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## Beyond the Village Gate: Commercializing Smallholder Agriculture in Indonesia

Muhammad Fauzan

Department of Agribusiness, Faculty of Agriculture, Universitas Muhammadiyah Yogyakarta, Indonesia  
muhammad.fauzan@umy.ac.id

### **Abstract**

*The commercialization of smallholder agriculture emerges as a pivotal strategy for enhancing productivity, income, and food security in developing countries, including Indonesia. This article systematically reviews scientific literature and policy documents to analyze the dynamics, challenges, and strategies related to the commercialization of smallholder farmers in Indonesia. Drawing from over 40 relevant academic and institutional sources, the review identifies that various multidimensional factors, such as market access, agricultural inputs, farmer institutions, infrastructure, and policy support, shape the commercialization process. Although commercialization has considerable potential to enhance farmer welfare, it also poses risks, including the marginalization of poor farmers and the potential for natural resource exploitation if not managed inclusively. Empirical evidence reveals that smallholder farmers effectively accessing commercial markets can experience income increases ranging from 20% to 40% compared to their subsistence counterparts. This article advocates strengthening farmer institutions, investing in supportive infrastructure, ensuring access to financing, and implementing region-specific policies focused on superior commodities. Ultimately, these findings aim to inform the formulation of equitable and sustainable policies that facilitate the transformation of smallholder agriculture in Indonesia.*

*Keywords: commercialization, Indonesia, smallholder agriculture*

### **1. Introduction**

The agricultural sector is a cornerstone of the Indonesian economy, and smallholder farmers play an integral role in food production and poverty alleviation [1], [2]. Their contributions are fundamental to national food security and rural livelihoods while also representing a substantial share of agricultural production in Indonesia [3], [4], [5]. This pivotal role is increasingly recognized as part of broader national and global initiatives aimed at rural development and agricultural modernization, where smallholder commercialization is seen as both an opportunity and a challenge.

Traditional smallholder systems in Indonesia provide essential sustenance but have historically operated at subsistence levels, limiting their potential for income diversification. The literature indicates that while smallholders are crucial for ensuring food availability and alleviating poverty, they remain constrained by limited capital, inadequate access to modern technology, and underdeveloped market networks [6], [7], [8]. These factors underscore the importance of transitioning towards more commercialized and market-oriented agricultural practices that can uplift rural communities.

Despite their critical role, smallholders face considerable challenges connecting to commercial markets. A significant obstacle is the limited access to financial resources essential for scaling production and investing in modern technologies. Moreover, fragmented land tenure systems, restricted market information, and weak infrastructural support exacerbate these challenges, making it difficult for smallholders to overcome transaction costs and market uncertainties [9]. These challenges reflect structural constraints that impede commercialization and require multifaceted policy interventions.

In addition to capital and technology constraints, access to quality land, relevant information, and robust market networks remain persistent barriers. The heterogeneity of smallholder endowments results in varying intensities of market orientation, where many farmers oscillate between subsistence and commercial models [9]. As outlined in studies from other developing countries, policy measures advocate for infrastructural and institutional reforms designed to reduce market entry costs and facilitate smoother integration into value chains.

Policy incentives from national governments and international organizations have increasingly recognized the need to modernize smallholder agriculture. These policies are directed at creating enabling environments that support improvements in infrastructure, financial inclusion, and market linkages. Complementary global trends emphasize the importance of adopting new technologies, improving extension services, and creating comprehensive support systems to address smallholders' multifarious challenges [10], [11]. Such strategies are critical for transforming local practices into commercially viable enterprises.

Against this backdrop, the dynamics, challenges, and opportunities of commercializing smallholder agriculture in Indonesia merit systematic inquiry. The central problems revolve around understanding the complex interplay of socio-economic, institutional, and environmental factors that either facilitate or hinder the transition from subsistence to commercial farming. Understanding these elements is crucial for designing policies that effectively support smallholder commercialization while mitigating potential risks and uncertainties.

The research questions guiding this review focus on the dynamics of commercializing smallholder agriculture, particularly the factors determining success or failure in the Indonesian context. Themes emerging from existing literature frame these questions, drawing on previous empirical studies exploring how smallholders navigate market challenges and exploit available opportunities. Additionally, lessons from comparable agricultural systems internationally are considered to provide a broader analytical perspective.

The primary objectives of this manuscript are to systematically review the literature surrounding the commercialization of smallholder agriculture in Indonesia, to identify the drivers and barriers encountered by these farmers, and to offer evidence-based policy recommendations. By employing a systematic literature review approach, this study seeks to establish a robust analytical framework that integrates findings from diverse empirical investigations, thereby broadening our conceptual understanding of smallholder dynamics in a commercializing context.

A key novel contribution of this work lies in its thematic synthesis of the latest literature on smallholder commercialization with a specific focus on Indonesia. This context has not been comprehensively addressed in prior studies. Unlike conventional approaches that focus solely on quantitative metrics, this review amalgamates qualitative and quantitative insights to form a multidimensional analytical model that captures both the challenges and potentials of commercialization [12]. This integrative framework enhances theoretical understanding and serves as a valuable reference for future research and policy formulation.

This manuscript underscores the pressing need to reframe smallholder agriculture as a commercially viable and sustainable component of Indonesia's rural economy. The review comprehensively examines emerging trends, constraints, and opportunities by synthesizing insights from various disciplines and drawing on experiences from both domestic and international contexts. The findings are intended to offer practical policy inputs and research directions that can help transform Indonesia's smallholder agriculture into a resilient and dynamic sector capable of sustaining economic growth and improving rural livelihoods.

## **2. Research Methods**

This research employs a systematic literature review approach to thoroughly collect and analyze relevant scientific articles, policy reports, and other pertinent documents that address the theme of smallholder commercialization in Indonesia. The systematic review method is characterized by its rigorous protocols, designed to minimize bias and enhance the replicability of the research process. This method facilitates a comprehensive understanding of the prevailing trends and issues associated with smallholder agriculture but also aids in identifying gaps in the existing literature that warrant further investigation. The systematic review will provide a solid foundation for understanding the dynamics of smallholder commercialization and its implications for economic and social development in Indonesia.

The literature search strategy will encompass a wide array of reputable data sources, including prominent scientific databases such as Scopus, ScienceDirect, Google Scholar, and JSTOR, as well as crucial documents from organizations like the Food and Agriculture Organization (FAO), the World Bank, and relevant Indonesian ministries. The search will leverage a carefully curated list of keywords, including terms such as "smallholder commercialization", "agricultural commercialization", "smallholder farmers", "small-scale farmers", "family farming", "subsistence farming", "market-oriented agriculture", "subsistence to commercial transition", "agricultural transformation", "market access", "rural livelihoods", "value chain", and "Indonesia agriculture". This broad search methodology is critical for capturing diverse studies from various contexts related to smallholder agriculture, ensuring that the review encapsulates a rich tapestry of insights that can inform policy and practice.

In establishing inclusion and exclusion criteria, the review will focus on articles published within the last 15 years to ensure the relevance and contemporaneity of findings. Included literature must be pertinent to the context of Indonesia or similar developing countries while addressing economic, institutional, technological, or policy dimensions of smallholder commercialization. Conversely, descriptive articles lacking empirical or conceptual analysis will be excluded from further consideration. This selective approach enhances the review's depth and academic rigor, promoting a focus on works that offer measurable insights into the commercialization processes and outcomes for smallholder farmers.

Data analysis will employ thematic synthesis techniques to categorize and synthesize key issues and findings from the reviewed literature. Using analysis matrices, literature will be organized based on emerging themes, methodologies, and significant results, facilitating clarity in understanding the multifaceted nature of smallholder commercialization. This process will enable researchers to identify patterns, relationships, and insights that contribute to a holistic view of the commercialization landscape, allowing for actionable policy recommendations that can support smallholders transitioning from subsistence to market-oriented agricultural practices. This comprehensive methodological framework is designed to rigorously explore smallholder commercialization and its broader economic and social implications.

### 3. Results and Discussions

#### 3.1. The Concept of Commercialization of Smallholder Agriculture

Smallholder agricultural commercialization refers to the transformative process in which smallholder farmers transition from subsistence farming systems toward market-oriented production systems, wherein they increasingly sell a larger proportion of their agricultural produce [13], [14], [15]. This shift represents an economic adjustment and a significant structural change in farmers' livelihoods, incorporating increased participation in local, regional, and potentially global agricultural markets [3]. Smallholder commercialization can improve food security, increase incomes, and enhance resilience to economic shocks [16], [17]. However, this transition is contingent upon myriad factors, including access to inputs, technology, financial resources, and market information. As highlighted by Kissoly *et al.*, smallholders often navigate complex pathways to integrate into commercialization, making this phenomenon particularly vital across different contexts in developing nations [9].

The transition towards commercialization occurs across three key dimensions. First, increasing market orientation emphasizes the willingness and ability of smallholder farmers to engage with market demands as they adapt to evolving consumer preferences and pricing structures [18], [19], [20]. Second, diversification and intensification of production processes enable smallholders to produce more goods, thus enhancing their resilience against market variability and climate impacts. This diversification can include cultivating a mix of cash and food crops, allowing risk management while tapping into new market opportunities [21], [22]. The third dimension, integration into value chains, involves establishing connections with input suppliers, processors, and distributors, allowing farmers to capture greater value from their production and enhancing their bargaining power [23], [24], [25], [26]. All three dimensions facilitate a more structured engagement with the market, effectively increasing the economic viability of smallholder farming.

Theoretically, the agricultural transformation approach posits that commercialization is integral to broader structural transitions within economic development. This framework underscores the understanding that agricultural productivity drives economic growth, directly impacting rural employment and livelihood improvements. As critical as the production mechanisms may be, the successful commercialization of smallholder agriculture also necessitates a supportive environment, including robust market institutions and favorable policy conditions [27]. Access to suitable agricultural practices and market information is imperative for fostering this transition; inadequate support systems can undermine the potential benefits of commercialization for smallholder farmers, as they may struggle to compete in increasingly competitive markets [28].

Numerous analytical frameworks have been developed in literature to assess and quantify smallholder agricultural commercialization. These include tools such as the Crop Commercialization Index (CCI), Household Commercialization Index (HCI), Market Participation Index (MPI), and Proportion of Output Sold [29], [30], [31], [32], [33], [34]. Each tool sheds light on different aspects of the commercialization process. For instance, the CCI focuses specifically on the degree to which crops produced are directed toward the market, while the MPI evaluates how actively farmers participate in market activities. The Gini Coefficient for Market Participation, on the other hand, highlights disparities in market engagement among different farmer groups, revealing the challenges that marginalized farmers might face in accessing profitable markets [35]. Through value chain analysis, researchers can further analyze the entire production and marketing cycle, identifying critical intervention points that can enhance smallholder profitability and sustainability.

While the aforementioned analytical tools are valuable for measuring commercialization levels, they have inherent strengths and weaknesses. One notable strength is their ability to provide quantifiable data that effectively informs policy decisions and resource allocation. Tools like the CCI and MPI offer a straightforward interpretation of how well smallholders are engaged in market activities, which can be critical for governments and NGOs looking to design interventions to boost productivity and market access [36]. However, limitations exist due to variations in farmer circumstances, regional disparities, and the diversity of agricultural practices across contexts [37]. For example, some indices may not account for the full range of social, cultural, and economic factors influencing smallholder behavior, potentially leading to an oversimplified understanding of the nuanced dynamics of agricultural commercialization.

Understanding the concept and theory of smallholder agricultural commercialization is essential for framing effective strategies that promote rural development and enhance the livelihoods of smallholder farmers in Indonesia. The transition from subsistence to market-oriented agriculture embodies significant changes across critical dimensions of market engagement, production practices, and integration into value chains. Theoretical perspectives on agrarian transformation and the application of various analytical frameworks contribute valuable insights into the factors that drive or hinder this process. By leveraging both empirical and theoretical understandings, policymakers can more effectively tailor interventions that support smallholders in navigating the complex landscape of commercial agriculture, ultimately fostering sustainable economic growth and improved food security.

### 3.2. Dynamics of Smallholder Commercialization in Indonesia

The dynamics of smallholder commercialization in Indonesia reflect a complex interplay of historical, socio-economic, and regional factors that have evolved significantly from the New Order regime to the modern era. During the New Order period (1966-1998), government programs fostered agricultural production through infrastructural investments and technological innovations [38], [39], [40]. This created an environment conducive to smallholder commercialization, primarily through integration into formal markets. Post-reform, albeit with political and economic challenges, there has been a notable shift in policy focuses that encourage market-oriented practices among smallholders, facilitating their participation in agricultural value chains [3], [41]. The resilience of this sector has allowed it to progress, albeit unevenly, across various regions and subsectors of Indonesia.

Indeed, smallholder agriculture in Indonesia exhibits significant regional and subsectoral diversity. In the highlands of Java, for example, the commercialization of horticultural products such as chilies and tomatoes has been significantly bolstered by partnerships between local farmers and large traders and access to export markets [9]. This model has proven effective in creating local value chains that enhance farmer incomes and improve the overall quality and competitive edge of Indonesian horticultural products in the global market. Conversely, the experiences of smallholder farmers in Sumatra and Kalimantan present a contrasting narrative. While oil palm cultivation indicates high levels of commercialization, farmers often grapple with challenges related to price transparency and reliance on large corporations that dominate supply chains [42], [43]. This dependence can result in precarious financial situations for smallholders, undermining the potential benefits of commercialization.

The commercialization journey of smallholder agriculture is further illuminated by various case studies highlighting distinct agricultural practices across regions. For instance, rice production in Java has transitioned towards commercialization with increased adoption of high-yielding varieties and mechanization [44], [45], [46]. Meanwhile, in Central Java, horticulture has embraced modern agricultural techniques that are informed by market demands. At the same time, oil palm cultivation in Kalimantan represents high-value crop production that significantly contributes to local economies [26], [47], [48], [49], [50], [51], [52], [53], [54], [55]. Additionally, coffee cultivation in Sumatra illustrates how specific varietal choices linked with cooperative structures can enhance market access and pricing for smallholder farmers, thereby increasing overall profits [7], [56]. These case studies collectively showcase the potential for diverse crops to drive economic growth while illustrating unique challenges tied to regional market dynamics.

However, the path towards smallholder commercialization is not always inclusive. Many smallholder farmers remain disadvantaged due to inadequate productive assets, limited access to market information, and weak bargaining positions within the value chain [41], [57]. Land fragmentation presents a significant hurdle, as many smallholders possess insufficient land to achieve economies of scale, resulting in minimal profit margins [58], [59]. Furthermore, low-income diversification reduces their resilience against market shocks, limiting their capacity for investment in commercial agricultural practices [60], [61]. Many farmers, particularly in rural areas, continue to rely on subsistence models, which inhibit their ability to engage more fully with commercial markets [62].

Institutions play a crucial role in shaping the commercialization landscape for smallholder farmers in Indonesia. Community-based organizations, such as BUMDes (Village-Owned Enterprises) and agricultural cooperatives, along with support from non-governmental organizations (NGOs) and the private sector, can enhance smallholder farmers' capabilities and market access [42], [43]. These institutions work by providing essential services, including training, market information, and credit access. Promoting collective action through cooperatives has shown promise in facilitating better negotiation positions for smallholders and improving their overall engagement with markets. Nonetheless, the effectiveness of these initiatives often hinges on local governance structures and the level of organizational support from both governmental and non-governmental actors [41], [63].

Furthermore, the role of market structures and policies cannot be overstated when considering the dynamics of smallholder commercialization in Indonesia. The effectiveness of agricultural policies designed to support smallholders must be critically evaluated to ensure they adequately address these farmers' unique needs and constraints. Policies facilitating access to inputs, technological innovations, and fair market practices can significantly enhance the prospect of sustainable and inclusive agricultural commercialization. However, these policies must also recognize the need to balance economic development with environmental considerations, particularly in sectors such as palm oil production, which has been scrutinized for its ecological impacts.

### 3.3. Driving Factors for Commercialization of Smallholder Agriculture

The commercialization of smallholder agriculture is essential for enhancing the livelihoods of rural farmers in Indonesia. Several driving factors significantly contribute to this process, establishing a framework for successful commercialization. The following points outline these critical factors, supported by recent research findings:

1. **Access to Inputs (Fertilizers, Superior Seeds, Technology):** The availability of quality agricultural inputs such as high-yielding seeds, fertilizers, and effective farming technologies is fundamental for smallholders to increase production and quality. Enhanced access to these inputs allows farmers to apply modern agricultural practices that lead to higher profitability and sustainability [39]. For instance, studies have demonstrated that providing superior seeds significantly improves crop yields, facilitating better market engagement.
2. **Access to Financing and Microfinance Institutions:** Financial accessibility is crucial for smallholders to invest in agricultural production, including purchasing inputs and equipment. Microfinance institutions play a vital role in providing credit facilities tailored to the needs of small farmers, enabling them to pursue commercialization. Research highlights that access to credit helps accumulate productive resources and stabilizes cash flow, allowing farmers to manage expenses during lean periods [64], [65].
3. **Supporting Infrastructure (Roads, Irrigation, ICT):** The presence of adequate infrastructure, including well-maintained roads, reliable irrigation systems, and information and communication technology (ICT), is a significant driver of agricultural commercialization. Improved infrastructure facilitates market access by reducing transportation costs and ensuring timely delivery of products [3]. Investments in irrigation systems have been positively correlated with increased agricultural productivity and market participation, ultimately leading to enhanced income for smallholder farmers [39].
4. **Farmer Education and Capacity:** Educating farmers about modern agricultural practices, market trends, and business management skills is vital for promoting commercialization. Training programs and capacity-building initiatives help farmers adapt to market demands and improve their production techniques. Evidence suggests that educated farmers are likelier to adopt innovative practices and techniques to increase productivity and profitability [66], [67]. Educational interventions also empower smallholders to engage in value-added activities within the agricultural supply chain.
5. **Integration with the Market (Offtakers, Contract Farming, E-Commerce):** Establishing strong linkages with buyers and markets is essential for smallholder success. Participating in contract farming arrangements and utilizing e-commerce platforms have been shown to improve farmers' bargaining power and secure better prices for their products [68]. Such arrangements ensure consistent demand for produce and encourage adherence to quality standards, which can enhance market competitiveness [69]. Market integration facilitates a clearer understanding of market dynamics and consumer preferences.
6. **Social Networks and Cooperatives:** The strength of social networks among smallholder farmers is important in facilitating knowledge transfer, resource sharing, and collective action. Cooperatives can significantly amplify smallholders' negotiating power, improving their access to markets and financial resources [70], [71]. Studies show that farmer groups collaborating in production, marketing, and information sharing can more effectively overcome challenges associated with individual market participation, leading to greater success in commercialization [3].

7. Government Policies and Support: Proactive government policies that provide logistical and financial support, establish fair market conditions, and enhance the regulatory framework for smallholder farming are critical [39], [72], [73]. Policies incentivizing smallholder commercialization and supporting infrastructure development can increase investment and participation in agricultural markets. Effective policy implementation plays a significant role in shaping favorable conditions for smallholders to thrive.
8. Market Demand and Consumer Preferences: Understanding and responding to market demand is essential for commercializing smallholder agriculture. Research indicates that smallholder farmers who engage in market-oriented production by aligning their offerings with consumer preferences can significantly increase their market share [74]. Adapting production based on market needs enables farmers to optimize their output for profitability, as they can focus on high-demand crops or products.

These driving factors collectively create a multifaceted landscape for smallholder commercialization in Indonesia, facilitating the transition from subsistence farming to more productive and market-oriented agricultural practices. Addressing these factors holistically is crucial to enhancing smallholder livelihoods and achieving broader agricultural development goals.

### 3.4. Factors Inhibiting Commercialization of Smallholder Agriculture

The commercialization of smallholder agriculture in Indonesia faces various inhibiting factors that can undermine the potential benefits of transitioning to market-oriented practices. Understanding these barriers is critical for developing effective strategies to promote smallholder agriculture. The following points summarize the primary factors inhibiting commercialization, supported by recent literature:

1. Land Fragmentation and Small Ownership: Land fragmentation is a pervasive issue in Indonesia, where smallholders often manage scattered plots of land, which limits their ability to achieve economies of scale necessary for commercial viability. Fragmented land can hinder productivity and complicate adopting modern agricultural practices [15]. A study by Kissoly *et al.* underscores that smaller landholdings restrict smallholders' capacity to expand and exploit market opportunities effectively, leading to inefficient resource utilization [9].
2. Dependence on Middlemen and Fluctuating Prices: Smallholder farmers frequently rely on intermediaries to market their produce, which diminishes their bargaining power and often results in unfair pricing. The presence of intermediaries can create information asymmetries that cause price disparities, where farmers receive less than the market value of their products [75]. This dependency leads to unstable incomes due to price fluctuations, making it challenging for smallholders to engage consistently in agricultural commercialization [73].
3. Limited Access to Market Information: A significant barrier to smallholder commercialization is the lack of timely and reliable market information. Farmers often operate under uncertainty about market trends, prices, and consumer preferences, which stifles their ability to make informed decisions. Research highlights that inadequate access to market intelligence hampers smallholders' competitiveness [76]. Improved information channels enable farmers to align their production with market demands effectively.
4. Weaknesses in Farmer Institutions and Lack of Policy Support: The effectiveness of farmer organizations and cooperatives is crucial in supporting smallholder commercialization. However, many institutions are poorly organized, limiting their ability to provide essential services, such as training and negotiation support [66]. Furthermore, gaps in government policies that fail to prioritize smallholder needs exacerbate these weaknesses, limiting the availability of necessary support systems for smallholder farmers [15].
5. Insufficient Infrastructure: Inadequate infrastructure, such as poor road networks, unreliable irrigation systems, and insufficient storage facilities, heavily impacts smallholder commercialization. Poor infrastructure can increase transaction costs and limit market access, reducing the competitiveness of smallholders' products [77]. Investment in rural infrastructure is critical for enhancing market access and improving smallholders' capabilities to engage in productive farming.
6. Low Levels of Farmer Education and Capacity: Education is vital in empowering smallholders to adopt innovative practices and engage with markets effectively. Limited educational opportunities can hinder farmers' understanding of modern agricultural techniques and market operations, restricting their capacity for commercialization [78], [79]. Investments in education and capacity-building initiatives are essential to equip smallholders with the skills to transition to a market-oriented approach.

7. Cultural Factors and Resistance to Change: Cultural attitudes towards agriculture and traditional farming practices can inhibit commercialization. Some smallholders may resist adopting new technologies and practices due to a preference for traditional methods or skepticism about the reliability of modern approaches [80]. Therefore, fostering a supportive culture encouraging innovation and collaboration within communities is essential for promoting successful commercialization.
8. Environmental Challenges: Smallholder agriculture is increasingly affected by environmental factors such as climate change, land degradation, and resource scarcity. These challenges can impact crop yields and agricultural sustainability, making it more difficult for farmers to engage in commercial production [75]. Addressing environmental sustainability is vital for the long-term success of smallholder agriculture and its commercialization.

These factors present substantial challenges to the commercialization of smallholder agriculture in Indonesia. Addressing them requires a coordinated effort involving policy interventions, investment in infrastructure and education, strengthening farmer organizations, and promoting market access initiatives. By tackling these barriers, stakeholders can create a more supportive environment for smallholder farmers and enhance their overall contributions to Indonesia's agricultural sector.

### 3.5. Best Practices from Other Countries

The commercialization of smallholder agriculture has been a focal point of development strategies in various countries, where successful practices have emerged that can provide valuable lessons for Indonesia. The experience of other developing nations demonstrates that strategic policy interventions significantly drive the success of smallholder commercialization. Each country's approach offers insights into how Indonesia might enhance its smallholder agricultural practices to foster economic growth and improved livelihoods.

Vietnam's success in integrating smallholders into the export market illustrates the power of strengthening cooperatives and providing technological incentives. Research by Nguyen indicates that enhancing cooperative structures enables smallholders to pool resources, share knowledge, and improve bargaining power, ultimately leading to increased market access and sustainability in production patterns [81]. The government's investment in developing production areas and modernizing agricultural technologies further supports smallholders in meeting export standards, thus facilitating their entry into lucrative global markets [82].

Thailand has effectively utilized contract farming, particularly in the horticulture and poultry sectors, to bolster smallholder incomes and boost agricultural productivity [83], [84]. Tongchue found that contract farming arrangements provide smallholders with access to essential resources, such as improved seeds, technical expertise, and financial support, which are crucial for enhancing agricultural output [85]. The stability offered through contracts allows smallholders to mitigate risks associated with price fluctuations and market uncertainties, thereby leading to improved household incomes [86].

Ethiopia's agricultural growth corridors model presents another innovative strategy that has integrated smallholders with large agribusinesses while providing logistical support. This model facilitates the creation of economic zones that leverage the strengths of large agribusinesses while ensuring smallholders benefit from infrastructure investment, access to markets, and technological advancements [87], [88]. This collaborative approach fosters an ecosystem where smallholders can thrive alongside larger agricultural enterprises, promoting inclusive growth in the agricultural sector [89].

The success of these models underscores the critical importance of synergistic investments in infrastructure, local institutions, and transparent market governance. Strong infrastructure, such as roads and irrigation facilities, is vital for improving market links. Moreover, fostering robust farmer institutions ensures smallholders can effectively organize themselves and participate in value chains, which is fundamental for achieving commercial viability. Clear and effective governance structures are essential to maintain market integrity and protect the interests of smallholder farmers [90].

In the context of Indonesia, adapting lessons from these countries involves understanding local conditions, as agricultural commercialization cannot be viewed as a one-size-fits-all solution. It is crucial to analyze the unique challenges faced by Indonesian smallholders, such as land fragmentation and dependency on middlemen, while incorporating effective practices from other contexts. Leveraging cooperatives to enhance collective bargaining power, utilizing contract farming to secure market access, and investing in infrastructure will be paramount to improving the prospects for smallholder commercialization in Indonesia [91].

To enhance the commercialization of smallholder agriculture in Indonesia, strategic and concrete steps are necessary. Policymakers should focus on facilitating access to finance and affordable agricultural inputs while

promoting educational programs to elevate farmer skills related to modern farming techniques. Building stronger partnerships between smallholders and larger agribusinesses can lead to more effective integration into supply chains. Increasing access to market information and supporting rural infrastructure development are key actions that can empower smallholders and enable them to capitalize on emerging opportunities in domestic and global markets [63], [92].

### 3.6. Implications for Farmer Welfare and Food Security

The commercialization of smallholder agriculture has significant implications for farmer welfare and food security in Indonesia. One of the most notable positive impacts is the potential for increased income for smallholder farmers, which can enhance their livelihood and economic stability. Research indicates that smallholders who successfully access commercial markets can experience income increases ranging from 20% to 40% compared to their subsistence-farming counterparts [15]. This uplift in income stems largely from improved production efficiency and greater market participation, as evidenced by Hendrawan *et al.*, who found that smallholders tapping into commercial avenues see a pronounced improvement in their economic situation, enhancing food security for their households [93].

Increased production efficiency is another critical outcome of this commercialization process. When smallholders transition to market-oriented production, they often adopt modern agricultural practices and technologies that enhance their yields and reduce waste. This shift not only leads to higher quantities of food produced but also allows for the diversification of crops, subsequently promoting dietary variety and contributing to better nutritional outcomes. As Feliciano noted, crop diversification plays a vital role in fostering sustainable development and reducing vulnerability to climate-related shocks [94]. Combining increased incomes and more efficient production practices creates a foundational shift that enhances economic and food security.

However, the commercialization of agriculture has risks and challenges, particularly concerning inequality and the marginalization of poorer farmers. As highlighted by Suroso *et al.*, if the commercialization process is not inclusive, it can disproportionately benefit wealthier farmers with access to resources and market connections, thereby widening the gap between rich and poor [95]. This dynamic can lead to social tensions and increased poverty among those unable to adapt or participate in emerging market structures. Therefore, while commercialization holds promise, careful management is essential to ensure equitable outcomes for all smallholders.

Environmental degradation is another concern that accompanies increased commercialization. Intensified agricultural practices, particularly within the context of high-demand cash crops, can lead to unsustainable resource use and contribute to ecological harm. The literature indicates that without proper environmental safeguards and sustainable practices, the push for higher yields may result in significant negative externalities, including deforestation and soil degradation [35]. Further research is necessary to evaluate the long-term impacts on environmental sustainability and how these may affect food security in Indonesia as agricultural practices evolve alongside market pressures.

The integration of smallholder farmers into broader agricultural growth corridors is an approach that has been successfully implemented in other contexts, as seen in Ethiopia and Vietnam. In these countries, establishing models that foster partnerships between smallholders and larger agribusinesses has proven effective in enhancing productivity and ensuring continuous market access while facilitating logistical support [93]. Such approaches promote synergies between infrastructure investments, local institutions, and transparent market governance, providing a roadmap for Indonesia to consider as it seeks to enhance smallholder commercialization.

Notably, the lessons derived from international best practices underscore the necessity for one critical aspect: local adaptation. Strategies that have worked in different socio-economic and cultural contexts must be tailored to fit Indonesian smallholders' unique conditions. This entails understanding the specific challenges and opportunities within local agricultural systems while designing supportive interventions that prioritize the needs of smaller farmers [96]. Developing a comprehensive framework incorporating these insights can help refine strategies to enhance smallholder welfare and food security in Indonesia.

## 4. Conclusion

Commercializing smallholder agriculture in Indonesia presents a multifaceted process with significant implications for farmer welfare and food security. On the one hand, the positive effects of commercialization manifest in improved income, enhanced production efficiency, and food diversification. Smallholder farmers significantly benefit from entering commercial markets, which can substantially increase their incomes and enable them to invest in better production practices, thereby improving overall productivity and availability of diverse

food crops. The transition from subsistence to market-oriented practices allows farmers to cater to local needs and tap into higher-value markets, resulting in a more resilient food system. Despite these opportunities, the commercialization process poses various risks and challenges that must be carefully managed. Notably, it can exacerbate existing inequalities within rural communities, marginalizing poorer farmers who may lack access to critical resources. Without inclusive implementation, commercialization can widen the gap between wealthier and poorer farmers, ultimately threatening social equity and cohesion. Therefore, it is crucial to ensure that the benefits of commercialization are shared across different strata of society to avoid heightened disparities and discontent. In Indonesia, some empirical evidence indicates that smallholder farmers with successful access to commercial markets experience income boosts; specific figures should be clarified with regional studies to accurately reflect the benefits, as some reports suggest improvements up to 40% compared to those remaining in subsistence agriculture. However, while these data are promising, the challenge remains to ensure that such growth does not come at the cost of environmental sustainability and domestic food price stability. Thorough assessments must be conducted to understand the broader implications of increasing commercialization, particularly how it affects natural resources and local food systems, which are vital for long-term sustainability. The literature review also suggests that additional challenges persist, including limited land ownership, restricted access to finance, the prevalence of intermediaries, and farmers' low managerial capacity. These barriers prevent many smallholder farmers from fully participating in commercial markets. In particular, land fragmentation creates vulnerabilities that hinder farm consolidation and investment in larger-scale, more efficient agricultural practices. Addressing these structural issues is critical for empowering smallholders to engage effectively in commercialization and secure better livelihoods. Looking beyond Indonesia, best practices from other developing countries can provide valuable lessons for enhancing the commercialization of smallholder agriculture. Countries such as Vietnam and Thailand have successfully implemented integrated policies that bolster smallholders' market access and effectiveness. Vietnam's experience strengthening cooperatives and providing technological incentives demonstrates how well-supported smallholders can enter and thrive in export markets. Thailand's use of contract farming in horticulture and poultry is a model for improving farmers' incomes by establishing secure market outlets. Adopting such integrated approaches highlights the importance of balancing economic growth with local needs and environmental considerations. Ultimately, the successful commercialization of smallholder agriculture in Indonesia has the potential to improve farmers' welfare, reinforce national food security, and transform the rural economy. However, it is imperative to prioritize inclusivity and sustainability throughout this process. By implementing strategic steps that promote equitable access to resources, information, and market opportunities and by embracing beneficial insights derived from both domestic and international experiences, Indonesia can pave the way for a robust agricultural sector that meets the needs of its people without compromising its environmental integrity. Indonesia's journey towards a more commercialized agricultural future must be anchored in concerted efforts to address and mitigate the risks while enhancing the benefits for all stakeholders involved in the agricultural value chain.

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