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Smart Farming:
Key to Sustainable Agriculture

Farming is the ultimate activity that feeds the world and sustains the human race. But what is significantly different today is that farmers have the opportunity to function very differently from their earlier counterparts – thanks to smart technologies which are replacing traditional methods and bringing about widespread improvement in the fields.

Smart farming

Smart farming is all about the application of modern Information Communication Technology (ICT) into agriculture, paving the way for what can be called a third green revolution. Smart farming entails the use of mobile applications, big data, artificial intelligence and machine learning. The reason why smart farming is arguably one of the most critical developments of our times is because the world needs to produce 50 per cent more food by 2050 to feed the growing population. This is the reason why both farmers and agri companies are turning to smart technologies for analytics that will guide higher production levels. Agriculture is also facing a host of growing concerns such as climate change, limited arable land and high costs of inputs. In such a scenario, smart farming can come to the rescue – it can help innovate in the available landscape using a combination of technologies and methods, with ground-breaking results. Without it, ramping up production to the levels necessary may barely be possible. The particular aspect of smart farming is that it is an information-driven approach which calls for a great deal of observation. It is such observation that ensures that systems are economically and ecologically meaningful to achieve improved output in production.

Smart farming as a concept does not exist in isolation. Rather, it is strongly related to three interconnected technologies. The first is MIS (Management Information Systems) which collects, processes, stores and disseminates data needed to carry out operations and functions on the farm. The second is precision agriculture, which is the management of spatial and temporal variability to improve returns on investment, while creating minimal environmental impact.

Technologies Used

Smart farming as a concept does not exist in isolation. Rather, it is strongly related to three interconnected technologies. The first is MIS (Management Information Systems) which collects, processes, stores and disseminates data needed to carry out operations and functions on the farm. The second is precision agriculture, which is the management of spatial and temporal variability to improve returns on investment, while creating minimal environmental impact. The third is agricultural automation and robotics, which is the process of applying robotics, automatic control and artificial intelligence techniques to all levels of agricultural production. The combined application of ICT solutions include mobile applications, precision equipment, the IoT, sensors, geo-positioning systems, big data, drones, hyper-spectral images and robotics– bringing in not just spatial precision, but the smartest treatment too.

Historically, one may recall that earth observation had been used by farmers in the olden times, but the advancement in technology has ensured the collection of quality satellite data. Such technology provides scope for excellent time series data of characteristics such as biomass development, crop types, farming practices and calamities.

Smart technologies and the farmer

As a concept and practice, smart farming is quickly catching on in the agricultural business. High-precision crop control, useful data collection and automated farming techniques are some of the key features of a smart farm. Sustainability in agriculture can be achieved through proper use of data in decision making.

From the farmer's point of view, smart farming provides added value through support to decision making, and bringing in more efficient ways of operations and management.

Smart farming technologies have been adopted by big farms in developed economies having hundreds and thousands of hectares of land. They have used these technologies to optimise irrigation, early pest detection, yield estimation and even for crop insurance. IoT is used to measure soil moisture and optimize irrigation. But it's not that easy to apply these technologies in the developing countries, where the holding size of farms is an average of just 2 hectares.

We need to understand that agriculture as a sector has always faced an information challenge, and where traditional approaches are simply not enough to answer these questions, smart farming can.

Smart farming calls for complex information for better results – that's a prerequisite. Through the analysis of such information, it can help establish the fertility of a particular farm along with comparison of satellite images and use the data to determine the yield potential of a given land. Similar, when GPS technology is applied to tractors, farmers can transmit data on the vehicle's position, enabling the land to be cultivated uniformly, allowing huge savings on fuel. What these examples indicate is that just about every aspect of farming can benefit from technological advancements – from planting and watering to crop health and harvesting. When advanced technologies are integrated into existing farming practices, it can increase the production efficiency and the quality of agricultural products. With increase in demand for food and the need for sustainability, it is becoming necessary for farmers and other stakeholders to invest a lot in knowledge and more sophisticated machines and devices.

Smart farming and sustainability

Smart farming is a precise and resource-efficient method, so it has real potential to deliver higher productivity and sustainability in agricultural production. This is achieved through a combination of satellite data and ground truth data processed through advanced AI/Machine Learning Algorithms which can provide precise actionable advice so that farmers can make informed decisions. For eg, the use of soil moisture sensors helps farmers make decisions on how, where and where and when to irrigate thus reducing the costs. Trends indicate that the continued implementation of smart farming in agriculture will help mitigate some of the food security problems that many parts of the world are experiencing. Precision in the use of pesticides and fertilizers can help reduce leaching problems and release of harmful greenhouse gases to the environment. Overall, smart farming encourages the use of technology in site-specific weather forecasts, probability mapping of diseases and disasters, and yield projections. Smart farming comes with all these opportunities, and the added benefit of reducing ecological footprint.

Future of smart farming

As a concept and practice, smart farming is quickly catching on in the agricultural business. High-precision crop control, useful data collection and automated farming techniques are some of the key features of a smart farm. Sustainability in agriculture can be achieved through proper use of data in decision making. In fact, innovative farming is now considered to be an offshoot of data analysis and mathematics! Each day, as farmers grapple with a series of variables ranging from soil composition to climate change, proper analyses needs to be applied to come up with the right action plan. Smart farming has a lot of potential in making agriculture profitable and sustainable, reducing cost and resources and finally raising consumer acceptance.

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