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Artificial intelligence in agriculture

Priyanka

Ph.D. Research Scholar, Department of Vegetable Science

Punjab Agricultural University, Ludhiana

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Introduction

Agriculture plays an important role in India's economy. In the previous decades, the meaning of agriculture is only limited to producing plants but with progress, agriculture is extended to the processing and marketing of crops (Fan et al. 2012). With the increasing population, it is important to look for new ways of increasing productivity efficiently. In 2050, the world's population will be increased up to 9.7 billion people, which ultimately increases the need for food to be produced (FAO, 2017). This requires the adoption of new technologies which will increase food productivity. Agriculture is the new emerging sector in artificial intelligence (AI). It can combat the increasing population's requirement for food. Along with that, there is an emerging issue, a climatic change that can be satisfied by artificial intelligence. AI can be used in irrigation, planting, weeding, herbicides- pesticide spraying, crop monitoring, and health assessment, etc. With the help of AI, judicious use of herbicides and insecticides can be done. It also has the advantage of minimal residue development in the crops which becomes very important from a health point of view. Artificial intelligence had become a friend of farmers. It is now possible to perform those work that was not feasible before this. Being the 2nd largest populated country and with an increasing economy, India can go very far in artificial intelligence. The goal of artificial intelligence is not to replace farmers or workers in the field but to make operations much easier which was not possible before. AI can provide tremendous job opportunities to our youth.

What is artificial intelligence?

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Artificial intelligence, a term coined by John McCarthy in 1956. AI is machine learning and utilizes human intelligence as its basic principle. E.g. Human beings remember things based on their happening. Previously, it is just regarded as a branch of computer science with limited access to different sectors. But in the 21st century, it emerges as a fast development tool in the field such as agriculture.

India and Artificial intelligence:

Indian agriculture is highly dependent on climatic factors such as monsoon. Artificial intelligence can give a better or accurate idea of weather and crop to be cultivated. The appreciated effort has been done by ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) in collaboration with Microsoft. They developed an app namely the AI sowing app which provides information about the accurate time of sowing of seeds for increasing yield. This app utilizes data of crop, weather, and rainfall and guide or advises farmers in their native language. The government of India had also taken an initiative by signing MoU with IBM to utilize AI in agriculture. It will give useful information to the farmers about weather forecasting, selecting crops and will improve the outlook of farming. There is a project named Maha Agri Tech project-based in Maharashtra which utilizes AI for reducing the various risk involved in agriculture as Maharashtra is very prone to weather alterations.

Applications of AI in agriculture:

Artificial intelligence technologies such as drones and robots have revolutionized the agriculture sector. Apart from that, it is used in predictive analysis such as time of sowing, assessment of risks.

Use of robots

The use of robotics in agriculture can increase productivity. Eli Whitney's cotton gin is the first machine invented in 1794 and was used for the removal of seed from the fiber of cotton. This changes the outlook of seed extraction and is the starting point of robotics in agriculture (Talaviya *et al.* 2020). Robots used in agriculture are based on GPS (Global Positioning System) and can be navigated with maps on the farm. Robots are being used for performing different operations right from planting to harvesting. Harvesting some crops like strawberries, tomatoes, etc. is a labor-based process. These crops are very specific of their

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harvesting stage and if farmers fall short of labor, there will be a huge loss to the farmers. Due to the bigger market of some crops, there is a development of machines which harvest many fruits in a short interval of time. E.g Agrobot is a company, whose strawberry harvester can complete 20 acres in three days as published by CNBC. Robotics does not involve the use of herbicides for weed control. These machines just pick out weeds. AI includes technologies that distinguish between crop and weed with the help of sensors.

Uses of drones

Drones are known as unmanned aerial vehicles. In precision agriculture, Drones take very close pictures of the grown crop and it is very useful in various aspects such as assessing the irrigation requirement, identifying insect pests and diseases in the crop. It can collect a large amount of data in a short time and convert it into useful information with the help of smart software. As in the case of diseases, the huge loss can be prevented if diseases will be detected at early stages. Thereafter, drones can also be used for spraying pesticides, it covers a maximum area with lesser use of the product and enhances efficiency (Kim *et al.* 2019). The use of drones for weed control helps in reducing herbicide use by utilizing minimum herbicide. Another operation, planting can also be performed using drones, however, it is in the developmental stage. The idea is that drones dispersed the seeds from a particular height and also provide pictures of the operation. Crop monitoring is an important operation in achieving the desired yield of the crop while it is tough to perform when the area is large and time is minimum. Advancement in sensors had made the crop monitoring process easy and affordable. For example low-cost system consisting of two cameras, one is the normal camera and another is sensitive to Infrared radiation had been developed for assessing crop health by taking images and processed by software (De Oca *et al.* 2018)

Conclusion: Agriculture productivity can be increased by innovation. Innovation in form of robotics and drones can reshape the farming experience. AI ensures better quality, the better yield of the crop, and can also protect from various risks. So, it can be incorporated with available resources for better yield. However, there are tremendous aspects and use of artificial intelligence in agriculture that remained uncover in this article.

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