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ARTIFICIAL INTELLIGENCE: THE DAWN OF NEXT AGRICULTURAL REVOLUTION

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INTRODUCTION:

Agriculture plays an important role in the world economy to the tune of \$ 5 trillion. The global population is expected to reach more than nine billion by 2050 which will require an increase in agricultural production by 70 percent to fulfil the food demand. In India agricultural exports constitute to 10 % and is the fourth largest exported commodity. According to the Department of Industrial Policy and Promotion (DIPP), the food processing sector has attracted around \$7.81 billion during April 2000 to June 2017. With an aim to boost innovation and entrepreneurship in agriculture, Government of India is introducing AGRI-UDAAN programme to mentor startups and enable them to connect with potential investors.

Due to increase in global population natural resources such as land and water becoming insufficient to which land water and resources becoming insufficient to continue the demand-supply chain. This situation calls for smart approaches based on machine learning and other sophisticated techniques to ensure high efficiency and productivity of agricultural farms. In this context, artificial intelligence (AI) may hold great promise in the near future compare to the existing traditional as well as modern agricultural practices. Use of AI in the

agriculture may really be considered a next step in agriculture revolution.

AI is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the simplest to those that are even more complex. The goals of AI include learning, reasoning, and perception.

Agriculture particularly the crop cultivation involves various steps since beginning to harvest and post-harvest (Fig.1).

optimum soil till and addition of organic matter.

Sowing: Sowing is one of the most important aspects of crop raising which takes care of seed placement in soil, seed spacing and depth. Besides, it also takes into consideration climatic conditions such as temperature, humidity and rainfall for good seed germination.

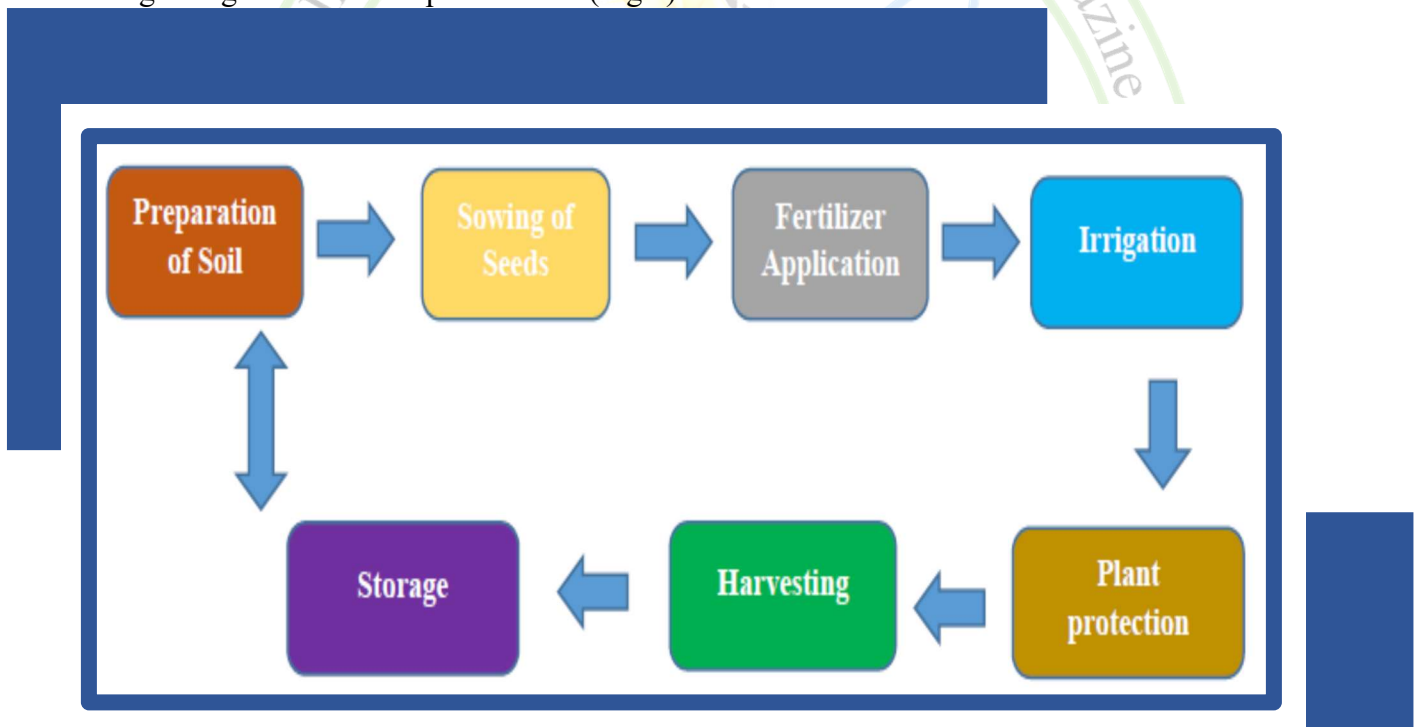


Fig. 1 Steps of agriculture production

Soil preparation: It is the initial stage for sowing of seed wherein several operations need to be follow for good initial crop starts. Such operations includes

Fertilizers application: is constitutes an important practice for ensuring nutrition to crops for optimum growth and yield.

Irrigation: It is important to maintain the plant growth and development by providing adequate soil moisture at various critical stages in crop growth period. However, both over and under water supply during irrigation hamper the optimum crop production.

Plant protection: it includes insect-pests, disease and weed management. Weeds are unwanted plants that grow near crops or at the boundary of farms. Weed management is important as it helps to decrease production cost, improves crop yield and quality.

Harvesting: It involves cutting of the ready to harvest crop at suitable stage. It is labour intensive activity which includes cutting, collecting and thrashing operations.

Storage: This is an important step wherein agricultural produce are kept in such a way so that produce quality is maintained for long time. Thus, it helps in ensuring food security in the time of need.

CHALLENGES UNDER TRADITIONAL FARMING:

- Climate change and its effect on rainfall and temperature which results in uncertainty in agriculture.
- Crop specific nutrient recommendation is required in big way.

- Weeds are serious menace to crop production, and thus poses great challenge to agriculture.

APPLICATIONS OF AI IN AGRICULTURE:

The industries are now backing AI technologies which supports the precision agriculture.

Use of weather forecasting: Changing climatic condition imposed uncertainties in agricultural operations specially sowing and harvesting. But with help of AI farmers can get exact information about weather conditions using weather forecasting.

Predictive agricultural analytics: Various AI and machine learning tools are being used to predict the optimal sowing time, get alerts on risks of pest attacks, and many more.

Soil and crop health monitoring system: It's important to monitor the soil health and in turn crops health. Plant nutrition and soil amendments are adequately used to ensure soil and crop health in a periodic cycle.

A German-based tech start-up PEAT has developed an AI-based application called Plantix to identify the nutrient deficiencies in



soils besides, pests and diseases. The farmers can get idea to use fertilizer which helps to improve harvest quality. This app uses image recognition-based technology. Similarly, Trace Genomics is another machine learning-based company that helps farmers to do a soil analysis. Such type of app helps farmers to monitor soil and crop's health conditions and produce healthy crops with a higher level of productivity.

Analysing crop health by drones: SkySquirrel Technologies has brought drone-based ariel imaging solutions for monitoring crop health. In this technique, the drone captures data from fields and then data is transferred via a USB drive from the drone to a computer and analysed by experts. After that analyse the captured images and provide a detailed report containing the current health of the farm. It helps the farmer to identify pests and bacteria helping farmers to timely use of pest control and other methods to take required action.

Precision farming and predictive analytics: AI applications in agriculture have developed applications and tools which help farmer's inaccurate and controlled farming by providing them proper guidance about water management, crop rotation, timely harvesting, crop to be grown, optimum planting, pest attacks and nutrition management. While, using the machine

learning algorithms in connection with images captured by satellites and drones, AI-enabled technologies predict weather conditions, analyze crop sustainability and evaluate farms for the presence of diseases or pests and poor plant nutrition along with data like temperature, precipitation, wind speed, and solar radiation.

Farmers without connectivity can get AI benefits with simple tools such as an SMS-enabled phone and the Sowing App. Farmers with Wi-Fi access can use AI applications to get a continually AI-customized plan for their lands. With such IoT- and AI-driven solutions, farmers can meet the world's food need without depleting precious natural resources.

Agricultural

Robotics:

Development of robots under AI is in trend to perform multiple tasks at fields. The robot is trained to control weeds and harvest the crops at a faster pace compared to humans. These robots are trained to check the crop quality and detect weed with picking and packing of crops at the same time.

AI-enabled system to detect pests:

AI systems use satellite images and compare them with historical data using AI algorithms and detect that if any insect has landed and which type of insect has landed, and send alerts to farmers. Smart phones so that farmers can take required precautions and use



required pest control thus AI helps farmers to fight against pests.

Supply chain efficiencies:

Developed countries are using real-time data analytics on data-streams coming from multiple sources to build an efficient and smart supply chain.

CONCLUSION:

AI in agriculture not only helps the farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality with fewer resources. AI-based products or services for agriculture will help the world to deal with food production issues for the growing population. In the near future increased used of AI in agriculture may be of immense value for the farmers. Finally, the AI will play significant role for next agricultural revolution worldwide including the developing nations like India, and many more countries from Asia.

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