The Internet of Things and Agriculture: Role and Advantages in Malaysia

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Abstract

The implementation of Agriculture 4.0 has created a new word to identify those players using this new and much more sophisticated model: the Agri-tech industry. In spite of the misunderstanding that people may have about the agricultural climate, the Internet of Things (IoT) is a extremely creative technology that offers many inventive avenues to modernize the agricultural sector and produce greater opportunities, the reality is that today's agricultural industry is more data-centric, efficient, and intelligent than ever before. Almost every sector has been redesigned by the exponential growth of Internet of Things (IoT) based technologies, including smart agriculture, which has moved the sector from statistical to quantitative approaches. These groundbreaking developments are shaking up traditional farming practices and generating new prospects along with a variety of challenges. The literature reviewed focused on The Internet of Things (IOT) in the field of agriculture and identified current and future IoT trends in agriculture and highlighted the role and advantages of farmers' organizations in ensuring sustainable food supply and helping farmers increase their incomes. The use of IoT in fields, orchards, and management would also enable farmers to reap the benefits of a wide range of technology.

Keywords: Internet of Things (IoT), Agriculture, Role of IoT, Advantages

INTRODUCTION

The Malaysian agricultural sector is important in ensuring that the food security of the country is secure and also contributes significantly to economic growth and the improvement of target group income, in particular farmers; breeders, and fishermen. The Malaysian population is estimated at 32,4 million in 2018, with a rise of 1.1 percent or 356,400 compared to the previous year. The population increase is expected to result in demand for food continues to rise. Farmers and agricultural firms are moving to the Internet of Things for analytics and improved processing capability to satisfy this need. In this production, the Internet of Things (IoT) will play a major role in gaining an

understanding of recent crop trends, a large global market. IoT is an integrated computer network capable of efficiently transmitting data without human intervention. Today, many farmers and agricultural industries, including farmers' organisations, are using smart agriculture IoT technology to improve production, productivity, global markets, and other characteristics such as minimal human interference, time and expense, etc.

INTERNET OF THINGS (IoT)

The latest term for the blend between the current Internet of Things (IoT) technologies and the industrial sector is Industry 4.0. As a result of the integration of the Internet of Things (IoT) and the Internet of Services (IoS) in the development process, Industry 4.0 was initiated. [1]. IoT may typically provide specialised technologies, utilities, physical objects networking, facilitates object-to-object communication, and data exchange. In different sectors, IoT can be accomplished by regulating and automating elements such as heating, ventilation, machining, and remote monitoring [2]. The Internet of Things (IoT) is the most effective and relevant tool for developing solutions to problems. IoT emerges from diverse building blocks that involve several sensors, applications, elements of the network, and other electronic devices. Also, it makes knowledge more effective. Without human-human participation, IoT facilitates the sharing of data across the network [3, 4]. According to [5], IoT is the Internet of Things, a network of physical objects that communicate with one another, reducing the need for human intervention and efficiently collaborating to achieve outcomes. Physical structures are interconnected and interact overtime to send results to humans. IoT is an environment in which, without the need for human-human or human-computer interaction, artefacts, animals, or people are provided with specific identifiers capable of transmitting data across the internet.

INTERNET OF THINGS (IoT) IN AGRICULTURE

Over the years, agriculture has undergone several technological changes and has become increasingly industrialised and powered by technology. As businesses and farmers turn to the Internet of Things (IoT) for research and increased processing capability, smart agriculture and high-tech farming are quickly becoming the trend. Appropriation of numerous smart agricultural instruments, such as climate stations and soil screens, has enabled farmers to gain control over the method of growing crops and raising livestock, making their trade more unsurprising, productive, and profitable. The Internet of Things has given the agriculture industry an unprecedented degree of autonomy and the potential to simplify decision-making by means of linked mobile machines and a mobile network of sensors, actuators, robotics, cameras, and drones.

Technology and big data technologies for the Internet of Things (IoT) are poised to play a key role in ramping up global food supply in the coming decades to feed billions. Experts envisage a data-driven future in which IoT-based technologies, ranging from farm machinery sensors, self-driving tractors, drones, and GPS imaging to weather monitoring, will not only enable farmers to feed the planet, but also better cope with the limited supply of fossil fuel, water, and arable land [6]; [7]. This makes the agricultural sector indirectly a lucrative source of income.

IOT APPLICATION IN AGRICULTURE

In Malaysia's economic development, agriculture plays a crucial role. Climate change, land scarcity, labor shortages, financial challenges, the marketing of agricultural products, costs, lack of youth involvement and the sustainability of value chains are the most critical obstacles to agriculture. This is seen to have induced a major decrease in

productivity. To maximize productivity and overcome obstacles in agriculture, innovative technology and techniques called the Internet of Things must be used. Recognizing innovation as the focal driver for advanced economic growth, Malaysia has been aiming to boost the nation's innovation as part of the nation's transformation strategy [8]. The Internet of Things (IoT) is now expanding into the agriculture sector and helping farmers overcome the major challenges they overcome. Once these advances are made in the agriculture field, they will increase revenues and will also allow farmers to control more land and gain a great deal of understanding and awareness of new IoT technologies and inventions. Thus, the Internet of Things (IoT) technology is projected toplay a major role in rising existing agricultural production to satisfy the growing demand for food as below.

Precision Farming

Precision farming is a method or activity for raising livestock and growing crops that makes the farming process more accurate and regulated. Main components of this approach are the use of IT and aspects such as cameras, autonomous vehicles, digital hardware, control systems, robotics, etc. Precision agriculture has been one of the most common IoT applications in the agricultural sector in recent years and a significant number of organisations have begun to use this technique around the world. Referring to [9] high reliability is required about whether the information which decreases the problems of crop damage. Agriculture in IoT such as precision farming makes precise delivery of real-time information on the weather changing, soil quality, labor cost, and many more to farmers.

a. Drones

An UAV (Unmanned Aerial Vehicle) or drone is a flying system that, with the aid of an autopilot and GPS coordinates, can fly a preset path. The unit also has standard radio controls; in the event of a malfunction or unsafe condition, it can be piloted manually. The term UAV is often used to refer to the whole system, including ground stations and camera systems, but the term is most widely used for model aircraft and helicopters with fixed and revolving wings [10]. Drones are used in agriculture to effectively improve the agricultural practices needed. Land and air drones are used to determine crop health, to assist with irrigation, to track crops, to harvest crops, and to evaluate farm/farm characteristics. The key advantages of drones include automated GIS mapping, time-saving ability (farmers instead must do it themselves), higher yields, and more complex crop health. The data obtained by these drones is of great assistance to the agricultural industry.

b. Crop Management

Allowing the drones to efficiently monitor the crops, efficient crop management can be performed using other devices other than drones that ensure the fertility of the soil is maintained while the production of the crop remains intact. Using the specifically built devices that monitor the crop growth including the temperature and leaf potential. Also, the health of the plant can be monitored well throughout time to ensure efficient crop management is done. Mentioned by [11], the main role is to track the growth of crops using digital methods. This will provide the precise values of the various parameters on which growth is dependent. Other than this, it will allow the farmer to simultaneously control more than one agricultural land.

c. Smart Greenhouse

The greenhouse is a common term used in agriculture to grow many crops well, maintaining their desired temperature and humidity. As a result, offering an efficient way to do so, a smart greenhouse has been developed where every operation and every system can be used to track and regulate temperature and humidity inside the greenhouse. A greenhouse (also referred to as a glasshouse) is a building constructed mostly of translucent material, such as glass, with walls and roofs in which plants grow under controlled climatic conditions. Greenhouses have a very important role in agriculture in all parts of the globe, including Malaysia. The greenhouse is an creative environment in which we can track the environment to promote plant growth and prevent the effect of seasonal changes on the plants. In comparison to the outside farming temperature, airflow and light can be managed within the greenhouse moisture. This control brings productivity to the production of the greenhouses [12].

d. Supply Chain Management

Management of the agri-product supply chain can be tracked by IoT. Through the efficient management of agricultural products controlled by the IoT, farmers will benefit from the efficient management of agricultural products. Highlighted by [13] the use of IoT in the product supply chain market processes and the driving force in the adoption of agricultural products by the influence of the IoT supply chain was studied. In addition, with the necessary implications, it provides a reference framework with node enterprises in the commodity chain.

ADVANTAGES IOT IN AGRICULTURE

The world population is estimated to be around 9.7 billion in 2050, as one of the key interests in developing countries and the world at large should be the demand for more food for the growing population. IoT can be used to adapt the agricultural practises of the nation to the harsh weather patterns, changing climate, and aggressive landscape (chemical compositions, floods, droughts, and soil erosion) [14]. The different situations of IoT deployment in agriculture in this chapter and their advantages. The main benefits of using IoT to boost agriculture are as follows:

a. Fertilizer and pesticide control

IoT solutions classified in this sub-domain have introduced conservation practices to improve nutrient usage, production, crop quality, overall yield, and economic return while at the same time reducing off-site transport of nutrients.

b. High productivity

IoT devices can increase agricultural production. Farmers can track better by tapping IoT devices around the field. Therefore, there is more production. The precision farming activity has been made possible by the advent of GPS and GSP. The quality of crops will get better and will help the farmers to maintain the good quality of hiscrops

c. Crop Monitoring

The farmer will be provided with proper information on the crops and the exact number of parameters needed for the growth of the crops. The IoT device would allow the farmer to make his land and farm available for the best quality of his crops.

d. Agri-product Digital Marketing

With a well-planned and well-targeted digital marketing strategy that can satisfy the right consumers at a much lower cost than conventional marketing methods, farmers

can discover new markets and sell internationally with just a small investment and a lower cost.

e. Remote Monitoring

From a web link, farmers can track multiple fields in several places around the globe. With real-time data and up-to - date details on plant parameters and field condition always, decisions can be made anywhere and in real-time.

f. Soil Monitoring

Internet of Things (IoT) for the farming climate. Temperature and moisture, along with other factors, may be important. The traditional approach to computing these variables in an agricultural atmosphere meant that farmers physically took measurements and tested them at different times.

g. Farming Innovations

Farming is now becoming more accurate, smart, scientific by using GPS systems, data analytics, and remote sensors included in farming equipment and machinery. Hence, farmers are ready to adopt new technologies in their farming to make it more precise.

CONCLUSION

Agriculture plays a critical role in the country over the next few years. The way the modern world works is to use the latest technologies in every area. IoT is one of the best technical developments seen today that will continue to boost smart farming. In various fields of agriculture, IoT works to improve time quality, water management, crop inspection, soil management, insecticide, and pesticide control, etc. It also minimizes human efforts, simplifies ways of farming, and allows smart farming to be done. Smart farming can help grow the market for farmers with a simple touch and limited effort in addition to these features. Such a field could not expand and achieve the full potential that does not require the use of advanced techniques and technologies. Overall, in agriculture, the use of the Internet of Things (IoT) would not only increase yields but also regulate all farm operations effectively. The IoT will continue to affect farming for the better in 2020 and beyond.

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