Reshaping Agriculture with Technology

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Abstract

Agriculture is defined as the cultivation and exploitation of animals, plants (including fungi) and other forms of organic life for human use including food, fiber, medicines, fuel and anything else. It is, and has been since there was an agricultural market, one of the largest employers of people; in the USA today, agriculture represents 20% of the US economy. Before organized agriculture, it is believed that the food supply could provide for just 4 million people globally Even as technology changes, agriculture adapts and could never become obsolete - even in a time when it might conceivably be vastly different from what it might have been at the dawn of agriculture. After all, we are always going to need to increase the number of crops we grow for food and for clothing, dyes and oils, seed development and engineering to cope with the growing needs of the world's population, even if the picture is not as bleak as the most conservative concerns might suggest. Today, agriculture is as much a science as an art. With a need to cope with the growing needs of the planet's population, and to find ways to keep producing food and other crops as we expand into marginal landscapes, and adapt to a changing climate, changes in agriculture practices, food technology and bio technology will continue to be a big part of human civilization.

Introduction

Modern farming began around the 18th century in what is generally referred to as "The British Agricultural Revolution" when several advances and changes were made to farming in a short space of time that saw massive increases in yield and a more efficient process. The three field crop rotation system was replaced with a four field system and sweeping enclosure acts regulated land management, selective cross-breeding began on an industrial scale to increase crop size as well as yields creating several cultivars in the process. Animal husbandry also improved, leading to a greater surplus than had been permissible under the old system. It is said that these changes permitted the industrial revolution and even greater

concentration of urban development, fueling the empire. How so? More crops for fewer workers, better methods of keeping and replacing nutrients in the soil meant that more people could work in industry. When the Corn Laws in England were repealed, it began the global food economy; about the same time, Charles Darwin's Theory of Evolution put agriculture on the modern path of a science as we began to understand the development of crops.

Agriculture is continuously changing through innovation in science and technology. However, the agriculture industry continues to be called upon to produce more with finite resources. A major way to improve traceability, sustainability, and quality of goods from a farm is through the adoption of technology, including an integrated farm management platform. The concept of FMS (farm management solution) is an effective way to manage natural resources while keeping pace with modern technologies. Technology advancements on the farm, like an integrated FMS, extend a farmers' overall capacity, automate routine tasks normally done by people, and give farmers more time to do things computers can't. It's not a means to replace the personalized care farmers put into creating resources essential to human life, nor will the FMS determine the root cause of a problem in the field. A good FMS will include one-on-one expert support in farm management, crop marketing and agronomy.

Why Fms is an Important Concept To Discuss

- increase efficient farmer productivity
- Accurately apply chemicals and fertilizers by reducing over-application or under-application errors
- Reduce ground and surface water pollutions
- Decrease greenhouse gases emission and pollution
- Improve economic production
- Increase timeliness of operations
- Increase efficiency through accurate equipment communication
- Increase product quality.

It's believed that by 2050, the human population will reach almost 10 billion. As our current agricultural systems stand, we won't be able to generate enough food to feed this population without the use of technological innovations.

Several years ago, a group of advocates of smart farming technologies published a thesis on the application of such technologies in Brazil. "Technological development, such as the use of electronic systems and data transmission, has introduced radical changes to the agricultural working environment in recent years," the paper outlined, "Given the persistent food shortage and population growth around the world, it is estimated that a 70% increase in world food consumption must be achieved from 2009 to 2050. The technologies linked to smart farming will be important in meeting this challenge of increased food production in the face of constraints such as climate change and other environmental issues."

Some New Technologies In Agriculture

Innovation is more important in modern agriculture than ever before. The industry as a whole is facing huge challenges, from rising costs of supplies, a shortage of labor, and changes in consumer preferences for transparency and sustainability. There is increasing recognition from agriculture corporations that solutions are needed for these challenges. In the last 10 years, agriculture technology has seen a huge growth in investment, with in the last 5 years $6.7 billion invested and $1.9 billion in the last year alone. Major technology innovations in the space have focused around areas such as indoor vertical farming, automation and robotics, livestock technology, modern greenhouse practices, precision agriculture and artificial intelligence, and block chain.

Indoor Vertical Farming

Indoor vertical farming can increase crop yields, overcome limited land area, and even reduce farming's impact on the environment by cutting down distance travelled in the supply chain. Indoor vertical farming can be defined as the practice of growing produce stacked one above another in a closed and controlled environment. By using growing shelves mounted vertically, it significantly reduces the amount of land space needed to grow plants compared to traditional farming methods.

Farm Automation

IT is a technology that makes farms more efficient and automates the crop or livestock production cycle. An increasing number of companies are working on robotics innovation to develop drones, autonomous tractors, robotic harvesters, automatic watering, and seeding robots. Although these technologies are fairly new, the industry has seen an increasing number of traditional agriculture companies adopt farm automation into their processes.

New advancements in technologies ranging from robotics and drones to computer vision software have completely transformed modern agriculture. The primary goal of farm automation technology is to cover easier, mundane tasks. Some major technologies that are most commonly being utilized by farms include: harvest automation, autonomous tractors, seeding and weeding, and drones. Farm automation technology addresses major issues like a rising global population, farm labor shortages, and changing consumer preferences

Modern Green Houses

Greenhouses are framed or inflated structures covered with transparent or translucent material large enough to grow crops under partial or fully controlled environmental conditions to get optimum growth and productivity.

Advantages of greenhouses :

1. The yield may be 10-12 times higher than that of out door cultivation depending upon the type of greenhouse, type of crop, environmental control facilities.
2. Reliability of crop increases under greenhouse cultivation.
3. Ideally suited for vegetables and flower crops
4. Year round production of floricultural crops
5. Off-season production of vegetable and fruit crops.
6. Disease-free and genetically superior transplants can be produced continuously.
7. Efficient utilisation of chemicals, pesticides to control pest and diseases.
8. Water requirement of crops very limited and easy to control.
9. Maintenance of stock plants, cultivating grafted plant-lets.

The Greenhouse industry has been transforming from small scale facilities used primarily for research and aesthetic purposes (i.e., botanic gardens) to significantly more large-scale facilities that compete directly with land-based conventional food production. Combined, the entire global greenhouse market currently produces nearly US $350 billion in vegetables annually, of which U.S. production comprises less than one percent.

Blockchain

Blockchain's capability of tracking ownership records and tamper-resistance can be used to solve urgent issues such as food fraud, safety recalls, supply chain inefficiency and food traceability in the current food system. Blockchain's unique decentralized structure ensures verified products and practices to create a market for premium products with transparency.The structure of blockchain

ensures that each player along the food value chain would generate and securely share data points to create an accountable and traceable system.

Digital Agriculture

Remote sensors, satellites, and UAVs can gather information 24 hours per day over an entire field. These can monitor plant health, soil condition, temperature, humidity, etc. The amount of data these sensors can generate is overwhelming, and the significance of the numbers is hidden in the avalanche of that data. Remote sensors enable algorithms to interpret a field's environment as statistical data that can be understood and useful to farmers for decision-making. Algorithms process the data, adapting and learning based on the data received