



The Role of Smart Farming in Sustainable Development


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ABSTRACT

This paper intends to explore the development of agriculture into smart farming and how smart farming can contribute to the sustainable development goals. The paper focuses on how smart farming can be imparted in sustainable agriculture by analyzing the environmental, economic, and social impact. This paper applied a systematic literature review technique to assess published academic literature on smart farming and sustainable agriculture in Southeast Asia. The review identified that smart farming can lead to less environmental damage, lower cost, and higher productivity and has the potential to create decent jobs for the youth, ultimately leading to a sustainable food system.

KEYWORDS

Agritech, ASEAN, Food Security, Internet of Things (IoT), Precision Agriculture, Sustainable Development Goals (SDGs), Sustainable Intensification, Systematic Literature Review

INTRODUCTION

Food security has always been a challenge in the Southeast Asia region. According to Marzęda-Młynarska (2017), this is due to the growing population, challenging environmental conditions, risks of climate change, and rapid urbanisation. The definition of food security has evolved; in 2002, it was redefined as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002).

The current pandemic of COVID-19 has resulted in a new dimension of food (in)security i.e. the disruption of supply and demand. This is mainly due to the lockdown of several major cities, border closures, and job or income losses. This has disrupted the food supply chain and affected the status of food security in many countries. COVID-19 has resulted in an abrupt change in the world's food consumption and production patterns which is a reflection that nature has a limited capacity to meet human needs. Human activities have been responsible for the crossover of zoonotic diseases like SARS, MERS and COVID-19. The hunting and handling of wild animals for the exotic food market has presented the opportunity for cross-species transmission of infectious diseases. Episodes of avian flu (H5N1) and swine flu (H1N1) outbreaks originating from densely packed farms of hybrid

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livestock have also shown that modern farming practices have shaped our disease ecology (Wallace, 2016). Suffice to say, humanity's increasingly exorbitant consumption patterns have contributed to this instability. To prevent another pandemic that is as damaging as or worse than the one presently raging, the world urgently needs to prioritize more sustainable patterns of food production and consumption.

Sustainability has been discussed globally through the concept of sustainable development. The World Commission on Environment and Development (1987) defines sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations, 1987). Having a sustainable approach is considered an important goal today due to the fast population growth whereby the world's population is expected to reach nearly 10 billion which is an increase by more than 30% by 2050 (from 7 billion in 2011) (FAO, 2017). This puts a strain on the world's agricultural resources especially on the land as higher yields are expected without considering the damage to the environment (Gil, et al., 2019). These trends threaten the sustainability of agricultural systems and undermine the global capacity to meet its needs. To ensure enough food is produced for a population of nearly 10 billion by 2050 without critically degrading natural resources, a transition to a smart and sustainable agricultural system is needed.

In a way, the pandemic also provides farmers and researchers the opportunity to reconsider their current approaches to agriculture and reinvent farming using greener techniques. The agritech scene in Southeast Asia is still in its early stages and just starting to expand; it is helping farmers to implement more resilient, productive and sustainable agricultural practices. However, regulatory hurdles and a digital divide especially in developing countries have stood in the way of the smooth adoption of smart farming methods. It is possible that this pandemic may become the catalyst that sets in motion smart farming in Southeast Asia.

Incidentally, COVID-19: the biggest crisis of this century has coincided with the Fourth Industrial Revolution (4IR) whereby new technologies like artificial intelligence (AI), Big Data, Blockchain and the Internet of Things (IoT) among others have altered the way in which people live, work and interact. Likewise, these new technologies also have the power to transform the food supply chain for the better as can be seen from trials and implementations abroad.

The objectives of this paper are twofold. First, it attempts to explore the changing global trend in agriculture which involves digital transformation in line with the industrial revolution. Secondly, this paper attempts to convince that smart farming could be the answer to sustainable food production and contribute towards achieving a number of the sustainable development goals (SDGs).

METHODOLOGY

This paper applies systematic literature review in an attempt to seek out the existing knowledge and research gaps on the subject matter. The five steps of conducting a systematic literature review put forward by Zimmerman et al. (2016) was used. The five steps are as follows: (1) formulating review questions, (2) searching for materials, (3) evaluating and selecting, (4) analysing and synthesising, and (5) reporting review results.

The research question of this study is how can smart farming be incorporated in to sustainable agriculture and contribute towards the 2.4.1 Sustainable Development Goal (SDG) Indicator? To identify a relevant set of articles concerning the research questions, criterion sampling based on keyword searches was applied. A number of keyword combinations were used to search for the articles from leading databases like Web of Science and Scopus. The search terms included smart farming, agritech, precision farming, information and communication technology (ICT) based farming and ASEAN and Southeast Asia, sustainable agriculture and sustainable development goals.

The database search resulted in 109 articles in the social science criteria. Articles that solely focused on technical issues or did not report results of empirical studies were excluded. This abstract screening resulted in a total of 13 relevant articles, which were subsequently analysed with respect to sustainability and smart farming in Southeast Asia. Due to the limited number of relevant articles, an

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