

# Horticultural Supply Chain Models: Strategies, Challenges, and Marketing Approaches

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## ABSTRACT

Indonesia's horticulture sector has undergone rapid expansion, driven by rising demand from both domestic and international markets. However, small-scale farmers continue to struggle with limited market access, price volatility, and high production costs, affecting their profitability and long-term sustainability. This study conducted a comprehensive literature review of 135 scientific articles to analyze three dominant supply chain models: direct marketing, contract farming, and cooperatives. Direct marketing allows farmers to secure higher prices by bypassing intermediaries but poses challenges in terms of operational scale, financial resources, and market access. Contract farming provides stability through guaranteed pricing, input support, and technical assistance, though profit distribution often favors contracting firms. Meanwhile, cooperatives offer better market access and collective bargaining power but require strong organizational structures to function effectively. The findings emphasize the importance of policies that support farmer education, improve market infrastructure, and encourage fair contractual agreements. Additionally, agribusiness stakeholders must invest in supply chain innovations and risk mitigation strategies to enhance efficiency and transparency. Strengthening these aspects is crucial for fostering a more resilient and sustainable horticultural sector in Indonesia.

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## 1. Introduction

The horticulture industry in Indonesia has experienced significant growth in recent years, driven by increasing demand from both domestic and international markets (Purnomo et al., 2018). Similarly, the demand for fresh and healthy products continues to rise (Don Piran et al., 2022). As a result, many businesses have begun entering this sector, adopting various marketing strategies to gain a competitive advantage. The horticulture industry involves a diverse range of actors, from small-scale local farmers to large commercial enterprises (Mariyono et al., 2020). These actors employ various marketing strategies to reach their target customers, ranging from traditional methods such as local markets and door-to-door sales to modern approaches like e-commerce platforms and social media marketing (Abdul-Rahaman & Abdulai, 2020). The growth of the horticulture industry presents both opportunities and challenges as the market becomes increasingly competitive (Leroux et al., 2010). This competitiveness is a concern for actors, particularly farmers, as they strive to maintain

profitability and business sustainability (Hoang, 2021).

Horticultural farmers often face significant challenges in improving profit margins (Mariyono et al., 2020). One of the contributing factors is the farmers' limited ability to market their products effectively (Hanik et al., 2018). In agribusiness, profitability is highly dependent on the selection of appropriate marketing channels (B. Zhang et al., 2017). The choice of marketing channels by farmers directly influences their income and helps maintain product supply stability (C. Zhang et al., 2019). Horticultural commodities, particularly fresh vegetables, are highly perishable and prone to rapid spoilage, making the timely transfer from farm to consumer a critical challenge (Besik & Nagurney, 2017). Additionally, market volatility and price fluctuations can make it difficult for farmers to plan operations effectively to maximize profits (B. Zhang et al., 2017). Farmers often face high production costs due to rising input prices, such as seeds, fertilizers, pesticides, and fuel, which impact productivity, selling prices, and profitability (H. Wang et al., 2014). Another significant challenge is the farmers' ability to negotiate with buyers and access more organized markets, which can affect their income (Mariyono et al., 2020). Small-scale farmers often struggle to establish reliable and stable sales channels due to a lack of resources, capital, and bargaining power to meet the favorable terms required by larger buyers or wholesalers (Flores et al., 2019). Farmers who sell their produce through organized markets tend to achieve higher prices and better outcomes compared to those who rely on informal and fragmented markets (Akinola et al., 2023).

In addressing the challenges encountered by farmers, two strategic pathways for enhancement have been identified: the establishment of cooperatives and the adoption of contract farming (Khapayi et al., 2018), (Shi & Wang, 2023), (Yang et al., 2022). Cooperatives are widely acknowledged as an effective mechanism for ensuring the sustainability of rural farmers' livelihoods (Bellemare, 2018). To empower farmers, increase productivity, and bolster the sustainability of the agricultural sector, agricultural cooperatives are deemed an optimal choice (Zou & Wang, 2022). The primary objectives of cooperatives include amplifying production, strengthening bargaining power, and facilitating access to ancillary benefits for farmers (Hao et al., 2018). Agricultural cooperatives consist of a collective of farmers who aggregate resources and collaboratively manage the production, processing, and distribution processes (Tran et al., 2023). By participating in cooperatives, farmers can leverage collective marketing strategies, gain access to superior inputs and advanced technology, and enhance their bargaining position, which collectively contributes to elevated income levels (Verhofstadt & Maertens, 2015), (Zhu et al., 2018).

In addition to cooperatives, contract farming is a widely adopted agricultural practice that provides numerous advantages and benefits across various types of commodities on a global scale (Bellemare & Bloem, 2018). This system involves the establishment of mutually beneficial agreements between farmers and buyers (Adam & Agegnehu, 2023). Contract farming arrangements delineate the terms of production, quality standards, and pricing, thereby offering stability and assurance to both contracting parties (Gramzow et al., 2018). A key advantage of the contract farming system is its capacity to mitigate market uncertainties and price volatility. By engaging in contractual agreements, farmers can secure access to stable markets with predetermined pricing for their agricultural outputs (Besik & Nagurney, 2017).

This study addresses this research gap by systematically comparing emerging horticultural product marketing models—direct sales, contract farming, and agricultural cooperatives. While past research has acknowledged the potential of these models, there is

a lack of comprehensive evaluation of their relative strengths, weaknesses, and applicability within the Indonesian horticulture industry. By critically analyzing these marketing models, this study aims to provide strategic recommendations that enhance the economic sustainability of agriculture.

Through a comprehensive literature review, this study contributes to academic discourse by evaluating the effectiveness of various marketing strategies, thereby assisting farmers and stakeholders in making informed decisions. The research culminates in the development of a conceptual framework for horticultural marketing, offering a structured approach for farmers to adopt sustainable and profitable marketing strategies. This study is necessary to bridge the existing knowledge gap and inform policies and programs that support smallholder farmers in optimizing their market access and business sustainability.

## 2. Methodology

Databases such as ScienceDirect, Emerald, Wiley, Taylor & Francis, and Google Scholar were utilized to conduct a literature survey on horticultural commodity sales models through a holistic approach. The keywords employed in the literature search included “Agriculture supply chain,” “Agriculture direct marketing,” “Contract Farming,” and “Cooperative farming.” The search was confined to journal articles published in English, resulting in 349 relevant articles. Subsequent steps involved a meticulous screening process, where abstracts, findings, and conclusions were reviewed to isolate and focus on articles directly pertinent to the research topic. Articles with titles and abstracts that did not correspond to the keywords were excluded, narrowing the selection to 189 articles. The remaining articles underwent a rigorous and thorough review (in-depth review) to ensure alignment with the research categories under examination. The final selection comprised 135 articles, which were systematically categorized into four groups, as presented in Table 1.

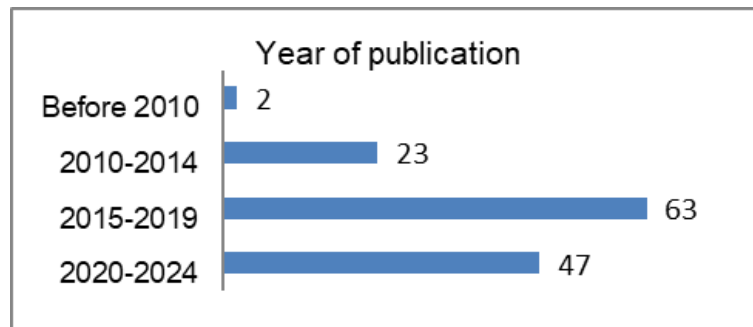
The selected articles were analyzed through a structured approach, beginning with classification into four categories. A thematic analysis identified key patterns and trends by coding article content to extract insights on advantages, limitations, and market dynamics. A comparative analysis further examined similarities and differences among sales models, emphasizing aspects such as price stability, farmer autonomy, technological support, and financial security. The findings were synthesized into a comprehensive framework outlining the strengths, weaknesses, and potential applications of each model, offering valuable insights for optimizing horticultural supply chains.

**Table 1.** Categories of articles and the number of articles reviewed

Article Categories	Number of article
Agriculture supply chain	7
Agriculture Direct marketing	21
Contract farming	53
Cooperative farming	54
Total	135

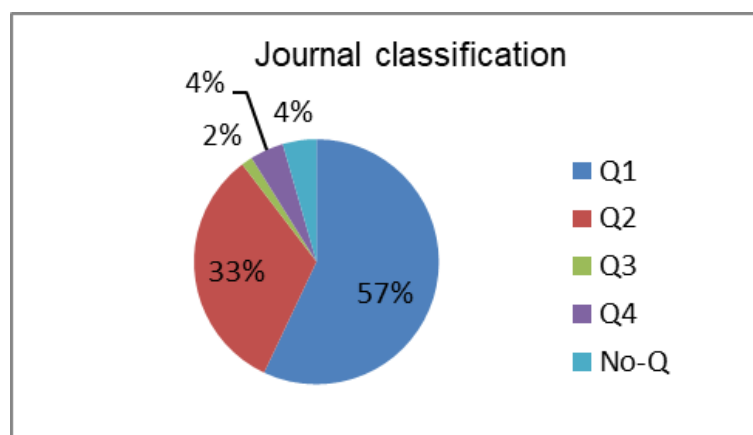
Based on the analysis of publication years, as depicted in Figure 1, the majority of the reviewed articles were published from 2015 to 2019, comprising 63 articles or approximately 46.7% of the total articles reviewed. This period reflects a marked increase in scholarly output

related to the topic under investigation. In the subsequent period of 2020-2024, 47 articles were published, underscoring the continued relevance of this topic, with these publications accounting for 34.8% of the total. In the earlier period from 2010-2014, 23 articles were published, representing 17% of the total, while prior to 2010, only 2 articles (1.5%) were published. This trend highlights a significant surge in research interest in this area over the past decade.



**Figure 1.** Year of publication

Additionally, the analyzed articles were classified based on the journal rankings according to Scopus, as illustrated in Figure 2. From this classification, the majority of the articles (57%) were published in Q1 journals, indicating high quality and significant impact in their respective fields. A total of 33% of the articles were published in Q2 journals, also reflecting good quality and relevance. Articles published in Q3 and Q4 journals each accounted for only 4% and 2%, respectively, while the remaining 4% were published in journals without a Q ranking (No-Q).



**Figure 2.** Journal classification based on Scopus

Regarding journal distribution, several prominent journals published the highest number of relevant articles, with the *Journal of Agribusiness in Developing and Emerging Economies* contributing 9 articles (6.67%), followed by *Food Policy* with 7 articles (5.19%), and *Agribusiness* as well as *Applied Economic Perspectives and Policy*, each contributing 6 articles (4.44%). Other journals, including *Agricultural Economics*, *Renewable Agriculture and Food Systems*, and *Agricultural and Resource Economics*, each accounted for 5 articles (3.7%). Comprehensive details on this distribution can be found in Table 2. It is important to

note that 48 articles, representing 35,6% of the total literature analyzed, were sourced from 48 different journals, with each journal contributing a single article. This suggests that the literature review encompasses a diverse and extensive range of academic sources, reflecting the broad scope of relevant scholarly contributions to the topic under study.

**Table 2.** Distribution of selected journal

Name of Journals	Number	Percentage (%)
Journal of Agribusiness in Developing and Emerging Economies	9	6,67
Food Policy	7	5,19
Agribusiness	6	4,44
Applied Economic Perspectives and Policy	6	4,44
Agricultural Economics	5	3,7
Renewable Agriculture and Food Systems	5	3,7
Agricultural and Resource Economics	5	3,7
Journal of Agricultural Economics	4	2,96
World Development	4	2,96
Land Use Policy	4	2,96
Journal of Rural Studies	3	2,2
Journal of Agricultural and Resource Economics	3	2,2
American Journal of Agricultural Economics	3	2,2
Australian Journal of Agricultural and Resource Economics	3	2,2
Agriculture	3	2,2
China Agricultural Economic	3	2,2
Sustainability	2	1,48
British Food Journal	2	1,48
Journal of International Development	2	1,48
Agronomy	2	1,48
Cogent Food & AgriCulture	2	1,48
International Food and Agribusiness Management Review	2	1,48
World Journal of Science, Technology and Sustainable Development	2	1,48
Others	48	35,6
Total	135	100

### 3. Results and Discussion

The selection of marketing channels for horticultural farmers represents a critical decision with profound implications for their income (Bha et al., 2020). The distinct value chain and associated input costs generated through marketing activities can enable farmers to optimize profits while simultaneously reducing risk (Lee et al., 2020). A study conducted by (Purnomo et al., 2018) demonstrates that the business performance of horticultural producers, including sales and profitability, is heavily influenced by their choice of marketing channels. Distribution channels in various regions are characterized by complex networks, where agricultural products pass through multiple actors before reaching the end consumer

(Bha et al., 2020). For instance, in Indonesia, vegetable marketing channels are notably intricate and protracted (Mariyono et al., 2020). Farmers frequently encounter challenges in selecting the most lucrative channels due to a range of factors, such as the distance between farms and markets, established relationships with traders, or obligations to sell produce to specific intermediaries. The appropriate selection of marketing channels is a decision that entails the consideration of multiple factors and requires careful deliberation, as it has significant repercussions for the productivity, profitability, and overall sustainability of vegetable farming enterprises (Dukpa & Zarenthung Ezung, 2020).

This study analyzes 135 scientific articles categorized by research focus. The analysis centers on three primary horticultural commodity marketing channels prevalent in Indonesia: direct sales, contract farming, and cooperative-based sales. The first section examines the direct marketing model, characterized by direct transactions between farmers and buyers, eliminating intermediaries. The second section assesses contract farming, which involves formal agreements between farmers and companies or distributors to sell their produce at predetermined volumes and prices. The final section explores cooperative sales, where farmers channel their produce through cooperatives that subsequently manage distribution and execute sales to end consumers. By evaluating the potential benefits and challenges associated with each agricultural sales model, this study seeks to offer in-depth insights for agricultural industry practitioners and stakeholders in devising optimal sales strategies.

### 3.1. Supply Chain 1 (Direct marketing)

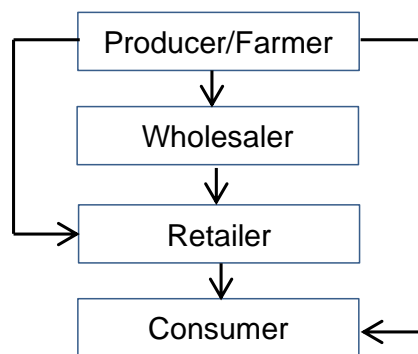
Direct marketing refers to the practice where farmers sell their agricultural products directly to consumers, either through traditional markets or online platforms (Plakias et al., 2020). Through direct sales, farmers can obtain detailed data on consumer preferences and behavior, enabling them to respond promptly to consumer needs (Leroux et al., 2010). This approach allows farmers the potential to achieve higher profits by eliminating intermediary costs, while direct interaction with consumers can enhance trust, loyalty, and long-term relationships (Cheng et al., 2012), (Silva et al., 2015). Additionally, direct sales provide farmers with the flexibility to set prices and determine the quantity of products to be sold. Beyond conventional sales, direct sales via e-commerce have been explored by (Liu et al., 2023) in Zhejiang Province, revealing that although marketing costs increased, farmers achieved higher selling prices, making it a viable alternative marketing channel. By leveraging digital platforms, farmers can effectively reach a broader customer base and potentially increase their profits.

In Indonesia, a study by (Mariyono et al., 2020) revealed that selling agricultural produce at roadside markets is more advantageous for farmers than selling to wholesalers, as it enables farmers to secure a higher share of the final consumer price. Research by (Bha et al., 2020) on the vegetable marketing system in Bihar, India, identified three primary marketing channels, with direct sales to consumers being the most commonly utilized. Farmers favor this method due to its proven ability to yield higher selling prices and its efficiency in the sales process. Studies conducted by (Govindasamy et al., 1999), (S. Kumar et al., 2011), and (Mishra & Uematsu, 2011) consistently demonstrate that direct retail sales are an effective approach for enhancing farmers' income. Similarly, research by (Detre et al., 2011) found that the Direct Marketing Strategy (DMS) led to a greater increase in gross sales compared to farmers who did not adopt this approach. In summary, direct sales provide farmers with significant advantages, including cost efficiency, data-driven decision-making,

and strengthened customer relationships. This makes it an invaluable strategy, particularly for highly perishable and time-sensitive commodities such as fruits and vegetables (Hardesty & Leff, 2010).

It is crucial to recognize that not all direct-to-consumer sales models are consistently successful, in fact, they can often be extremely challenging and intricate (Jablonski *et al.*, 2019). Farmers are required to manage not only crop production and harvesting but also the processing, packaging, transportation, and direct sales to consumers (Boys & Fraser, 2019). Direct sales models further present challenges such as limited market reach and scale, as they primarily focus on local markets (Hanik *et al.*, 2018). This complexity can be particularly problematic for small-scale farmers, who may lack the necessary resources, infrastructure, and expertise to oversee all activities within the supply chain effectively. Additionally, farmers involved in direct sales must navigate high operational costs, including venue rental fees, transportation expenses, and compliance with food safety and labelling regulations (Mukaila *et al.*, 2021). While direct sales have the potential to command higher prices, the substantial operational costs can make it challenging for small-scale farmers to maintain profitability.

Another substantial challenge is the issue of seasonality and supply consistency (Huizhen, 2013), (Dias, 2011). Unlike wholesalers or retailers who can source vegetables from diverse regions to maintain a steady supply, farmers engaged in direct sales are constrained by local seasonal harvests, making it challenging to meet consumer demand for year-round availability. The emergence of supermarkets has exacerbated the pressure on direct sales channels for small-scale farmers (Geng *et al.*, 2020). Consumers often favor supermarkets due to the convenience, product variety, and quality assurance they provide. As a result, farmers dependent on direct marketing face difficulties in competing with the marketing strategies, operational capacity, and brand strength of supermarkets. While direct sales can offer higher profit margins for farmers, this sales model presents significant obstacles, often forcing farmers to revert to selling their produce to wholesalers or retailers at reduced prices (Gonzaga *et al.*, 2020), as depicted in Figure 3.



**Figure 3.** Horticultural direct marketing model

Farmers can mitigate various sales risks by collaborating with wholesalers, retailers, or intermediaries (Cong & Zheng, 2017). These intermediaries often take the initiative to visit farms, purchase agricultural produce, and coordinate its delivery to wholesale markets through a cash-and-carry system. Farmers frequently adopt this traditional approach due to its familiarity and the ability to sell their produce without adhering to strict quality standards. Additionally, small-scale production and the perishable nature of the products often diminish

farmers' negotiating power, leading them to favor direct sales (Ebata & Hernandez, 2017). The lack of formal contracts between farmers and intermediaries further weakens the farmers' bargaining position, allowing intermediaries to dictate the prices of agricultural commodities.

### 3.2. Supply chain 2 (Contract farming)

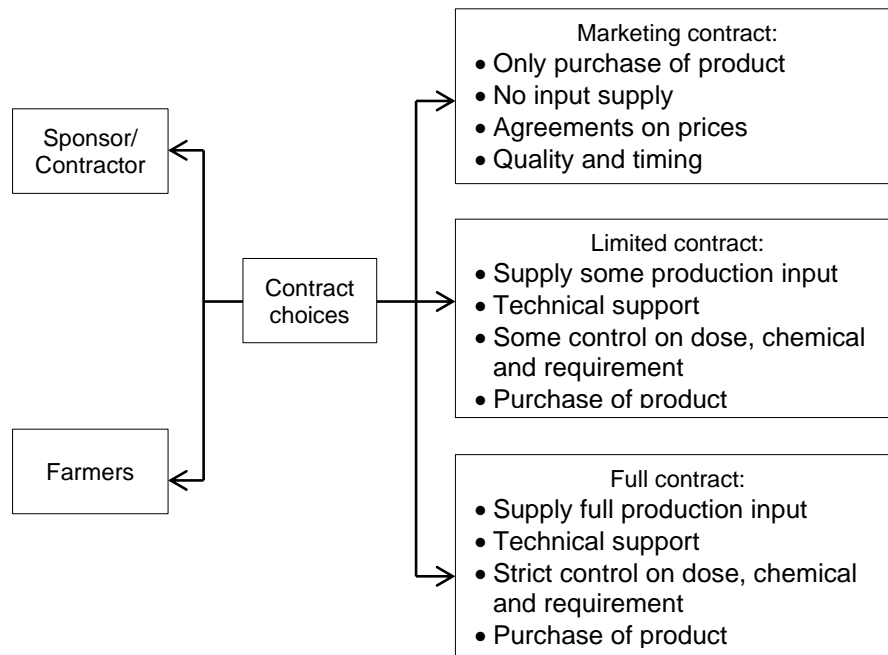
Contract farming is an agricultural practice that offers numerous advantages and has become a key factor in supporting the modernization and commercialization of the agricultural sector globally (Bellemare & Bloem, 2018), (A. Kumar et al., 2023). Moreover, contract farming is widely adopted by major corporations in the global food industry as a strategic approach to achieving the Sustainable Development Goals (SDGs) (Vabi Vamuloh et al., 2019). Farmers and contractors enter into pre-planting agreements that ensure mutual benefits, stability, and security for both parties (Adam & Agegnehu, 2023), (H. D. Pham et al., 2019). The term "contractor" encompasses not only agribusinesses and multinational corporations but also includes entities such as restaurants, supermarkets, cooperatives, and exporters (Yang et al., 2022), as depicted in Figure 4. Critical elements to be considered in contract farming arrangements include the precise specifications of the commodity. Contracts must explicitly outline the type of commodity to be produced, along with the required production techniques and quality standards (Khapayi et al., 2018). Additionally, the contract should provide detailed information on the mechanisms for procurement, technical support, and the distribution of inputs such as seeds, fertilizers, and pesticides, ensuring their timely availability to farmers (Melese, 2012), (de Zegher et al., 2019). To uphold transparency and equity for both parties, the contract must also clearly define the terms of sale transactions, pricing structures, and payment methods (Arouna et al., 2021).



**Figure 4.** Horticultural contract farming model

Contract farming has emerged as a promising collaboration model that offers substantial opportunities and benefits for the parties involved. By combining the resources and expertise of both sides, contractual arrangements have the potential to revolutionize agricultural practices, particularly in developing countries. According to Rehber (1998) in (T. T. Pham et al., 2021), there are three types of contract farming that farmers can choose from based on their preferences and circumstances: marketing contracts, limited contracts, and full contracts, as illustrated in Figure 5.





**Figure 5.** Contract farming types

Numerous studies have investigated the advantages of contract farming in enhancing farmers' income and economic well-being (Bellemare, 2012). Additionally, research by (Mishra, Shaik, et al., 2018) has highlighted the increase in agricultural productivity facilitated by this cooperative model. This study will delve into the primary benefits of contract farming, including its role in risk management, ensuring food quality and security, promoting sustainable agricultural practices, and elevating the overall well-being of farmers.

### 3.2.1. Risk management

Contract farming offers farmers greater stability and enhanced market access (Khanal et al., 2020). By entering into agreements to supply specific commodities, farmers can secure more consistent market opportunities. In the face of market fluctuations, whether in price or demand, contract farming is particularly beneficial, as traditional selling methods often subject farmers to significant uncertainty. Moreover, contract farming has the potential to reduce price risk through the establishment of fixed pricing mechanisms (Bellemare et al., 2013). With prices predetermined in the contract, farmers are shielded from volatile market price fluctuations, allowing them to plan production more efficiently and experience greater financial security due to predictable and stable income streams.

### 3.2.2. Inputs and Technical Support

Smallholder farmers often encounter difficulties in obtaining the necessary financing to purchase inputs or invest in new technologies (Bellemare & Lim, 2018). However, within the framework of contract farming, these farmers are provided with access to reliable agricultural inputs, such as high-quality seeds, fertilizers, and pesticides, with the contracted crops acting as collateral (Akhtar et al., 2021). Additionally, farmers receive comprehensive technical support, including training on best practices for cultivation, pest management, and post-harvest handling (Khapayi et al., 2018), (Elifneh, 2019). Farmers often view the extension services offered through contract farming as more effective and reliable than public extension services. (Bellemare, 2010) identified a positive and significant relationship between crop yields and the frequency of extension services and technical assistant visits to farms. (Melese,

2012) further noted that these inputs and support services can significantly enhance productivity and quality, leading to higher yields and reduced losses.

Research by (Mishra, Shaik, et al., 2018) on rice and ginger farmers in Nepal demonstrated that contract farming enhances productivity and technical efficiency. (Bidzakin et al., 2020) Conducted interviews with 350 small-scale rice farmers in Ghana to evaluate the impact of contract farming on farmer performance, reporting improvements in technical efficiency and economic benefits of up to 26%. Studies by (Kanburi Bidzakin et al., 2019) in Ghana and (Kar et al., 2020) in India revealed a positive and significant relationship between contract farming and increased yields and gross margins among rice farmers compared to non-contract farming. In the western Tigray region of Ethiopia, (Hailu & Kidu Mezgebo, 2024) assessed the impact of contract farming on sesame productivity, finding that yields could decrease by up to 400 kg per hectare without farmer participation in the contract system. In addition to boosting crop productivity, (Dubbart, 2019) found a positive and significant correlation between contract farming participation and increases in labor productivity by 62%, price margins by 46%, and net income by 36% for cashew farmers in Ghana. However, a study by (Ayamga, 2023) on the efficiency of input use in contract farming raises concerns, indicating that small-scale farms (1-10 hectares) are more productive than medium-scale farms (11-50 hectares).

### 3.2.3. Technology Adoption, Quality, and Food Security

In the rapidly evolving agricultural landscape, the adoption of advanced technologies is essential for enhancing productivity and ensuring sustainable food production (Yépez-Ponce et al., 2023). Farmers engaged in contract farming arrangements often gain access to training and technologies that were previously beyond their reach. According to (H. Wang et al., 2014) and (Elifneh, 2019), contract farming incentivizes farmers to invest in new technologies that can significantly improve productivity and income. Beyond increasing crop yields, as shown in studies by (Dubbart, 2019) and (Ragasa et al., 2018), the integration of technology in contract farming has been proven to elevate the quality of agricultural products. Within contract farming systems, farmers are required to adhere to standardized practices to ensure consistent crop quality, with production closely monitored to maintain these standards. Research by (Adabe et al., 2019) on rice farming in Togo revealed that the implementation of technology, coupled with extension services and technical support in contract farming, enhanced rice quality from substandard to premium levels. Contract farming also empowers farmers to meet the increasingly stringent food safety standards demanded by consumers and retailers, a feat that would be challenging for individual farmers to achieve independently (Khapayi et al., 2018). Similarly, in vegetable production, while contract farming may not significantly boost profits, it does encourage farmers to obtain quality certifications (Liang et al., 2021).

Contract farming has the potential to significantly enhance food security by providing a stable supply of high-quality agricultural products (Ncube, 2020). In a study by (Binpori et al., 2021), the impact of contract farming on food security among rice farmers in Ghana was explored. The study's findings indicated that participation in contract farming could improve food security by as much as 109%. (Bellemare & Novak, 2017) Examined the relationship between contract farming and food security, specifically its role in reducing hunger rates in Madagascar. Analyzing data from six regions in Madagascar, they discovered an average reduction in hunger rates of 18%.

#### 3.2.4. Environmentally Sustainable Production

Agricultural production is one of the largest contributors to global climate change (Ren *et al.*, 2021). The sector emits greenhouse gases such as carbon dioxide, methane, and nitrous oxide, largely from agricultural practices, including the use of synthetic fertilizers. One approach to mitigating this impact is through environmentally sustainable production, which is a critical issue in sustainable agricultural development. Sustainable production involves producing goods with minimal negative environmental impact (Vicol *et al.*, 2022). This concept emphasizes efficient resource use, pollution prevention, and environmental responsibility. (Ren *et al.*, 2021) assessed the impact of contract farming on environmentally sustainable production practices among 623 farmers in China. The results indicated that participation in contract farming can promote environmentally sustainable production, potentially protecting the environment from the misuse of inorganic fertilizers and pesticides in agricultural production. Another study (Dapilah, 2023) explored the relationship between contract farming and climate change. It found that contract farming provides various inputs to farmers that can better support environmental resilience compared to non-contract farmers.

#### 3.2.5. Cost Reduction

Empirical research has shown that contract farming can significantly reduce transaction costs (H. Wang *et al.*, 2014). Farmers benefit from access to high-quality agricultural inputs, such as seeds, fertilizers, and pesticides, at lower prices, often included as part of the contractual agreement. Moreover, the provision of technical support services, including extension services and the adoption of efficient farming practices, has further reduced operational expenses. (H. D. Pham *et al.*, 2019) highlight that contract farming also reduces financial risk by securing market access, allowing for more effective production planning and minimizing the potential losses associated with market volatility.

#### 3.2.6. Welfare

Numerous studies have investigated the impact of contract farming on the welfare of farmers in developing countries (Bellemare & Lim, 2018), (Meemken & Bellemare, 2020). Contract farming significantly enhances the welfare of farmers, particularly smallholders, by providing income stability through pre-agreed purchase agreements for their crops. This is further supported by the provision of high-quality inputs, technical assistance, and training, which contribute to increased agricultural productivity and efficiency. The rise of contract farming in various regions globally has transformed the lives of millions of farmers (W. Zhang *et al.*, 2023). Several studies have explored this impact. For instance, (A. Kumar *et al.*, 2023) in India found that contract farming in the production of onions, okra, and pomegranates ensures higher profits for small farmers and enables them to access higher-end markets. (Bezabeh *et al.*, 2020) Revealed that contract farming generates an annual gross farm income that is 27.80% higher than that of non-contract farmers. The application of contract farming to vegetable, rice, and avocado production has shown significant positive effects on income compared to direct marketing (H. Wang *et al.*, 2014), (A. Kumar *et al.*, 2019), (Mwambi *et al.*, 2016). In the case of tomatoes, contract farmers achieved much higher profits and better yields (Mishra, Kumar, *et al.*, 2018). The relationship between contract farming and household income for oil palm farmers in Ghana was discussed by (Ruml *et al.*, 2022), who found that their household incomes were significantly higher than those of non-contract farmers. Beyond increasing income, contract farming also absorbs a substantial amount of wage labor, indicating that this farming system stimulates job growth as well.

Although contract farming has the potential to enhance income, sustainability, and overall welfare in the medium to long term, its short-term outcomes are often not as significant (Hoang, 2021a). This is due to factors such as initial prices under the agreement being comparable to or lower than standard market prices, higher production costs, and inefficiencies in contract execution. Moreover, the adoption of contract farming systems is often complicated and marked by challenges, including unequal bargaining power, lack of trust, and inequitable distribution of risks (Khapayi et al., 2018).

(T. T. Pham et al., 2021) conducted a literature review on the application of contract farming for managing agricultural risks. Several challenges were identified, including the difficulty farmers face in accessing accurate and up-to-date market information, which makes them vulnerable to price manipulation by contractors. As a result, farmers may receive prices lower than the actual market value. Additionally, the negotiation process can be costly and complicated, particularly for small-scale farmers who have less bargaining power compared to larger-scale farmers.

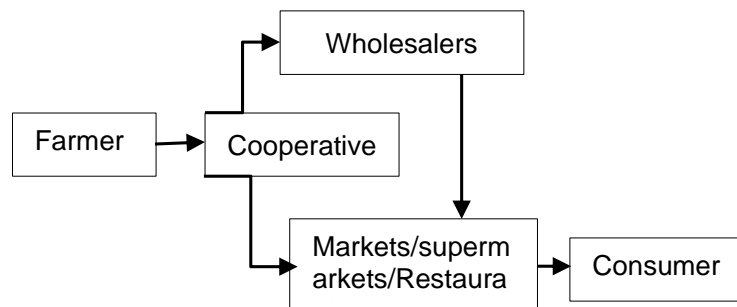
Delayed payments by contractors are a prevalent issue for farmers. These delays can severely impact the financial stability of small-scale farmers, who often do not have the resources to withstand prolonged periods without income (Akhtar et al., 2021). This situation imposes significant financial pressure, especially on those farmers who depend on harvest income to cover daily expenses and finance the next planting season (Meemken & Bellemare, 2020). As a result, payment delays often compel farmers to revert to direct markets that provide immediate cash transactions.

### 3.3. Supply chain 3 (Cooperative farming)

Cooperative farming has emerged as a critical solution to the various challenges faced by small-scale farmers and has proven effective in promoting agricultural and rural development (Akinola et al., 2023), (Olagunju et al., 2021). These cooperatives can be independently established by farmers or supported by the government or NGOs, forming a symbiotic development model between the cooperatives and the farmers (Bachke, 2019). Cooperative farming is widely regarded as an effective bridge between "farming" and "the people," reducing farmers' reliance on intermediaries (Yang et al., 2022). Through cooperative farming, groups of farmers pool their resources and collectively manage production, processing, and distribution (Grashuis & Ye, 2019), (Tran et al., 2023).

Cooperative farmers deliver their agricultural products to the cooperative's facilities, where these products are aggregated with those from other farmers. This process, known as aggregation, increases the overall volume of available products, allowing the cooperative to fulfil the demands of larger buyers and negotiate more favourable prices. Cooperatives are heavily involved in the marketing of products and are responsible for negotiating with prospective buyers on matters such as product quality, volume, and pricing. The sales process within cooperatives encompasses various methods, including direct sales to markets or stores, supermarkets, restaurants, or wholesale transactions with large buyers, as depicted in Figure 6. The cooperative oversees all aspects of the transaction, from payment processing to delivery, ensuring a seamless execution of each stage. Following the sale, profits are distributed equitably and transparently among members based on their contributions. Moreover, the cooperative reinvests a portion of the profits into its development, such as organizing member training, acquiring new equipment, or upgrading infrastructure. These

initiatives aim to enhance efficiency and productivity, ensuring the continued growth and sustainability of the cooperative and its members in the long term.



**Figure 6.** Horticultural cooperatives model

Limited access to capital is a major challenge for small-scale farmers. Agricultural cooperatives provide a credit payment system that allows farmers to secure the necessary funds to purchase inputs such as seeds, fertilizers, pesticides, and equipment. This financial support enables farmers to enhance their production capabilities significantly. Additionally, cooperatives facilitate greater efficiency in the distribution of agricultural commodities. By collaborating, farmers can streamline logistics, transportation, and storage, thereby minimizing post-harvest losses and waste, which are frequent obstacles for small-scale agriculture (L. Wang & Luo, 2019). Moreover, cooperatives allow farmers to better synchronize their production with market demand, ensuring that the appropriate quantity and quality of produce are consistently available to consumers (Grashuis & Ye, 2019).

Cooperatives play a crucial role in enhancing the productivity of agricultural outputs. Membership in cooperatives provides direct benefits that positively impact crop yields through the adoption of technology, cost efficiency, and improved market access. Several studies have been conducted to investigate the relationship between cooperative membership and productivity across various commodities in developing countries. (Hoken & Su, 2018) found that rice production and net income for cooperative members were higher compared to non-members, a finding similarly observed by (Debela et al., 2018) among onion farmers. Research by (Ma, Zheng, & Yuan, 2022) and (Ahado et al., 2021) demonstrated that cooperative membership increased banana production by 3% and served as a vital tool for enhancing productivity and efficiency among small-scale potato farmers. (Ortega et al., 2019) and (Grashuis & Skevas, 2023) explored similar relationships in the coffee sector in Rwanda and Peru. Compared to non-members, coffee farmers who were part of cooperatives produced 120-295 kg/ha more in Peru and showed significant increases in income for coffee farmers in Rwanda.

The increase in productivity among small-scale farmers who are members of cooperatives is largely due to the adoption of advanced agricultural technologies (S. Zhang et al., 2020). Studies by (Abebaw & Haile, 2013) and (Chagwiza et al., 2016) emphasize the crucial role cooperatives play in facilitating the adoption of these technologies. (Manda et al., 2020) further found that cooperative membership enhances the probability of technology adoption by 11-24%. The implementation of modern technologies, such as advanced agricultural machinery, irrigation systems, and soil management tools, enables farmers to operate with greater efficiency (Ma & Abdulai, 2017). With the use of modern pesticides, fungicides, and herbicides, farmers can more effectively manage pests, diseases, and weeds,

leading to healthier crops and improved yields. Early detection and pest monitoring technologies empower farmers to take preventive measures before significant damage occurs. The precise application of fertilizers and soil management technologies enhances nutrient absorption, thereby increasing crop yields (Ma, Zheng, Zhu, et al., 2022). Additionally, the adoption of superior crop varieties through advanced breeding technologies offers resistance to diseases, pests, and extreme environmental conditions, outperforming local varieties (Bernard et al., 2008). Furthermore, post-harvest storage and processing technologies, such as cold storage and drying, help preserve product quality, ensuring that more produce reaches the market in optimal condition, which in turn boosts farmers' income.

To enhance the productivity and sustainability of agricultural cooperatives, the roles of extension services and technical efficiency are crucial. Several studies have evaluated the impact of agricultural cooperatives on the technical efficiency and extension services provided to small-scale farmers. (Olagunju et al., 2021) and (Ma et al., 2018) found that the technical efficiency levels of cooperative members are consistently higher than those of non-members. Similarly, research by (C. Zhang et al., 2019) indicates that agricultural cooperatives are effective in providing support services that significantly contribute to the technical efficiency of their members. Extension services equip farmers with the knowledge and skills needed to adopt better farming practices and new technologies. At the same time, technical efficiency ensures that inputs are used optimally to maximize production outputs. In addition to improving farmer productivity, cooperatives are also established to enhance bargaining power and enable farmers to benefit from modern value chains (Hao et al., 2018). By pooling resources, knowledge, and negotiating capabilities, agricultural cooperatives can offer advantages to both farmers and consumers (Zheng et al., 2023). For instance, farmers who are part of cooperatives often purchase equipment, seeds, and fertilizers at lower prices, thereby significantly reducing production costs (Shi & Wang, 2023). The long-term effects of cooperative membership include improved welfare and reduced poverty rates among small-scale farmers (Shen et al., 2022) (Mojo et al., 2017).

Membership in cooperatives has been shown to increase household income and improve the welfare of farmers in rural areas (Olagunju et al., 2021), (Ahmed & Mesfin, 2017). Studies conducted by (Bachke, 2019) and (Verhofstadt & Maertens, 2014) explored how membership in agricultural cooperatives can affect the welfare of small-scale farmers. The findings indicate a positive impact of membership on farmers' productivity and profits. Surveys conducted by (Boadu et al., 2023), (Ma, Zheng, Zhu, et al., 2022), (Hoken & Su, 2018) and (Ma & Abdulai, 2017) on cocoa, banana, rice, and apple farmers examined the impact of cooperatives on income. The results show that through cooperatives, farmers achieve higher profits compared to non-members.

Furthermore, cooperatives facilitate the vertical integration of agricultural supply chains by addressing challenges such as low bargaining power, high transaction costs, and the risk of default, which individual farmers often face when attempting to engage directly with large companies, wholesalers, or supermarkets (Franzen, 2020). The cooperative structure empowers farmers not only to secure better prices but also to participate in value-added activities such as processing and marketing, enabling them to derive greater benefits than simply the profits generated within the supply chain (L. Wang & Luo, 2019), (Zhu et al., 2018).

While cooperative farming presents several advantages, it is crucial to recognize the potential drawbacks and challenges that farmers may encounter. Cooperative farming has been critiqued by (Otsuka et al., 2016) for potentially eroding individual farmer autonomy. In

a cooperative framework, decision-making authority can become centralized, which may constrain each farmer's ability to make independent decisions regarding their agricultural practices. Furthermore, the complexity of cooperative governance can give rise to conflicts of interest among members, leading to coordination difficulties. Aligning the diverse interests of all stakeholders can become increasingly challenging, potentially compromising the overall efficiency of the cooperative (Ruml *et al.*, 2022).

Cooperative farming may encounter challenges in ensuring that profits are distributed fairly among all members (Binpori *et al.*, 2021). Disparities can arise when certain farmers contribute more resources or effort than others, leading to unequal distribution of profits and benefits. Another significant challenge is the difficulty in adapting to shifting market conditions and consumer preferences (Grashuis & Ye, 2019). The collective decision-making process inherent in cooperatives can be slower and less responsive compared to individual farm management, potentially hindering the ability to innovate and adapt to rapidly changing market demands. Additionally, although cooperative farming is designed to enhance farmers' bargaining power, there is a risk that larger agribusinesses or wholesalers may exert undue influence on cooperatives, complicating the negotiation of favorable prices (Chauhan *et al.*, 2021).

#### 4. Conclusion

Based on the comprehensive literature review, there is a deep understanding of the three main sales models in the horticultural sector: direct sales, contract farming, and cooperatives. Each model represents a distinct approach to the management and marketing of agricultural products, significantly impacting farmers' financial and operational outcomes. These sales models are characterized by their unique attributes, offering different advantages and limitations depending on the specific conditions of the farmers and the dynamics of the market, as outlined in Table 3.

**Table 3.** A comparisons of horticulture supply chain model

Focus	Direct Marketing	Contract	Cooperative
Marketing	Yes	Yes	Yes
Supply input	No	Yes	Yes
Training	No	Yes	Yes
Technological adoption and			
Technical efficiency	No	Yes	Yes
Information sharing	No	Yes (limited)	Yes
Internal quality control	No	Yes	Yes
Credit payment	No	Yes	Yes
Price	Low	Medium and stable	High and stable
Priority	Collectors/wholesaler's profit	Contractor's profit	Farmers' profit

Direct marketing allows farmers to sell directly to consumers, bypassing intermediaries for higher prices but requiring full marketing management, which can be challenging. Contract farming offers stability through formal agreements, providing inputs, training, and financial

support, though profit distribution often favors contracting entities. Cooperatives enhance farmers' bargaining power, market access, and profit equity through collective efforts. Farmers must choose the best model based on resources and market access, while policymakers should support education, infrastructure, and financial incentives. Agribusinesses can foster fair contracts and efficient supply chains. Future research should focus on risk assessment frameworks to strengthen sustainable agricultural marketing in Indonesia.

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