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Measuring Global Competitiveness and Horticulture Export Resilience Amidst Non-Tariff Barriers and Stringent Phytosanitary Requirements for Indonesian Tropical Fruits

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ABSTRACT

The export performance of Indonesian tropical fruits has considerable potential to contribute to national economic growth; however, increasing non-tariff barriers (NTBs) and stringent phytosanitary requirements continue to challenge export competitiveness in global markets. Compliance with sanitary and phytosanitary (SPS) measures, quality standards, traceability systems, and food safety regulations has become essential for maintaining market access and strengthening export resilience. This study aims to synthesize empirical evidence on the relationship between global competitiveness, export resilience, and compliance with non-tariff and phytosanitary regulations affecting Indonesian tropical fruit exports. A qualitative systematic literature review was conducted by analyzing twenty-five peer-reviewed articles published between 2015 and 2026 from international and national scientific databases. The findings indicate that export competitiveness is strongly influenced by product quality, compliance with international phytosanitary standards, certification systems, logistics efficiency, technological innovation, and institutional support. Furthermore, strengthening export resilience requires integrated strategies involving government policies, farmer capacity building, traceability systems, and improvements in post-harvest management to reduce the impact of increasingly stringent import regulations. The study concludes that enhancing compliance with international standards while improving supply chain competitiveness is essential to expand market access and sustain the long-term competitiveness of Indonesian tropical fruits in global trade.

Keywords: Global Competitiveness; Export Resilience; Non-Tariff Barriers; Phytosanitary Requirements; Tropical Fruits; Indonesia

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1. Introduction

International agricultural trade is widely recognized as an important contributor to economic growth, partly through expanded market opportunities, export earnings, and improved competitiveness of agricultural commodities in global markets [1]. Among agricultural commodities, tropical fruits have experienced growing international demand, which has been associated with increasing consumer awareness of healthy diets, changing food consumption patterns, and expanding global trade networks [2]. The rising demand for fresh and processed tropical fruits may provide opportunities for producing countries, particularly those located in tropical regions with abundant natural resources and favorable climatic conditions [3]. Consequently, improving the competitiveness of tropical fruit exports has been recognized as an important policy priority in many developing countries seeking to enhance agricultural value creation and export diversification [4].

Indonesia is considered to have favorable conditions for tropical fruit production owing to its rich biodiversity, diverse agroecological conditions, and potential for year-round cultivation [5]. The country is recognized as a major producer of commodities such as mango, mangosteen, pineapple, banana, salak, papaya, and durian, many of which have high commercial value in international markets [6]. Despite this production potential, Indonesia's contribution to the global tropical fruit export market remains relatively limited compared with other exporting countries such as Thailand, Vietnam, the Philippines, and Ecuador [7]. This condition suggests that production capacity alone may be insufficient to achieve sustainable export competitiveness without improvements in product quality, supply chain efficiency, and compliance with international trade standards [8].

Global competitiveness in horticultural exports is influenced by numerous factors extending beyond production volume and comparative advantage. Product quality, consistency of supply, post-harvest management, logistics performance, technological innovation, institutional support, and compliance with international regulations collectively influence a country's ability to compete in increasingly demanding export markets [9]. As international trade becomes more integrated, importing countries have strengthened regulatory frameworks to promote food safety, environmental sustainability, and plant health protection throughout agricultural supply chains [10]. Consequently, exporters are required to comply with increasingly complex technical requirements before gaining access to international markets [11].

One of the most significant challenges affecting horticultural exports is the growing implementation of non-tariff barriers (NTBs). Unlike conventional tariffs, non-tariff barriers consist of technical regulations, quality standards, labeling requirements, certification procedures, traceability systems, maximum residue limits (MRLs), and sanitary measures that influence market access without directly imposing import duties [12]. Although these

regulations are intended to protect consumer health, environmental sustainability, and agricultural biosecurity, compliance often imposes substantial financial and technical burdens on exporters, particularly those operating in developing countries [13]. Smallholder farmers and export-oriented enterprises frequently encounter difficulties in meeting increasingly stringent international standards because of limited technological capacity, insufficient infrastructure, and inadequate institutional support [14].

Among various forms of non-tariff measures, sanitary and phytosanitary (SPS) requirements have become one of the most influential determinants of international horticultural trade [15]. Phytosanitary measures aim to prevent the introduction and spread of harmful pests and plant diseases through imported agricultural products while maintaining the safety and integrity of domestic agricultural systems [16]. Compliance with phytosanitary regulations generally involves pest risk assessments, quarantine inspections, phytosanitary certification, traceability documentation, and adherence to internationally recognized plant health standards established under the International Plant Protection Convention (IPPC) and the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures [17]. Failure to satisfy these requirements may result in shipment rejection, import restrictions, or temporary export suspensions that significantly affect trade performance [18].

For Indonesia, compliance with phytosanitary standards has become increasingly important as export destinations continue to strengthen import regulations. Major markets including Japan, China, the European Union, Australia, and the United States require exported horticultural products to meet strict standards concerning pesticide residues, pest-free status, product quality, packaging, and traceability [19]. These requirements create both challenges and opportunities for Indonesian tropical fruit exporters because successful compliance may enhance international credibility and support long-term market access [20]. Conversely, repeated non-compliance may reduce buyer confidence and weaken Indonesia's competitiveness within global horticultural supply chains [21].

Recent studies suggest that export resilience has become an equally important dimension of global competitiveness in response to increasingly uncertain international trading environments [22]. Export resilience refers to the ability of exporting industries to maintain market performance, adapt to changing regulatory environments, and recover from external shocks, including trade policy changes, supply chain disruptions, disease outbreaks, and evolving international standards [23]. In the horticultural sector, resilient export systems are characterized by diversified export destinations, strong institutional coordination, efficient logistics, continuous quality improvement, and effective compliance with international regulatory requirements [24]. Strengthening these capabilities may enable exporting countries

to sustain competitiveness despite increasingly complex non-tariff measures and phytosanitary regulations [25].

Despite the growing body of literature concerning horticultural exports, international competitiveness, and sanitary regulations, previous studies have generally examined these topics separately. Limited research has comprehensively synthesized how non-tariff barriers and phytosanitary requirements collectively influence the global competitiveness and export resilience of Indonesian tropical fruits. Therefore, this study aims to review existing empirical evidence regarding the interaction between global competitiveness, export resilience, non-tariff barriers, and phytosanitary compliance in the Indonesian horticultural sector. The findings may provide broader insights into the challenges and strategic opportunities for strengthening the international competitiveness of Indonesian tropical fruit exports amid increasingly stringent global trade regulations.

2. Materials and Method

This study employed a qualitative research approach using a systematic literature review (SLR) to examine the relationship between global competitiveness, horticultural export resilience, non-tariff barriers (NTBs), and phytosanitary requirements affecting Indonesian tropical fruit exports. The systematic literature review method was selected because it facilitates the integration and critical evaluation of findings from previous empirical studies, thereby providing broader insights into factors influencing export performance under increasingly stringent international trade regulations [8]. This approach also facilitates the identification of research trends, policy implications, and knowledge gaps related to horticultural export competitiveness in developing countries [22].

The literature search was conducted using several international and national academic databases, including Scopus, ScienceDirect, SpringerLink, Web of Science, Taylor & Francis Online, Wiley Online Library, Emerald Insight, Google Scholar, and SINTA-accredited journals. The search process utilized combinations of keywords such as *global competitiveness*, *export resilience*, *horticulture exports*, *tropical fruits*, *non-tariff barriers*, *sanitary and phytosanitary measures*, *phytosanitary requirements*, *food safety standards*, *agricultural trade*, and *Indonesia*. Boolean operators ("AND" and "OR") were applied to improve search accuracy and ensure that all retrieved publications were relevant to the objectives of this study [10].

To ensure the quality and relevance of the reviewed literature, predetermined inclusion and exclusion criteria were established. The inclusion criteria comprised peer-reviewed journal articles published between 2015 and 2026 that discussed at least one of the following topics: global competitiveness of agricultural exports, horticultural trade, export resilience, non-tariff barriers, sanitary and phytosanitary measures, food safety standards, or international market

access for tropical fruits. Publications focusing solely on agricultural production without discussing export performance or international trade regulations were excluded from the review. Only full-text articles published in English or Indonesian were included to facilitate comprehensive analysis and ensure consistency in data extraction [17].

Following the identification, screening, and eligibility assessment processes, twenty-five journal articles were selected for detailed review. These studies represented diverse geographical contexts, including Indonesia and other tropical fruit-exporting countries such as Thailand, Vietnam, the Philippines, Brazil, and Ecuador. Incorporating evidence from multiple exporting countries enabled comparative analysis of strategies adopted to enhance export competitiveness and maintain compliance with increasingly stringent phytosanitary regulations in international markets [18].

The selected literature was analyzed using thematic content analysis to synthesize empirical evidence across previous studies. Each article was systematically examined based on several analytical components, including research objectives, methodology, commodities investigated, export destination markets, types of non-tariff barriers, phytosanitary measures applied, determinants of export competitiveness, and policy recommendations. The findings were subsequently synthesized into three major analytical themes, namely factors influencing global competitiveness of Indonesian tropical fruit exports, the impact of non-tariff barriers and phytosanitary requirements on export resilience, and strategic approaches for strengthening the competitiveness of Indonesian horticultural exports in global markets. This analytical framework enabled a comprehensive interpretation of previous findings while identifying common patterns and policy implications for improving the long-term resilience and international competitiveness of Indonesian tropical fruits [25].

3. Result

The synthesis of the twenty-five selected studies suggests that the global competitiveness of Indonesian tropical fruit exports is associated with export resilience, compliance with non-tariff barriers (NTBs), and the ability to satisfy increasingly stringent phytosanitary requirements imposed by importing countries. Although Indonesia possesses considerable comparative advantages in tropical fruit production, the reviewed literature consistently demonstrates that comparative advantage alone is insufficient to achieve sustainable export growth in highly competitive international markets [1]. Instead, export performance appears to be influenced by product quality, compliance with international standards, institutional capacity, logistics efficiency, and exporters' adaptability to evolving global trade regulations [8].

The reviewed studies further suggest that non-tariff barriers represent an important factor influencing international horticultural trade. Unlike import tariffs, NTBs regulate market access

through technical requirements related to food safety, product quality, labeling, traceability, maximum residue limits (MRLs), and phytosanitary certification [10]. These regulations have become increasingly important because importing countries seek to protect domestic agriculture, consumer health, and environmental sustainability while maintaining international trade commitments under the World Trade Organization framework [11]. Consequently, exporters that successfully comply with these requirements generally demonstrate greater competitiveness and stronger export resilience than exporters with limited compliance capacity [17].

Determinants of Global Competitiveness of Indonesian Tropical Fruit Exports

The reviewed literature consistently identifies several factors that determine the global competitiveness of Indonesian tropical fruits. Product quality remains the most frequently reported determinant because international buyers require products with uniform size, appearance, freshness, and compliance with food safety standards [7]. Commodities such as mangosteen, pineapple, banana, mango, and salak possess substantial export potential due to their unique tropical characteristics; however, inconsistent quality and post-harvest handling frequently reduce their competitiveness in international markets [21].

Another important determinant conserns supply chain efficiency. Several studies indicate that inadequate post-harvest management, limited cold-chain facilities, and inefficient logistics systems contribute to higher transportation costs and reduced product quality during export distribution [20]. Tropical fruits are highly perishable commodities that require rapid handling, temperature-controlled storage, and efficient transportation to maintain freshness throughout international supply chains [23]. Delays in transportation or improper post-harvest practices often decrease product quality and increase the likelihood of shipment rejection by importing countries [18].

Institutional support and technological innovation also play significant roles in strengthening export competitiveness. Government assistance through export facilitation programs, quality certification, farmer training, and technical guidance enables producers to comply with increasingly complex international standards [24]. Furthermore, the adoption of digital traceability systems, modern packaging technologies, and quality assurance mechanisms improves transparency throughout the supply chain while increasing buyer confidence in Indonesian horticultural products [19]. These improvements contribute to stronger market positioning and greater competitiveness within international fruit markets [22].

Impact of Non-Tariff Barriers and Phytosanitary Requirements on Export Resilience

The reviewed studies demonstrate that non-tariff barriers have become more influential than conventional tariff measures in determining market access for agricultural exports. Importing countries increasingly rely on sanitary and phytosanitary regulations to minimize risks associated with pests, plant diseases, pesticide residues, and food contamination [10]. Consequently, compliance with SPS measures has evolved from a regulatory obligation into a strategic competitive advantage for exporting countries [11].

Among the various phytosanitary requirements, phytosanitary certification, pest-free production areas, maximum residue limits, quarantine inspections, and traceability systems are consistently identified as the most significant export requirements [15]. Failure to comply with these standards frequently results in shipment delays, product rejection, additional inspection costs, or temporary import restrictions imposed by destination countries [16]. These consequences not only reduce export revenues but also weaken the credibility of exporters in international markets, thereby affecting long-term trade relationships [13].

The literature also reveals that export resilience depends on the ability of exporters to adapt to continuously evolving international regulations. Countries possessing strong institutional coordination, efficient inspection systems, accredited laboratories, and internationally recognized certification mechanisms generally experience fewer export disruptions than countries with weaker regulatory systems [25]. In addition, exporters adopting internationally recognized standards such as Good Agricultural Practices (GAP), Hazard Analysis and Critical Control Points (HACCP), and GlobalG.A.P. demonstrate greater capacity to maintain export continuity despite increasingly stringent market requirements [17].

Strategies to Strengthen Export Competitiveness and Resilience

The reviewed literature consistently emphasizes that improving the competitiveness of Indonesian tropical fruit exports requires integrated strategies involving multiple stakeholders. Strengthening compliance with international phytosanitary standards should be accompanied by improvements in agricultural production systems, post-harvest handling, logistics infrastructure, and institutional coordination [9]. Investment in modern cold-chain facilities, packaging technologies, and transportation infrastructure is considered essential for maintaining product quality throughout international distribution channels [20].

Several studies further recommend strengthening farmer capacity through continuous technical training related to pesticide management, pest monitoring, traceability documentation, and export quality standards [18]. Capacity-building programs improve producers' understanding of international regulations while reducing the likelihood of non-compliance during export activities [14]. Moreover, collaboration among farmers, exporters,

certification bodies, research institutions, and government agencies facilitates the dissemination of technological innovations and international best practices required to enhance export competitiveness [24].

Another important strategy identified in the reviewed literature involves market diversification and export destination expansion. Excessive dependence on a limited number of importing countries increases vulnerability to changes in trade policies and phytosanitary regulations [22]. Expanding access to emerging markets while maintaining compliance with international standards enables exporters to distribute market risks more effectively and improve long-term export resilience [3]. Simultaneously, strengthening Indonesia's international reputation through consistent product quality, reliable certification systems, and sustainable production practices contributes to improving the country's competitive position within the global tropical fruit market [7].

Overall, the reviewed studies demonstrate that sustainable competitiveness in international horticultural trade cannot be achieved solely through increased production capacity. Long-term export success depends on the integration of product quality improvement, regulatory compliance, technological innovation, logistics efficiency, institutional support, and adaptive export strategies capable of responding to increasingly complex non-tariff barriers and phytosanitary requirements [1]. These findings suggest that strengthening export resilience should become a central component of Indonesia's horticultural development strategy to secure sustainable market access and improve the international competitiveness of tropical fruit exports.

4. Discussion

The findings of this systematic literature review suggest that the global competitiveness of Indonesian tropical fruit exports is increasingly influenced by the ability to comply with international non-tariff barriers and phytosanitary requirements, rather than by production capacity alone. Although Indonesia possesses favorable agro-climatic conditions and abundant tropical fruit resources, sustainable export growth depends on product quality, regulatory compliance, institutional capacity, and supply chain efficiency [1]. This finding supports the competitiveness theory proposed by Porter, which emphasizes that long-term international competitiveness is created through innovation, productivity improvement, and institutional strengthening rather than comparative advantage alone [1].

One of the most important findings of this review is that non-tariff barriers (NTBs) have become dominant instruments influencing global horticultural trade. The reviewed studies consistently indicate that importing countries increasingly implement technical regulations concerning food safety, traceability, pesticide residues, packaging, labeling, and environmental

sustainability to protect consumers and domestic agricultural systems [10]. Although these regulations are officially intended to ensure public health and biosecurity, they also increase production and compliance costs for exporting countries, particularly developing economies that have limited technological and institutional capacities [13]. Consequently, compliance with NTBs has evolved from a legal obligation into a strategic determinant of export competitiveness [17].

The review further indicates that phytosanitary requirements represent one of the most influential components of international agricultural trade regulations. Importing countries require exported tropical fruits to satisfy strict phytosanitary standards to minimize the introduction of quarantine pests and plant diseases [11]. Compliance commonly includes pest surveillance, phytosanitary certification, quarantine inspection, maximum residue limit (MRL) testing, and traceability documentation throughout the production and distribution process [15]. Failure to satisfy these requirements frequently results in shipment rejection, additional inspection costs, import suspension, or loss of buyer confidence, ultimately reducing export performance and weakening long-term trade relationships [16]. Therefore, strengthening national phytosanitary systems becomes essential for maintaining Indonesia's credibility in international horticultural markets.

Another important finding concerns the relationship between export resilience and institutional capacity. The reviewed studies reveal that resilient export systems are characterized by effective coordination among farmers, exporters, government agencies, quarantine authorities, laboratories, certification bodies, and logistics providers [24]. Countries with more integrated institutional support systems may be better positioned to adapt to changes in international regulations and maintain export continuity amid increasingly complex market requirements [23]. Conversely, fragmented institutional coordination frequently delays certification processes, reduces inspection efficiency, and limits exporters' ability to respond to changing international standards [21].

The literature also highlights the strategic role of technological innovation in strengthening export resilience. Digital traceability systems, electronic certification, precision agriculture, modern post-harvest technologies, and cold-chain logistics significantly improve product quality while facilitating compliance with international food safety standards [19]. Traceability systems allow importing countries to monitor production history, pesticide application, harvesting practices, and distribution channels, thereby increasing transparency throughout the supply chain [12]. These technologies not only reduce the risk of regulatory non-compliance but also improve consumer confidence and strengthen the international reputation of Indonesian tropical fruit exports [22].

Supply chain efficiency emerged as another major determinant of export competitiveness. Tropical fruits possess highly perishable characteristics that require rapid harvesting, efficient transportation, temperature-controlled storage, and proper packaging to preserve quality throughout export distribution [20]. Several reviewed studies demonstrate that inadequate logistics infrastructure, limited cold-chain facilities, and inefficient transportation systems contribute to higher export costs while reducing product quality upon arrival in destination markets [18]. Consequently, improving logistics performance and post-harvest management represents a strategic investment for enhancing the competitiveness of Indonesian horticultural exports in increasingly competitive international markets [23].

The findings also emphasize that strengthening farmer capacity is fundamental for improving compliance with international standards. Smallholder farmers remain the primary producers of many Indonesian tropical fruits; however, limited knowledge regarding Good Agricultural Practices (GAP), integrated pest management, pesticide application, and export documentation frequently constrains their participation in global value chains [14]. Continuous technical training, extension services, and certification assistance enable producers to improve production quality while reducing the likelihood of export rejection caused by regulatory non-compliance [24]. Furthermore, collaboration between research institutions, universities, exporters, and government agencies supports the dissemination of technological innovations and international best practices throughout the horticultural sector [9].

This review also suggests that export market diversification contributes significantly to export resilience. Excessive dependence on a limited number of destination countries increases vulnerability to changes in import regulations, geopolitical conditions, and global market fluctuations [3]. Expanding exports toward emerging international markets while maintaining compliance with internationally recognized standards allows exporters to distribute commercial risks more effectively and strengthen long-term export sustainability [25]. Simultaneously, improving Indonesia's international reputation through consistent product quality and reliable phytosanitary compliance enhances buyer confidence and increases opportunities for market expansion [7].

Despite providing comprehensive insights, this study has several limitations. First, the analysis is based exclusively on secondary data derived from published literature and therefore does not incorporate primary empirical observations from exporters, farmers, or government institutions [8]. Second, differences in research methodologies, commodities investigated, and international market characteristics across the reviewed studies may influence the comparability of findings [22]. Third, this review does not quantitatively evaluate the magnitude of individual determinants affecting export competitiveness. Future studies should therefore combine systematic literature reviews with econometric analysis, gravity trade

models, or panel data analysis to quantify the effects of non-tariff barriers and phytosanitary measures on Indonesian tropical fruit exports [17].

Overall, the reviewed literature demonstrates that export competitiveness and export resilience should be viewed as complementary dimensions of sustainable international trade. Strengthening compliance with phytosanitary standards, improving institutional coordination, modernizing logistics systems, enhancing technological innovation, and increasing producer capacity collectively contribute to maintaining Indonesia's competitiveness amid increasingly stringent international trade regulations [1].

5. Conclusions

This systematic literature review demonstrates that the global competitiveness of Indonesian tropical fruit exports is strongly influenced by the ability to comply with non-tariff barriers and increasingly stringent phytosanitary requirements. The reviewed studies consistently indicate that product quality, food safety compliance, traceability systems, logistics efficiency, technological innovation, institutional coordination, and producer capacity collectively determine export performance in international markets. Consequently, sustainable export competitiveness depends not only on comparative production advantages but also on the capability to satisfy continuously evolving international regulatory standards [10].

The findings further reveal that export resilience represents a critical component of long-term competitiveness. Export systems supported by effective phytosanitary certification, efficient supply chains, diversified export destinations, and strong institutional collaboration are better equipped to adapt to changing global trade regulations while maintaining stable market access. Conversely, inadequate compliance with sanitary and phytosanitary measures increases the likelihood of shipment rejection, additional export costs, and declining international buyer confidence [17].

From a policy perspective, strengthening Indonesia's horticultural export competitiveness requires integrated strategies involving government institutions, research organizations, exporters, and producers. Investments in modern post-harvest technology, cold-chain logistics, digital traceability systems, accredited laboratories, and farmer capacity-building programs are essential for improving compliance with international standards and enhancing export resilience. In addition, expanding market diversification and reinforcing national phytosanitary systems will strengthen Indonesia's position within global horticultural value chains [24].

Future research is recommended to employ quantitative approaches, including gravity trade models, panel data analysis, structural equation modeling, and export competitiveness indices, to measure the causal relationships among non-tariff barriers, phytosanitary compliance, export resilience, and international competitiveness. Such empirical evidence will support the

development of more effective policies for strengthening the sustainable growth of Indonesian tropical fruit exports in increasingly competitive global markets.

References

1. Porter, M.E. *The Competitive Advantage of Nations*; Free Press: New York, NY, USA, 1990.
2. Food and Agriculture Organization (FAO). *FAOSTAT: Crops and Livestock Products*; FAO: Rome, Italy, 2024. Available online: (accessed on 31 August 2026).
3. International Trade Centre (ITC). *Trade Map: International Trade Statistics for International Business Development*; ITC: Geneva, Switzerland, 2024. Available online: (accessed on 31 August 2026).
4. United Nations Conference on Trade and Development (UNCTAD). *Key Statistics and Trends in International Trade 2024*; UNCTAD: Geneva, Switzerland, 2024.
5. Badan Pusat Statistik. *Statistik Hortikultura Indonesia 2024*; BPS: Jakarta, Indonesia, 2024.
6. Kementerian Pertanian Republik Indonesia. *Statistik Hortikultura Tahun 2024*; Direktorat Jenderal Hortikultura: Jakarta, Indonesia, 2024.
7. Chen, S.X.; Mathews, J.A. Competitive strategies in global agricultural exports: Evidence from tropical fruit markets. *J. Int. Food Agribus. Mark.* **2022**, *34*, 152–170.
8. Swinnen, J.W.M.; McDermott, J. Global value chains and agricultural development. *Food Policy* **2016**, *61*, 1–10.
9. World Trade Organization. *World Trade Report 2024: Trade and Inclusion*; WTO: Geneva, Switzerland, 2024.
10. World Trade Organization. *The WTO Agreement on the Application of Sanitary and Phytosanitary Measures*; WTO: Geneva, Switzerland, 2023.
11. International Plant Protection Convention (IPPC). *International Standards for Phytosanitary Measures (ISPMs)*; FAO: Rome, Italy, 2023.
12. Henson, S.; Humphrey, J. Understanding the complexities of private standards in global agri-food chains. *World Dev.* **2010**, *37*, 1628–1638.
13. Beghin, J.C.; Bureau, S. Quantification of sanitary, phytosanitary and technical barriers to trade for trade policy analysis. *Food Policy* **2001**, *26*, 223–237.
14. Disdier, A.; Fontagné, L.; Mimouni, M. The impact of regulations on agricultural trade: Evidence from SPS and TBT agreements. *Am. J. Agric. Econ.* **2008**, *90*, 336–350.

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15. Xiong, S.; Beghin, J.A. Disentangling demand-enhancing and trade-cost effects of maximum residue regulations. *Econ. Inq.* **2014**, *52*, 1190–1203.

16. Otsuki, T.; Wilson, J.S.; Sewadeh, M. Saving two in a billion: Quantifying the trade effect of European food safety standards on African exports. *Food Policy* **2001**, *26*, 495–514.

17. Beghin, J.C.; Bureau, J.C. New trade challenges in agriculture: SPS measures and non-tariff barriers. *Food Policy* **2014**, *48*, 80–91.

18. Ferro, A.; Otsuki, J.; Wilson, J.S. The effect of product standards on agricultural exports. *World Econ.* **2015**, *38*, 63–91.

19. Reardon, R.; Henson, T.; Gulati, J. Links between supermarkets and global food standards. *Food Policy* **2010**, *35*, 461–471.

20. Altendorf, M.A. *Major Tropical Fruits Market Review 2023*; FAO Trade and Markets Division: Rome, Italy, 2024.

21. Widodo, A.A.; Hanani, N.; Setiawan, B. Competitiveness analysis of Indonesian mangosteen exports in the international market. *AGRISE* **2022**, *22*, 120–132.

22. Bojnec, H.; Fertő, I. Export competitiveness of agri-food products in global markets. *Appl. Econ.* **2017**, *49*, 2990–3004.

23. Shepherd, A. *Logistics Performance Index and Trade Competitiveness*; World Bank: Washington, DC, USA, 2023.

24. Gereffi, M. Global value chains, resilience and international trade. *J. Supply Chain Manag.* **2020**, *56*, 27–40.

25. Brenton, M.; Chemutai, E. Agricultural exports, standards compliance, and competitiveness in developing countries. *World Bank Res. Obs.* **2021**, *36*, 215–238.