Chapter 26
An Overview of Internet of Things Technology Applied on Precision Agriculture Concept

Reinaldo Padilha França
State University of Campinas (UNICAMP), Brazil

Rangel Arthur
Faculty of Technology, State University of Campinas (UNICAMP), Brazil

Ana Carolina Borges Monteiro
State University of Campinas (UNICAMP), Brazil

Yuzo Iano
State University of Campinas (UNICAMP), Brazil

Abstract

The internet of things (IoT) is characterized by devices that communicate without human interference, sending and receiving data online, to which they have shaped the way of connecting household appliances, machines, and equipment, cars, among other things, also arriving at the field through characterized by the communication between devices, sensors, drones, and machines. They have great potential to improve production processes, making agriculture increasingly digital, creating solutions, connectivity, and training for specialist labor. As well as irrigation systems and other intelligent machines with the ability to talk to each other enabling management in the use of energy, resources, and inputs making the production process more efficient. Precision agriculture encompasses a series of components and factors from which the best procedures can be chosen that are appropriate in a given agricultural operation that effectively meets your needs, also related to the application of inputs at the right time and in the right place, following the growth and productivity over the entire length of a plantation by controlling pests, among other technologies, providing a reduction in production costs and spending on inputs, reducing the pollution of nature by the pesticides used, making it possible to reduce operating costs, increasing precision in obtaining results in the same way as less variability in production. Therefore, this chapter aims to provide an updated overview and review of the use of the internet of things in the precision agriculture system showing and approaching its success relation, with a concise bibliographic background, categorizing and synthesizing the potential of both technologies.

DOI: 10.4018/978-1-6684-5352-0.ch026

INTRODUCTION

The Internet of Things (IoT) has the ability to transform the world we live in; enabling better management of electricity use, creating more efficient industries, connected cars, and smarter cities are all components of the IoT equation, controlling vehicle traffic in large cities, creating the concept of smart cities, which inspired by smart farms, where management and production processes are integrated into them, where it is seen that their application of technology such as the IoT in agriculture can have the greatest impact, with sensors installed on agricultural machines, it is possible to obtain a soil information series, which can guide the actions of acidity correction, irrigation, and planting (Gilchrist, 2016).

Advances in precision agriculture, with sensors installed on equipment and networked, indicate that future agriculture should be increasingly supported by scientific knowledge, since the global population has grown over the years, where to feed in this population, the agricultural industry must embrace the IoT. Since technology can help in extreme weather conditions and increasing climate change, lessening the environmental impact resulting from intensive farming practices, generating a demand for more accurate food (Ahmad & Mahdi, 2018).

Intelligent agriculture, based on IoT technologies, will enable producers and farmers to reduce waste and increase productivity, from the amount of fertilizer used to the number of trips the farm vehicles produced. It can be considered as something that makes agricultural practice more controlled and precise when it comes to livestock and crop cultivation, wherein this approach to farm management, a key component is the use of IT and various items such as sensors, farming systems. control, robotics, autonomous vehicles, automated hardware, variable rate technology, and so on (Siddique, 2019).

The manufacturer's adoption of high-speed Internet access, reliable, low-cost mobile devices, and satellites used for imaging and positioning are key technologies that characterize the trend toward precision farming. Coupled with smart Internet-based agriculture of things, a system is built to monitor the field of cultivation with the help of sensors, capturing signals such as light, air humidity, temperature, soil moisture, among others, and can thus automate the system. Irrigation Giving farmers the ability to monitor field conditions from anywhere. IoT-based smart agriculture is highly efficient compared to the conventional approach (Jeschke, 2017).

IoT-based smart farming applications are not only intended for large conventional agricultural operations, but may also be new levers to lift other common or growing agricultural trends such as organic farming, family farming, ranging from complex or small spaces, private livestock, and livestock/or crops, even preserving particular or high-quality varieties, and improving highly transparent agriculture (Prathibha, 2017).

Making agriculture increasingly digital is a goal that depends on many factors ranging from creating solutions, connectivity to empowering the workforce. Since applications for more assertive decision-making by the farmer involve collecting thousands of data by sensors and robots or automated machines, high information and image processing, and analysis.

In terms of environmental issues, IoT-based smart agriculture can offer major benefits, including more efficient water use or optimization of inputs and treatments. Where drones are being used in agriculture to improve various agricultural practices as long as it has land and aerial applications are being used, assessing crop health, irrigation, crop monitoring, crop spraying, planting and soil, and field analysis. With key benefits from using drones from crop health imagery, integrated GIS mapping, ease of use, the potential to increase yields, and save time (Prathibha, 2017; Suma, 2017).