# FROM SOIL TO SOFTWARE:

## THE AI REVOLUTION IN FARMING

***Rajesh Kumar[1], Ankita Kumari[2] and Dr. Megha Panwar[3]**
Department of Horticulture,
Doon (PG) College of Agriculture Science and Technology,
Dehradun

Agriculture and Artificial Intelligence (AI) words seem vastly different, but actually they can work together. Agriculture is focused on producing foods and managing the earth land, while AI involves combined computer systems and problem-solving methods. AI is based on the principle that human intelligence can be defined in a way that a machine or robot can easily mimic it and observe tasks, from the understanding to those that are even more complex. The goals of AI include learning, reasoning, and understanding.

With the world population growing rapidly, traditional farming methods may not be sufficient to fulfill the demand. AI can be used to help farmers in different ways, such as monitoring crops, irrigation, and pest control using sensors and robots. This can helps us to save resources, increase efficiency, and improve productivity and quality. AI has become an important tool for solving agricultural problems and helping experts worldwide search better solutions.


# APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN AGRICULTURE

Agriculture sector is turning to AI technologies to help yield healthier crops, control insect-pests, monitor soil properties, and growing conditions, organize data for farmers, help with the workload, and improve a wide range of agricultural related tasks in the overall food supply chain.

## A. Use of weather forecasting

With the change in climatic conditions and increasing pollution in environment, it is difficult for farmers to determine the proper time for sowing seeds. With the help of AI, farmers can analyze weather conditions using weather forecasting data which helps them plan the type of crop that can be grown in field and correct time when the seeds should be sown.

## B. Soil and crop health monitoring system

The type of soil and essential nutrient of soil plays an important factor in the type of crop is grown and the quality of the crop. Due to increasing deforestation day by day, soil quality is degrading and it is hard to determine the quality of the soil. A German-based tech startup Progressive Environmental and Agricultural Technologies (PEAT) has developed an AI-based application called Plantix that can identify the nutrient deficiencies in soil including plant insect-pests and diseases by which farmers can also get an idea to use fertilizer for control which helps to improve harvest quality of food. This app uses image recognition-based technology. The farmer can capture images of deficit plant part using their Smartphone's. We can also see soil reclamation techniques with tips and other best solutions through short videos on this application.

Fig. 2 Monitoring soil and crop health in field

## C. Analyzing crop health by drones

SkySquirrel Technologies has brought drone-based Ariel imaging technology for monitoring crop health. In this technique, the drone captures data in air from fields, and then transfers the capture data via a USB drive from the drone to a computer and analyzed by experts. This company uses algorithms to analyze the captured images and provide a detailed report containing the current health of the farm and proper solution. It helps the farmer to identify insect-pests and bacteria and helping farmers to timely control of insect-pest and other methods to take required action.

## D. Precision agriculture and predictive analytics

Agri-based AI startups have developed applications and tools that help farmers with correct and real-time farming advice. These apps provide them with proper guidance about plant and soil health, water management, pesticide usage, sustainable agriculture farming techniques, and plant and soil nutrient management. They also teach farmers on crop rotation, timely harvesting, type of crop to be grown according to climatic condition and optimum planting, based on the different cropping seasons. In the future, AI will help farmers to evolve into agricultural technologists, using data and new technologies to improve yields down to individual rows of plants.

## E. Agricultural robotics

AI companies are developing robots that can easily perform multiple tasks in farming fields and helps farmers. This type of robot is trained to control weeds and harvest crops at a high speed with higher volumes compared to humans. These types of robots are trained to check the quality of food crops and detect weeds with picking and packing of crops at the same time. These robots are also capable to survive the challenges faced by agricultural labor.

Fig. 4 Agricultural robot working in field

Artificial intelligence has rapidly developing beyond machines and enterprises, to improve agricultural system and maintaining the world's food system. AI greatly helps farmers in data-driven, decision-making and improving their farming practices. It guides farmers to shift to sustainable agriculture and precise cultivation for higher crop yield and better quality while using fewer resources.

Tech companies in the agricultural industry are working on improving AI tools or services that will provide more useful applications to farmers for getting good quality and high yield of crops. AI will thus help the world by solve food production issues for the growing population.

## F. AI-enabled system to detect pests

Pests are one of the worst enemies of the farmers which harmful for crops. AI systems use satellite captured images and evaluate them with mythological data using AI algorithms to detect any insect landings and the type of insect landed like the locust, grasshopper, etc. And send alerts to farmers on their Smartphone's so that farmers can take immediate required precautions and use required pest control thus AI helps farmers to fight against pests.

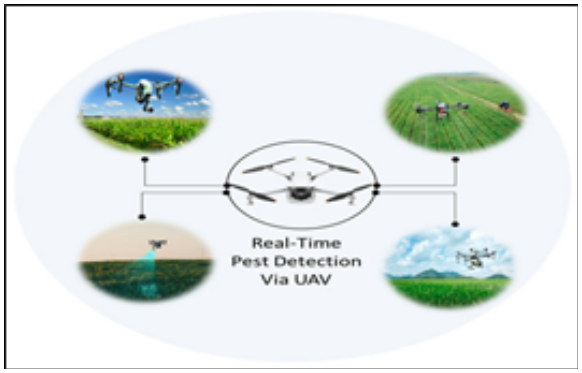


Fig. 5 UAV-based early pest detection system