

Aeroponics: The Future of Crop Production**Mousumi Malo**

Assistant Director of Agriculture, Group A (Gazetted Officer), WBAS Administration, Government of West Bengal

SUMMARY

In the modern world, there is no need to spend days and nights on farms to combat pests and weeds. Artificial organizations are working to develop robots exceptional in performing multiple tasks in real-time. They made them expert in controlling weeds and harvesting the crop in fields. The AgBot do their work at a faster speed with high accuracy than humans. Artificial Intelligence (AI) plays a vital role in boosting agriculture and farming thus helping agriculture-based economies to grow. Agriculture can take benefit from the emerging technologies like AI-based Automated Robotic Systems to optimize irrigation, crop monitoring, farming, automate spraying and optimize the exercise of pesticides and herbicides. Many mobile applications are available that leverage the power of AI to facilitate farmers by offering a variety of functions from better trade opportunities to controlling and boosting the fields yield.

INTRODUCTION

Artificial intelligence (AI), today our eardrums are not left untouched by this word. 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). 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. AI defines its meaning by itself i.e., man-made intelligence. AI refers to ingraining of intelligence in machines which enables them to learn, think, behave and mimic like humans. 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 In 1956 AI got recognition as an academic field and from then it has been growing and touching every sector of the economy. Machine learning, robotics, deep learning are some sub set of AI.

- ANI- Also known as “weak AI”, and its performance is limited to a single task. Example- Alexa by Amazon, Chat boats
- AGI- It represents general human ability in software. Scientists are still working on it
- ASI- More advance AI which perform better than human. It is a hypothetical AI

AI in farming

Why is there a need of AI? About 55% of cultivable land in India depends upon rainfall. Sowing is delicate relation between water and soil where time management and accuracy decide the yield. Just a week delay in rainfall can affect the profit of the farmer. The farmer brings all his past experience and knowledge from previous generation into play and predict the right time for sowing. In every field operation, farmer apply these three steps i.e., “Sense, Think, Act”. In the first step farmer sense the problem, in the second he thinks of the right combination of the solution, and in third, he acts upon it and this imprecise manual forecasting becomes a reason for their low return to some extent.

While on other hand, population of India is assumed to be nearly 1.63 billion by 2050 and will shove farmers in trouble where it will become impossible for them to make a balance between both increasing population and food demand without the adoption of new technology and automation which is always a concern for Indian farmers. Agriculture and farming both play an important role in the Indian economy. Agriculture contributes more than 15% to GDP and employs 49% of the workforce. Upgradation in agriculture would definitely positively contribute to the well-being of the agriculture-dependent population. AI can make this positive progress in Indian agriculture by minimizing post-harvest losses, increasing productivity, strengthening the supply chain, correct

prediction of weather etc. It would increase productivity by introducing precision farming and work as a catalyst in doubling the farmer income.

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 ICRIAT (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 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)

Use of AI in agriculture

Following are the main areas where AI can bring the next big revolution in the agriculture sector

Yield improvement- The data collected by drones, satellite and in-ground sensors are analysed by machine learning and artificial intelligence to give farmer accurate information and creating farming decision handy. Even scientist can predict the potential yield of a given crop by analysing 3D mapping and soil colour data. In many

area of India like Telangana, Madhya Pradesh and Maharashtra, farmers are receiving this automated information by an AI application developed by Microsoft which is powered by Microsoft Cortana Intelligence Suite including Machine Learning and Power BI.

Pest Infestation- By using infrared data and on-field sensor data, now experts can predict infestation before they occur. Microsoft collaborated with UPL to build a pest prediction application based on AI technology.

Automated machinery- Lots of farm labours are shifting to urban areas for their livelihood. During the COVID pandemic due to migrant labours, harvesting gets delayed due to which farmers bear a huge loss. But with the help of AI technology robotics machinery can be used for various agricultural operations and it could also cut down the cost of cultivation results in a better profit for the farmer.

Irrigation- As the water level is going down day by day it is now coming in the list of scary resources. A sustainable approach is required for efficient utilisation of resources. Machine learning algorithm and linear programming could be used to ensure that the crop gets enough water to get a satisfactory yield. Apart from this AI and machine learning can be used for soil testing, the right combination of Agri input, price prediction, strengthen supply chain etc. The government of India is using AI in PMFBY (Pradhan Mantri Fasal Bima Yojana) in carrying out pilot projects for crop cutting, yield estimation and to reduce the time for claim settlement.

Future of AI in Farming

Although today Indian farmers are laggards in adopting AI and other modern technology on a large scale but many Agri tech start-ups are blooming with their technological solutions based on AI, strengthening and encouraging farmers to do smart farming by making them techno-friendly. The Government of India introduced AGRI-UDAN program with the aim to attract more entrepreneurs in Agri-tech sector. As new agriculture reforms increase the chances of investment in AI and other technology for better yield under contract farming. The diversity of India in soil type, climate and topography will open the gate for AI experts and data scientists for new developments in AI. So, there are many opportunities for AI in Indian farming.

CONCLUSION

AI has the potential to boost the agriculture sector, but still, it is not used at its full potential in Indian farming. But newly growing Agri-tech start-ups are coming up with a new ray of hope. On the other hand, new agriculture reforms and government investment in AI would also work as a catalyst in bringing a boom in the Agri-tech revolution. Diversity of India is also standing with Indian agriculture to attract more researchers and AI experts for bringing new developments in this sector.

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