

# The Digitalization Approach in The Paddy Sector To Achieve The Self-Sufficiency Level In Malaysia

*Ahmad Zubir Ibrahim\**

School of Government, Universiti Utara Malaysia

**Abstract.** Digitization indeed presents a valuable opportunity to tackle the pressing challenges of productivity, sustainability, and resilience in agriculture. The evidence of its adoption and impact in the agriculture sector highlights notable increases in production and crop resilience. In the specific context of paddy production in Malaysia, the government consistently underscores the importance of embracing digitization in this sector. This paper aims to explore how a digitization approach can be effectively utilized in paddy production to attain self-sufficiency levels (SSL) in Malaysia. Additionally, it identifies key issues and challenges that need to be addressed to achieve self-sufficiency in paddy production. These challenges include: natural resource scarcity: agricultural productivity & innovation and climate change. To ensure the sustainability of paddy production and the successful adoption of digitization, governments play a pivotal role in addressing these challenges. In conclusion, the integration of digitization in paddy production is a promising strategy for Malaysia to achieve self-sufficiency in rice production. However, it requires a comprehensive approach that addresses challenges related to resource scarcity, productivity, demographic shifts, and climate change. Governments have a critical role in facilitating this transition by providing support, knowledge, incentives, and a conducive environment for innovation and technology adoption in the agricultural sector.

## 1 Introduction

In Malaysia, rice holds a pivotal role as a vital commodity, serving as the primary dietary staple for nearly the entire population. Simultaneously, these commodities bear significant importance in maintaining the stability and fostering the growth of the nation. As of 2020, Malaysia boasted approximately 190,000 paddy farmers who considered this occupation their

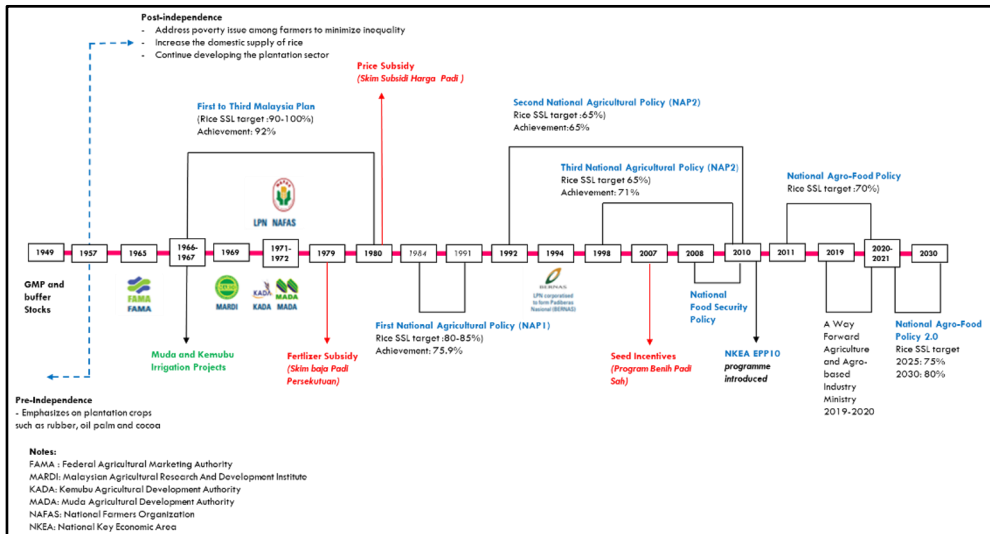
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\*Corresponding Author : [azubir@uum.edu.my](mailto:azubir@uum.edu.my)

primary source of income. To secure a rice supply, the government has assessed the performance of this commodity in terms of the national Self-Sufficient Level (SSL), which acts as a crucial indicator of a nation's ability to fulfil its food requirements through domestic production. With an eye toward food security, the Malaysian government has established SSL targets for key food items to be reached by the year 2030.

Historically, the policy of achieving self-sufficiency in rice production through local means served as the primary government policy from 1957 until a few years following the country's independence. Various governmental initiatives have been undertaken to bolster rice production, as depicted in Figure 1. The Malaysian Food Policy was crafted with a special emphasis on enhancing overall food production, including rice, with the objectives of ensuring food safety, availability, affordability, and accessibility. Additionally, it seeks to promote the competitiveness and sustainability of the agricultural and food sector while elevating the income levels of agricultural entrepreneurs. This policy also aims to identify new priority areas and take proactive measures to enhance the economic contribution, competitiveness, inclusiveness, sustainability, and resilience of the agri-food sector in the face of global challenges. To reinforce the rice sector, the government is now concentrating on augmenting domestic rice production to guarantee an ample supply for the nation. As part of this strategy, Malaysia maintains a buffer stock of 292,000 tonnes to meet 45 days' worth of demand.

To fortify the rice industry further, the government's focus lies in increasing productivity and enhancing rice quality, intensifying the use of rice by-products, enhancing the management of national rice reserves, restructuring rice subsidies and incentives, and strengthening the institutional oversight of rice and paddy. Achieving success in the rice industry necessitates collaborative efforts among all agencies involved in the agricultural sector to enhance the skills and capabilities of those involved.

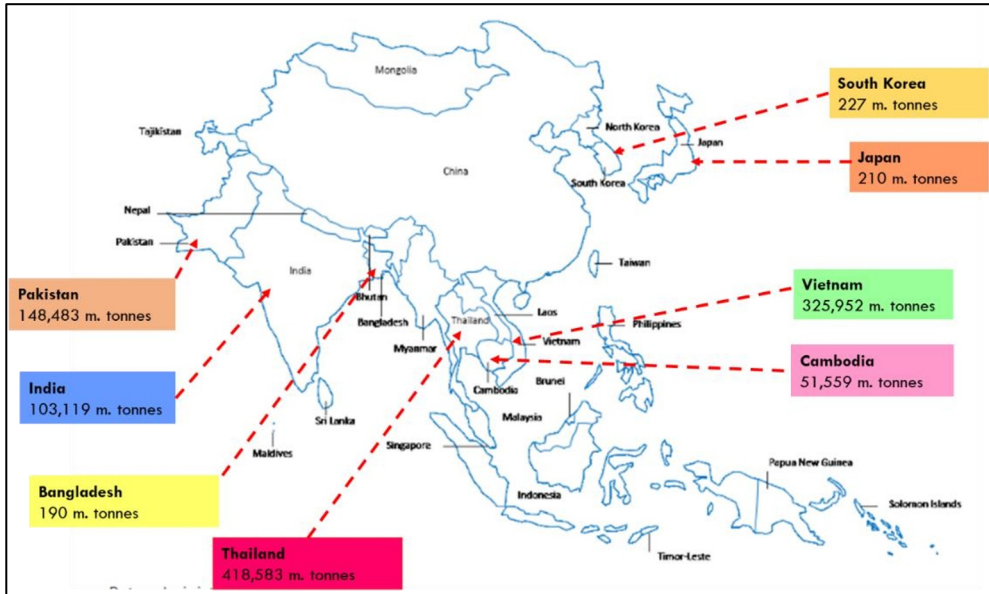


**Fig 1.** Policies and action plan in paddy production

Sources: Modified from [3]

As of 2015, a total of 2,689,821 tonnes of paddy, or 1,736,179 rice has been produced from a cultivated area of 619,312 hectares. The average paddy production is 4.3 tonnes per hectare.

The quantity produced is not enough to meet the country's food requirements. To meet the domestic demand for rice, Malaysia also imports rice from foreign-producing countries amounting to 1,049,249 tonnes of rice valued at RM 2,081,413,719. There are five main countries (Thailand, Vietnam, Pakistan, India, and Cambodia) that are the major rice importers for Malaysia as shown in Figure 2.



**Fig 2.** Import Of Rice By Country, Malaysia, 2015

Source: [4]

The rice industry in Malaysia grapples with a multitude of issues and obstacles in its quest to meet the demand for healthy and affordable food. The key challenges confronting the rice sector include subpar productivity levels, inadequate institutional support, and a shortage of skilled labour. Furthermore, this industry faces formidable challenges in the form of climate change, competition from countries with lower production costs, and stringent market access requirements imposed by importing nations.

Simultaneously, the inadequacy and poor maintenance of infrastructure have taken a toll on production efficiency. In rice-growing areas, the dearth of irrigation and drainage infrastructure has resulted in a sparse network of water pipelines, adversely affecting the water supply to rice fields. Another significant concern lies in post-harvest losses, primarily stemming from shortcomings in efficient storage and logistics management. These losses not only impact farmers' production and income but also result in the wastage of valuable resources. The reliance of farmers on imported agricultural inputs like fertilizers and seeds, owing to the absence of local supply sources, drives up input costs and ultimately undermines the profitability of rice production.

The influence of climate change, with its direct reliance on weather and climatic factors, carries long-term implications for rice production within the country. Elevated temperatures can induce heat stress, crop failures, and reduced yields, particularly when nighttime temperatures rise. Additionally, erratic rainfall patterns and water shortages due to declining

river levels disrupt rice crop production across seasons. Frequent natural disasters like droughts and floods pose a severe threat to rice production, further exacerbating the challenges faced by the industry. The projected rise in sea levels by 70 cm by 2100 is anticipated to reduce land area and lead to saltwater intrusion, jeopardizing the sustainability of this vital crop.

Beyond these intrinsic challenges, global events such as the conflict between Russia and Ukraine have reverberations throughout the global food production landscape. The Food and Agriculture Organization (FAO) estimates that the Russian-Ukrainian war may result in an increase of 7.6 to 13.1 million undernourished individuals in 2022-2023. As per the United Nations, the number of severely food-insecure people reached 276 million in May 2022. The hostilities in Ukraine have also triggered price spikes for locally produced goods in third countries, driven by elevated costs of fertilizers, energy, and, to a lesser extent, seeds and pesticides. In addition, impoverished countries may curtail their food production due to their inability to afford fertilizers and other inputs. Higher prices and shortages pose grave ramifications for food assistance to vulnerable nations. These external factors directly impact paddy and rice production in Malaysia, prompting the need for a digital approach to achieve

## **2. Digitalization Approach In The Paddy Sector To Achieve The Self-Sufficiency Level**

Sustained efforts are not solely confined to rice crop production but extend to downstream crops, demanding a more streamlined and improved approach. This holds significant importance in ensuring the continued productivity of the food supply chain and enhancing the resilience of paddy farmers, helping them break free from the poverty cycle. This model can be applied not only at the local level but also by all stakeholders involved in the development of human capital among impoverished or low-income groups.

The food supply chain in paddy production can be likened to a black box interaction, where each segment of the supply chain has limited information and control over processes that occur before and after it. Economic shifts and globalization introduce new challenges as supply chains transcend national borders and regulatory jurisdictions. Supply chain management encompasses not only the physical transfer of products from producer to consumer but also aspects such as payments, credits, working capital, advanced technologies and techniques, property rights, and information regarding user requests (Cooper et al., 1997, as cited in [7]). Blockchain technology holds the potential to enhance the efficiency of transactions in all these domains.

The application of blockchain technology also offers comprehensive, transparent, reliable, and timely data, fostering trust in food products and facilitating data acquisition by both the public and private sectors without excessive time consumption. It equips players in the food industry to respond adeptly to market demands and enables governments to formulate improved agricultural policies.

### **Use of Blockchain Technology in the Rice Industry**

Blockchain technology presents an opportunity to enhance the efficiency of the supply chain in rice farming. Developed economies like the US and Australia have already witnessed the adoption of blockchain technology among industry participants. Malaysia can harness this technology to generate trustworthy and transparent data concerning the food supply chain, particularly for the national staple, rice. Figure 4 illustrates how blockchain technology can

address concerns regarding transparency, accessibility, and the frequency of data in the rice industry.

The heightened transparency afforded by blockchain technology enables swift detection of contamination, potentially saving time, money, and lives in the event of foodborne disease outbreaks. Furthermore, consumers gain deeper insights into the origins of their food, the farmers involved, and the processing methods employed. This helps prevent issues like mislabelling and fraud. For instance, companies like Ripe.io in San Francisco and Provenance in London offer blockchain-based solutions to track food along the supply chain, from farmers to retailers and consumers. In the Malaysian rice and paddy industry, blockchain technology can be deployed to verify the authenticity of organic and artisanal rice varieties like Bario rice. Despite the registration of geographical indications (GI) for Bario rice, consumers are not entirely safeguarded from mislabelling [3].

However, notwithstanding its merits, there are limitations to consider when using blockchain technology in the Malaysian agri-food industry. These encompass the management of diverse stakeholder interests to strike a fair balance between privacy and public access to information. Adequate capital resources are also necessary for the full-scale implementation of blockchain technology throughout the supply chain. Disagreements may arise regarding funding sources, particularly if the system is designed to be decentralized. Additionally, the use of blockchain technology may contribute to increased electricity consumption, which could have implications for climate change and environmental sustainability. Despite these considerations, blockchain technology remains a worthwhile option to explore.”

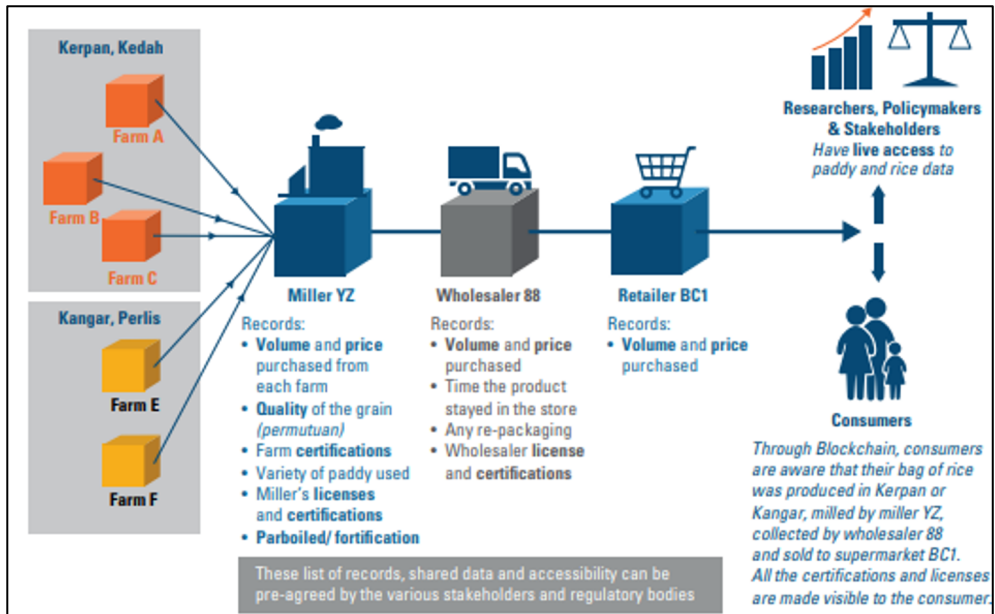


Fig 3. Blockchain platform in paddy industry

Source: [3]

## Conclusion

To attract and sustain the interest of food producers, investors, and the private sector in the agri-food industry, it is imperative to foster a conducive business ecosystem that supports their participation and operations within the sector. In the context of the agri-food industry, several key areas comprise this ecosystem:

- i. **Land Tenure and Property Rights:** Ensuring secure land tenure and well-defined property rights is fundamental. It provides confidence to investors and producers that their investments in land will be protected and respected.
- ii. **Regulatory Framework:** Clear and well-defined standards, rules, and regulations are essential for establishing a transparent and predictable environment in which businesses can operate. Regulatory clarity reduces uncertainty and encourages investment.
- iii. **Financial Services:** Access to financial services, including credit and investment capital, is critical for the growth and sustainability of agri-food enterprises. Adequate financial support enables businesses to expand and innovate.
- iv. **Physical Infrastructure:** Robust physical infrastructure, such as transportation networks, irrigation systems, and storage facilities, is vital for efficient production, distribution, and access to markets.
- v. **Digital Connectivity:** In today's interconnected world, digital connectivity is crucial. Access to technology and digital platforms can improve communication, market access, and overall efficiency throughout the value chain.
- vi. **Value Chain Integration:** A well-coordinated and integrated value chain, especially between upstream and downstream segments, ensures that products can flow smoothly from production to distribution and consumption.

To enhance the governance of the agri-food industry, several steps can be taken:

- i. **Progressive Policies and Plans:** Governments should develop and implement policies and plans that promote the sustainable growth of the industry. These policies should be adaptable to changing circumstances and market dynamics.
- ii. **Effective Coordination and Collaboration:** Collaboration among key industry stakeholders, including government agencies, producers, investors, and private sector entities, is essential. Coordinated efforts can address challenges and seize opportunities more effectively.
- iii. **Effective Implementation:** Policies and plans must be translated into action through effective implementation and delivery mechanisms. This ensures that the intended benefits of these initiatives are realized.

Additionally, strengthening the fundamental elements that underpin business operations, such as land security, accessibility of finance, and availability of infrastructure, is crucial.

When these foundational aspects are reinforced, it boosts the confidence and willingness of private actors and investors to engage or expand their investments in the agri-food industry.

Furthermore, embracing digitalization across all segments of the value chain can significantly enhance the industry's efficiency and competitiveness. Digital technologies can streamline processes, improve decision-making, and open up new opportunities for growth and development. In summary, creating an enabling business environment for the agri-food industry involves a holistic approach that encompasses legal and regulatory aspects, financial support, physical and digital infrastructure, and effective coordination among stakeholders. Such an ecosystem can not only attract but also retain the interest and participation of key players in the sector, ultimately contributing to its sustainable growth and development.

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