**Digitalizing the agricultural sector to reduce rural-urban gaps in Indonesia: opportunities and challenges**

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**Abstract**

The disparity between Indonesia's rural and urban areas is a complex issue affecting the country's development. While urban areas have experienced significant economic growth, many rural communities remain impoverished and underdeveloped. This inequality is evident in various sectors such as health, education, and access to public services. This article explores the critical role of digitalization in bridging the gap, particularly in the agricultural sector. Digitalization offers numerous advantages, including increased production efficiency, direct access to markets, and real-time information on agricultural conditions. However, to fully realize these benefits, several challenges must be addressed, including inadequate infrastructure, limited digital literacy among farmers, and financial constraints that hinder technology adoption. To promote inclusive development, this study calls for the creation of smarter policies and greater collaboration among government, the private sector, and educational institutions. The article emphasizes the need for continuous digital literacy training for farmers, covering essential skills such as using agricultural applications and relevant digital resources. Furthermore, the government should invest in digital infrastructure, particularly in rural areas, to facilitate the adoption of advanced agricultural technologies. Engaging the private sector in this transformation is also crucial, with incentives like tax breaks to encourage investment in rural technological initiatives. A comprehensive approach involving in-depth research into local needs is essential to ensure that the solutions implemented are both impactful and sustainable.

**Keywords:** rural and urban disparities, digitalization, inclusive development

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1. **Introduction**

The disparity between rural and urban areas in Indonesia represents a complex and multidimensional issue that continues to challenge the country’s development agenda. Indonesia, as a large and diverse archipelagic nation, faces significant geographic and demographic variations that contribute to unequal growth. While urban areas have witnessed rapid economic development, many rural regions remain trapped in poverty and underdevelopment. This disparity is evident in various sectors such as education, healthcare, infrastructure, and access to public services. According to Indonesia’s Central Statistics Agency (BPS), the poverty rate in urban areas stands at 6.89 percent, compared to 13.10 percent in rural areas—highlighting a significant gap in well-being. Despite the abundance of natural resources in rural areas, the local population continues to face poverty and limited opportunities, often leading to rural-urban migration in search of better livelihoods (Indrawati et al., 2024).

Uneven development is frequently driven by limited investment, restricted access to technology, and low-quality human resources in rural areas. As a result, rural communities experience more significant challenges in attaining equitable living standards. Urban centers, with their dynamic environments and better infrastructure, attract migrants and further widen the development gap. Addressing this issue requires a holistic and sustainable approach involving collaboration between the government, communities, and private sector actors. Inclusive development efforts are necessary to ensure that both rural and urban populations benefit equally from national progress. The consequences of rural marginalization not only affect the economy but also social and cultural structures, often excluding rural voices from decision-making processes and leading to dissatisfaction and social unrest.

Furthermore, disparities in access to information and technology exacerbate the gap. Urban populations benefit from digital connectivity and modern tools that enhance productivity and adaptability, while rural communities often remain bound by traditional methods. Hence, policies must not only focus on economic growth but also prioritize equitable welfare. Infrastructure development, education, and health programs should be emphasized in rural areas to bridge this divide. Failure to address these inequalities can hinder national development, provoke social tensions, and limit the country’s global competitiveness. Empowering rural communities through participatory planning and human resource development is critical for building resilience and sustainability.

The agricultural sector plays a vital role in Indonesia’s economy, particularly as many rural populations depend on it for their livelihoods. Enhancing agricultural productivity and ensuring fair market prices for farmers can significantly improve rural well-being. Jhingan (Tanaman et al., 2024) outlines several ways in which agriculture contributes to economic development: increasing food surplus raises income, stimulates industrial demand, boosts foreign exchange through exports, improves rural incomes, and ultimately enhances rural welfare. Yet, data from BPS show that 63.73% of poor households relying on agriculture are located in rural areas, compared to 26.71% in urban areas. Decline in agricultural performance has led to poverty, food insecurity, high dependency on imports, rural unemployment, and environmental degradation (Sihombing, 2021).

To avoid these issues, it is essential to empower and modernize the agricultural sector, particularly through digital transformation. Existing literature emphasizes the significant contribution of agriculture to rural development. A thriving agricultural sector raises income and improves welfare, creating a multiplier effect on non-agricultural sectors. The growth of agro-industry can also enhance infrastructure and human resource capacities in both rural and urban regions.

The modernization perspective in social change theory argues that scientific and technological advancements are key drivers of transformation. Digitalization has become a central force shaping social behavior, economic activities, and cultural patterns in modern society (Sari & Diana, 2024). Arthur Lewis’s dual-sector theory highlights the division between traditional rural agriculture and modern urban industry, mirroring Indonesia’s economic structure. Overpopulation in rural areas leads to labor surplus and subsistence-level living standards due to stagnant economic capacity (Desa et al., 2022). Myrdal’s Cumulative Causation Theory further explains how market forces aggravate regional inequalities, with advanced areas continually gaining more advantages while underdeveloped regions fall further behind (Tumangkeng, 2018).

Against this backdrop, the integration of digital technologies into the agricultural sector presents a strategic opportunity to reduce rural-urban gaps in Indonesia. This study explores the opportunities and challenges of digitalizing agriculture to support inclusive development and promote rural welfare.

1. **Research Design and Method**

This study uses a qualitative methodology that combines case studies and literature analysis to investigate the impact of digitalization on the Indonesian agricultural industry. To assess current initiatives and government policies related to digitalization of the agricultural sector, secondary source document analysis was also conducted. The study aims to provide a comprehensive understanding of the potentials and challenges faced by rural communities in embracing digital technologies, as well as to identify practical methods to enhance their engagement in the digital economy, using primary and secondary data. It is hoped that the results of this approach will provide useful suggestions for policy makers to create more successful empowerment initiatives.

1. **Results and Discussion**

The lives of people, even those in rural areas, have undergone significant changes as a result of the increasing digitalization and rapid progress of the times. Urban and rural communities will certainly be affected by digital technology, which will cause major changes in behavioral, cultural, social, and economic aspects of life.

The process of integrating advanced digital and information technologies into several aspects of agricultural practices to improve production, sustainability, and efficiency is known as agricultural digitalization. This process involves the use of digital devices and systems that allow farmers to collect and analyze data in real time, such as soil sensors, smartphone applications, and the Internet of Things (IoT). Therefore, better decision-making in resource management—such as crop maintenance, irrigation, and fertilization—is enabled by agricultural digitalization, which increases agricultural yields and ensures food security.

In the era of digital transformation, several technologies have been widely adopted in agriculture to enhance productivity, efficiency, and decision-making. One of the most prominent is the IoT, which enables real-time monitoring of environmental conditions. Soil sensors can detect nutrient levels, pH, and moisture content, while weather sensors track key variables such as temperature, humidity, and rainfall, providing farmers with up-to-date insights to optimize planting and harvesting schedules.

Another significant innovation is the use of Big Data and analytics, which allows for the collection and processing of large-scale agricultural information from various sources. This data can be used to identify market demand, predict crop yields, and understand farming trends. These insights contribute to more informed decision-making and resource allocation.

Mobile applications also play a crucial role in digital agriculture. These digital platforms offer agronomic advice, pest and disease alerts, weather forecasts, and crop maintenance tips. Additionally, mobile-based land management and market access tools help farmers improve operations and connect with buyers directly.

Precision agriculture frameworks have introduced mechanized equipment capable of planting, fertilizing, and harvesting with high accuracy, based on data-driven recommendations. These systems contribute to resource efficiency and minimize input waste.

Artificial Intelligence (AI) technologies further enhance agricultural productivity by analyzing complex datasets to predict crop performance, pest outbreaks, and environmental risks. These predictive capabilities support proactive interventions and risk mitigation.

Moreover, the use of agricultural robotics is expanding, especially in labor-intensive activities. Robots can now perform tasks such as seeding, fertilizing, and harvesting with high precision, thereby reducing labor costs and increasing operational efficiency. This innovation lays the foundation for agribusiness digitalization, which contributes to production productivity, better asset management, and increased food security.

Illustration of the Implementation of Digitalization in the Agrarian Sector in Indonesia the West Java Provincial Government (Pemdaprov Jabar) through the Communication and Informatics Agency (Diskominfo Jabar) launched the Integrated Village Competition program which aims to invite villages in West Java that have agricultural and fisheries potential to collaborate with Integrated Village partners in order to realize the Integrated Village program. Through this program, the West Java Provincial Government provides training and funds for the rental of Internet of Things (IoT)-based agricultural equipment for 1 year in collaboration with Habibi Tani, a start-up company in the field of agricultural innovation. The Agriculture Agency has responded to this by holding the Tani on Organize (ToS) program which aims to provide an understanding to farmers, business actors, and farming partners about the importance of utilizing digital innovation. Indonesia plans to develop itself by encouraging modern programs in the form of agribusiness digitalization. In general, this program supports the government's efforts to improve the welfare of Indonesian farmers and realize the country's food sovereignty. The digitalization of the agricultural system is a concrete manifestation of President Joko Widodo's direction for agrarian welfare. In collaboration with Telkomsel, the government is creating a digital-based application related to agriculture. This application is very useful for farmers to obtain administrative services from State-Owned Enterprises (BUMN) in the midst of four planting seasons (pre-planting, planting, post-harvest, and harvest. This application is called LogTan which contains information on farmers, destination areas, planting plans, and other data that can be accessed. Not only that, the harvest from 1 cut tomato tree increased from 3 kg to 6 kg. Overall, he also said that the quality of the harvest has increased, as seen from the increasingly bright color of the cut tomatoes and the increasingly green leaves. The Computerized Village Competition activity by the West Java Regional Government has given new enthusiasm to farmers in West Java. With more and more farmers implementing digital technology, it is hoped that the agricultural sector in West Java can continue to grow and make a greater contribution to the economy and farmer welfare.

Benefits of the agrarian digitalization program are: 1) to increase rural productivity and efficiency: 2) to improve the quality and quantity of rural goods; 3) to increase farmer wages; 4) to improve access and advertising data for farmers; 5) to increase farmer capacity to manage rural assets; 6) to increase farmer capacity to negotiate climate change and climate, 7) to increase farmer capacity to produce quality rural goods; and, 8) to advance farmer capacity to improve their wages and welfare.

***Enhancement***

Expanding agrarian efficiency through digitalization offers a tremendous opportunity to create a more effective and viable rural segment. By implementing advanced innovations such as spatial mapping, information analysis, and smartphone-based applications, farmers can optimize the use of assets, including water, fertilizers, and pesticides. Accurate agricultural innovations empower farmers to obtain real-time data on land and editing conditions, so they can make better and more timely choices in the administration of arrivals. In addition, digitalization also makes a difference in the collection and investigation of market information, so farmers can obtain it according to consumer demand and change their production in a better way. Through the advanced stages, access to data and agrarian administration, including preparation and expansion, becomes easier, thereby increasing the capacity of farmers. By leveraging the opportunities advertised by digitalization, the rural division can not only increase efficiency but also contribute to food maintenance and security, making it more resilient to the environmental and economic challenges faced today.

***Access***

Accessing climate data and information can be a critical component in improving the efficiency and success of agricultural divisions. Through computerized innovations, farmers can now effectively obtain real-time data on climate conditions, such as rainfall, temperature, and humidity, which are essential for making decisions about planting, fertilizing, and pest control. By offering real-time market data, up-to-date weather information, and an online marketplace for direct product sales, broadband internet connections can benefit rural farming communities. This can increase profit margins and eliminate middlemen. Farmers may find it difficult to gain these benefits in remote locations with inadequate internet connectivity, which will limit their ability to sell products directly and utilize precision farming methods efficiently. (Sarjito, 2023)

In addition, obtaining marketing data allows farmers to know the real-time prices of agricultural products and demand conditions in the market. With this information, they can decide when and where to sell their crops to get better prices. Computerized platforms also provide market trend analysis that helps farmers know which products are in high demand and have the potential to be productive. In general, the combination of strong access to climate and marketing data not only promotes the efficiency of rural operations but also strengthens farmers' financial flexibility by ensuring they are less affected by surprising external variations.

***Platforms***

E-commerce platforms for rural goods have emerged as an inventive arrangement to improve market access for farmers. By leveraging cutting-edge innovation, farmers can offer their goods specifically to customers without having to go through middlemen, who often reduce their profits. Through these platforms, farmers can showcase a wide range of agricultural goods, both fresh and finished, to a wider audience, including urban buyers who may be difficult to reach physically. E-commerce also allows farmers to gain much better data on market demand and usage patterns, so they can modify production accordingly. In addition, these platforms are often equipped with payment and coordination features that drive trade planning, so farmers can focus on improving the quality and quantity of their goods. In this way, e-commerce contributes to increasing farmer incomes, strengthening food security, and driving local economic development in general.

***Intermediaries***

Removing intermediaries in the agricultural supply chain is a key tactic to increase farmer productivity and income. Before agricultural products reach the end consumer in a traditional supply chain system, they often pass through a number of intermediaries, including traders, distributors, and retailers. The profit margins taken by each of these intermediaries can reduce the amount of money farmers receive. Farmers can take their goods directly to consumers by eliminating intermediaries, whether through local markets, online marketplaces, or other direct marketing strategies.

In addition to increasing farmers’ income, this gives them the opportunity to interact directly with customers, which can increase their loyalty and trust in the product. Additionally, eliminating intermediaries can speed up delivery, resulting in a higher quality and fresher product for consumers. It can also reduce distribution and transportation costs, resulting in a more effective and sustainable system. Thus, eliminating intermediaries in the supply chain helps build a more equitable and transparent agricultural ecosystem while empowering farmers and improving food security.

***Market development and distribution of agricultural products***

A planned and long-term process, market development for agricultural products aims to increase the competitiveness and reach of agricultural products in local, national, and global markets. Market development in the context of contemporary agriculture encompasses more than just product sales operations; it also involves marketing innovation, increasing product value, and fostering lasting ties between producers and consumers. The use of information and communication technologies (ICTs), such as social media, e-commerce platforms, and digital farmer market applications, is one strategy often used in market development. These tools allow farmers to communicate with consumers directly without the need for many intermediaries.

In addition to increasing distribution effectiveness, this also provides farmers with the opportunity to increase their profit margins. Improving product quality through the use of quality standards, attractive packaging, and certifications such as organic, halal, or pesticide-free products can help increase consumer confidence. These steps are farmer institutions, such as cooperatives or farmer groups. Through targeted advertising and more effective logistics services, the use of digital marketplaces can greatly improve market access and farmer incomes, according to a case study of the Nusantara Chili Farmers Group (Made et al., 2025) Meanwhile, distributing products is part of market development. To provide farmers with a better negotiating position in the market, the market development plan also emphasizes the importance of strengthening agriculture as an important step to ensure that products reach customers effectively, on time, and in a condition suitable for consumption. Harvest collection, packaging, storage, transportation, and distribution of products to markets or end consumers are all included in the broad category of distribution activities. In general, Indonesia continues to experience a number of challenges in the distribution of agricultural products, such as long supply chains with multiple intermediaries, inadequate rural transportation facilities, and price swings caused by a lack of fair market information. Long distribution chains often lead to high consumer costs and low product value at the farmer level. Farmer welfare declines and the agribusiness system becomes more unequal. Therefore, to improve a sustainable agricultural system, effective distribution is needed. (Bhinadi, 2012) stated that the distribution and structure of the rice market in Yogyakarta shows the dominance of wholesalers and collectors, which often creates an oligopoly market. As a result, prices are determined by a small number of business actors and do not accurately represent the value of farmers' goods. Strengthening market institutions, creating auction markets as a substitute for price transparency, and integrating markets in various regions to create supply and price stability are the ways needed to improve this distribution system.

***Challenges***

Rural administrations can benefit from digitalization, but there are a number of barriers and challenges that must be overcome. These barriers include inadequate digital literacy, inadequate infrastructure, and budget constraints. To overcome these barriers, stakeholders—including governments, development organizations, and private sector actors—must work together and implement targeted policy assistance to collectively address the challenges and harness the potential that digitalization presents in rural areas.

Many interrelated issues often contribute to the lack of internet connectivity in rural locations. Inadequate infrastructure is a major factor; many places still lack the transmitter towers or fiber optic cable networks needed to provide reliable and fast internet service. In addition, service providers are often reluctant to invest in rural locations due to the high cost of building and maintaining networks, especially when potential customers are considered disproportionate. The development of telecommunications infrastructure is further complicated by challenging physical conditions, such as the presence of mountains or forests. The difficulties in rural locations are further compounded by the lack of human resources with the skills needed to manage and maintain internet networks. Users often experience problems with erratic or sporadic signals, especially those who rely on cellular services. Lack of public knowledge and understanding of the benefits of the internet is also another difficulty because it prevents people from using this technology. Finally, necessary progress can be slowed down by regulations and bureaucracy in the licensing process for infrastructure development. All of these elements play a role in the limited internet access that many rural communities have, which has an impact on the social and economic progress of local communities (Miftahur Rahman et al., 2023).

***Quality of physical infrastructure***

One key element that significantly impacts public services and access to various services, including the internet, is the quality of physical infrastructure. As seen from the condition of roads, bridges, and other public facilities, physical infrastructure is often inadequate in many places, especially in rural areas. Damaged or poorly maintained roads make it difficult to move people and goods, limiting community mobility and access to essential services such as health and education. The quality of telecommunications infrastructure is another issue; with few service providers investing in the area, many places still rely on slow or unstable networks. Due to the lack of transportation options, rural farming communities often struggle to access internet marketplaces and educational resources. This can result in missed opportunities to increase income and improve farming methods. Additionally, students in these areas may struggle to access online learning materials and assignments, putting them at a disadvantage compared to students in cities. Limited internet access and technology infrastructure can also make it difficult for farmers in densely populated metropolitan areas to market their produce or learn new farming methods. Low-income households in urban areas may face similar challenges when trying to access educational resources or complete online assignments. Lack of adequate physical infrastructure can lead to a gap between urban and rural populations, with urban populations having easier access to first-class services, while rural populations are confined to disadvantaged conditions that hinder social and economic progress. Therefore, to promote equitable access and sustainable growth across the region, the quality of physical infrastructure must be improved.

***Limited digital knowledge and skills***

One of the main issues that has a major impact on the social and economic lives of farmers in Katingan Regency is their low level of digital literacy. Given the current rapid pace of technological development, digital skills are essential to maximize the potential of online information. However, many farmers still have difficulty using digital devices or accessing online services, making it difficult for them to obtain important information such as market prices, better agricultural techniques, and government services. These findings suggest that low digital literacy and low education levels among farmers are often correlated, leaving them trapped in traditional practices without adequate understanding of technology. Their ability to compete in the digital era is greatly hampered by these limitations. In addition, their inability to communicate with intermediaries or other parties who may be able to increase sales of agricultural products is another consequence of their low level of digital literacy. Due to their inability to use digital media, many of them continue to choose traditional approaches, including visiting markets directly, which hinders their ability to investigate wider market potential. Because of this situation, farmers are unable to benefit from digitalization, which puts them at risk of being economically isolated from global trends and at a greater disadvantage. To address this issue, the government and related organizations must create a comprehensive digital literacy program that teaches farmers how to use technology to improve their productivity in the agricultural industry and their quality of life, in addition to focusing on providing internet access.

***The need for ongoing training***

To improve digital literacy in communities, especially in remote areas such as Katingan Regency, ongoing training is essential. In addition to improving the technical skills of communities in using technology and internet connectivity, ongoing training is also needed to ensure that they can quickly adapt to the rapidly evolving technological landscape. Communities in remote areas can learn the latest information on how to use applications, digital platforms, and online marketing tactics that suit their needs by using ongoing training strategies. In addition, this training can help close the skills gap that currently exists, which often prevents communities from realizing the full potential of the digital economy. Additional benefits, such as better resources and access to experienced mentors, will arise from involving the commercial sector and educational institutions in the delivery of training programs. As a result, ongoing training will help rural communities develop inclusive and sustainable economies, while also enhancing individual talents, so that they can take part more fully in today's digital environment.

***Uncertainty and risk in technology adoption***

Purchasing agricultural technologies such as drip irrigation systems, building infrastructure for community discussion groups, and financing technical skills training are some of the components that make up the initial investment in farmer human resource development (HRD). These investments are needed to facilitate farmers in obtaining appropriate education and training to meet the goals of improving production efficiency and farmer welfare. In addition, investments in the provision of up-to-date technology and relevant information resources are also critical to encourage the adoption of better agricultural practices and the learning process. These initial investments are expected to provide long-term benefits in the form of higher production and incomes, which in turn will support local economic prosperity and food security, despite constraints related to the availability of funds and accessibility of training.

***Risk of technology failure***

Developing human resources (HR) for farmers in the agricultural industry can be very difficult due to the risk of technology failure. The implementation of modern agricultural technologies is not always guaranteed to be successful due to a number of factors that can affect its success, including the incompatibility of technology with local conditions, maintenance challenges, and farmers’ lack of knowledge on how to use equipment. In addition, farmers may not be able to make the most of these advances if they do not have adequate access to knowledge and training on new technologies. Technology failures can also have a negative impact on productivity, which in turn impacts the overall welfare of the community and farmers’ incomes. Therefore, to reduce the risk of failure and maximize the expected benefits, it is essential to develop policies that support comprehensive education and training as well as continuous evaluation and adaptation of technology.

There are many advantages to digitalization in the agricultural industry, but there are also disadvantages that must be considered. Increased productivity is one of the main potentials, as precision agriculture enabled by technologies such as sensors and drones can effectively monitor crops and increase yields. In addition, farmers can make better judgments by using digital platforms to obtain information on market conditions and optimal farming methods. In addition, e-commerce provides farmers with the opportunity to offer their products directly to customers, expanding their market and increasing their income. However, limited infrastructure, especially in rural areas, hinders access to the internet and digital technologies. Furthermore, many farmers lack the necessary digital knowledge and skills, making it difficult for them to take advantage of available technologies. Limited financing is also a barrier as the initial investment required to implement digital solutions continues to increase. For example, cybersecurity risks are increasing as digital technologies become more widely used in everyday life, so farmers must be aware of potential threats to their data and systems. To maximize the benefits of digitalization, it is important to acknowledge these challenges and ensure that all employees can access and use technology effectively.

***Strategy***

It is essential to develop a strategy to overcome the difficulties in improving digital infrastructure for the use of precision agriculture technology in North Sumatra Province. Making significant investments in rural internet networks is one of the main tasks. Farmers will find it easier to use digital technology to track crop growth and manage resources effectively if they have reliable and fast internet connectivity. To build a conducive ecosystem, the public and private sectors must also work closely together. In addition to making technology more accessible, the government can encourage private businesses to get involved in infrastructure development, as well as reduce the financial burden on farmers. It is hoped that this partnership will result in the development of a more advanced and effective agricultural system, as well as the ability to increase the competitiveness of agricultural products in domestic and international markets. By using technology to increase productivity and efficiency, this program is also very important to ensure the sustainability of agriculture in the future (Tuah, 2023).

***Education and training programs***

Improving farmers’ digital literacy should be a key objective of strategies to address issues with education and training programs related to the use of precision agriculture technologies in North Sumatra Province. Implementing training programs aimed at improving farmers’ understanding of relevant digital technologies is one possible effort. Farmers can learn how to use crop monitoring applications, agricultural software, and other resources that support modern farming methods during these sessions. An important component of the education program should also include technology-based agricultural extension, where extension agents can provide the latest knowledge on technical advances and their real-world applications. By doing this, farmers will be better prepared to use new technologies to improve the sustainability and production of their farms, in addition to being more open to their adoption. Farmers should be better prepared to face the challenges of implementing precision agriculture technologies through a combination of improved digital literacy and technology-based extension.

***Government Policies Supporting Digitalization***

Strong incentives for technology adoption and comprehensive support for research and development are two ways to address the problems with government policies that encourage digitalization. The private sector can be encouraged to be bolder in implementing creative digital solutions by the government developing tax incentive programs for businesses that invest in new technologies. In order for useful innovations to be created, the government must also provide the funds and resources needed by universities and research organizations to conduct studies that are relevant to business demand. Education and training programs must also be improved to improve the skills of the workforce in digital technologies. It is hoped that an ecosystem that supports successful and sustainable digital transformation can be achieved through collaboration between the public sector and businesses and educational institutions. In the digital era, this will increase economic competitiveness while accelerating the adoption of new technologies.

1. **Conclusions**

To address the growing gap between rural and urban areas, this essay explores the critical role that digitalization plays in Indonesia’s agricultural sector. While urbanization has significantly impacted economic progress, poverty and disempowerment continue to plague many rural populations. The opportunities offered by digitalization include increased production efficiency, direct connection to markets, and up-to-date information on agricultural conditions. However, the article identifies a number of issues that need to be addressed to fully realize this potential. These include inadequate infrastructure, lack of digital literacy among farmers, and budget constraints that hinder the purchase of new technologies. Consequently, creating smarter and more inclusive policies is critical. To build synergies that can successfully address the needs of rural areas, the article suggests engaging multiple stakeholders, including government, the commercial sector, and educational institutions. To close the current skills gap and help farmers adapt to the changes brought about by digital technologies, it is also considered essential to provide ongoing training in digital literacy. It is hoped that by addressing these issues and implementing a comprehensive plan, farmer welfare will improve and the social and economic gap between urban and rural areas will be reduced, which will help communities as a whole develop in a more sustainable and inclusive manner.

The study’s recommendations focus on the need for an integrated strategy for advancing digitalization in Indonesia’s agricultural sector, emphasizing collaboration between the public and private sectors, as well as between educational institutions and local communities. First, to ensure reliable and fast internet connections, the government should invest more in digital infrastructure, especially in rural areas. This will encourage the use of advanced agricultural technologies that can improve yields. To further improve farmers’ digital literacy, a sustainable training program should be created. To help farmers acquire the skills needed to function in the digital economy, this training should include programming, use of agricultural applications, and use of relevant digital resources. Encouraging private sector participation is also critical, as businesses that invest in innovative technologies and educational initiatives in rural areas may receive incentives such as tax breaks. To ensure that the solutions implemented are truly impactful, more in-depth research and study of the unique needs of local communities is needed. By taking these actions, it is hoped that digitalization will improve the quality of life for rural communities in general while simultaneously increasing the efficiency of the agricultural sector.

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