Artificial Intelligence in Indian Agriculture

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Agriculture is one of the most fertile industries there are for artificial intelligence (AI) and machine learning (ML). AI, machine learning and the Internet of Things (IoT) sensors that provide real-time data for algorithms increase agricultural efficiencies, improve crop yields and reduce food production costs. Global spending on smart, connected agricultural technologies and systems, including AI and machine learning, is projected to triple in revenue by 2025, reaching $ 15.3 billion. IoT-enabled Agricultural (IoTAg) monitoring is smart, connected agriculture's fastest-growing technology segment projected to reach $ 4.5 billion by 2025, according to PwC.

Indian Government, during 2020-21 and 2021-22, has allocated funds to the tune of INR 1756.3 cores and INR 2422.7 crores to the States for introducing new technologies including drones, artificial intelligence, blockchain, remote sensing and GIS etc. in agriculture. Further, the Government also allocated INR 7302.50 crores and INR 7908.18 crores in 2020-21 and 2021-22 respectively to ICAR (Indian Agricultural Research Institute) for undertaking Research and Development in Agriculture for developing new technologies, their demonstration at farmer's fields and capacity building of farmers for adoption of new technology.

In addition to due focus on ensuring improved service delivery and facilitating market access to farmers, the government also accords adequate emphasis on reducing transaction costs, and promotion of Farmer Producer Organisations (FPOs) to improve their bargaining power. The development of infrastructure has also been given due attention to ensure better connectivity of farmers to national and international markets. High-yielding, cost-saving, disease/pest resistant, and climate-resilient varieties and technologies in crops, horticulture, animal, and fisheries science developed by ICAR have played an important role in increasing production and productivity, reducing the cost of production and enhancing the income of the farmers. The adoption of Farming Systems Models developed by ICAR has also enabled farmers to enhance their income and strengthen their economic condition. Besides, State-specific strategies for increasing farmers' income, provided to States by ICAR, are also helping farmers to increase their incomes.

Some of the areas that exhibit maximum potential to improve agriculture, with the integration of artificial intelligence are described below:

Cognitive computing has become the most disruptive technology in agricultural services as it can learn, understand, and interact with different environments to maximize productivity. Microsoft is currently working with 175 farmers in Andhra Pradesh to provide agricultural, land, and fertilizer

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advisory services. This initiative has already resulted in 30 percent higher average yield per hectare last year. The pilot project was completed using agricultural AI applications to communicate dates, soil preparation, fertilization based on soil tests, seed treatment, optimal spreading depth, and more. Further, mobile robots and field sensors support digital agricultural robots, and multidisciplinary cameras and laser scanners are used for facilities and areas of radiation that cannot be measured.

Proximity sensing, remote sensing, Internet of Things (IoT), and image-based Precision Farming are being used for intelligent data integration related to historical meteorology, soil reports, recent research, rainfall, and insect infections, along with drone imagery is being used for in-depth field analysis, crop monitoring, and field surveys.

The artificial use of image recognition using intelligence approaches for plant identification, cation, pest infestation, and disease diagnosis is also becoming prevalent. Using AI and machine learning-based surveillance systems to monitor every crop field's real-time video feed identifies animal or human breaches, sending an alert immediately can become very useful to prevent crop damage.

Yield mapping to find patterns in large-scale data sets and understand the orthogonality of them in real-time, and optimizing irrigation systems to measure the effectiveness of frequent crop irrigation is invaluable for crop planning.

Today, there is a shortage of agricultural workers, making AI and machine learning-based smart tractors, robots and robotics a viable option for many remote agricultural operations that struggle to find workers. These robots can harvest faster, locate and remove weeds more accurately, and thus reduce operating costs and dependence on labor. In the meantime, farmers are already turning to chatbots for help. Chatbots help farmers by answering their questions and providing advice and guidance on specific agriculture and yield-related queries.

Improving the track-and-traceability of agricultural supply chains by removing roadblocks to get fresher, safer crops to market can help reduce inventory shrinkage by providing greater visibility and control across supply chains.

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