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BOOK CHAPTER ON ARTIFICIAL INTELLIGENCE IN MANAGEMENT AND COMMERCE



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AI IN AGRICULTURE MARKETING: CHALLENGES, BENEFITS, START UPS

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ABSTRACT

Technology has redefined farming over the years and technological advances have affected the agriculture industry in more ways than one. Agriculture is the mainstay occupation in many countries worldwide and with rising population, which as per UN projections will increase from 7.5 billion to 9.7 billion in 2050¹, there will be more pressure on land as there will be only an extra 4% of land, which will come under cultivation by 2050. This means that farmers will have to do more with less. According to the same survey, the food production will have to increase by 60% to feed an additional two billion people. However, traditional methods are not enough to handle this huge demand. This is driving farmers and agro companies to find newer ways to increase production and reduce waste. As a result, Artificial Intelligence (AI) is steadily emerging as part of the agriculture industry's technological evolution. The challenge is to increase the global food production by 50% by 2050² to feed an additional two billion people. AI-powered solutions will not only enable farmers to improve efficiencies but they will also improve quantity, quality and ensure faster go-to-market for crops.

INTRODUCTION

Every day, farms produce thousands of data points on temperature, soil, usage of water, weather condition, etc. With the help of artificial intelligence and machine learning models, this data is leveraged in real-time for obtaining useful insights like choosing the right time to sow seeds, determining the crop choices, hybrid seed choices to generate more yields and the like.

AI systems are helping to improve the overall harvest quality and accuracy – known as precision agriculture. AI technology helps in detecting disease in plants, pests and poor nutrition of farms. AI sensors can detect and target weeds and then decide which herbicide to apply within the region. This helps in reduced usage of herbicides and cost savings. Many technological companies developed robots, which use computer vision and artificial

intelligence to monitor and precisely spray on weeds. These robots are able to eliminate 80% of the volume of the chemicals normally sprayed on the crops and bring down the expenditure of herbicide by 90%. These intelligent AI sprayers can drastically reduce the number of chemicals used in the fields and thus improve the quality of agricultural produce, and bring in cost efficiency.

USING AI FOR PREDICTIVE ANALYTICS – ENABLES RIGHT DECISION-MAKING

PREDICTING THE BEST TIME TO SOW

The difference between a profitable year and a failed harvest is just the timely information on a simple data point of timing of sowing the seed. To combat this, scientists of ICRISAT used a predictive analytics tool to arrive at a precise date for sowing the seeds to obtain maximum yield. It even gives insights on soil health and fertilizer recommendations in addition to a 7-day weather forecast.

CROP YIELD PREDICTIONS AND PRICE FORECASTS

For many farmers, the biggest worry is the price fluctuation of the crop. Due to unstable prices, farmers are never able to plan a definite production pattern. This problem is highly prevalent in crops like tomatoes that have very limited shelf time. Companies are using satellite imagery and weather data to assess the acreage and monitor crop health on a real-time basis. With the help of technologies like big data, AI and machine learning, companies can detect pest and disease infestations, estimate the tomato output and yield, and forecast prices. They can guide the farmers and governments on the future price patterns, demand level, type of crop to sow for maximum benefit, pesticide usage etc.

Innovative startups are using AI in the field of agriculture. A Berlin-based agricultural tech startup developed a multi-lingual plant disease and pest diagnostic app, which uses various images of the plant to detect diseases; a smartphone collects the image that is matched with a server image and then a diagnosis of that particular disease is provided and applied to the crop using intelligent spraying technique. In this way, the application uses AI and ML to solve plant diseases. Over seven million farmers have downloaded this app and it has helped identify over 385 crop diseases among field crops, fruits, and vegetables.

CHALLENGES IN AGRICULTURE USING TRADITIONAL METHODS

Before understanding AI impact and application in Agriculture, we must understand what are the challenges in agriculture by using traditional methods, which are given below:

- In farming, different weather factors such as Rainfall, temperature, and humidity play an important role. Due to pollution, sometimes climate varies abruptly, and hence it becomes difficult for farmers to make proper decisions for harvesting, sowing seeds, and soil preparing.
- For a better crop, it is necessary that the soil should be productive and have the required nutrition, such as Nitrogen, Phosphorous, and Potassium. If these nutrients are not present in effective way in the soil, then it may lead to poor quality crops. But it is difficult to identify these soil-quality with traditional ways.
- In the agriculture lifecycle, it is required that we save our crops from weeds. Else it may increase the production cost, and it also absorbs nutrients from the soil. But by traditional ways, identification and prevention of crop from weeds is not efficient.

AI START-UPS IN AGRICULTURE

Prospera:

It is an Israeli start-up founded in the year 2014. This company creates intelligent solutions for efficient farming. It develops cloud-based solutions that collect all the data from the fields such as soil/water, aerial images, etc. and combine this data with an in-field device. This device is known as the Prospera device, and it makes insights from this data. The device is powered by various sensors and technologies such as computer vision.

Blue River technology:

Blue-River technology is a California-based start-up that has started in the year 2011. It develops next-generation agriculture equipment using AI, computer vision, and robotics technology. This equipment identifies individual plants using computer vision, ML decides action, and with robotics, the action is performed. This helps the farmers to save costs and chemicals in farming.

FarmBot:

Farmbot is an open-source CNC precision farming machine and software package, which is developed to grow crops by anyone at their own place. The complete product "Farmbot" is available at a price of \$4000, and it enables anyone to do complete farming ranging from seed plantation to weed detection on their own with the help of a physical bot and open-source software system. It also provides a webapp that can be downloaded on any smartphone or computer system and allows us to manage farming from any place at any time.

Fasal:

The use of AI in the agriculture industry is increasing day by day in various places across the world. However, agriculture holdings per farmer in the poorer region is less compared to the rich region, which is advantageous for automated monitoring as it requires a lesser number of devices with low bandwidth and size to capture the complete agriculture data. In this field, the Indian start-up Fasal is working. It uses affordable sensors and AI to provide real-time data and insights to farmers. With this, farmers can be benefitted from real-time, actionable information relevant to day-to-day operations at the farm. The company's devices are easy to implement for small places. They are developing AI-enabled machines to make precision farming that can be accessible by every farmer.

OneSoil:

Onesoil is an application that is designed to help farmers to take a better decision. This app uses a machine-learning algorithm and computer vision for precision farming. It monitors the crops remotely, identifies problems in the fields, check the weather forecast, and calculate nitrogen, phosphorus, and potassium fertilizer rate, etc.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN AGRICULTURE**USE OF WEATHER FORECASTING**

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

SOIL AND CROP HEALTH MONITORING SYSTEM:

The type of soil and nutrition of soil plays an important factor in the type of crop is grown and the quality of the crop. Due to increasing, deforestation soil quality is degrading and it's hard to determine the quality of the soil.

A German-based tech start-up PEAT has developed an AI-based application called Plantix that can identify the nutrient deficiencies in soil including plant pests and diseases by which farmers can also get an idea to use fertilizer which helps to improve harvest quality. This app uses image recognition-based technology. The farmer can capture images of plants using smartphones. We can also see soil restoration techniques with tips and other solutions through short videos on this application.

Similarly, Trace Genomics is another machine learning-based company that helps farmers to do a soil analysis to farmers. Such type of app helps farmers to monitor soil and crop's health conditions and produce healthy crops with a higher level of productivity.

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CONCLUSION

Artificial Intelligence in agriculture not only helping farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality while using fewer resources. Companies involved in improving machine learning or Artificial Intelligence-based products or services like training data for agriculture, drone, and automated machine making

will get technological advancement in the future will provide more useful applications to this sector helping the world deal with food production issues for the growing population.

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