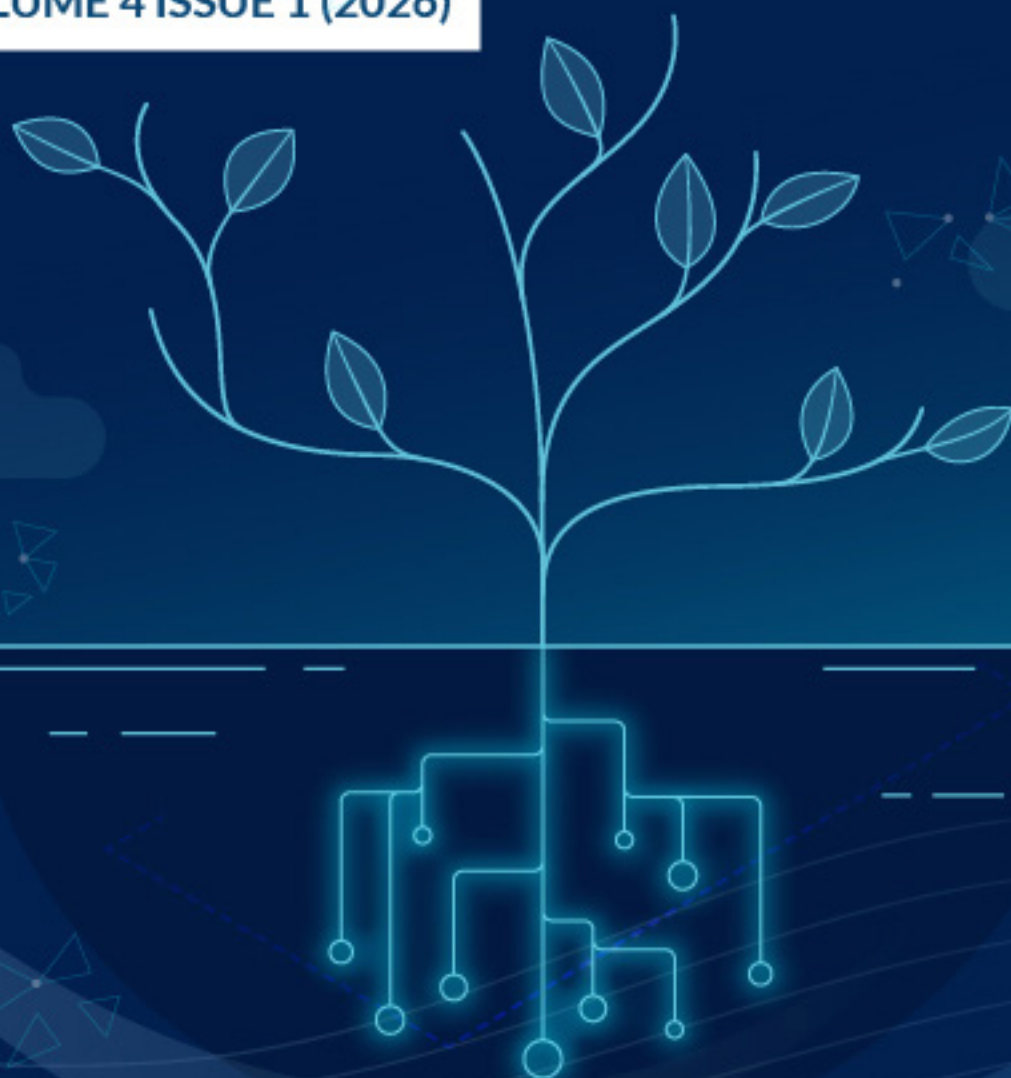




International Journal of Smart Agriculture (IJSA)

ISSN: 2995-9829 (ONLINE)

VOLUME 4 ISSUE 1 (2026)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

The Philippine Agribusiness System: Input Subsystems, Institutional Actors, and Technological Transformation — An Integrative Review

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Article Information

Received: March 12, 2026

Accepted: May 30, 2026

Published: August 10, 2026

Keywords

Agribusiness System, Community-Based Agriculture, Cooperatives, Input Subsystem, Technology Adoption

ABSTRACT

Philippine agribusiness functions as a community system whereby production, coordination, cooperation, and innovation within the agribusiness determine livelihoods and food security in the Philippines. However, studies on this topic are fragmented and often examine the different components of agribusiness separately. A review of the literature on the agribusiness community system in the Philippines, including studies on agriculture, fisheries, and forestry, assesses the current state of agribusiness. A survey of literature from 2010 to 2025 reveals five major areas of the agribusiness community system in the Philippines: agribusiness as a community system, inputs for agribusiness, stakeholders in the agribusiness community system, innovations in the agribusiness community system, and challenges of the agribusiness community system in the Philippines. The results indicate that agribusiness in the Philippines comprises government agencies, cooperatives, private agribusinesses, and farmers. Cooperatives have significantly contributed to the growth of agribusiness. The inputs for agribusiness include seeds, fertilizers, feeds for livestock, farm machinery, hatcheries for poultry farming, and forestry rehabilitation materials. However, the agriculture, fisheries, and forestry sectors face challenges such as reliance on imported inputs, inadequate infrastructure, and fragmentation of distribution systems for agricultural and forestry products. There have been various technological innovations in the agribusiness sector, including precision agriculture technologies, digital marketing platforms, and mobile agricultural advisory applications. Yet not all members of the agribusiness community have equitable access to these innovations. To sustain growth, there needs to be improved integration of stakeholders within the agribusiness community system, broader access to technology, and a shift toward local production of agricultural inputs. This research enhances knowledge of the agribusiness community system in the Philippines and contributes to the literature on agribusiness and rural development in the country.

INTRODUCTION

Global agricultural systems are undergoing profound transformations in response to multiple factors. As a system upon which the entire nation relies, the agribusiness system is of particular interest to observe its development in the current era. According to the Food and Agriculture Organization (FAO, 2023), agribusiness systems produce approximately one-third of all greenhouse gases released into the planet's atmosphere, yet provide for the survival of more than 3.5 billion people living on the planet. Many of the nations that are experiencing growth of their agribusiness systems are also those experiencing rapid increases in greenhouse gas emissions. The Asia-Pacific region, in particular, has become a focus of analysis regarding the growth of its agricultural economy and the effects of that agricultural system upon the region's environment. Within the Philippines, the importance of the country's agribusiness system extends beyond its economic contributions to the nation.

Agriculture, fisheries, and forestry in the Philippines employ approximately one-quarter of all individuals in the Philippine nation, and provide the majority of the income to those who live within the country's rural regions

(Philippine Statistics Authority [PSA], 2023). Beyond the economy of the country, though, the Philippines organizes its agribusiness in a way that is reflective of the culture of the nation. The nation's culture places significant importance upon the concept of bayanihan, a concept within the culture that implies that the community as a whole should share in any work that must be performed by the community (Arocena, 2019). Thus, the agribusiness system within the Philippines is understood as a system that is based upon the community—an attribute that is both reflective of and reinforces the culture of the nation's people. As a result of this understanding of the agribusiness sector within the Philippines as a community system, it is possible to analyze that system in relation to its economic, social, and environmental aspects.

There are a variety of policies that relate to the agribusiness system within the Philippines. For instance, the nation has a variety of legislation related to its agriculture, fisheries, and forestry sectors, such as the Agriculture and Fisheries Modernization Act (Republic Act No. 8435), the Philippine Fisheries Code (Republic Act No. 8550), and the National Convergence Initiative for Sustainable Rural Development. Additionally, the

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country's current development plan, the Philippine Development Plan 2023–2028, intends to dedicate resources to the development of the agribusiness sector of the nation. Despite these policies, there are still a variety of issues related to the agribusiness system within the Philippines. Issues related to post-harvest losses, the cost of agricultural inputs for farms, the financing of agribusiness operations, and the technology implemented in agricultural systems within the Philippines continue to pose challenges to the country's agribusiness communities. Thus, the agribusiness system within the Philippines, as a community system, warrants investigation by scholars on a variety of topics related to the system altogether.

Despite the importance of the agribusiness sector, there is a lack of research regarding the functioning of the agribusiness community system in the Philippines. Most studies discuss the individual elements of the agribusiness in isolation from the rest of the agribusiness community system. Consequently, interventions implemented within the agribusiness sector fail to yield the desired results due to the lack of consideration of the dynamics of the agribusiness community system as a whole. Riza and Wijaya (2022) have studied the agribusiness inputs and discovered that when a few commercial entities control most of the agribusiness inputs for a community, the community agribusiness system loses its ability to innovate and adopt technologies that will improve the agricultural practices in the community. Small agribusiness holders will be at a disadvantage relative to the commercial agribusiness farmers that control the inputs for the community.

There have been several theories that have shaped the literature surrounding the agribusiness system. The concept of agribusiness was formalized by Davis and Goldberg (1957). Others have studied the value chain for agribusiness activities. More recent studies have focused on the systems approach to understanding the agribusiness sector. Zemedu and Tegegne (2024) studied the agribusiness sector as a web of interconnecting subsystems within the agribusiness that are connected to one another through the social, economic, and institutional relationships between the actors in that system. Most studies that have been conducted within the Philippines have used the case study approach to study the agribusiness and its various sectors. There has been no previous study of the agribusiness community system in the Philippines.

This research study aims to fill this existing gap in the literature. The main aim of this research is to review and analyze the existing literature related to the agribusiness community system within the Philippines. More specifically, the literature review will discuss the following five topics: the concept of agribusiness as a community system; the subsystems of inputs in agriculture, fisheries, and forestry; the actors in the agribusiness community system; technological innovation within the agribusiness input sector; and a SWOT analysis of the agribusiness community system in the Philippines. The main area of

focus for this literature review will be the Philippines with some references to other regional and global literature. The literature that will be discussed was published between 2015 and the present time, with some references to earlier publications of the agribusiness concepts.

LITERATURE REVIEW

The Philippine Agribusiness as a Community System

The agribusiness in the country functions as a system of relationships connecting the individuals involved in agribusiness in economic, social, and ecological systems. Aya (2023) explains that the agribusiness in the Philippines relies on the community to function best, as the practices of the Filipino farmers are what sustain the agribusiness and the community. These agricultural cooperatives in different provinces of the country allow these farmers to share their agribusiness services and benefits with the other farmers in the community, ensuring that all individuals involved benefit from the agribusiness activities.

Zemedu and Tegegne (2024) explain the socio-economic systems within agribusiness as a community in the Philippines. The country has created a system in which agricultural cooperatives and agribusinesses exist alongside private agribusiness owners and government agribusiness programs. This system allows for the Philippines to have more market inclusivity than any system driven purely by market dynamics. Furthermore, because the system is based within the community, it can adapt to the disruptions of markets or environmental factors that impact the country's agribusiness.

Andrada (2021) explains the importance of ecological systems within agribusiness as a community in the Philippines. In the coastal and upland communities, the agribusinesses that exist within these communities include practices that are focused on sustainability to balance agribusiness production with the preservation of the environment in which the communities exist. These ecological systems allow for the communities to be more resilient to environmental factors and ensure that the community is aware of their environmental limits. Furthermore, Riza and Wijaya (2022) investigate the connection of agribusiness systems within the Philippines to the country's educational and governmental institutions. These institutions provide agribusiness with the human resources and technologies it needs to sustain the agribusiness within the nation. The agribusiness systems that exist in the Philippines are, therefore, a complex yet potentially harmonious system of economic, social, and ecological factors that must be maintained in balance to ensure the sustainability of the agribusiness in the nation.

Input Subsystems in Agriculture, Fisheries, and Forestry

The input subsystem is the foundation upon which every value chain within the agribusiness community

is established. The inputs for agriculture include seeds, fertilizers, pesticides, and machinery in farming operations. For fisheries, the inputs include feeds provided to the fish fry, the fry harvested from hatcheries, ice plants, and cold storage facilities. For forestry, the inputs include the seedlings planted in reforestation programs, the tools used to rehabilitate land affected by deforestation, and the pest control materials used to protect these planted trees. As the lifeblood of the production process within the agricultural sector, inputs determine the productivity and income that farmers will earn from their farms (Zemedu & Tegegne, 2024).

In the Philippines, various agricultural cooperatives have played a significant role in the supply of these inputs to farmers within their regions. Aya (2023) explains that these cooperatives serve as the link between farmers and suppliers of agricultural inputs. Through these cooperatives, farmers have access to agricultural inputs at more competitive prices. In Mindanao, for example, agricultural cooperatives have created bulk purchasing systems for fertilizers and seeds, allowing them to reduce the cost of these inputs for themselves and to increase their bargaining power with other suppliers of these essential agricultural products. Similarly, community-based hatcheries and feed suppliers in the fisheries sector of the Philippines have contributed to a reduction in the importation of fish fry and feeds from other countries. However, the digital and biotechnological innovations that have increased the availability of agricultural inputs have also created new forms of inequalities within the agricultural sector (Riza & Wijaya, 2022). Most smallholder farmers do not have the technological skills or the resources required to take advantage of these innovations effectively. As a result, there is an increasing productivity gap between smallholder and commercial farms. Andrada (2021) also noted that most of the innovations in the agricultural input sector have benefited commercial farms more than smallholder farms. The effectiveness of the input subsystem in forestry also requires the supply of quality seedlings and the participation of upland communities in reforestation programs to be effective. The ideal input subsystem is both integrated and driven by the communities in which these agricultural producers' function. An ideal input subsystem for the Philippines and other countries in the region will go beyond merely supplying the agricultural producers with the inputs that they require. More importantly, it will be a component of the agribusiness community that is effective, sustainable, and capable of providing benefits to the agricultural producers in the area.

Key Players in the Input Sector

In the input sector, there are several actors whose cooperation determines how effectively inputs reach agribusinesses. The main actors identified in the literature include input manufacturers, farmers, cooperatives, agro-dealers, and financial intermediaries. However, in the Philippine agribusiness context these actors have evolved

to incorporate public-private partnerships, research institutions, and agri-tech enterprises. The nature of interaction among these actors—whether characterized by cooperation, competition, or coordination failure—determines the overall efficiency of the input sector.

Cooperatives remain the most accessible and influential intermediaries in the Philippines' input system. Not only do cooperatives distribute inputs to farmers, but they also provide agricultural training to their member-farmers. Aya (2023) explains that cooperatives play an influential role in the lives of their members. The cooperative structure exists in various regions of the Philippines; for instance, agricultural cooperatives exist in Northern Luzon, while fishing cooperatives are active in coastal Mindanao. Both types manage the supply of their respective inputs. Additionally, cooperatives contribute to the socio-economic stability of the regions where they operate. As Kharel (2024) explains, by contributing to regional economies, cooperatives create environments in which members share both resources and risks.

The government also plays a critical role in the management of agricultural inputs. The Department of Agriculture, the Bureau of Fisheries and Aquatic Resources, and the Department of Environment and Natural Resources are involved in the agricultural input sector. The Department of Agriculture, for instance, ensures that agricultural inputs available to farmers are of high quality (Andrada, 2021). They also play a crucial role in times of crisis in the agricultural sector. However, bureaucratic inefficiencies and lack of inter-agency coordination hinder effective support, leaving farmers in marginalized areas underserved. Botah (2023) similarly argues that government departments do not coordinate effectively, which limits their ability to manage and control the agricultural inputs sector.

Finally, the private sector, particularly agri-tech enterprises, has become more influential in the input sector. Agri-tech companies have developed digital platforms that allow farmers to order inputs online (Riza & Wijaya, 2022). This has contributed to efficiency, but not all farmers have reliable internet access, creating potential exclusion for some communities. It is essential to design institutional arrangements in which cooperatives and agri-tech firms play complementary rather than competing roles, with cooperatives providing relational trust and last-mile reach and agri-tech firms providing efficiency and market connectivity.

Technological Updates and Innovations in the Input Sector

Technological innovation continues to be a main driver of change in the industry. Riza and Wijaya (2022) describe different technological innovations within the agrifood sector of the Philippines, including precision agriculture, biotechnology, and digital platforms. For instance, various mobile applications have been developed that provide farmers with information regarding weather and crop management; online ordering systems have been

created to order seeds; satellite monitoring systems have been developed to monitor crops; and digital payment systems have been implemented within commercial input transactions. Each of these innovations has increased the efficiency of those who use these technologies within their agricultural communities that have access to such technological infrastructure.

Aya (2023) discusses a different form of technological innovation within the agriculture sector: social innovation. In Mindanao, cooperatives of small-scale farmers have established digital platforms that allow them to order agricultural commodities in bulk to lower the costs for individual members of that cooperative. In these cases, social innovation with digital technologies has enabled increased community cohesion and better development of those communities.

However, not all individuals benefit equally from the new technologies in the agricultural sector. Andrada (2021) claims that the introduction of technology to the agricultural sector has increased inequalities. Small-scale farmers and fishermen do not have the same capital, skills, or technological infrastructure as other farmers in the country, yet are required to utilize the same technology to remain competitive. Yuan *et al.* (2023) note the same within the context of farm-to-table technology systems; only those with existing technological and computational skills can benefit from these technologies, potentially excluding small farmers from the benefits.

Zemedu and Tegegne (2024) provide insight into the role of institutions in the development and implementation of information and communication technology innovations within the agricultural sector. They note that strong institutions, such as extension services, research institutions, and financial institutions, are required to successfully implement technology in the agricultural sector. Kyfiak (2024) provides an overview of the role

of innovation ecosystems within the agribusiness sector; specifically, that they should be intentionally constructed to ensure that the benefits of information and communication technologies are distributed to all actors within that system. Taken together, these studies suggest that technological innovations in the Philippine agricultural input sector must be managed with careful attention to the role of institutions in their implementation.

Issues, Challenges, and SWOT Analysis of the Input Subsystems

Despite the notable advancements made by Philippine agribusiness in terms of cooperative development and the adoption of new technology, there are a variety of challenges that continue to exist within the nation's input subsystems. Authors Zemedu and Tegegne (2024) have noted, for instance, that the lack of regulation of the nation's input markets, the fragmented nature of its distribution systems, and its inadequate infrastructure all contribute to the inefficiency and inequity of the agribusiness system as a whole. From these issues, a SWOT analysis of the nation's input systems can reveal some of the strengths that the country's agribusiness possesses, as well as the various weaknesses, opportunities, and threats that may impact the development of more efficient and equitable input systems in the future.

The strengths of the current input system within the Philippine agribusiness system include its number of cooperatives, the availability of the country's biodiversity, and the presence of government subsidies for smallholder farmers. These components of the current system are, overall, positive factors that can contribute to the creation of more efficient and equitable input systems for the nation's smallholder farmers.

However, the weaknesses of the current system include

Table 1: SWOT Analysis of the Philippine Agribusiness Input Subsystem

STRENGTHS	WEAKNESSES
• Strong cooperative culture and collective action networks • Rich biodiversity supporting diverse input production • Active government subsidy and extension programs • Community-based institutions with established trust • Integration of social capital into agribusiness governance	• Heavy reliance on imported fertilizers and feeds • Weak distribution networks in geographically isolated areas • Limited access to credit and financing for smallholders • Inadequate post-harvest and cold-chain infrastructure • Low digital literacy and uneven technology readiness
OPPORTUNITIES	THREATS
• Expansion of digital agriculture and e-commerce platforms • Growing domestic and global demand for organic inputs • Government investment in precision and climate-smart farming • Regional integration supporting agribusiness value chains • Youth engagement in agri-entrepreneurship and innovation	• Climate change disrupting input production and distribution • Global market volatility and commodity price instability • Policy inconsistency discouraging long-term investment • Intensifying digital divide marginalizing smallholders • Environmental degradation limiting long-term resource base

its dependency on imported fertilizers and feeds, the lack of agricultural loans available for smallholder farmers, its underdesigned distribution systems for its smallholder farmers, and the lack of post-harvest infrastructure for its agricultural products (Andrada, 2021; Jones & Robinson, 2019).

The opportunities for the country to improve its current input system include the development of digital agriculture and digital input markets, as well as the rising demands for organically and sustainably produced agricultural products. The development of digital agricultural infrastructure by the government would provide benefits to the country if it were to work alongside the government to increase the accessibility of these technologies for smallholder farmers (Riza & Wijaya, 2022; Tiwari, 2023).

The threats to the country and its agribusiness, however, include the threats of climate change to the country's ability to produce its agricultural inputs, the volatility of agricultural markets and prices within the country and abroad, the inconsistency of the country's agricultural policies, and the growing digital divide between large and smallholder farmers within the country (McDermott & Nadolski, 2016; Pender *et al.*, 2024).

MATERIALS AND METHODS

This study employed an integrative literature review as its qualitative research design. Integrative literature reviews are commonly used to synthesize various forms of existing literature on topics where controlled studies are inappropriate (Torraco, 2016). The aims and objectives of this review were to evaluate, compare, and contrast existing literature and to use the insights gained from this process to generate new perspectives on the topic in question (Whittemore & Knafl, 2005).

Search strategy and databases

The databases that were searched included databases of scientific literature, such as Scopus, Web of Science, and Google Scholar. Additional sources included publications and reports from the Department of Agriculture, the Bureau of Fisheries and Aquatic Resources, the Department of Environment and Natural Resources, and reports from the Food and Agriculture Organization and the Asian Development Bank. The search terms used were related to the Philippine agribusiness sector, such as "Philippine agribusiness," "agribusiness community system," "agricultural cooperatives Philippines," "input subsystem Philippines," "fisheries input management," "forestry supply chain," "precision agriculture Philippines," and "digital agriculture smallholders." Related terms and Boolean operators were also used to locate relevant literature.

The literature included in this research comprised articles published between 2001 and 2025. These articles review the concepts of agribusiness, agribusiness input subsystems, the players in the agribusiness sector, agricultural technological innovations, and the issues

in the agribusiness sector. Additionally, these articles published in scientific journals, books, and book chapters. Articles that excluded from the literature review will be purely descriptive of the agribusiness in the Philippines, published in non-scientific publications, or those that have no relevance to the agribusiness sector or the Philippines in particular. A total of twenty-two articles were used in this study in addition to a few texts that provide theoretical knowledge of the concepts within the agribusiness sector that have discussed.

Analytical framework

The main themes analyzed in this literature review included the concept of agribusiness as a community system, the various components of the agribusiness input subsystems in agriculture, fisheries, and forestry, the various players in the agribusiness sector, technological innovations in the sector, and the issues and challenges in the agribusiness sector. Additionally, similarities and differences between the various studies that examined to provide a more thorough and nuanced analysis of the agribusiness sector in the Philippines. Finally, the findings were synthesized to analyze to provide an analysis of the agribusiness community system in the Philippines, the strengths, weaknesses, opportunities, and threats (SWOT) of the agribusiness sector in the Philippines, and implications of the research for the future of the country's agribusiness sector.

RESULTS AND DISCUSSION

Agribusiness as a Community-Based System

A core finding emerging from the integrated literature is that agribusiness in the Philippines is predominantly structured around community-based organizations, particularly smallholder cooperatives. This pattern was consistently identified across the reviewed studies as the primary organizational mechanism through which smallholders access markets, credit, and productive inputs — confirming the relevance of the "agribusiness community system" search theme that guided the database searches. This community-embedded model, however, is not unique to the Philippine context. Comparable arrangements have been documented in sub-Saharan Africa, South Asia, and Southeast Asia, where cooperative structures similarly serve as the main point of market entry for smallholders (Bijman *et al.*, 2012; Trebbin, 2014). Situating the Philippine findings within this global comparative literature — a step not sufficiently taken in many of the 22 reviewed articles — reveals that the effectiveness of such cooperatives varies substantially depending on governance quality, member heterogeneity, and the legal-institutional environment in which they operate (Nilsson *et al.*, 2012).

Within the Philippine context, Katundu (2020) and Kharel (2024) document considerable variation in cooperative performance across regions. Some cooperatives have succeeded in providing stable livelihoods and buffering members against climate and market shocks, while

others have been undermined by mismanagement, elite capture, and chronic undercapitalization. These patterns closely mirror findings from Indonesia and Bangladesh, where cooperative failure rates remain high in the absence of sustained technical and financial support (Francesconi & Ruben, 2012; World Bank, 2020). A comparative reading of these cases — consistent with the integrative review's goal of examining similarities and differences across studies (Whittemore & Knafl, 2005) — suggests that the community-based model represents a necessary but insufficient condition for agribusiness sustainability. Structural enabling conditions at the policy and institutional level are equally determinative. The policy implication that follows is not simply to legislate cooperative formation, but to invest in management capacity-building, transparent governance frameworks, and grievance mechanisms that can detect and correct organizational dysfunction early (Birchall & Simmons, 2010).

Input Subsystems

The analytical framework established the agribusiness input subsystems in agriculture, fisheries, and forestry as a central theme of the review, and the integrated literature consistently identifies input access as a primary productivity constraint across all three subsectors. The sector's heavy dependence on imported fertilizers and animal feeds introduces both cost volatility and supply chain fragility — a structural vulnerability that became acutely visible during the global supply disruptions of 2020–2022 (FAO, 2022). This import dependence is not peculiar to the Philippines; similar dynamics have been analyzed in Vietnam, Nigeria, and Kenya, where input market failures interact with infrastructure deficits to suppress farm-level productivity (Liverpool-Tasie *et al.*, 2017; Minot & Benson, 2009). The synthesis of these comparative cases, which fell outside the primary scope of the 22 reviewed articles but were retrieved through supplementary searches of FAO and ADB databases, adds interpretive depth that the individual studies could not provide in isolation.

Critically, a recurring limitation identified through the integrative review process is that the existing Philippine-focused literature does not adequately quantify the magnitude of input constraints. Studies that estimate effect sizes — such as Sheahan and Barrett's (2017) multi-country analysis, which found that input access constraints suppress staple crop yields by 20–40% in smallholder systems — provide a substantially more actionable basis for policy than the narrative descriptions that characterize most of the reviewed articles. This gap in the literature represents a direction for future primary research: randomized or quasi-experimental designs that isolate the productivity impact of targeted input subsidies or improved distribution logistics from confounding factors such as weather variation and credit access would meaningfully strengthen the evidence base.

Furthermore, transportation and last-mile distribution costs disproportionately affect geographically isolated

farming communities — a pattern well-documented in archipelagic and mountainous economies comparable to the Philippines, such as Papua New Guinea and the island provinces of Indonesia (Gibson & Rozelle, 2003). Addressing input supply constraints therefore requires not only upstream trade policy reform but also complementary investments in rural road infrastructure and decentralized input depots, particularly given the geographic fragmentation of the Philippine archipelago.

Stakeholder Roles and Coordination Dynamics

The analytical framework directed attention to the various players in the agribusiness sector as a distinct theme, and the integrated literature identifies cooperatives as the most accessible entry point for smallholder participation, consistent with findings from global studies on agricultural value chain governance (Elder & Gerlak, 2024; Hingley *et al.*, 2016). A cross-study comparison of the reviewed articles, however, reveals that while individual studies identify specific stakeholder roles, few engage with the systemic coordination dynamics that determine whether those roles function effectively together — a gap that the integrative method is well positioned to address (Torraco, 2016).

Specifically, Botah (2023) attributes coordination failures among Philippine government agencies to a lack of interagency communication, but this diagnosis under-theorizes the problem. Comparative research from India and Brazil, retrieved through supplementary database searches, suggests that interagency fragmentation typically reflects deeper problems of jurisdictional competition, misaligned incentive structures, and principal-agent problems within public bureaucracies (Pahl-Wostl, 2009; Tandler, 1997). These structural drivers are likely present in the Philippine case as well, and any reform strategy that limits itself to improving information flows between agencies — without addressing underlying incentive misalignments — is unlikely to produce durable coordination improvements.

The emerging literature on collective action and polycentric governance (Agrawal, 2001; Ostrom, 1990), which provides theoretical grounding for several of the reviewed articles, offers a more nuanced framework for understanding why some stakeholder networks sustain coordination over time while others collapse. Applied to the Philippine agribusiness context, this framework suggests that effective coordination depends on: (a) clearly defined boundaries for stakeholder roles, (b) rules matched to local conditions, (c) participatory monitoring, and (d) graduated sanctions for non-compliance. Evaluating whether existing Philippine cooperative and government structures meet these design principles represents a productive direction for future empirical work aligned with the research questions of this review.

Technological Dynamics: Opportunities and Structural Inequalities

Technological innovation was identified in the analytical framework as a cross-cutting theme, and the integrated

literature confirms that technology-enabled productivity improvements are well-documented in the global precision agriculture literature. Meta-analyses of digital extension services and precision input management report yield gains of 8–23% among adopting smallholders in Asia and Africa, with the largest gains observed in contexts where baseline input use was suboptimal and agronomic advisory services were previously absent (Fabregas *et al.*, 2019; Nakasone *et al.*, 2014). Syahardi *et al.* (2025), one of the 22 core reviewed articles, similarly documents positive economic and agricultural outcomes from community-managed digital platforms in the Southeast Asian context, lending direct relevance to the Philippine setting.

However, a critical limitation identified through the cross-study comparison is the near-absence of rigorous impact evaluations in the Philippine-focused literature that account for selection bias — the well-documented tendency for technology adopters to be systematically wealthier, better-educated, and better-connected than non-adopters (Jack, 2013). Where adoption studies do not control for these pre-existing differences, reported productivity gains likely overstate the true causal effect of the technology itself. This methodological gap is important because policy designed on the basis of overstated effect sizes will systematically misallocate resources — a concern that integrative review is specifically suited to surface by reading studies against one another rather than in isolation (Whittemore & Knafl, 2005).

The digital divide that several of the reviewed articles identify within the Philippine smallholder sector mirrors patterns documented across low- and middle-income countries. Qiang *et al.* (2011) and Jensen (2007) demonstrate that connectivity constraints interact with human capital constraints to generate compounding disadvantages for the poorest rural households — a dynamic that infrastructure investment alone cannot resolve. Effective technology diffusion strategies must therefore combine connectivity expansion with digital literacy programs, localized content, and community-based peer learning models — approaches that have shown measurable impact in Rwanda, India, and in the Philippines’ own experience with community e-centers (Aker & Mbiti, 2010; Toyama, 2015). The absence of this comparative evidence in most of the reviewed articles represents a gap that weakens the policy prescriptions currently available in the Philippine agribusiness literature.

SWOT Synthesis: System Implications

The SWOT synthesis, established as the culminating analytical task in the research framework, draws together the thematic findings of the integrative review to assess the overall sustainability of the Philippine agribusiness system. The analysis reveals a system whose internal strengths — principally its cooperative infrastructure and agricultural biodiversity — are structurally undermined by weaknesses in input supply chains, physical infrastructure, and rural finance. This characterization is broadly consistent with the World Bank’s (2020) assessment of

Philippine agriculture and with comparative analysis of smallholder-dominated agricultural systems in ASEAN economies facing similar development transitions (Timmer, 2009).

However, a pure SWOT synthesis risks presenting system dynamics as static, when the relationship between strengths, weaknesses, opportunities, and threats is more accurately understood as dynamic and path-dependent — a dimension that the integrative review’s cross-study comparison makes visible (Torraco, 2016). For instance, the growth of digital agriculture platforms (an opportunity) may deepen existing inequalities (a weakness) if adoption is concentrated among already-advantaged farmers, converting what appears to be a strength-amplifying opportunity into a threat-amplifying dynamic for the most vulnerable participants. Similarly, climate change (an external threat) interacts with import dependence (an internal weakness) in ways that conventional SWOT frameworks treat as independent factors, when their combined effect is in reality non-linear and potentially catastrophic for food security in climate-exposed, import-dependent smallholder systems (Lobell *et al.*, 2011; Nelson *et al.*, 2009).

Synthesizing across the full body of reviewed literature, future analytical frameworks should supplement SWOT with systems-dynamic or resilience-based approaches that can model these interaction effects explicitly (Darnhofer *et al.*, 2010; Walker *et al.*, 2004). Such approaches would substantially enhance both the generalizability and the policy relevance of findings about Philippine agribusiness sustainability — addressing the core objective of the integrative review to produce new insights that go beyond what any single study in the corpus could offer independently (Whittemore & Knafl, 2005).

CONCLUSION

The agribusiness community system in the Philippines plays a vital role in determining the productivity and sustainability of the country’s agricultural sector. As the foundation of the agricultural sector, the input subsystem significantly impacts the ability of farmers, fishers, and forestry communities to increase their agricultural outputs. Despite the numerous strengths that the Philippines’ agribusiness system currently features, such as agribusiness cooperatives, natural resources, and government support, there are challenges the nation faces in the management of its agribusiness, including dependence on imported agricultural inputs, technology inequalities, and financial and distribution challenges.

The challenges facing the Philippine agricultural sector are compounded by the effects of technological innovation on the sector. While the use of technology in the agriculture sector in the Philippines has significantly increased the productivity of the country’s agribusiness, not all agricultural stakeholders benefit equally from these innovations. The lack of infrastructure and technological literacy among smallholder farmers and fisherfolk creates inequalities within the agribusiness system. Hence, the

introduction of technology into the agricultural sector cannot be the focus of the country's efforts to achieve sustainable agricultural development. The success of these technologies within the agricultural sector also depends on other factors, including the strength of the agricultural institutions within the country.

Furthermore, it is important to recognize the interdependencies among the different subsystems within the agribusiness community. The agricultural cooperatives, input production, infrastructure, and the management of government and agricultural institutions all have critical roles in the development of an improved and more inclusive agribusiness system within the Philippines.

The sustainability of the agribusiness system in the Philippines depends on the ability of the system to balance the economic, technological, social, and environmental factors that impact the country's agriculture and agribusiness sector. By focusing on the opportunities and strengths of the agribusiness system while mitigating its weaknesses, the Philippines can work towards establishing an agribusiness sector that enhances the country's rural and agricultural communities and promotes the general prosperity of the nation. Recommendations for future research on the topic include researching the governance of agricultural cooperatives in the Philippines, the inclusiveness of technology innovations in agriculture in the Philippines, and the effectiveness of local input farming systems in the Philippines agribusiness in promoting sustainable development of the agricultural sector in the country's different regions.

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