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The Impact of Risk Management and Economic Development on Agri-Business in the Context of Vietnam

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Abstract: In recent times, there has been a growing demand for the development of Agribusiness worldwide, necessitating the attention of current literature and seasoned policymakers. This article investigates the influence of risk management and economic development on the expansion of Agribusiness in Vietnam. Risk management includes the management of production, market, and financial risks. The study collected data from secondary sources, such as World Development Indicators (WDI), spanning from 1996 to 2022. The article employed the non-linear autoregressive distributed lag (NARDL) approach to examine the relationships between the variables. The outcomes of the study suggest that there is a positive correlation between risk management (production, market, and financial risk management), population growth, and economic development with the growth of Agribusiness in Vietnam. The results informed policymakers in establishing policies to promote Agribusiness through risk management and economic development.

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Introduction

The intricate interplay between risk management techniques and economic development, particularly in the evolving landscape of Vietnam, is a crucial facet of the agri-business environment. This study aims to investigate various aspects of the relationship between risk management, economic development, and the agri-business industry in Vietnam. By examining these concepts, we can gain a better understanding of their interplay and the impact they have on each other. Vietnam, a nation with a rich agricultural heritage and a rapidly evolving economy, finds itself at a crucial juncture where traditional values intersect with modern advancements. This unique position brings forth a range of opportunities and challenges (Chin et al., 2021). The intricate interplay between climate change, market volatility, technological advancements, and socio-economic concerns necessitates a comprehensive examination of risk management strategies and their impact on the economic prosperity of the agri-business sector (Amoozad Mahdiraji et al., 2022). It is crucial for policymakers, business professionals, and academics to have a comprehensive understanding of the intricate links between risk reduction strategies and economic development, especially in the context of global population growth and increasing demands for food security (Corvellec et al., 2022).

Wang et al. (2022) assert that the agri-business industry in Vietnam plays a crucial role in the economy, providing employment opportunities, generating export revenues, and contributing to overall economic stability. The agriculture industry, like any other, is susceptible to various risks, including market volatility, unpredictable weather patterns, and insect infestations. Implementing effective risk management strategies is crucial for safeguarding farmers' livelihoods, ensuring food security, and sustaining the growth potential of the agribusiness sector. The research recognises the intricate and interconnected aspects of risk management in Vietnam's agri-business industry. It encompasses various categories like production risk, financial risk, market risk, and population growth. The study evaluates the effectiveness of these categories in mitigating issues and fostering sustainable economic growth. Furthermore, there exists a crucial link between risk management and economic development. Effective risk management not only safeguards agri-businesses from potential challenges but also fosters an environment conducive to economic growth (Egbeadumah et al., 2023).

Alternatively, a robust economy provides agri-businesses with the resources and incentives to invest in contemporary risk management strategies (Secinaro et al., 2022). Our research primarily centres on the reciprocal relationship between risk management techniques and economic development in Vietnam's agri-business industry. We aim to identify the ways in which these two factors impact and support each other. Bekkevold (2020) highlights the resilience of Vietnam's agricultural industry in the face of external shocks, while also acknowledging the challenges it faces in terms of modernization and technological integration. Effective risk management becomes increasingly crucial as Vietnam transitions from an agrarian economy to a more diversified and technologically advanced one (Pham et al., 2021). This study delves into the impact of technological advancements and risk management practices on the agri-business industry, paving the way for sustainable growth. The introduction of agricultural precision, data analysis, and climate-resilient technology has revolutionised risk management techniques. These advancements empower agri-businesses to make informed decisions and swiftly adapt to changing conditions.

Technological advancements and socio-economic factors both have an impact on how people perceive risk and management strategies in the agribusiness sector. This study examines the impact of market dynamics, financial institutions, and government regulations on the risk environment of agri-businesses in Vietnam. An in-depth analysis of the relationship between external variables and internal risk management systems provides valuable insights into the broader ecosystem in which Vietnamese agri-businesses operate. The study examines the impact of economic development initiatives on the risk tolerance and risk-taking behaviour of agri-businesses. It sheds light on the delicate balance that needs to be maintained between risk avoidance and the pursuit of growth opportunities. The study examines the impact of market dynamics and international commerce on the risk faced by Vietnamese agri-businesses as the country continues to integrate into the global economy. International marketplaces present a multitude of challenges for risk management in agri-businesses. These challenges include regional obstacles, trade agreements, geopolitical fluctuations, and vulnerabilities in supply chains. Handling these complexities requires careful attention and strategic planning (Settembre-Blundo et al., 2021). To maintain Vietnam's agri-business industry's strength and competitiveness in the dynamic global economic environment, it is crucial to comprehend the interaction between global forces and local risk management techniques.

This study aims to provide readers with a comprehensive understanding of various important aspects in Vietnam's agri-business industry. The study focuses on analysing risk management techniques employed by agri-businesses, with a specific emphasis on market risk, production risk, financial risk, and the impact of population growth. The study aims to gain insight into the current risk tolerance within the industry by assessing the efficacy of different measures. Furthermore, considering the increasing population, this study aims to identify and evaluate any shortcomings in the existing risk management protocols by examining potential deficiencies in technology implementation, financial risk mitigation, and sustainable strategies. Additionally, this study seeks to provide actionable suggestions for improving risk management strategies considering the evolving dynamics of Vietnam's agri-business sector. In addition, these goals aim to offer valuable information to scholars, industry stakeholders, and policymakers, empowering them to make informed decisions and foster Vietnam's agri-business sector into a more dependable and sustainable one.

This study provides a comprehensive analysis of risk management measures in Vietnam's agri-business sector. However, it does identify some areas that require further attention and consideration. A potential gap could arise due to the inherent disparities in risk perceptions and management strategies among different agri-business companies. The study may not have covered all organisational changes, which could limit the generalizability of the results. There is a notable issue regarding the availability of data, specifically related to the distinct risk management strategies employed by different companies. This presents a significant gap that needs to be addressed. Access to sensitive and specific material may be limited for the study, potentially constraining the investigation of certain techniques. In addition, it is challenging to provide up-to-date information due to the ever-changing external factors that impact

agribusiness, such as changes in global market dynamics and policy.
In the upcoming sections of this study, we will explore the pertinent literature, outline the research methodology, and perform a comprehensive empirical analysis to evaluate the proposed hypotheses.

Literature Review

Production risk management plays a crucial role in ensuring the stability and future growth of agri-businesses, as highlighted by Barman et al. (2021). The intricate interplay between disease outbreaks, insect invasions, and climate change underscores the significance of implementing efficient production risk management techniques. By efficiently addressing and minimising these challenges, agri-businesses can safeguard their operations and generate positive impacts on various facets of the industry.
In response to the unpredictable nature of farming in Vietnam's diverse climatic zones and ever-changing weather patterns, production risk management has emerged in the agricultural sector (Nguyen & Hens, 2019). Weather fluctuations pose a significant challenge for Vietnam's agri-businesses, directly affecting crop quality and overall production (Wassmann et al., 2019). According to the research by Benyam et al. (2021), agribusinesses can use a variety of adaptive strategies to lessen the negative effects of production risks brought on by climate change. These methods include diversifying crops, utilising resilient crop varieties, and adopting agricultural precision technology. In addition, these actions contribute to the positive impact on the economy by ensuring consistent yields and a continuous supply of crop products to meet the needs of both domestic and international markets.
Efficient management of production risks in agri-businesses plays a crucial role in bolstering stability and resilience in the financial sector (Zhan & Chen, 2021). Previous studies by Hansen et al. (2019) and Usman et al. (2023) suggest that farmers who employ risk-reduction strategies are better equipped to navigate financial challenges caused by crop failures or reduced profits due to adverse weather conditions. Agri-businesses with a proven history of effectively implementing production risk strategies are more likely to secure funding, an essential aspect of financial risk management (German et al., 2020). Ensuring financial stability is crucial in Vietnam, particularly for the numerous small-scale farmers who make up a significant portion of the agri-business sector. This stability is vital for sustaining their businesses and preventing the onset of debt cycles.
Furthermore, the research conducted by Wassmann et al. (2019) highlights the robust market dynamics of the agri-business industry in Vietnam, which can be attributed to effective production risk management. Consistency and reliability in manufacturing are crucial for the success of distribution, sellers, and customers. This is achieved through effective risk management. The availability of agricultural products plays a crucial role in maintaining stable pricing and ensuring the overall resilience of the agri-business market (German et al., 2020). In addition, agri-businesses that adopt effective production risk management techniques can build a positive reputation, which can enhance their market access and resilience, ultimately leading to sustainable growth (Barman et al., 2021). The understanding of the interdependence between efficient production risk management and the overall prosperity of the agricultural sector has a significant impact on policies, business practices, and the resilience and success of agricultural settings in agri-business.
In Vietnam's dynamic agri-business landscape, effective market risk management plays a vital role in driving positive outcomes across economic, strategic, and social dimensions. The agri-business industry in Vietnam is susceptible to the volatility of market dynamics, influenced by factors like changing customer preferences, fluctuating demand, and the interdependence of global trade (Pham & Petersen, 2021). Amidst the uncertainties faced by agri-businesses, the implementation of effective market risk management methods becomes crucial to achieve favourable outcomes that extend beyond mere market fluctuations. Nguyen et al. (2020) state that the Vietnamese agribusiness industry can benefit from market risk management by enhancing economic stability. Effective diversification of market exposures allows agriculture-related companies to mitigate the negative impact of market volatility on their income sources (Khatri et al., 2023). This enhances the resilience of individual firms against external economic shocks, safeguarding them from sudden downturns in specific markets and contributing to the overall stability of the sector. In a recent study, Namany et al. (2020) highlight the importance of market risk management techniques such as hedging and forward contracts for agri-businesses. These techniques help ensure stable pricing for their products, safeguarding against unpredictable market fluctuations and ensuring a more consistent revenue stream.
Furthermore, effective management of market risk plays a crucial role in bolstering the competitiveness and strategic positioning of Vietnamese agri-businesses. Efficient risk management techniques empower companies to navigate external challenges in a globalised market where trade agreements and geopolitical shifts can greatly influence the agri-business landscape (Sjah & Zainuri, 2020). Effective market risk management allows agri-businesses to establish robust supply chains, capitalise on advantageous trade conditions, and strategically position themselves in emerging markets (Jia et al., 2020). This allows them to thrive in a competitive and interconnected global economy, as their market share is positively influenced. In line with Adams et al. (2020), it has been observed that market risk management plays a significant role in positively impacting the overall welfare of communities reliant on agri-business companies.
A recent study conducted by Faraz et al. (2023) highlights the positive impact of stable and well-managed markets on livelihoods and poverty reduction. These markets create an environment that fosters sustained employment opportunities. Khatri et al. (2023) found that agri-businesses can enhance employee well-being, implement sustainable farming methods, and promote socioeconomic development in their operating regions by effectively managing market fluctuations. The implementation of robust market risk management methods goes beyond mere financial necessity. It serves as a fundamental pillar for fostering sustainable development by enhancing resilience to market fluctuations, facilitating strategic decision-making, and fostering social well-being (Jia et al., 2020). It is essential for policymakers, business executives, and other stakeholders to recognise and support the positive impacts of these effects. This will enhance Vietnam's agri-business sector and ensure its adaptability and prosperity in an ever evolving and interconnected global market.
Financial risk management plays a crucial role in the dynamic agri-business industry of Vietnam, impacting various aspects such as the economy, operations, and long-

term planning. Agri-businesses must prioritise financial risk management to ensure stability and sustainable development, as agricultural markets are inherently volatile and input pricing and commodity costs are unpredictable (Rodríguez-Espíndola et al., 2022). Effective financial risk management techniques contribute significantly to economic resilience, offering substantial benefits (Dormady et al., 2022). Agri-businesses in Vietnam have the option to safeguard against the adverse effects of price fluctuations through the utilisation of various tools such as financial derivatives, insurance products, and futures contracts.

As a result, this enhances their ability to maintain steady income, secure funding, and manage the complex financial aspects of the industry. In a recent study conducted by Geza et al. (2023), it was found that financial risk management plays a crucial role in improving the efficiency of agri-businesses, particularly in Vietnam, where small-scale agriculture is prevalent. For agri-business enterprises to operate efficiently, it is crucial to have effective financial risk management. This not only enhances credibility but also plays a vital role in ensuring loan availability (Rodríguez-Espíndola et al., 2022). Developing robust risk-reduction strategies enables agri-businesses to enhance their eligibility for loans, facilitate investments in cutting-edge technology, and optimise their manufacturing processes. This operational resilience contributes to the development of a sustainable and flexible agricultural environment in Vietnam. It focuses on enhancing the financial well-being of individual enterprises and promoting overall stability in the agri-business sector (Geza et al., 2023).

Geza et al. (2023) suggest that effective financial risk management can help agri-businesses capitalise on opportunities and make informed decisions. Businesses can make more informed strategic decisions by safeguarding themselves against risks associated with commodity prices, interest rate changes, and currency fluctuations. This assurance enables them to act with confidence (Rodríguez-Espíndola et al., 2022). A study conducted by Dormady et al. (2022) highlights the importance of active financial risk management for agri-businesses. It enables them to make informed decisions regarding resource allocation, investments in research and development, and market expansion. Their adeptness at adapting not only positions them favourably for future success but also bolsters the sector's overall economic contribution to the country.

Furthermore, financial risk management plays a crucial role in fostering positive social outcomes, particularly in rural regions where agri-businesses often serve as vital contributors to local economies (Pham & Petersen, 2021). Stable and financially strong agri-businesses play a crucial role in preserving and generating job opportunities, supporting livelihoods, and fostering economic growth in rural communities (Pandey & Pandey, 2023). As companies expand, they serve as catalysts for investments in infrastructure, healthcare, and education, promoting the development of communities. Financial risk management has a significant social impact that extends beyond economic factors and influences the overall welfare of communities dependent on agri-business.

The interdependence of economic development and agri-business in Vietnam's dynamic landscape exemplifies the pivotal significance of agriculture in shaping the country's developmental trajectory. Economic development, which from various angles is characterized by advancements in market integration, technology, and infrastructure, greatly benefits the agricultural industry (Lopes & Lopes, 2019). Enhanced market access plays a crucial role in driving economic growth and reaping benefits for the agri-business sector. As the economy expands and infrastructure improves, agri-businesses can tap into domestic and international markets more easily, as highlighted by Lopes and Lopes (2019). Thanks to this enhanced connectivity, the transportation of agricultural products has become more efficient, reducing technical challenges and providing Vietnamese agri-businesses with broader market opportunities (Dung et al., 2020).

In addition, economic development facilitates the implementation of technological advancements in the agri-business industry, leading to increased efficiency and innovation. Agri-businesses can now utilise cutting-edge technologies such as smart irrigation systems, precision agriculture, and enhanced crop management strategies, thanks to economic recovery and increased research and development investments (Abbate et al., 2023). These innovations align the agri-business industry with evolving customer demands and global standards while also advocating for sustainable practices and boosting production. The advantages encompass higher profits, reduced resource usage, and an improved ability to withstand environmental disruptions, all of which contribute to a more resilient and adaptable agricultural landscape (Lopes & Lopes, 2019).

In line with Khan's (2021) findings, economic development has been shown to stimulate the financial potential of agri-businesses. Developing economies frequently facilitate access to credit and funding, allowing agri-businesses to invest in modernising machinery, expanding their operations, and adopting industry best practices (Modi, 2022). Investment plays a crucial role in enhancing the financial stability of the agri-business sector. It enables companies to navigate through economic uncertainties and allocate resources towards long-term sustainability initiatives. In addition, Dung et al. (2020) state that economic growth leads to the emergence of a larger middle class, resulting in increased purchasing power and a higher demand for agricultural products that offer additional value. The increasing demand from consumers has led to the growth of agri-businesses and encouraged specialisation and diversity (Abbate et al., 2023). Additionally, employees in the agribusiness sector reap the rewards of economic growth. As Khan (2021) asserts, the expansion of the overall economy leads to enhanced access to educational opportunities and skill development programmes. Through active participation in agribusiness, individuals gain valuable knowledge and experience that enhances agricultural practices, increases productivity, and promotes the adoption of modern management strategies.

The management of population growth plays a crucial role in shaping farming methods, food production, and economic sustainability in Vietnam's agri-business sector. Effective population growth management has several positive effects on agri-business. It promotes sustainable agricultural growth while addressing the challenges posed by a growing population (Pandey & Pandey, 2023). The increasing global population has led to a corresponding rise in the demand for food, presenting both opportunities and challenges for agri-businesses. Research conducted by MacPherson et al. (2022) suggests that implementing population growth control measures, such as family planning initiatives and education campaigns, can help achieve a well-balanced population structure. Due to this, there exists a dependable and foreseeable market for agricultural goods, aiding agri-businesses in strategic planning and optimising resource utilisation.

In addition, population growth control has a direct impact on the allocation of resources and land use methods in the agri-business sector. Efficient land use becomes crucial when prioritising sustainable agriculture (Zulu et al., 2021). MacPherson et al. (2022) found that controlled population growth enables more effective land allocation, enabling agri-businesses to implement strategies that balance environmental preservation and food production. Maintaining a stable and controlled population facilitates the implementation of sustainable agricultural techniques, such as agro-ecological methods and precision farming (Khan, 2021). This ensures that agri-businesses can effectively address the requirements for long-term environmental sustainability while also meeting the current demands of a growing population.

According to Cordovil et al. (2020), agri-business companies could enhance their technological innovations and strategic investments in a controlled population growth environment. Implementing data-driven farming, precision agriculture, and adopting innovative technologies can optimise output while minimising environmental impact (Zulu et al., 2021). In addition, the controlled growth of the population has a positive impact on the socioeconomic dynamics of rural areas that rely on agri-business. Education prospects could potentially increase as family sizes stabilise, especially for women. According to a study by German et al. (2020), there is a significant link between the promotion of increased agricultural production and agri-business activities and the empowerment and education of women. Therefore, the overall socioeconomic structure of rural communities is enhanced, fostering a more inclusive and sustainable form of development.

Research Methodology

The article examines the impact of production risk management, market risk management, financial risk management, population growth, and economic development on agri-business growth in Vietnam. The study extracted the data from secondary sources like WDI from 1996 to 2022. The study established the equation given below:

$$AB_t = \alpha_0 + \beta_1 PR_t + \beta_2 MR_t + \beta_3 FR_t + \beta_4 ED_t + \beta_5 PG_t + e_t \quad (1)$$

Where.
AB = Agri-business
t = Time Period
PR = Production Risk
MR = Market Risk
FR = Financial Risk
ED = Economic Development
PG = Population Growth

The article focused on the growth of the agri-business sector, specifically measuring it through the annual percentage growth of agricultural, forestry, and fishing value added. Also, the article utilised two predictors: risk management, which was measured using the crop production index, wholesale price index, and lending interest rate; and economic development, which was measured by GDP growth (annual%). Ultimately, the study incorporated a single control variable called population growth, which was measured as the annual percentage change in population. The constructs and measurements are provided in Table 1.

Table 1: Variables with Measurements.

S#	Variables	Measurement	Sources
01	Agri-business	Agricultural, forestry and fishing, value added (annual % growth)	WDI
02	Production Risk	Crop production index	WDI
03	Market Risk	Whole sale price index	WDI
04	Financial Risk	Lending interest rate (%)	WDI
05	Economic Development	GDP growth (annual %)	WDI
06	Population Growth	Population growth (annual %)	WDI

The article examines the specifics of the variables using descriptive statistics. In addition, the study also investigates the relationship between constructs using a correlation matrix. Furthermore, the article analyses the unit root using ADF and PP tests. The equation is mentioned below:

$$d(Y_t) = \alpha_0 + \beta t + YY_{t-1} + d(Y_t(-1)) + \varepsilon_t \quad (2)$$

Furthermore, the article examines co-integration using the ARDL-bound test. In addition, the article utilises the ARDL model to examine the relationship between variables. It is crucial to consider a situation where certain constructs remain at a constant level while others undergo a first difference (Qamruzzaman & Jianguo, 2018). Furthermore, the article employed ARDL as it effectively addresses the impacts of heteroscedasticity and autocorrelation (Sohail et al., 2021). The estimation equation is given below:

$$\Delta AB_t = \alpha_0 + \sum\delta_1 \Delta AB_{t-1} + \sum\delta_2 \Delta PR_{t-1} + \sum\delta_3 \Delta MR_{t-1} + \sum\delta_4 \Delta FR_{t-1} + \sum\delta_5 \Delta ED_{t-1} + \sum\delta_6 \Delta PG_{t-1} + \varphi_1 AB_{t-1} + \varphi_2 PR_{t-1} + \varphi_3 MR_{t-1} + \varphi_4 FR_{t-1} + \varphi_5 ED_{t-1} + \varphi_6 PG_{t-1} + \varepsilon_t \quad (3)$$

The article employed the NARDL approach to examine the relationships between the variables. The article aims to examine the asymmetric relationship between ED, PG, and AB. Hence, the asymmetric function is mentioned below:

$$AB = f(PR, MR, FR, PG^+, PG^-, ED^+, ED^-) \quad (4)$$

So, the empirical model along with asymmetric linkages is established below:

$$AB_t = \alpha_0 + \beta_1 PR_t + \beta_2 MR_t + \beta_3 FR_t + \beta_4 {PG_t}^+ + \beta_5 {PG_t}^- + \beta_6 {ED_t}^+ + \beta_7 {ED_t}^- + e_t \quad (5)$$

The article aims to examine the asymmetric relationship between PG, ED, and AB. The partial sum of negative and positive changes between variables is provided below:

$$ED^+ = \sum_{i=1}^{t} \Delta ED_i^+ = \sum_{i=1}^{t} \max(\Delta ED_i\ 0) \quad (6)$$

$$ED^- = \sum_{i=1}^{t} \Delta ED_i^- = \sum_{i=1}^{t} \min(\Delta ED_i\ 0) \quad (7)$$

$$PG^+ = \sum_{i=1}^{t} \Delta PG_i^+ = \sum_{i=1}^{t} \max(\Delta PG_i\ 0) \quad (8)$$

$$PG^- = \sum_{i=1}^{t} \Delta PG_i^- = \sum_{i=1}^{t} \min(\Delta PG_i\ 0) \quad (9)$$

The research has established the nonlinear ARDL model equation, which captures the asymmetric linkages between ED, PG, and AB as given below:

$$\Delta AB_t = \alpha_0 + \sum\delta_1 \Delta AB_{t-1} + \sum\delta_2 \Delta PR_{t-1} + \sum\delta_3 \Delta MR + \sum\delta_4 \Delta FR_{t-1} + \sum\delta_5 \Delta PG_{t-1}^+ + \sum\delta_6 \Delta PG_{t-1}^- + \sum\delta_7 \Delta ED_{t-1}^+ + \sum\delta_8 \Delta ED_{t-1}^- + \varphi_1 AB_{t-1} + \varphi_2 PR_{t-1} + \varphi_3 MR_{t-1} + \varphi_4 FR_{t-1} + \varphi_5 PG_{t-1}^+ + \varphi_6 PG_{t-1}^- + \varphi_7 ED_{t-1}^+ + \varphi_8 ED_{t-1}^- + \varepsilon_t \quad (10)$$

Research Findings

The article examines the specifics of the variables using descriptive statistics. The results revealed that the average value of AB was 3.456, PR was 55.012, and MR was 12.901. Furthermore, the findings revealed that the average FR value was 10.792, ED was 6.433, and PG was 1.060. The outcomes are listed in Table 2.

Table 2: Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
AB	27	3.456	1.053	0.486	5.235
PR	27	55.012	5.081	46.55	63.332
MR	27	12.901	0.507	12.092	13.731
FR	27	10.792	3.369	6.960	20.100
ED	27	6.433	1.446	2.562	9.340
PG	27	1.060	0.185	0.735	1.597

In addition, the study also analyses the relationship between constructs using a correlation matrix. The findings suggest that various factors, including risk management in production, market, and finance, as well as population growth and economic development, are positively correlated with the growth of agri-business in Vietnam. The outcomes are listed in Table 3.

Table 3: Correlations Matrix.

Variables	AB	PR	MR	FR	ED	PG
AB	1.000					
PR	0.490	1.000				
MR	0.488	1.000	1.000			
FR	0.345	-0.617	-0.615	1.000		
ED	0.176	-0.320	-0.315	0.227	1.000	
PG	0.273	-0.759	-0.760	0.709	0.297	1.000

The article analyses the unit root using ADF and PP tests. The findings suggest that AB, PR, and ED exhibit a stationary level, whereas MR, FR, and PG display a stationary first difference. The outcomes are listed in Table 4.

Table 4: Unit Root Test.

ADF			PP	
Series	Level	First difference	Level	First difference
AB	-2.094***	----	-3.201***	----
PR	-2.981***	----	-3.456***	----
MR	----	-4.376***	----	-5.464***
FR	----	-4.763***	----	-5.765***
PG	----	-4.092***	----	-5.098***
ED	-3.218***	----	-3.101***	----

Furthermore, the article examines co-integration using the ARDL-bound test. The results suggest that the calculated f-statistics value (4.764) exceeds the critical values, indicating the presence of co-integration. The outcomes can be found in Table 5.

Table 5: Bound Test of Nonlinear ARDL.

	F-statistics	Lower Bound	Upper Bound	Decision
Linear ARDL	0.675	1.674	2.784	No Co-integration
Asymmetric ARDL	4.764	1.642	2.674	Co-integration

The article employed the NARDL approach to examine the relationships between the variables. The study findings revealed that various factors, including risk management in production, market, and finance, as well as population growth and economic development, are positively correlated with the growth of agri-business in Vietnam. The outcomes are presented in Table 6.

Table 6: Nonlinear ARDL Results.

Variables	Coefficients	Std. Err.	t-statistics
C	0.674	0.065	10.369
AB (-1)	0.249	0.071	3.507
PR (-1)	1.645	0.432	3.808
MR (-1)	2.101	0.267	7.869
FR (-1)	3.102	1.091	2.843
PG-P (-1)	2.765	0.761	2.844
PG-N (-1)	0.762	0.322	2.366
ED-P (-1)	3.212	0.373	8.611
ED-N (-1)	2.762	0.431	6.408
Adj. R Square	0.665		
F-statistics	45.166		
Prob.(F-statistics)	0.002		

Discussions

This study delves into the intricate connection between risk management, economic development, and different risk dimensions in Vietnam's agri-business sector. It examines production risk, financial risk, market risk, and population growth management. The findings resulting from a comprehensive analysis of these factors offer valuable insights into the challenges and opportunities that agri-businesses encounter in this dynamic environment. When it comes to production risk management, it is crucial to address the unpredictability of climate, pets, and diseases to maintain agricultural output. This study emphasises the importance of implementing effective solutions to mitigate these risks.

In Vietnam, agriculture plays a crucial role in the economy, and the positive effects of production risk management are clearly evident (Nguyen & Hens, 2019). Research conducted by Hansen et al. (2019) and Nguyen et al. (2020) demonstrates that agri-businesses employing a combination of techniques, resilient crop varieties, and advanced technology exhibit greater adaptability to environmental challenges. The advantages extend beyond mitigating risk, as they contribute to economic stability through consistent yields and a steady provision of agricultural products to meet both domestic and international demand. The integration of advanced agricultural techniques, data analysis, and climate-resilient technology has brought about a significant shift in risk management strategies. This has empowered agri-businesses to make informed decisions and adapt swiftly to dynamic conditions (Zhan & Chen, 2021).

This study also highlights the significance of financial risk management in ensuring the stability and growth of agri-businesses. The study reveals that employing efficient financial risk management strategies, including future agreements, insurance products, and partnerships with financial institutions, plays a significant role in maintaining economic stability in the agribusiness sector. According to a study by Sjah and Zainuri (2020), people are more likely to have easier access to credit if they consistently use effective financial risk management strategies. In Vietnam, financial stability is crucial for ensuring the continuous activities of agri-businesses, which are primarily

farmers, and for avoiding debt cycles. Financial risk management has a positive impact on not only economic stability but also enhances strategic decision-making by providing a sense of confidence in an unpredictable market (Namany et al., 2020). By implementing this approach, agri-businesses can strategically prepare for the future, optimise resource allocation, and prioritise expansion prospects. However, market risk management is seen as a transformative force that has a positive impact on the growth of Vietnamese agribusinesses (Faraz et al., 2023).

The study reveals that implementing effective risk management strategies, such as market growth, supply chain integration, and leveraging current market knowledge, contributes to economic stability by safeguarding companies against market fluctuations. As companies strategically expand into new markets, leverage favourable trade conditions, and establish robust supply chain networks, the positive impact extends to the overall strength and efficiency of the agri-business sector (Adams et al., 2020). According to Jia et al. (2020), strategic flexibility not only enables sustainable growth but also enhances the sector's overall contribution to the national economy. Market risk management plays a crucial role in positively influencing social dimensions. It helps support incomes, create employment opportunities, and contribute to poverty reduction in rural areas that rely on agri-business activity (Lopes & Lopes, 2019).

An analysis of population growth management highlights its significant influence on Vietnamese agriculture. Based on the research, effective management of population growth has a positive effect on the stability and reliability of demand for agricultural products. This assists in the development of strategic plans and the efficient allocation of resources in agribusinesses. Research conducted by Khan (2021) and Zulu et al. (2021) provides evidence in favour of the hypothesis, suggesting that managing population growth can lead to improved land allocation practices in sustainable agriculture. This, in turn, allows agri-businesses to implement strategies that integrate food production with environmental protection. The positive impact extends to optimising land use, adopting sustainable farming techniques, and developing a technologically advanced agri-business industry (Zulu et al., 2021). The study highlights the positive impact of economic development on Vietnam's agri-business sector.

The promotion of enhanced interconnection and reduction of technical difficulties in economic development expands market access for agri-business (Modi, 2022). The positive impact extends to technological advancements that are prevalent in the agricultural sector, enhancing innovation and productivity. In their study, Dung et al. (2020) examine the impact of economic development on agri-businesses. They find that economic development leads to increased access to credit and funding, which in turn enables these businesses to invest in modernising their equipment and adopting best practices. In addition, economic development has positive effects on employees in the agri-business sector, as it promotes entrepreneurship, innovation, and knowledge enhancement (Khan, 2021). According to a study conducted by Lopes & Lopes (2019), economic development has been shown to enhance the standard of living, agricultural infrastructure, and overall social well-being at a societal level. This, in turn, has a positive effect on the socio-economic conditions of rural areas.

Implications

The findings of this study hold significant importance for policymakers, agri-business managers, and individuals engaged in the advancement of Vietnam's agricultural economy. The documented favourable impacts of successful risk management, economic development, and population growth management suggest potential for strategic interventions. These insights can inform policymakers in developing and implementing targeted measures to support sustainable farming practices, enhance financial stability, and foster innovation in the agri-business sector. Agri-business managers can enhance their effectiveness by adopting best practices in risk management, promoting technological innovation, and embracing strategic market positioning. The study highlights the importance of achieving a balance between population growth and sustainable agriculture practices. It emphasises the need for collaboration to ensure food security without compromising the environment. The results informed policymakers in developing policies to improve the agri-business sector through risk management and economic development.

Limitations

This study offers valuable insights into risk management, economic development, and population growth in Vietnam's agri-business sector. However, it is important to acknowledge certain limitations associated with this research. First, it is important to consider that the specific conditions and timing of the study may restrict the applicability of the results. Agri-business ecosystems exhibit dynamic characteristics, with consequences that can vary over time and across different locations. Furthermore, the study's reliance on publicly available data may limit the depth of research, especially when it comes to exclusive risk management procedures and financial data of individual agri-businesses. In addition, the study focuses on the positive effects, potentially overlooking any nuanced issues or negative consequences associated with certain approaches. Providing up-to-date data is challenging due to the ever-changing nature of external factors such as policy changes and global market fluctuations. Furthermore, a more thorough analysis of different sectors within agri-business could enhance the study by yielding more comprehensive results. Understanding these limitations is crucial for accurately interpreting the study's results and informing future research efforts in Vietnam's ever-changing agri-business sector.

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