

Issues and Challenges of Modern Agriculture: An Overview

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Abstract. Farmers have always played a crucial role in the ongoing attempts to feed a population that is ever rising. Therefore, it is necessary for researchers to identify ways to better use contemporary technologies in agriculture so that present agricultural practices may have their management enhanced. In today's world, a part of agricultural production is dependent on technology, which brings with it its own unique set of problems and difficulties, some of which are discussed in this article. An analysis of the articles that earlier scholars have written on various subjects connected to agricultural technology has been carried out. There are a total of eight separate problems that have been pointed out in this article. Some of these problems include Malaysia, while others involve other nations. In this article, readers will get an overview of all eight of the challenges.

Keywords: Agriculture, modern, challenges, issues

INTRODUCTION

In March 2022, Jia-Qi Cheong of CodeBlue reported that food insecurity affected around 10 million people in Malaysia. There are growing efforts to promote diverse food sources, but many obstacles still need to be overcome. It was made clear by the pandemic's effect on food distribution networks just how rapidly city dwellers might suffer food shortages and soaring prices. After soy oil and palm oil reached all-time high prices in 2021, the price of cooking oil in Malaysia skyrocketed in February of the following year. But a lot of money has been put in, not just by the government but also by private investors, because the government is so committed to modernising agriculture as a whole and making it better for everyone.

The vast majority of the populace lives in rural areas, where the agricultural sector is the primary source of income. There are several obstacles in the way of implementing modern agriculture in rural areas, such as poor communication and connection, a lack of expertise and resources, and so on. Some nations, including India, have brought attention to the fact that modern agriculture faces a wide range of challenges, including those related to improving productivity, producing high-quality grains, guaranteeing a steady supply of food products, preserving soil fertility and quality, farming in a sustainable manner, preventing soil and water pollution, and protecting endangered species (Dr. Kanwar Bhan and PT Chiranji Lal, 2019). Dr. Kanwar said that the provision to offer life insurance on

the crops of the farmers in the event of crop loss due to natural calamities has significantly impacted the economic well-being of the farmers, which is crucial for the successful implementation of modern agriculture in India. An integral part of India's agricultural system is the provision of credit cards and low-interest loans to farmers in order to improve the agricultural sector's infrastructure. (Dr. Kanwar Bhan and PT Chiranji Lal, 2019).

Current technology, such as drones and artificial intelligence, should have a part in the decision-making process, and if viable, a startup for advances in current agricultural practices might be a game-changer toward more sustainable and profitable agriculture. In Malaysia, the National Agro-Food Policy 2021–2030 (DAN 2.0), which focuses on new approaches based on modern technology and sustainable development in line with Industry Revolution 4.0 (IR4.0) and the Sustainable Development Goals (SDGs) 2030, identifies modernisation and smart agriculture as the key game-changers for transforming the agro-food sector (Bernama,2022).

MODERN AGRICULTURE

Modern agriculture is an approach to agricultural inventions and farming methods that is always changing. This allows farmers to be more efficient and use fewer natural resources to meet the world's needs for food, fuel, and fibre. Modern agricultural systems let farmers increase their output while having less of an effect on the environment. Modern agriculture is based on the idea that things should always get better. This is done with the help of innovation, digital equipment, and data. Meanwhile, an increasing number of modern agricultural studies are being conducted to determine how to address the problem. The expansion of intelligent agriculture is driven by both the rise in production and the constraints of time. The advancement of science and technology is driving the revolution in modern agriculture. According to X. Yang et. al. (2021), figure 1's objective is to assist readers in comprehending the features and obstacles of agricultural growth (from Agriculture 1.0 to Agriculture 4.0).

Agriculture 1.0

Between 1784 and about 1870, when traditional agriculture was at its peak, people and animals were the most important resources, and poor operational efficiency was the main problem.

Agriculture 2.0

Wasteful use of resources was the biggest problem in the 20th century, which was the age of automated agriculture.

Agriculture 3.0

Between 1992 and 2017, when automated agriculture grew quickly, there was a lack of intelligence.

Agriculture 4.0

The age of smart agriculture, which starts in 2017 and is defined by autonomous operations, is mostly defined by the smart use and development of current information technology to help agriculture.

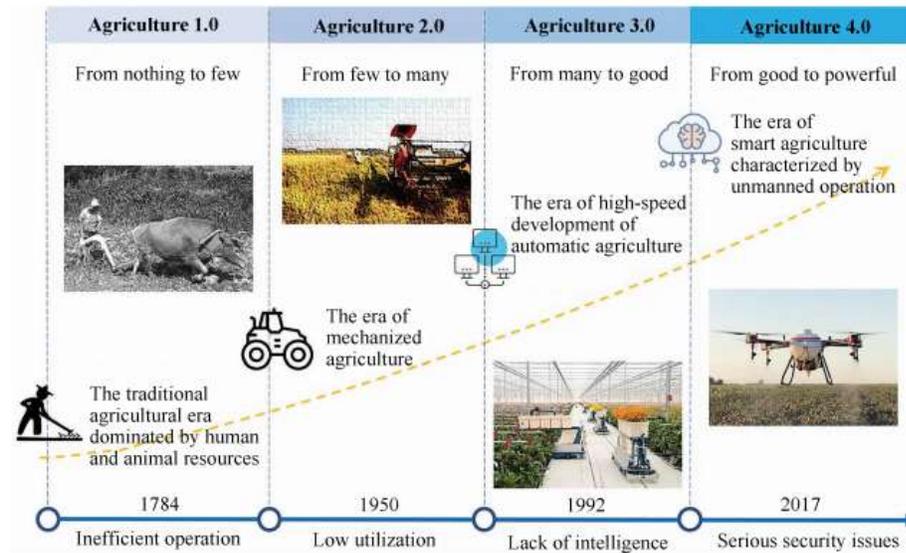


FIGURE 1. Agriculture development's defining characteristics and challenges (from Agriculture 1.0 to Agriculture 4.0) X. Yang et. al. (2021)

In order to maintain Malaysia's position as a global leader in food production, the country's agricultural industry will undergo a dramatic modernization and revitalization under Budget 2022. Datuk Seri Ronald Kiandee said at the opening of the Malaysia Agriculture, Horticulture, and Agrotourism (2022 Maha) expo that the modernization and smart agriculture agenda are one of the main focuses of the 12th Malaysia Plan in order to propel the country's sustainable, resilient, and technology-driven agro-food sector (Bernama,2022).

Younger generations are showing an increased interest in contemporary farming practises. In spite of the fact that young people's participation in agriculture is currently limited, positive trends point to their increased participation being undoubtedly felt in the not too distant future. This is especially the case given the growing number of young people who express an interest in becoming modern farmers. Some individuals are willing to give up their secure jobs in exchange for the substantial monthly income that may be made in the agricultural industry. Farming is no longer considered a "third-class" job because it can lead to high levels of financial success. Referring to the study by Jithin Das V. et al. 2019, utilisation of Cloud Computing technology by Irish farmers would aid in identifying barriers to adoption and ways to improve the current system. For this study, both surveys and interviews were used to obtain data from Irish farmers. This research examined the primary variables influencing Irish farmers' adoption of new technologies. Young farmers in Ireland are more likely to use cloud computing than their older peers.

THE CHALLENGES OF MODERN AGRICULTURE

Adoption of modern agriculture is constrained by a variety of factors in Malaysia and other countries, including:

Concerns About Agriculture, Analysis, Evaluation, Production and Demand

According to Dr. Kanwar B. et. al., 2019, modern agriculture has to deal with a lot of problems, such as increasing productivity, making sure food grains are of good quality, making sure there is a steady supply of food, keeping the fertility and quality of soils, making sure agriculture is sustainable, preventing soil and water pollution, and protecting biodiversity. In India's public distribution system, there is a good way for food grains to get to people, and this system keeps food prices low, even though the agriculture sector is expected to grow by 3.6% in 2020–21. In 2021–22, about 18.8% of the Indian work force will be in the agriculture sector. Indian agriculture isn't just about growing crops; it's also supported by activities like raising animals, hunting, fishing, forestry, horticulture, and other related jobs. During the pandemic, agriculture did so well that it gave a lot of people in rural areas jobs.

Natural Catastrophes

The challenge of young farmers involves natural calamities such as floods. For example, many farmers lost a lot of money because of the terrible floods that hit Malaysia in March of this year. Undoubtedly, the consequences of climate change have hindered their attempts to survive in the agricultural sector (Mohd Rozaimy Ridzuan, 2022). Therefore, they should examine disaster risk mitigation strategies and agricultural expertise in order to reduce the likelihood that agricultural goods will be severely destroyed by floods. Their harvests may be safeguarded by a dependable drainage system and meticulous planting techniques. In addition to floods, the nation is also experiencing a drought, which has devastated crops and livestock to the point where some farmers have given up.

Inadequate Study of Agricultural Technology

Current agriculture's limitations impede research. Cooperation between university academics and farmers should be enhanced so that new agricultural areas and practices may be investigated in an effort to boost the agricultural sector's production. (Mohd. Rozaimy Ridzuan, 2022). The government of Malaysia is acutely aware of the nation's dependency on food imports and seeks to strengthen the agriculture sector via technological adoption. This would also generate much-needed employment, since unemployment remains higher than pre-pandemic levels. However, Malaysia has limited space for urban agriculture, and other obstacles include inadequate resources, unpredictable returns, a lack of expertise and inadequate training. Malaysia's greatest obstacle is competing with the global supply chain (Jia-Qi Cheong, 2022).

Farmers Imposed Land Limits on the use of Modern Agriculture

Issue on land restrictions imposed by farmers on the use of modern agriculture. Some industry insiders assert that land restrictions and difficulty acquiring land are the primary

reasons why young people find it difficult to join the agricultural sector. In addition, when a farmer does not own the land, he or she is considerably less likely to be willing to spend and enhance the farm's condition (Alexandr Sakal, EOS Crop Monitoring, 2019). Food and commodities [palm oil and natural rubber] are the two major sectors of the Malaysian agricultural business. The majority of food producers are smallholders. Nationwide, around 200,000 paddy farmers cultivate an average of 2 ha to 312 ha of land, which is rather small. When it is small and farmers are cash-strapped and impoverished, it is exceedingly difficult to convince them to experiment with new technologies and jeopardise their production (Pathma Subramaniam, 2021).

High Costs Impede Modernisation of Agriculture

The high cost of modernising agriculture is an impediment to its progress. Changing farms to be more technically advanced, purchasing specialised equipment, and using various precision farming techniques are all costly endeavours. Certain changes are necessary, particularly for nations with larger populations, such as China and India, which constitute 19% and 18% of the world's population, respectively, and have more than one billion people. India's population is projected to exceed China's by 2022. These nations are likewise highly dependent on agriculture to maintain the livelihoods of their expanding populations. Due to a lack of access, high cost of commissioning and operation, or lack of understanding, the absence of agricultural technology in developing countries and rural regions is one of the greatest obstacles to agriculture (Shiva Pujan Jaiswal et. al., 2019).

Farmers' Lack of Knowledge and Qualifications

Another obstacle to the modernization of agriculture is the lack of knowledge and qualifications among farmers, especially among the elderly. Age is an additional crucial aspect. It was discovered in 2013 that 31% of farm managers in the European Union were over the age of 65. In comparison, only 6% were under the age of 30. In America, the numbers are comparable. The average age of an American farmer is 58 years old. Furthermore, nearly one-third of American farmers are 65 or older (Alexandr Sakal, EOS Crop Monitoring, 2019). In addition, farmers face various obstacles when implementing smart farming, including a lack of technical expertise, information fragmentation, greater implementation costs, and inadequate network access to support smart technology (Pathma Subramaniam, 2021).

The Telecommunications Infrastructure

Internet connectivity is a crucial aspect in implementing agricultural technology tools and processes. The United States has no difficulties with it. According to this survey, 94% of American farmers claim to have access to high-speed internet. However, substantial problems still exist in Europe today. Internet connectivity remains challenging in several regions of the United Kingdom. In 2017, just 59% of rural residences had access to ultra-fast broadband internet. Consequently, farmers in remote regions struggle to integrate new technology and instruments. This is a global problem that must be addressed globally (Alexander Sakal, EOS Crop Monitoring, 2019). Dr. Sarena Che Omar, deputy director of research at Khazanah Research Institute, notes that in Malaysia, smallholders, who are

largely responsible for food crops, lag behind large-scale farming and agribusinesses in terms of productivity and efficiency due to issues such as lack of access to technology, innovation, financial support, infrastructure, and opportunities (Pathma Subramaniam, 2021).

The Security Issues in Modern Agriculture

According to X. Yang et. al., 2021, the possible security problems associated with smart agriculture are identified and separated into two categories: (1) agricultural production and (2) information technology. Additionally, agricultural equipment will impact the security plan. For instance, high voltage discharge interference of Solar Insecticidal Lamps Internet of Things (SIL-IoT) should be regarded as an attack or have an influence on security strategy. The findings of the studies conducted by K. Huang et. al., 2020, demonstrate that interference from high voltage discharge impacts data transmission. The findings of their further tests presented in this publication revealed that interference had an effect on data capture. Also, the electromagnetic interference that comes from making solar power could be used in photovoltaic Internet of Things agriculture. In Section IV, Figure 2 shows an overview of the security and privacy countermeasures for smart agriculture. In Section V, X. Yang et al., 2021, look at the security challenges of smart agriculture.

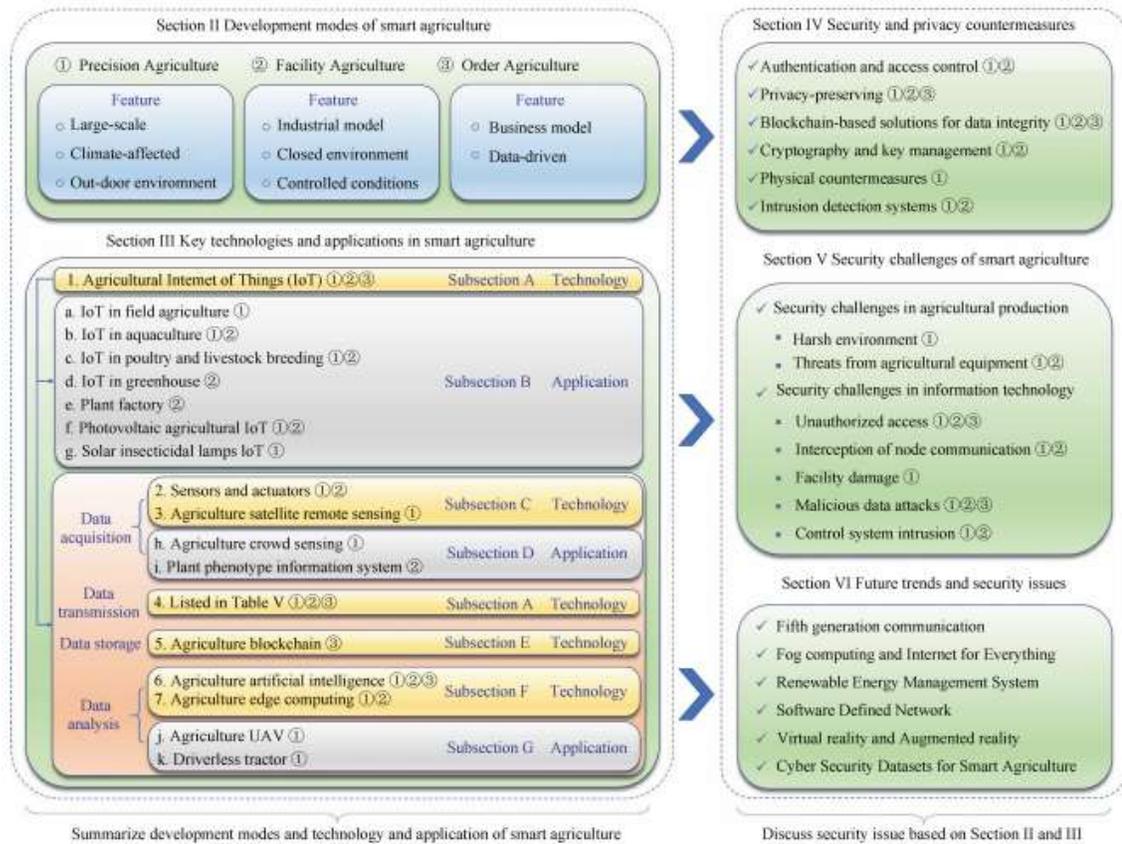


FIGURE 2. Summarization of smart agriculture security issues in Section IV, V and VI by X. Yang et. al., 2021.

CONCLUSION

Agriculture has to embrace technology in order to solve the issue of food security. Implementing agricultural advances is essential for securing the nation's food supply, particularly in light of an imminent climate emergency and high population expansion. Already, the epidemic has caused significant and widespread increases in global food insecurity, impacting many vulnerable families throughout the globe, including those in Malaysia. Increased use of modern agriculture may cut production costs and the nation's reliance on food imports. Reducing a nation's reliance on food imports improves food security by ensuring that people have access to a sufficient amount of inexpensive, nutritious food.

When preparing for the future of agriculture, there are a few different recommendations that have to be taken into consideration. A farmer needs to consult with a knowledgeable individual first before forming any opinions or making any purchases. Second, farmers should see their financial investment in agricultural technology as a long-term endeavour that has the potential to deliver considerable returns on their investment. Last but not least, be ready to enable all of the necessary changes that will follow with the modernised agriculture plan. These adjustments include learning how to deal with a large amount of new data, learning and training on how to operate technological instruments, and other similar things.

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