

ARTIFICIAL INTELLIGENCE: PREDICTIVE ANALYTICS TOWARDS FUTURE FARMING TRANSFORMING THE AGRICULTURE INDUSTRY

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Agriculture is one such critical area, with 30.7 percent of the world's population directly working on 2781 million hectares of agricultural land. Pest and disease infestation, inappropriate chemical application, improper drainage and irrigation, weed management, yield prediction, and other challenges are key concerns. According to the FAO, plant pests and diseases cause up to 40% of crop yield reductions each year around the world. Weeds can cause billions of dollars in economic losses and a 50% reduction in output if they are not controlled. Agrochemicals are essential for maintaining plant development while also managing diseases, pests, and weeds, ensuring food production. Targeted application of such inputs guarantees efficient crop production while also reducing input waste. However, farmers sometimes have incomplete knowledge about field conditions at small sizes, especially if they farm hundreds or even thousands of hectares, making this a difficult endeavour. As a result, new types of technologies are needed to offer this type of information to farmers. In recent years, farmers have become more interested in using digital technologies to better focus crop inputs.

INTRODUCTION

One of the most important areas of computer science research is artificial intelligence (AI). It is rapidly becoming prevalent due to its robust applicability in situations that cannot be solved well by people or traditional computing architectures, as well as its rapid technological improvement and broad range of applications. Artificial intelligence aims to improve learning, reasoning, and perception. Agriculture has a significant impact on the economy. In 1983, the first mention of computers in agriculture was made. To overcome the existing difficulties in agriculture, various ways have been proposed, ranging from databases to decision support systems. Systems that use AI have been determined to be the most excellent performers in terms of accuracy and robustness among these solutions. Agriculture is a dynamic domain in which it is impossible to generalise conditions in order to propose a common answer. We've been able to capture the fine details of each case using AI approaches, and then deliver the optimum solution for that problem.

FARMERS THAT USE TRADITIONAL FARMING METHODS CONFRONT THE FOLLOWING CHALLENGES:

- Climate change is a result of increasing deforestation and pollution, making it difficult for farmers to make judgments about how to prepare the soil, sow seeds, and harvest.
- Each crop necessitates a certain type of soil nutrition. Nutrient insufficiency can cause crops to be of poor quality.
- If weeds are not controlled, they can increase production costs and consume nutrients from the soil, resulting in nutrient deficit in the soil.





Artificial Intelligence

Applications in Agriculture:

AI is being used by the agriculture industry to help produce healthier crops, control pests, monitor soil and growing conditions, organise data for farmers, reduce effort, and improve a wide range of agriculture-related tasks along the food supply chain.

Soil and crop health monitoring system:

PEAT, a German tech start-up, has developed Plantix, an AI-based application that can detect nutrient deficits in soil, as well as plant pests and diseases, and provide farmers advice on how to use fertiliser to increase harvest quality. Image recognition technology is used in this app. Smartphones can be used by the farmer to photograph plants. Farmers can use such an app to track the quality of their soil and crops, resulting in healthier, more productive crops.

Weather forecasting:

Farmers can analyse weather conditions, which helps them plan the type of crop that can be grown and when seeds should be sown, with the help of Artificial Intelligence. With the change in climatic conditions and increasing pollution, it's difficult for farmers to determine the right time for sowing seed.

To save the bees:

Technology can be leveraged to help save the bees in a similar way that it is applied to other innovative projects. Human ingenuity and innovations such as wireless technologies, robotics, and computer vision could deliver new insights and solutions to the issue. The sounds that a hive makes are one of the most important indicators of its health. The ability to "listen" to the hives in order to evaluate colony health, strength, and behaviour, as well as collect temperature, humidity, apiary weather conditions, and hive weight, is critical to the data-gathering activities. Hornets, which can

pose a threat to bee numbers, can also be detected using the sound and vision sensors. The data is subsequently sent to Oracle Cloud, where AI algorithms analyse the information. The algorithms will search for trends and attempt to forecast hive behaviour, such as if it is about to swarm. The information is then shared with beekeepers and conservationists, who can intervene to help save the hives.

Use of AI in sericulture:

Reshamandi is a silk Agritech start-up that uses artificial intelligence, cloud platforms, and sensors to help sericulture farmers enhance their silk production and quality. ReshaMandi's app allows silk industry participants to buy and sell their products directly. Farmers can make an appointment with ReshaMandi at the farmgate to collect their cocoons. Weavers, reelers, and retailers can use the app to place orders for cocoons or yarns. It has a real-time market value for silk cocoons to keep farmers informed about price swings, bringing transparency to the process and preventing it from exploitation.

Drones for crop health analysis:

SkySquirrel Technologies has introduced drone-based Aerial imaging tools for agricultural health monitoring. In this method, the drone collects data from fields, which is subsequently sent to a computer via USB drive and examined by experts. This

company analyses the taken photographs with algorithms and provides a full report on the farm's current health. It assists farmers in identifying pests and bacteria, allowing them to utilise pest management and other ways in a timely manner.

Precision Farming and Predictive Analytics:

AI applications in agriculture have developed applications and tools that assist farmers in performing accurate and controlled farming by providing proper guidance on water management, crop rotation, timely harvesting, type of crop to be grown, optimum planting, pest attacks, and nutrition management. AI-enabled technologies predict weather conditions, analyse crop sustainability, and evaluate farms for the presence of diseases or pests, as well as poor plant nutrition, using data such as temperature, precipitation, wind speed, and solar radiation in combination with machine learning algorithms and images captured by satellites and drones.

Pest-detection system powered by AI: AI systems analyse satellite photographs and compare them to previous data to determine whether any insects have landed and, if so, what species of insect has landed (locust, grasshopper, etc.). And send notifications to farmers' smartphones so that they can take the necessary measures and employ the necessary pest management, allowing AI to assist farmers in their pest control efforts.

CONCLUSION:

Farms of all sizes are using equipment, artificial intelligence, and automation to produce adequate food while using less natural resources. In practically every industry, AI-based digital technologies are improving decision-making. Farmers may utilise a sophisticated mix of data, analytics, hardware and software, and unique algorithms to make informed decisions about their operations that go beyond what the eye can perceive. AI can also assist farmers in choosing the best seeds, applying crop protection precisely where it is needed, and diagnosing plant diseases that threaten their crops in real time. Companies that improve machine learning or Artificial Intelligence-based products or services, such as training data for agriculture, drones, and automated machine manufacturing, will benefit from technological advancements in the future, which will help the world deal with food production issues for a growing population.