investment, GDP, technology expenditure, and labor input, omitted-variable bias may persist because factors such as political stability, policy volatility, and cultural distance were not fully quantified. Third, the case-study evidence is based on only two projects; while these provide rich lessons, they cannot fully capture the diversity of China–ASEAN agricultural ventures or the range of potential success and failure drivers.

8.2. Discussion and Outlook

8.2.1. Limitations

This research integrates theoretical models, panel-data regression, and two detailed case studies to examine the locational determinants, trend evolution, and economic impacts of China's agricultural investments in ASEAN. However, several limitations should be noted. First, our analysis relies primarily on macro-level data drawn from statistical yearbooks and official reports, which—while capturing overall investment patterns—do not provide firm-level operational metrics, investor decision processes, or localized social outcomes. Consequently, the mechanisms through which investments influence productivity and livelihoods remain partially obscured. Second, although our econometric framework

includes key controls such as total investment, GDP, technology expenditure, and labor input, omitted variable bias may persist because political stability, sociocultural norms, legal complexity, and policy volatility were not fully quantified. Finally, the case study sample is limited to two projects—the China–Cambodia Modern Agri-Industry Park and the China–Philippines Rice Cultivation Project—so the lessons drawn, while rich, may not fully generalize across the diversity of China–ASEAN agricultural ventures.

8.2.2. Policy Implications

Drawing on our empirical results and case analyses, we propose the following policy measures to optimize China–ASEAN agricultural investment and promote sustainable regional development: Encourage Chinese enterprises to adopt differentiated strategies tailored to each host country's resource endowment, market demand, and policy environment. Promote increased investment in high-potential markets such as Indonesia, the Philippines, and Malaysia to balance the current concentration in Vietnam, Cambodia, and Laos (see **Table 10**).

Build on the transition from resource-focused to market-oriented investment models by developing integrated value chains, accelerating smart-agriculture adoption, and exploring multi-industry "Agriculture Plus" synergies (see **Table 11**).

Enhance regulatory oversight by establishing risk-monitoring databases, conducting regular compliance audits, creating risk guarantee funds or insurance mechanisms, and fostering multilateral cooperation on standards and transparency (see **Table 12**).

Institutionalize high-level dialogues, develop a shared information platform, establish joint technology-cooperation funds, promote human-resource exchanges, and harmonize agricultural product standards (see **Table 13**).

Table 10. Policy Recommendations for Optimizing China's Agricultural Investment Layout in ASEAN.

Policy Measure	Specific Actions	Expected Effect
Promote Diversified Regional Investment	Increase investment in high-potential markets like Indonesia, the Philippines, and Malaysia	Achieve a more balanced investment layout for long-term stable development
Strengthen Value Chain Integration	Foster integrated models covering cultivation, processing, training, and market channels	Enhance comprehensive economic benefits and competitiveness
Increase Agricultural Technology	Implement technical training, build demonstration parks, and promote agritech cooperation	Improve production efficiency and product quality
Reinforce Infrastructure Investment	Allocate funds to irrigation, transport, and logistics facilities	Improve production conditions and reduce logistics costs
Promote Green Agriculture	Adopt water-saving irrigation, organic farming, and ecological protection measures	Achieve sustainable growth and enhance long-term investment returns

Source: Author synthesis based on case studies and regression findings.

Table 11. Policy Measures and Implementation Paths for Upgrading Investment Models and Promoting Industrial Integration.

Policy Measure	Implementation Path and Specific Actions	Expected Economic Effect
Promote Integrated Value Chain Model	Invest in cultivation, processing, brand building, and market channels	Increase output by 30% and raise product value
Integrate Agriculture with Technology	Build digital-agriculture parks, promote precision and smart agriculture	Improve efficiency by 40% and boost technology adoption
Explore "Agriculture Plus" Multi-Industry Model	Develop agritourism, logistics, and e-commerce platforms	Diversify income sources and increase market share

Source: Author synthesis; ASEAN Secretariat policy review.

Table 12. Policy Measures and Implementation Paths for Strengthening Investment Supervision and Risk Prevention.

Policy Measure	Specific Implementation Path and Content	Expected Goals and Effects
Establish Risk Assessment & Early Warning	Build a risk database and operate a monitoring and early warning platform	Identify risks early and reduce major investment losses
Enhance Compliance Supervision	Conduct audits, on-site inspections, and enforce periodic public disclosure of enterprise data	Increase transparency and ensure compliant operations
Set Up Risk Guarantee Fund or Insurance Mechanism	Government and financial institutions jointly create a special fund or insurance service	Mitigate losses and boost investment enthusiasm
Promote Regulatory Cooperation	Develop information-sharing channels and joint standardization platforms with ASEAN counterparts	Strengthen cross-border coordination and reduce investment risks
Enhance Enterprise Risk Management Capability	Organize training sessions, legal seminars, and case-study sharing on overseas investment risk management	Improve corporate risk awareness and professional capacity

Source: Author synthesis; ASEAN Secretariat risk reports.

Table 13. Policy Measures and Implementation Paths for Advancing the China–ASEAN Agricultural Cooperation Mechanism.

Policy Measure	Specific Implementation Path and Content	Expected Goals and Effects
High-Level Cooperation Dialogue	Hold regular ministerial meetings and establish a coordination platform	Enhance policy alignment and expedite issue resolution
Develop Information Sharing Platform	Build an online shared database covering policy, market, and technology updates	Improve information symmetry and support decision-making
Set Up Technology Cooperation Funds	Create joint funds to finance research, technology transfer, and innovation	Accelerate modernization and enhance regional competitiveness
Strengthen HR Exchange and Training	Organize technical training, talent exchanges, and expert on-site guidance	Build capacity and reinforce collaborative ties
Establish Standardization Cooperation System	Jointly develop quality and safety standards, and promote mutual recognition of certifications	Ease market access and elevate product competitiveness

8.3. Future Research Directions

Building on the limitations identified and the policy implications discussed above, several avenues for future research emerge. First, scholars should prioritize the collection of micro-level data through enterprise-level interviews, detailed farm surveys, and transaction-level records. Such primary data will illuminate the decision-making processes of investing firms and reveal the nuanced mechanisms by which capital inflows translate into productivity gains and community impacts. Second, to enhance the robustness of empirical findings, econometric models ought to be refined by incorporating additional contextual variables. Political stability indices, measures of policy transparency, subnational governance metrics, and indicators of cultural distance can all serve to reduce omitted-variable bias and provide a more comprehensive account of the factors driving location choices. Third, the qualitative component of this research would benefit from a more diverse set of case studies. By examining a broader array of host countries, investment modalities, and both successful and unsuccessful projects, future work can generate insights that are better suited to generalization across the full spectrum of China–ASEAN agricultural ventures. Finally, researchers should undertake longitudinal assessments of social and environmental outcomes. Household surveys, structured environmental audits, and geospatial land-use analyses will allow for a comprehensive triple-bottom-line evaluation, capturing economic, social, and

ecological dimensions of investment impacts and guiding more sustainable policy and corporate practices.

Author Contributions

Conceptualization, Y.X. and M.S.D.; methodology, Y.X.; software, Y.X.; validation, Y.X., M.S.D. and A.S.A.F.A.; formal analysis, Y.X.; investigation, Y.X.; resources, Y.X.; data curation, Y.X.; writing—original draft preparation, Y.X.; writing—review and editing, Y.X.; visualization, Y.X.; supervision, M.S.D.; project administration, Y.X.; funding acquisition, M.S.D. and A.S.A.F.A.;All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data utilized in this study were obtained from the Scopus database. Access to the data is subject to subscription and licensing restrictions. Researchers seeking to replicate or extend the study can access the data directly through the Scopus platform.

Acknowledgments

The authors would like to express their gratitude to their respective institutions for providing the necessary resources and support for this research.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Nie, F., Li, J., Bi, X., et al., 2022. Agricultural trade liberalization and domestic fertilizer use: Evidence from China–ASEAN free trade agreement. Ecological Economics, 195(C), 107341. DOI: https://doi.org/10.1016/j.ecolecon.2022.107341.

[2] Zhou, L., Tong, G., 2022. Research on the competitiveness and influencing factors of agricultural products trade between China and the countries along the "Belt and Road". Alexandria Engineering Journal, 61(11), 8919–8931.

[3] Fahim, K.E., De Silva, L.C., Hussain, F., et al., 2023. An evaluation of ASEAN renewable energy path to carbon neutrality. Sustainability, 15(8), 6961. DOI: https://doi.org/10.3390/su15086961.

[4] Gregorioa, G.B., Ancog, R.C., 2020. Assessing the impact of the COVID-19 pandemic on agricultural production in Southeast Asia: toward transformative change in agricultural food systems. Asian Journal of Agriculture and Development, 17(1), 1–13.

[5] Hossain, S.S., Huang, D., 2022. Measuring economic impact in Korea, Japan, India, China, and ASEAN considering agricultural sectors: a dynamic CGE approach based on GAMS. Review of World Economics, 158(2), 571–613.

[6] Chandio, A.A., Shah, M.I., Sethi, N., et al., 2022. Assessing the effect of climate change and financial development on agricultural production in ASEAN-4: the role of renewable energy, institutional quality, and human capital as moderators. Environmental Science and Pollution Research, 29(11), 1–15. DOI: https://doi.org/10.1007/s11356-021-16670-9.

[7] Tian, Y., Yin, M., 2022. Re-evaluation of China's agricultural carbon emissions: basic status, dynamic evolution and spatial spillover effects. 20220209317.

[8] Han, M.S., Yuan, Q., Fahad, S., et al., 2022. Dynamic evaluation of green development level of ASEAN region and its spatio-temporal patterns. Journal of Cleaner Production, 362, 132402. Available from: https://www.x-mol.com/paperRedirect/1530383458085384192 (cited 22 March 2025).

[9] Liu, W., Zhou, W., Lu, L., 2022. An innovative digitization evaluation scheme for spatio-temporal coordination relationship between multiple knowledge driven rural economic development and agricultural ecological environment—coupling coordination model analysis based on Guangxi. Journal of Innovation & Knowledge, 7(3), 100208.

[10] Tolliver, C., Fujii, H., Keeley, A.R., et al., 2021. Green innovation and finance in Asia. Asian Economic Policy Review, 16(1), 67–87. DOI: https://doi.org/10.

1111/aepr.12320.

[11] Liu, H., Zhou, R., Yao, P., et al., 2022. Assessing Chinese governance low-carbon economic peer effects in local government and under sustainable environmental regulation. Environmental Science and Pollution Research, 61304–61323. DOI: https://doi.org/10.1007/s11356-021-17901-9.

[12] Raihan, A., 2023. An econometric evaluation of the effects of economic growth, energy use, and agricultural value added on carbon dioxide emissions in Vietnam. Asia-Pacific Journal of Regional Science, 7(3), 665–696.

[13] Mishra, A., Ketelaar, J.W., Uphoff, N., et al., 2021. Food security and climate-smart agriculture in the lower Mekong basin of Southeast Asia: evaluating impacts of system of rice intensification with special reference to rainfed agriculture. International Journal of Agricultural Sustainability, 19(2), 152–174. Available from: https://ui.adsabs.harvard.edu/link_gateway/2021IJAgS..19..152M/doi:10.1080/14735903.2020.1866852 (cited 22 March 2025).

[14] Randive, K., Raut, T., Jawadand, S., 2021. An overview of the global fertilizer trends and India's position in 2020. Mineral Economics, 1–14.

[15] Abula, K., Abula, B., Wang, X., et al., 2022. Performance evaluations and influencing factors of the agricultural product trade supply chain between China and central Asian countries. Sustainability, 14(23), 15622. DOI: https://doi.org/10.3390/su142315622.

[16] Khan, D., Nouman, M., Ullah, A., 2023. Assessing the impact of technological innovation on technically derived energy efficiency: A multivariate cointegration analysis of the agricultural sector in South Asia. Environment, Development and Sustainability, 25(4), 3723–3745.

[17] Wang, T., Yu, Z., Ahmad, R., et al., 2022. Transition of bioeconomy as a key concept for the agriculture and agribusiness development: An extensive review on ASEAN countries. Frontiers in Sustainable Food Systems, 6, 998594. DOI: https://doi.org/10.3389/fsufs.2022.998594.

[18] Ali, S.A.S., Rahman, A.S.A., Mohamad, M.F.N., et al., 2023. Assessing the energy efficiency of fossil fuel in ASEAN. International Journal of Renewable Energy Development, 12(6), 1008–1017. DOI: https://doi.org/10.14710/ijred.2023.57601.

[19] Shen, Z., Wang, S., Boussemart, J.-P., et al., 2022. Digital transition and green growth in Chinese agriculture. Technological Forecasting and Social Change, 181, 121742. DOI: https://doi.org/10.1016/j.techfore.2022.121742.

[20] Han, J., Qu, J., Maraseni, T.N., et al., 2021. A critical assessment of provincial-level variation in agricultural GHG emissions in China. Journal of Environmental Management, 296, 113190. DOI: https://doi.org/10.1016/j.jenvman.2021.113190.

[21] Jiang, Q., Khattak, S.I., Rahman, Z.U., 2021. Measuring the simultaneous effects of electricity consumption and production on carbon dioxide emissions (CO_2e) in China: New evidence from an EKC-based assessment. Energy, 229, 120616.

[22] Cao, Y., Jiang, A.Y., Cao, Z.J., et al., 2022. Impact of the belt and road initiative on economic–social–natural ecological niches and their coupling coordination: evidence from 11 countries along the route. Frontiers in Environmental Science, 10, 913928. DOI: https://doi.org/10.3389/fenvs.2022.913928.

[23] Erokhin, V., Diao, L., Du, P., 2020. Sustainability-related implications of competitive advantages in agricultural value chains: Evidence from Central Asia–China trade and investment. Sustainability, 12(3), 1117.

[24] Khan, Y., Taimoor, H., Kirikkaleli, D., et al., 2022. The impact of economic policy uncertainty on carbon emissions: evaluating the role of foreign capital investment and renewable energy in East Asian economies. Environmental Science and Pollution Research, 1–19. DOI: https://doi.org/10.1007/s11356-021-17000-9.