

# SMART TECHNOLOGY IN FARMING DEVELOPMENT

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## ABSTRACT

*The world is entering a period of economic uncertainty and the impact on global economic growth is ambiguous. In contrast, these uncertainties are balancing on emerging markets' growth prospects particularly in India. Agriculture has always been associated with the production of basic food crops. Agriculture and farming were synonymous so long as farming was not commercialised. But as the process of economic development accelerated, many other occupations allied to farming came to be recognised as part of agriculture. Agriculture is the primary source of livelihood for about 60% of India's population (Situation Assessment Survey of Agricultural Households, conducted by the National Sample Survey Office). The farming industry will become arguably more important than ever before in the next few decades. According to the UN Food and Agriculture Organization, the world will need to produce 70% more food in 2050 than it did in 2006 to feed the growing population of the earth (United Nations Food and Agriculture Organisation, 2012). To meet the growing demand, farmers and agricultural companies are embracing technology for analytics and greater production capabilities. In rural India, agriculture being one of the largest sources of livelihood is exposed to periodic droughts and floods, and farmers lack market access, marketing networks, and information systems. This paper conceptualizes smart farming effectiveness and the main lessons that emanate from this paper are that Internet of Things (IoT), combined with big data, provides farmers with a wealth of information that they can use to maximize productivity in the vulnerable environment and maintain the quality of food in the supply chain.*

**Key words:** Technology, Internet of Things (IoT), Internet of farm Things (IofT), Connected Farming, Drones, Sensors

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## 1. INTRODUCTION

Life in 2017 will be transformed by the development of multidisciplinary technology across all dimensions and the revolution of information availability and utility will continue to profoundly affect the world. As the world's population inches toward eight billion, the focus worldwide has shifted to feeding it in a sustainable way. It's estimated that 2.5 billion people live directly from agricultural production systems, either as full or part-time farmers, or as members of farming households that support farming activities (International Fund for Agricultural Development, and the United Nations Environment Programme, 2013). Agricultural technology is one of the most impactful fields of modern technology that drives the need for food to feed the growing population. The current world population of 7.3 billion is expected to reach 8.5 billion by 2030, 9.7 billion in 2050 and 11.2 billion in 2100 (United Nations Department of Economic and Social Affairs, 2015).

It has opened an era in which powered machinery does the work formerly performed by people and animals. With the coming of the Industrial Revolution and the development of more advanced machines, farming methods have taken a great leap forward. Instead of the traditional harvesting practices like sickles & blades, wheeled machines cut a continuous swath. Instead of threshing the grain by beating it with truncheons, threshing machines were used to separate the seeds from the stalks. These complex machines required a lot of power, originally supplied by bulls or other domesticated animals.

But, the invention of tractors has changed the way farming is done. Instead of cutting the grain stalks and transporting them to a stationary threshing machine, the modern tractors can now cut, thresh, and separate the grain while moving continuously through the field. Currently, mechanized agriculture also involves the use of airplanes, helicopters, drones (Unmanned Aerial Vehicles) & Internet of Things (IoT).

## 2. INTERNET OF THINGS

Technological innovation in farming is not a new concept. Handheld mechanisms were used hundreds of years ago followed by the Industrial Revolution which brought about the change. The 1800s brought the chemical fertilizers, grain elevators, and the tractor. In the late 1900s, farmers start using technology to plan their work. The Internet of Things (IoT) is set to push the future of farming to the next level. The Internet of Things is a concept that dates back to the end of last century and is related to connecting everyday objects to the Internet, but as technology continues to advance, it becomes more important in the disruptive innovation segment (BBVA Innovation Center, 2016). IoT is being driven by revenue growth across various sectors such as manufacturing, military, transportation and the agriculture. Most importantly IoT is transforming the agriculture sector by enabling the farmers to face their day to day challenges.

The industry must overcome increasing water shortages, limited availability of lands, difficult to manage costs while meeting the increasing consumption needs of a global population that is expected to grow by 70% by 2050 (Food and Agriculture Organization of the United Nations, 2009).IoT could play a crucial role in meeting this need and push the future of farming to the next level. Smart farming is already becoming the norm among farmers and is quickly gaining acceptance. When combined with big data, it can improve the efficient use of inputs like fertilizers and pesticides, monitor the livestock, predict diseases, scan the storage capacities like water tanks, and make sure that crops are fed and watered well. IoT applications in agriculture and Internet of farm Things (IoFT) will help farmers meet the world's food demands in the coming years.

### **3. INTERNET OF FARM THINGS**

The advancement in the technology ensures that the smart devices are getting sophisticated, smaller in size, highly secure and more economical. The primary objective of these connected devices is to ensure that important information is collected for future use. Though awareness about these connected devices has been created recently, there are progressive signs. Innovative practices like smart farming will be the answer to the problems that the agricultural sector is currently facing. Connected farming is the future of agriculture and this is possible by developing IoT across the agricultural sector.

The concept of connected farming will disrupt the agriculture sector and make the future of farming possible. Smart farming offers automated farming techniques, precision in crop control, and useful data collection. Internet of Farm Things (IoFT) can be used to monitor data on soil and crop condition and predict and prevent crop disease in real-time.

IoFT can make sure that the crops are fed and watered without any intervention. Smart agriculture is becoming common among farmers, and the usage of advanced techniques in farming is growing. A survey conducted last year by the American Farm Bureau Federation, a farm trade association, found that 39 percent of respondents in major corn- and wheat-growing states were using sensor--driven technologies on their farms (Internet of Farm Things, 2015).

This shift has been made possible by the proliferation of wireless networks in farm regions and the popularity of smartphones that can deliver information to farmers working in the fields. Tractor manufacturers have been fixing sensors on field equipment for a decade, making it possible to collect data like the topography of each field and the location and depth of each seed planted.

### **4. REAL TIME INFORMATION FOR HIGHER PRODUCTIVITY**

With real-time data, farmers can work in their vast land and monitor their assets across entities such as their field, machinery, and finance even without being physically present. IoT, combined with big data, further provides farmers with a wealth of information that they can use to optimize efficiency, maximize productivity, and maintain the quality of food in the supply chain - from the field to fork.

By developing IoT systems and using data collected from a variety of sensors can enhance the welfare of the livestock. Systems have to be put in place to ensure that all operations are being executed within the certain constraint that can alert farmers for any issues. For example, using IoT farmers can monitor the health of livestock and also track& establish their grazing patterns which will help to increase the yield.

### **5. ENHANCING IRRIGATION AND PRODUCTIVITY USING DRONES AND SENSORS**

Businesses can focus on improving the agri-industry. Using the contract farming model, businesses can help farmers by providing better quality information using IoT that aids better decision making. The solutions must primarily address two crucial issues prevalent which are irrigation and productivity in the agriculture space.

According to the United Nations Global Assessment Report, since 1900 more than 11 million people have died as a consequence of drought and more than 2 billion have been affected by drought, more than any other physical hazard. Using technology in agriculture, this problem can be resolved with assets such as drones, or unmanned aerial vehicles (UAVs).

Drones in agriculture are low-cost aerial camera platforms with an autopilot mode which uses GPS and sensors to collect relevant data using a regular camera for aerial visuals. A

regular camera can provide information about plant growth, coverage, and other things. However, a multi-spectral sensor expands the utility to its full potential. It allows a farmer to see things which cannot be seen in the visible spectrum, such as the moisture content in the soil and plant health. The use of drones in agriculture is expected to make up to 80% of the future commercial UAV market (Association for Unmanned Vehicle Systems International (AUVSI), 2013).

Drones or Unmanned Aerial Vehicles are used in data collection and analysis for precision farming. These vehicles and systems provide data to the farmers. Routine observation by drones can help farmers track problems faster and react more quickly, which can help in preventing crop losses. It can also help farmers to use fertilizers and pesticides at an optimum level thereby reducing costs and pollution of the water bodies. The data generated by drones can help to gain more accurate information of how crops are reacting to these techniques, which will lead the more effective use of resources available.

Real-time data about the soil, weather and moisture levels can help farmers make better-informed decisions about the sowing and harvesting of crops. This information can, therefore increase the overall yield of crops. Using IoT in their fields, farmers can collect relevant information directly from the source, and then use that information to gain insights and use those insights to overcome problems.

## 6. CONCLUSION

Despite being an agrarian nation India faces various challenges while applying IoT in agriculture. The application of technology requires the development of a whole ecosystem of government policies, good infrastructure, public funding and private entrepreneurship with a concerted and collaborative effort. Internet connectivity is one of the major challenges. Another challenge is the presumption about Indian farmers not being ready for the advanced technology. Thereby it results in drastically low awareness of IoT devices and systems amongst Indian farmers. The positive outcome is that the awareness of the benefits of smart farming and the applicability of IoT is slowly growing in the agricultural circuits. It is perceived that innovation in agriculture with connected farming will be the future of Indian agriculture. With the government initiatives like make in India and digital India- smart technology could be applied to make the best out of our agricultural potential.

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