



Artificial Intelligence in Agriculture

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INTRODUCTION

On the back of increased FDI and conducive government initiatives, the agriculture sector is increasingly looking at ways to leverage technology for better crop yield. Many technology companies and startups have emerged in the past few years with targeted agri-based solutions that benefit the farmers. Artificial intelligence (AI) is the best technological solution to cope with the rising population and global climatic changes. AI is expanding its significant effects on world's top important sector called Agriculture. AI in agriculture is proved to be a cutting-edge technology in getting high productivity and better crop yield. Agriculture and cultivation industry involve in generating \$330 billion annually to boost the economy according to the Environmental Protection Agency (EPA) Report. The world's population will cross 9.1 billion people and need 70% more food than required today in 2050. On the other hand, it will leave only 4% of the planet Earth to be cultivated for sustaining life. People should be more creative in developing farms in limited space and getting high yields of a quality product. Artificial intelligence in agriculture helps to control pests, organize farming data, produce healthier crops, reduce workload, and many more.

Applications of AI in Agriculture

Artificial Intelligence (AI) is used in many different industries, From manufacturing to automotive, One of the most interesting industries that AI is breaking into is agriculture, Agriculture is a major industry and a huge part of the foundation of our economy, As climates are changing & populations are increasing, AI is becoming a technological innovation that is improving & protecting crop yield.

The most popular applications of Artificial Intelligence in agriculture industry are three major categories which are Agricultural Robots, Predictive Analytics, Crop & Soil Monitoring, Computer vision & deep-learning algorithms are used to process data captured by drones and/or software-based technology to monitor crop & soil health, Machine learning models are used to track & predict various environmental impacts on crop yield such as weather changes.

Agricultural robots

Agricultural Robots are useful for the harvesting the crops which makes the work faster, and easier to pick the produce and at a low cost, Robots are useful for the labour involvement and reduce the price to farmer. Agricultural robots can protect crops from harmful weeds that may be resistant to herbicide chemicals that are meant to eliminate them.

Automation & Robots can protect the crops from the weeds, A robot called See & Spray reportedly leverages computer vision to monitor & precisely spray weeds on cotton plants, Automation eliminates 80% of the volume of chemicals normally sprayed on crops. Automation can help address challenges in the labor force, The industry is projected to experience a 6% decline in agricultural workers from 2014 to 2024, Robot mounted with a camera and a laser scanner can predict the expected yield. Lack of laborers has led to millions of dollars of revenue losses in key farming regions.

Robots can do a work of 30 human laborers, and they can harvest nearly 8 acres in one day. An estimated 40% of annual farm costs are funneled into “wages, salaries and contract labor expenses” for crops such as fruits and vegetables where labor needs tend to be the highest.

Plantix app

This app will identify potential defects & nutrient deficiencies in soil. The app uses images to detect plant diseases, the image recognition app can identify possible defects

through images captured by the user’s Smart phone camera, the farmers can participate in the online community to network with other farmers to discuss plant health issues and access their local weather reports.

Plantix can diagnose plant diseases, pest damages and nutrient deficiencies affecting crops and offers corresponding treatment measures, Users are provided with soil restoration techniques, Analysis is conducted by software algorithms which correlate particular foliage patterns with certain soil defects, plant pests & diseases.

Drones

These are newly highly advanced of aerial spraying of pesticides, and other chemicals where it reduces the cost of cultivation by reducing the labors, many herbicides and other chemicals, can be sprayed which are harmful to human being and even there is no alley ways to spray they are very helpful.

Drone technology helps users improve their crop yield & reduce costs, Users pre-program the drone’s route and once deployed the device will leverage computer vision to record images which will be used for analysis, AI & aerial technology can monitor crop health, When the drone completes its route, users can transfer a USB drive from the drone to the computer and upload the captured data to a cloud drive, It can use algorithms to integrate & analyze the captured images and data.

Drones can capture high standard images which can be useful analyzing the data. These image technology can be useful for the analyzing where the weeds has been present and whether the crop has reached to harvesting stage or not and height of the plant can be analyzed. Imaging technology can assist with overall field management, providing estimates in real-time identifying where specific crops may require more water, fertilizer, soil or pesticides, Machine learning is used to provide an analysis of crop or soil health.

They can provide an insight for the crop strength and weakness of the crop. One of the main intention was to eliminate the weed crops

and gives potentiality to main crop for growing healthy.

By using the agriculture drones we can monitor the crop growth and increase the yield. Data given by drones will be helpful for monitoring crop growth at every stage and can analyze the yield.

They allow farmers see their fields from the sky, this birds-eye view would expose intending issues on the farm such as irrigation problems, soil variation as well as pest and fungal infestations, Having identified these issues, the farmer can come up with solutions to improve crop management and production.

This will provide accurate data i.e when to irrigate and stage of crop and wasting of time by moving all over the field. This drone is mounted with a sensor that uses the same wavelength, the same science as a satellite so literally it is like we are capturing satellite data at greater detail.

For capturing the data extension workers have been trained to finding the data on the fields and they can capture the image data which was invisible to human eyes and they can detect the changes in the

Government's Initiative to Include Drones in Agriculture

A recent government incentive provides payments to state-run institutions that make owning farm drones nearly cost-free. Farmers' Producers Organizations or large collectives can obtain funding up to 75 percent of the cost of the drone for demonstrations.

The government has also set aside Rs 6,000 per acre as a contingency fund for implementing agencies that do not want to buy drones but want to hire them for demonstrations "The contingency expenditure to implementing agencies for drone demonstrations would be capped at Rs 3,000 per acre. These grants for the promotion of drone technologies will be available till March 31, 2023", an official quoted.

Drone hiring centers will also receive special funding to provide agricultural services

through drones. This includes 40% of the basic cost of drone and its attachments or Rs 4 lakh, whichever is lower.

Driverless tractors

It is an driverless tractor i.e autonomous farm vehicle which delivers a high effort at low speeds which will use for the tillage operation and it works without human being. They can optimize the work which can reduce the stress on the labour and work can be done faster.

They are programmed in advance where the data has been feed and to avoid the obstacles, human beings, animals and will be monitored by a supervisor at a distance.

Although at present they are not using in India it costs more and many of the farmers are not affordable.

Precision Farming

The phrase "Right Place, Right Time, Right Product" sums up precision farming. This is a more accurate and controlled technique that replaces the repetitive and labor-intensive part of farming. It also provides guidance about crop rotation; Key technologies that enable precision farming are give below:

Precision farming uses Artificial intelligence to generate accurate and controlled techniques that help offer guidance & understanding about water and nutrient management, optimal harvesting and planting times as well as when the right times for crop rotation would be, These processes make farming more efficient, and can help predict ROI on specific crops based on their costs and margin within the market.

Improved ROI

By including data, for example, climate conditions, kind of soil, commercial centers, potential invasions, and information in the algorithm, artificial intelligence, can decide the best seeds to utilize and assist farmers maximize production, This can improve the ROI (Return on Investment) for all farms, AI innovation can process investigations that help farmers minimize losses in the production supply chain of their farms.

Soil testing

Two technologies that stand for intelligent data fusion are Proximity Sensing and Remote Sensing. One use case of this high-resolution data is soil testing. While remote sensing requires sensors to be built into airborne or satellite systems, proximity sensing requires sensors in contact with soil or at a very close range. This helps in soil characterization based on the soil below the surface in a particular place.

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