Artificial Intelligence and Agriculture

Preeti Dhanker1, Monika Mathur2 and Rahul Dhankar3

Department of Chemistry1, CCS HAU, Hisar

Department of Food Science & Technology2 , CCS HAU, Hisar

Department of Agronomy3, MVN University, Palwal

Email ID: dhankerpreeti37@gmail.com

Received: **March 12, 2022;** ***Revised:*** **March 14, 2022** ***Accepted:*** **March 16, 2022**

With the global advancement in technology in the 21st century, there is seen a regular development in the level of agriculture practices too. Moving of world from letters to video chats, steam engines to rapid metro as well as from hand sprayers to drones, technology has totally turned up the human life globally.

As the world population continues to grow, arable land is becoming scarcer. The only workable option before us is to increase the productivity of the in-hand land through the use of much efficient and improved technology.

The sector of agriculture is experiencing numerous challenges. Usually, most of our farmers relay upon traditional knowledge/wisdom for farming. But, face an immense array of challenges including disease and infestation by pest, declined yield, improper soil treatment, inadequate drainage and irrigation, monsoon and many more leading to yield losses and hence economic distress. This leads to dreadful crop losses along with environmental hazards due to inflated use of chemicals. Several researches have been conducted to address these concerns. Artificial intelligence technology is supporting different sectors to hoick productivity and efficiency. AI solutions are serving to overcome the conventional challenges in every field.

Technology in agriculture is an influential element in magnifying the magnitude of production as well as productivity. Artificial intelligence is one of the voguish technologies being adapted now-a-days. Agriculture is seeing rapid adoption of Artificial Intelligence (AI) and Machine Learning (ML) both in terms of agricultural products and in-field farming techniques. Furthermore, AI in agriculture is serving farmers to brush-up their efficiency and reduces environmental antagonistic impacts. The agriculture industry robustly embraced AI into their practice to change the overall outcome. Adapting AI technology is helping to control and manage many unwelcomed natural conditions too.

Presently, majority of startups in agriculture are adapting AI-enabled approach to intensify the efficiency of agricultural production. Implementation of AI-empowered approaches can act smartly by detecting diseases or climate changes.

Improving agriculture productivity is not a simple task as it involves all the activities starting from deciding the crop up to final harvesting and marketing as well. So, the solution for these problems and challenges is to have a self guided automatic model that can benefit all.

AI in general involves the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The main characteristic of AI is its ability to rationalize and take actions that have the best chance of achieving a specific goal. The technique includes imaging an installed application, guiding our farmers about the timings of crop growing, harveststing as well as selling the produce. Further it also looping our agriculture resource persons to

track all the problems faced by our farmers. Thus, an immediate and fast action can be taken for all the problems faced.

Pest Management

Pest management has always been an alarming problem to our farmers, which lead to high crop losses as well as declined productivity. It took decades to mitigate this menace by development of computerized systems that could identify the active pests and suggest control measures. Through this the probable pest emergence can be predicted.

Crop readiness identification

The ripeness of different fruits as well as vegetables can be predicted by imaging of different crops under white/UV-A light. Different levels of crop readiness can be created by the farmers based on the crop/fruit category and add them into separate stacks before sending them to the market.

Field/crop management

Air-borne systems such as drones can be used for capturing high-definition images and real-time analysis can be done during cultivation period by creating a field map. Different area can be identified, where crops require water, fertilizer or pesticides. This helps in resource optimization to a huge extent.

Weather forecasting

AI in also playing a very vital role by helping the farmer to remain updated with regular data related to weather forecasting. This up to date information of forecasted/ predicted data help farmers avoid crop losses dure to harsh weather conditions and

Hence, the technique of AI is gaining immense importance in agriculture sector including the following sections:

increase yields as well as profits without risking the crop. With the proper analysis of the forecasted data our farmer can take the precaution by understanding and learning with AI. And implementation of such practice results in a smart decision on time.

Monitoring Crop and Soil Health

With the application of image recognition approach, AI identifies all the crop or soil defects. AI can be utilized in an efficient way to conduct or monitor or identify possible defects and nutrient deficiencies in the soil. With the help of Al deep learning application are developed to analysis flora patterns in agriculture.

AI enabled Agriculture Bots

AI-enabled agriculture bots help farmers to find more efficient ways to protect their crops from weeds as well as to overcome the labor challenge too. These AI enabled bots can harvest crops at a higher volume and at a much faster pace than human laborers. Computer vision helps to monitor the weed and spray them. Thus, Artificial Intelligence is helping farmers find more efficient ways to protect their crops from weeds.

Reduced pesticide usage

Pesticides are one of the major concerns now-a-days from farmer health as well as environment point of view. Weeds can be managed by farmers with the use of AI by implementing computer vision, robotics, and machine learning. With the help of the AI, a regular analysis of collected data

allows us to keep a check on the weeds and thus proper emergence time can be predicted leading the farmers to spray chemicals only when the weeds appear. As a result, AI reduces herbicide usage in the field comparatively the volume of chemicals normally sprayed.

Advantage of implementing AI in Agriculture

The adoption of AI in agriculture has revolutionized the modern agriculture. The technology helps the farmers to understand the data insights including temperature, precipitation, wind speed, and solar radiation. Also, the best thing about using AI in agriculture is that it preserves the jobs of human farmers additionally it will improve their processes. Adoption of AI has the following advantages-

- It provides farmers with better and efficient ways to grow, trace, harvest as well as sell the produce.
- Keeps a check on possible or probable crop defects, resulting in improved potential towards healthy crop production
- AI has also emphasized on efficiency and strengthening of agro-based businesses, being used in applications such as automated machine adjustments for weather forecasting and disease or pest identification.
- AI technique in agriculture provides us with the potential to solve the challenges our farmers face such as harsh climate variation, an infestation of pests and weeds that reduce yield.

Challenges in AI Adoption in Agriculture

Though Artificial Intelligence provides us with boundless opportunities for application in agriculture, there still exists a lack of familiarity with high tech machine learning solutions in farms across most parts of the world. Farming is highly exposed to many external factors like weather conditions, soil conditions and presence of pests. So, the planning made during the start of harvesting may not be an optimal one because of changes in various external parameters. Also, a lot of data is required by the AI systems to train machines and to make precise predictions. In case of vast agricultural land, though spatial data can be gathered easily, temporal data is hard to get. Additionally, most of the crop-specific data can only be obtained once in a year when the crops are growing. Hence a lot of time is required to obtain a significant amount of data in order build a robust machine learning model. Because of this reason only, AI has a lot of application in agronomic products such as seeds, fertilizer, pesticides and so on rather than in-field precision solutions.

Future prospects

On this day, AI-enabled technologies are being are markedly being used for solving several industrieal purposes. AI is finding its applications in almost each and every sector such as finance, transport, healthcare, and now in agriculture. AI is

assisting the farmers to keenly monitor their crops without the obligation to invigilate personally into the farm. Innumerable startups and enterprises are looking forward to AI development in agriculture sector. AI is reformulating the conventional pattern of agriculture. The future of AI in agriculture is way ahead in offering radical transformation with many improved approaches.