Harvesting Opportunities: Transforming Indonesia’s Agribusiness through Smart City Planning in the Digital Economy Era

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Introduction

Indonesia, a country characterized by its stunning natural landscapes and abundant agricultural legacy, currently stands at a pivotal juncture in its trajectory of economic advancement. The agriculture sector of the nation, which is closely interconnected with its cultural and economic underpinnings, is on the verge of a significant period of transformation. The aforementioned shift is propelled by the intersection of two influential factors: the digital economy and the concepts underlying intelligent urban development. In a period marked by rapid global population expansion, escalating environmental issues, and the crucial need for sustainable resource management, the agriculture sector in Indonesia has been confronted with an exceptional prospect to transform itself.

The agricultural capabilities of Indonesia are indisputable, as the country is recognized as one of the leading global producers of many commodities, including palm oil, rubber, coffee, and spices. Nevertheless, the journey towards tapping this vast potential has been riddled with intricate challenges. Various challenges, including as fragmented smallholder farming systems, difficulties in market access, quality control concerns, and resource inefficiencies, have impeded the advancement in this area. However, these particular problems also function as drivers for innovation and motivation for transformation.

Indonesia, possessing abundant natural resources and a prosperous agricultural legacy, finds itself at a crucial point in its economic development. The agricultural industry has historically been a fundamental pillar of the Indonesian economy, making a substantial contribution to both employment and gross domestic product (GDP). Nevertheless, conventional agribusiness methods encounter a multitude of obstacles, including restricted technological and financial resources, as well as concerns regarding land utilization and sustainability (World Bank, 2020; Ministry of Agriculture Republic

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Received: 30 December 2023, Revised: 9 February 2024, Accepted: 17 February 2024

KEYWORDS: Smart city, Agribusiness, Smart agriculture, New capital city, Nusantara
Transforming Indonesia’s Agribusiness

of Indonesia, 2019). Indonesia has initiated a process of smart city planning, incorporating digital technology to tackle urban issues and improve effectiveness in several sectors, acknowledging the importance of innovation and modernization (Ministry of Agrarian and Spatial Planning/National Land Agency, 2021). The combination of smart city planning and agribusiness in the digital economy era offers remarkable prospects for change (Ministry of Communication and Informatics Republic of Indonesia, 2022; Asian Development Bank, 2023). Through the utilization of digital innovation and planned urban development, Indonesia has the potential to open up new avenues for sustainable growth and prosperity in its agriculture sector.

The digital economy has the potential to transform Indonesia’s agribusiness sector by combining agriculture and technology. Smart city planning, traditionally linked to urban environments, is now extending its impact to rural and agricultural areas, using data, connectivity, and automation to disrupt the entire agricultural value chain. This study explores the convergence of smart city planning, digital technologies, and the agricultural sector in Indonesia, aiming to explore the potential for transformation when forward-thinking urban design intersects with advanced digital advances of the 21st century.

The study examines the domains of smart city planning and digital technology, examining international case studies and notable achievements within Indonesia. It aims to provide a comprehensive viewpoint on Indonesia’s journey towards a renaissance in the field of agribusiness, utilizing thorough case studies and rigorous analysis. The primary aim is to elucidate how Indonesia can effectively utilize these prospects to enhance its agriculture industry and establish itself as a paradigm for agricultural transformation in the era of digitalization.

This investigation uncovers the imminent potential for significant transformation within Indonesia’s agribusiness sector, offering an opportunity to tap into Indonesia’s rich agricultural legacy and revitalize the agrarian sector in an increasingly interconnected and technologically advanced global landscape. The study identifies an appropriate framework for cities transitioning into the agriculture sector and the essential criteria that must be fulfilled to achieve the notion of a smart city within the agribusiness industry.

Literature Review

The agriculture sector in Indonesia has historically had a pivotal position in the nation’s economy, serving as a primary source of employment for a substantial number of individuals and making a substantial contribution to the country’s GDP. The agricultural sector comprises a diverse range of operations, which include the cultivation of many important commodities such as palm oil, rubber, coffee, and spices. Nevertheless, despite its significant presence, the industry encounters certain obstacles that have impeded its complete realization, such as fragmented supply chains, restricted market accessibility, and apprehensions regarding sustainability (Smith et al., 2020).

The agricultural industry in Indonesia is a multifaceted and significant sector within the country’s economy. In the Figure 1, the significance of this pivotal role is seen in the sector’s significant impact on the economy, as evidenced by its enormous contributions to employment and GDP, which amounted to 12.4% in the year 2022. Agribusiness holds the position of the third largest contributor to the GDP, following the manufacturing industry. The Indonesian government has identified the agricultural sector as a significant priority for industrial growth. This industry holds substantial importance for both domestic and foreign investments. In the Figure 1, between the years 2021 and 2022, the European Union (EU) had a notable increase in its export value to Indonesia, amounting to USD 1.223 million. This growth rate corresponds to a 6.4% expansion. The primary agricultural commodities cultivated in Indonesia are corn and soybeans. Despite the presence of domestic manufacturing, Indonesia continues to rely heavily on imports of these commodities to fulfil its local demand (European Commission, 2023).

The trade relationship between the EU and Indonesia in the agriculture sector has exhibited a consistent and steady rate of growth. According to the data presented in Table 1, there was a notable increase of 18.7% in the European Union’s import value from Indonesia between the years 2021 and 2022. This resulted in a total import value of 6,708 million Euros. The primary product imported by the EU from Indonesia is fruit, nuts, and vegetables, constituting 56.1% of the overall imports. This is closely followed by confectionery, chocolate, coffee, tea, cocoa, and spices, which account for 50% of the total imports. The agricultural export value from
Figure 1. Gross domestic product (GDP) share of Indonesia in 2022, by sector

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<table>
<thead>
<tr>
<th>Description</th>
<th>Value in 2022 (Million Euro)</th>
<th>Share in all Agri 2022 (%)</th>
<th>Change 2021-2022 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Import</td>
<td>Export</td>
<td>Import</td>
</tr>
<tr>
<td>Agri Food</td>
<td>6708</td>
<td>1157</td>
<td>100.0</td>
</tr>
<tr>
<td>Dairy products</td>
<td>2502</td>
<td>429</td>
<td>37.3</td>
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<tr>
<td>Cereal preparations and milling products</td>
<td>2269</td>
<td>95</td>
<td>33.8</td>
</tr>
<tr>
<td>Pet food and forage crops</td>
<td>754</td>
<td>92</td>
<td>11.2</td>
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<tr>
<td>Mixed food preparations and ingredients</td>
<td>529</td>
<td>87</td>
<td>7.9</td>
</tr>
<tr>
<td>Cereals</td>
<td>170</td>
<td>83</td>
<td>2.5</td>
</tr>
<tr>
<td>Preparations of fruit, nuts and vegetables</td>
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<td>57</td>
<td>2.5</td>
</tr>
<tr>
<td>Non edible for technical use</td>
<td>142</td>
<td>57</td>
<td>2.1</td>
</tr>
<tr>
<td>Other animal products</td>
<td>64</td>
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<td>1.0</td>
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<tr>
<td>Tobacco, cigars and cigarettes</td>
<td>35</td>
<td>47</td>
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</tr>
<tr>
<td>Vegetables</td>
<td>25</td>
<td>29</td>
<td>0.4</td>
</tr>
<tr>
<td>Confectionery and chocolate</td>
<td>18</td>
<td>21</td>
<td>0.3</td>
</tr>
<tr>
<td>Wine and wine based products</td>
<td>14</td>
<td>15</td>
<td>0.2</td>
</tr>
<tr>
<td>Coffee, tea, cocoa and spices</td>
<td>6</td>
<td>15</td>
<td>0.1</td>
</tr>
<tr>
<td>Pigmeat</td>
<td>6</td>
<td>14</td>
<td>0.1</td>
</tr>
<tr>
<td>Beef and veal</td>
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<tr>
<td>Remaining Agri-food products</td>
<td>2</td>
<td>54</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: European Commission, Agri-food Trade Statistical Factsheet EU-Indonesia, 2022
the EU to Indonesia experienced a notable growth of 20.6% between the years 2021 and 2022. This gain played a significant role in the overall rise of 14% observed in the period spanning from 2013 to 2017. The European Union predominantly engages in the exportation of vegetables, pigmeat, and wine-derived products, along with various edible preparations, to the country of Indonesia (European Commission, 2023).

The agriculture sector in Indonesia has a somewhat underdeveloped state. Indonesia has a diverse agricultural environment; however, it is necessary to recognize that its agriculture industry is relatively less developed compared to countries such as the United States. Indonesia's agricultural productivity, namely the yield per hectare for important crops such as rice, maize, and soybeans, is lower than that of the United States (FAOSTAT, 2022). The level of technological adoption and mechanization in Indonesian agriculture is comparatively lower than that of the United States, resulting in inefficiencies in production and distribution (USDA, 2021; Ministry of Agriculture Republic of Indonesia, 2019). In addition, the United States enjoys the advantages of sophisticated infrastructure and efficient logistics networks that enable the smooth transit of agricultural goods. Conversely, Indonesia encounters difficulties in transportation and storage, leading to losses after harvest and limited market reach (World Bank, 2020). The existence of these differences highlights the necessity for focused interventions and strategic investments to drive Indonesia's agriculture industry towards increased productivity and sustainability. The agricultural sector will continue to hold significance in Indonesia's economic development through industrialization, as it may serve as a complementary and supportive sector to the growth of the industrial sector. By identifying the sectors that exhibit a strong connectivity with the agricultural sector, it becomes possible to strategically guide the development of the agricultural sector towards fostering intersectoral integration. The expectation is that it can foster synergy across various sectors and ultimately enhance economic growth (Widyawati, 2017).

Methodology

The primary objective of this research is to investigate and suggest a revolutionary smart city planning framework that accelerates the development of Indonesia's agribusiness within the digital economy setting. This methodology delineates the research strategy, data gathering methods, and analytical approaches utilized to accomplish this purpose.

1. Research Design

The research design for this study is essentially mixed-methods, encompassing both qualitative and quantitative methodologies. This design facilitates a thorough comprehension of the complex difficulties pertaining to the incorporation of smart city planning in the Indonesian agriculture industry. Developing a robust smart city planning framework is at the core of this research. The framework will be designed based on a synthesis of literature review findings, case studies, and insights gained from stakeholders. It will encompass key elements such as:

- Integration of Internet of Things (IoT) applications in agriculture.
- Data analytics for informed decision-making.
- Communication infrastructure to facilitate connectivity.
- Sustainability and inclusivity considerations.

2. Case Study Analysis

Analyzed will be a range of selected case studies that demonstrate effective smart city design initiatives in the field of agribusiness, both inside Indonesia and on a worldwide scale. An examination of comparative case studies will yield useful insights into the aspects that contribute to success and the suitability of methods in the Indonesian setting. The study predicts favorable results, such as higher efficiency, optimized allocation of resources, and heightened socio-economic advantages for stakeholders. The anticipated outcomes will rely on the amalgamation of discoveries from the literature review and case studies.

Results and Discussion

1. Smart City in Agriculture

The notion of smart city has conventionally been linked to urban environments. However, its significance has been progressively recognized in rural and agricultural regions. The core tenets of smart city design prioritize the incorporation of data, connection, and technology as means to augment the well-being and efficiency of inhabitants. When implemented in the context of agriculture, these ideas have the potential to generate significant and far-reaching effects. According to
Johnson and Kim (2019), the implementation of smart cities has the potential to enhance resource allocation, enhance market access, and optimize supply chain management within the agriculture industry.

A smart city can be defined as an urban area that integrates information and communication technology (ICT) infrastructure with the collective knowledge and resources of its inhabitants to effectively tackle societal challenges, promote long-term sustainability, and enhance the overall well-being of its residents (European Commission, 2020). The use of the smart city idea serves three primary objectives: attaining sustainable development, enhancing the quality of life for residents, and optimizing the efficiency of both current and future infrastructure (UNESCO, 2019).

The development of smart cities involves the integration of environmental, social, and economic factors through the use of intelligent applications. This integration aims to create urban environments that are both liveable and equitable, while also fostering economic growth (World Economic Forum, 2020). The integration of smart city principles into agriculture has shown encouraging outcomes in terms of productivity and sustainability. Through the utilization of data analytics and AI (Artificial Intelligence), farmers may make well-informed decisions instantaneously, resulting in higher crop production, less expenses, and enhanced utilization of resources. Moreover, the implementation of precise irrigation systems has not only enhanced the efficiency of water utilization but also played a role in preserving water resources, hence resolving issues pertaining to water scarcity and environmental deterioration.

Despite there have been promising results, there are still obstacles to fully harnessing the potential of smart cities in agriculture in Indonesia. Insufficient availability of technology and lack of knowledge about digital tools among farmers, especially in rural regions, provide obstacles to their adoption. Furthermore, it is imperative to tackle concerns pertaining to data privacy, cybersecurity, and infrastructural limitations in order to guarantee the long-term viability of smart agriculture methodologies.

Nevertheless, these obstacles also offer prospects for inventive solutions and cooperative efforts. Public-private partnerships, bolstered by government initiatives and community involvement, can have a crucial impact in surmounting obstacles and promoting the extensive implementation of intelligent technology in agriculture. Furthermore, allocating resources towards research and development, in addition to implementing capacity-building initiatives, can equip farmers with the necessary expertise and abilities to effectively use the advantages provided by smart city solutions.

2. Digital Technologies in Agriculture

The worldwide agricultural sector has seen a significant transformation due to the emergence of digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), and blockchain. These technological advancements provide novel approaches to longstanding obstacles. Internet of Things (IoT) sensors play a crucial role in facilitating precision agriculture through the provision of real-time information pertaining to soil conditions and crop health. Artificial intelligence (AI)-based algorithms play a crucial role in various aspects of crop management, encompassing disease prediction and resource optimization. According to Brown and White (2018), the implementation of blockchain technology in the supply chain guarantees both transparency and traceability. An instance of such enhancement resulting from Agritech can be derived from the initiative undertaken by the Indonesian government in collaboration with the Asian Development Bank spanning the years 2017 to 2021. The project facilitated the establishment of localized digital ecosystems, wherein farmers collaborated with Information and Communication Technologies (ICT) service providers to manage the operations. The proliferation of accessible mobile devices has facilitated enhanced connectivity between farmers and stakeholders, enabling expedited and transparent transactions. Concurrently with a distinct initiative aimed at enhancing irrigation infrastructure in 74 districts across Indonesia, the digital ecosystem project was implemented to provide support to farmers in making informed decisions on crop selection, taking into account market dynamics and climatic factors (Ministry of Public Works and Housing Republic of Indonesia, 2021).

The lack of advanced technology in Indonesian agritech startups represents a greater growth opportunity in logistics, supply chain and infrastructure. In the context of Indonesia, eFishery encountered a comparable issue, as depicted in Table 2. The aforementioned firm offers automated feeding apparatuses, commonly referred to as auto feeders, designed specifically for piscine and crustacean species such as fish and shrimp. Farmers are able to plan and organize their feeding
schedules through the utilization of smartphones. The device incorporates a sensor based on the Internet of Things (IoT) technology, enabling it to detect satiety in fish or shrimp and then cease the dispensation of food. According to eFishery, a significant proportion, ranging from 70% to 90%, of the expenses incurred in the cultivation of fish or shrimp can be attributed to the cost of feed (eFishery, 2020).

3. Smart City Planning in Agribusiness

The concept of a smart city entails the utilization of cutting-edge technology to enhance the intelligence and efficiency of several domains. The concept of a smart city facilitates interconnectivity across several sectors within an urban environment. The open data idea facilitates communication and data exchange between communities and governments. The subsequent information outlines the architectural framework of a smart city. According to the illustration provided in Figure 2, the concept of a smart city encompasses various architectural components that contribute to the transformation of a city into a smart city. The essential elements required for the implementation of a smart city in a municipality that is poised to develop as an agribusiness include many components such as smart industry, smart homes, smart health, smart energy, smart infrastructure, smart city services, smart transportation, and smart agricultural.

A. Smart Industry

Smart industries should prioritize environmental considerations through the implementation of effective waste treatment methods and the adoption of efficient energy utilization practices (Chen et al., 2017; Zheng et al., 2018). The concept of smart industry can be seen as an industry that prioritizes the optimization of production in terms of both quality and quantity through the utilization of cutting-edge technology, communication systems, automated processes, artificial intelligence, and mechatronic technology.

B. Smart Homes

The Smart Home is a vital element within Smart Cities as it serves as the core of the residents' daily lives. Smart Homes encompass the deployment of sensory devices strategically placed within an individual's residence, which gather pertinent data pertaining to both the physical attributes of the dwelling and the individuals inhabiting it. The sensors in question may encompass various user activity monitors, such as environmental sensors, motion trackers, and power/energy usage sensors.

C. Smart Health

Multiple studies have regarded smart health as a fundamental component of smart city architecture (Chen et al., 2017; Khan et al., 2012). The implementation of intelligent healthcare systems can leverage technological advancements and streamlined processes to enhance the overall well-being of individuals. The city's population increase poses numerous issues and hurdles that need to be addressed within the health sector. Hence, it may be argued that old and conventional health services are becoming insufficient and are projected to become obsolete until enhanced. There is a pressing need to enhance the physical infrastructure within the health sector,

<table>
<thead>
<tr>
<th>Business Models</th>
<th>Indonesia</th>
<th>Philippines</th>
<th>Vietnam</th>
<th>Thailand</th>
<th>Myanmar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer Advisory</td>
<td>eFishery, Karsa, Neurafarm</td>
<td>TechAguru, Tagani</td>
<td>Mimosatek, Agrihub</td>
<td>Listenfield, Algaeba</td>
<td>GreenWay, VillageLink</td>
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<td>Peer to Peer Landing</td>
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<td>Cropital, FarmOn</td>
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<td>Traceability</td>
<td>HARA, Koltiva</td>
<td>Agricheck, Wowtrace</td>
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<td>Session Groceries, Mayani</td>
<td>Foodmap, Global Connect Agriculture, Thuocthuysan.net</td>
<td>Ricult, 100rai, Farmstory</td>
<td>Impact Terra</td>
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<tr>
<td>Mechanization Platforms</td>
<td>Sentragro, Agrodrome</td>
<td>New Hope Corporation</td>
<td>TaladApp, GetzTrac</td>
<td></td>
<td>Tunsyat</td>
</tr>
</tbody>
</table>

Source: Katadata.co.id
particularly by using cutting-edge technologies to address challenges related to service speed, accuracy, and capacity. There is a need for health facilities to enhance patient examination services, enhance the quality of drug services, and mitigate the repercussions of disease transmission. Presently, disparities persist between the anticipated outcomes set forth by governmental entities, societal expectations, and the actual state of affairs. The field of information technology presents a significant potential to address the aforementioned health concerns (Silva et al., 2018).

D. Smart Energy

Energy management is a primary area of focus for governmental entities. The preservation and provision of energy for future generations presents a formidable task. The promotion of an energy-saving culture should be consistently emphasized. Next, we go into the notion of intelligent energy, which accompanies technology advancements aimed at promoting energy conservation and the utilization of renewable energy sources. In order to prioritize renewable, sustainable, and environmentally friendly energy sources, it is imperative to employ more comprehensive methodologies (Silva et al., 2018). The primary goal of smart energy is to save non-renewable resources for use in critical areas (Batista et al., 2017). The government, when implementing smart city administration, ought to prioritize environmental concerns.

E. Smart Infrastructure

The quality of life in a city is heavily dependent on its infrastructure. City governments must prioritize the construction of new bridges, roads, and buildings to meet the needs of their residents, as well as ensure regular maintenance to ensure uninterrupted usage. Smart infrastructure plays a crucial role in enabling cities to effectively maintain and utilize its infrastructure. This is achieved by the implementation of sensors, such as accelerometers, for assessing the structural state of buildings and bridges. Additionally, the utilization of smart materials further enhances the capabilities of structural health monitoring (Konovalov et al., 2018; Farag, 2019). The collection of data facilitated by these sensors enables the implementation of predictive maintenance strategies for these crucial units, thereby ensuring the continuous and optimal functioning of the urban environment.

F. Smart City Services

Smart city services cover a range of activities that support the well-being and functioning of a city's inhabitants. These activities mostly entail municipal chores, including the provision of water, management of waste, control and monitoring of the environment, and other related functions. Water quality sensors have the capability to be deployed in order to consistently furnish real-time information regarding the quality of water utilized within urban areas, as well as to identify instances of leakage (Rojek and Studzinski, 2019). The management of waste is a widely recognized and frequently implemented aspect of smart city initiatives. This facet has been observed in various smart city projects, such as the implementation of waste chutes in Barcelona and the utilization of sensor-equipped bins connected to cloud networks. These technological advancements not only notify the appropriate authorities when waste bins require emptying, but also employ artificial intelligence algorithms to optimize waste collection routes, thereby minimizing costs (Pardini et al., 2019). Sensors can be employed for the purpose of monitoring the environmental conditions inside an urban setting, with the aim of assessing the levels of pollution (Dutta et al., 2017). Additionally, these sensors can aid in directing individuals towards available parking spaces, so contributing to the reduction of fuel expenses (Al-Turjman and Malekloo, 2019).

G. Smart Transportation

Numerous metropolitan areas encounter challenges pertaining to traffic, encompassing issues such as congestion, pollution, as well as concerns regarding the efficiency and affordability of public transportation. The proliferation and integration of emerging Information and Communication Technologies (ICTs) have led to the widespread adoption of Vehicle-Infrastructure-Pedestrian (VIP) communication systems. The implementation of technologies such as Vehicle to Vehicle (V2V), Vehicle to Infrastructure (V2I), Vehicle to Pedestrian (V2P), and Pedestrian to Infrastructure (P2I) has facilitated the development of intelligent transportation systems. The utilization of GPS technology in vehicles, along with the widespread ownership of cellphones among drivers, has led to the adoption of many methodologies that leverage GPS data for the purpose of monitoring driver behavior and analyzing traffic patterns (Wang et al., 2016). Real-time data is being utilized for route mapping in popular applications like
Waze and Google Maps, as well as for trip scheduling in public transportation systems. Parking systems that are equipped with sensors have the capability to provide guidance to vehicles in locating the closest available parking space.

H. Smart Agriculture

In advocating for the establishment of a city as an agribusiness hub, the agricultural sector can serve as a means of providing essential resources for both industrial operations and the nutritional requirements of the local populace. The imperative to enhance agricultural productivity arises as urban areas undergo industrialization. The reason for this is that as the population grows, there will be a corresponding increase in the demand for food resources. If the industrial essentials are sourced locally, it can lead to a reduction in transportation expenses (Branca et al., 2011). The Industry 4.0 strategy can be employed in its implementation. The use of this notion is feasible within the context of an industrial city that has been built as a smart city. The initial phase involves establishing networks, followed by conducting research on two primary themes pertaining to industrial technology, and ultimately culminating in the implementation of integration. The overarching focus of contemporary discourse revolves around the concepts of smart factory and intelligent production. The types of integrations identified in the study include horizontal, vertical, and end-to-end integrations (Zhou et al., 2015).

3.1. Policies Digital Transformation in Indonesian Agribusiness

The agribusiness sector in Indonesia has recently started to adopt digital technologies. The utilization of drones for crop monitoring and the advancement of mobile applications tailored for farmers have exhibited the inherent capabilities of these technological innovations. Nonetheless, there are ongoing issues in relation to digital infrastructure, data protection, and the digital divide that continue to exist (Ministry of Agriculture, Republic of Indonesia, 2021).

The relocation and development of the National Capital are widely debated topics concerning the equitable allocation of growth centers in Indonesia. The development of the Indonesia-Korea cooperation encompasses strategic concerns pertaining to the domains of economy, innovation, and knowledge. As to the provisions outlined in Law no. 3 of 2022 pertaining to the State Capital, the New Capital City encompasses an estimated expanse of 256 thousand hectares, with a minimum allocation of 10% specifically designated for agricultural pursuits. Currently, there is a lack of a comprehensive plan pertaining to the governing body responsible for overseeing food distribution and maintaining equilibrium in food pricing within the IKN region. Conversely, as per the statistics provided from the Global Food Security Index (GFSI), Indonesia's food security in the year 2021 has seen a decline of 59.2 points in comparison to the preceding year, resulting in a score of 61.4 (Global Food Security Index, 2021). Moreover, the construction of urban areas like IKN often results in diminished food security, mostly attributable to the volatility in food accessibility. If not well managed, this illness will have an impact on the surrounding area as well. Hence, it is imperative for the government to implement a strategy for sustainable agriculture and inclusive food planning in order to mitigate food imbalances in urban areas of IKN and enhance local food security.

One of the challenges prevalent in the contemporary food supply is to the high costs associated with logistics, inadequate products management, and inefficient supply chain operations. However, the management of IKN will be entrusted to the IKN Authority, which possesses unique powers in comparison...
to other local governing bodies. These powers can be utilized to accomplish the following objectives:

- Establish a dedicated agency responsible for facilitating the efficient distribution of local farmers’ produce within the IKN region.
- Enhance the utilization of 10% of the designated area through the implementation of stringent spatial management practices, thereby promoting the adoption of smart urban farming techniques to ensure the production of high-quality food.
- It is imperative to develop regional policies pertaining to food security planning that encompass not only staple foods, but also encompass superior goods, herbs, fisheries, and other relevant sectors.

4. Smart Urban Farming

The proposed location for the establishment of the new capital city is in the East Kalimantan Province. Based on the data provided by the Central Bureau of Statistics (BPS) East Kalimantan in 2021, the total count of farmer households in East Kalimantan Province amounted to 217,000 individuals, of which 87% were aged 35 years or older. In 2022, the unemployment rate in East Kalimantan Province was recorded as 6.77%, above the national average in Indonesia (BPS, 2021). Hence, it is imperative for IKN to establish a precise delineation of its intelligent urban agriculture practices in accordance with the specific requirements and circumstances of the local vicinity.

- Smart urban farming prioritizes enhancing production and improving product quality rather than replacing human labour.
- The concept of smart urban farming entails the advancement of food research and the intensification of agricultural land.
- In order to foster the growth of smart urban farming, it is imperative to recruit young farmers who can contribute to the regeneration of the farming community, hence promoting higher rates of exchange and values.

The concept of multi-stakeholders refers to the involvement and participation of several individuals or groups who have a vested interest or influence on the ambitious objectives of the proposed relocation of the capital city necessitate the involvement of the central government and the Nusantara National Capital Authority in engaging both external and local communities:

- This engagement should focus on facilitating capacity building for local farmers through collaboration with regional partners, with a specific emphasis on enhancing their knowledge and skills in utilizing new technologies and improving production efficiency.
- It is recommended to reallocate their assistance towards marginalized farmers as well as small and medium firms operating within the food sector around the newly established capital city.
- It is suggested to extend invitations to start-up companies and young innovators to actively participate in offering ideas for the promotion of sustainable agricultural development in the aforementioned capital city. Enhancing individuals’ sense of belonging and active engagement will contribute to the promotion of inclusivity within the organization, hence fostering sustainability in management practices.

The establishment of the Nusantara Capital City presents a significant opportunity to establish a model for effective management of agricultural land, research and development, and integration of food supply at a smaller scale. Therefore, the establishment of the new capital city has the potential to serve as a model of success for other cities in Indonesia.

Conclusion

The exploration of enhancing Indonesia’s agricultural sector through the implementation of smart city planning in the era of the digital economy unveils a landscape abundant with opportunities and prospects. This study has examined the potential impact of integrating urban planning concepts and modern digital technology on the Indonesian agricultural sector, highlighting the transformative possibilities that may arise.

The concept of smart city planning, which has historically been linked to metropolitan areas, has now extended its reach to encompass rural and agricultural districts in Indonesia. The shift in focus has been motivated by the acknowledgment that the principles of effective allocation of resources, decision-making based on data, and interconnectedness are equally applicable to rural areas as they are to urban environments. The consequences of this shift are diverse, impacting several aspects of the agribusiness industry.

Digital technologies, such as the Internet of Things (IoT),
artificial intelligence (AI), blockchain, and data analytics, have become crucial in facilitating precision agriculture, thereby improving crop productivity, optimizing resource utilization, and promoting sustainable practices. The utilization of intelligent irrigation systems, which are fueled by up-to-date information, has brought about a significant transformation in the realm of water management. This aspect holds immense importance in a nation that experiences fluctuating climatic circumstances. The transparency and traceability of supply chains have engendered a sense of assurance regarding the quality and safety of agricultural products. Farmers, equipped with data and informed perspectives, are strategically making decisions that have significant implications for their economic well-being and the overall food security of the nation.

This study aims to emphasize the feasibility of implementing smart city planning within the agricultural environment of Indonesia. These success stories provide as evidence that it is possible to achieve radical change, especially in locations that have traditionally encountered difficulties pertaining to infrastructure and access to technology. They function as symbols of optimism and motivation for anyone venturing into the realm of agriculture innovation.

Nevertheless, the expedition is not devoid of challenges. Persistent challenges in the digital realm include discrepancies in digital infrastructure, issues regarding data privacy, and the existence of a digital divide. The aforementioned issues necessitate strategic policy interventions, substantial investment in rural connection, and an all-encompassing approach that guarantees equitable distribution of the advantages brought about by digital transformation throughout all regions of Indonesia.

In the context of Indonesia’s agricultural revitalization, it is crucial to acknowledge that the evolution of agribusiness extends beyond the mere adoption of technology. The aforementioned concept encompasses the ideals of fostering rural development, promoting economic empowerment, and ensuring environmental care. The objective is to provide Indonesian farmers with the necessary tools and expertise to adapt and succeed in a dynamic global environment, while simultaneously safeguarding the country’s valuable agricultural legacy.

In summary, the pursuit of enhancing Indonesia’s agriculture sector through the implementation of smart city planning in the era of the digital economy holds considerable importance. This endeavour possesses the capacity to not only enhance the agriculture sector in Indonesia but also serve as a model for agricultural transformation within a digitally integrated global context.

Acknowledgements

This work is financially supported by Korea Ministry of Land, Infrastructure and Transport (MOLIT) as ‘Innovative Talent Education Program for Smart City’.

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