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Perspective

Artificial Intelligence in Agriculture

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Artificial intelligence (AI) has wide application in all sectors including agriculture. There are many challenges with traditional methods of agricultural tasks. Due to climate changes and deforestation, agricultural production has had an adverse impact and farming has become more challenging. Artificial intelligence is a promising technique which can help farmers to overcome such challenges and increase gross production.

As a lot of data gets generated during all stages of crop harvesting, this data can be processed and utilized for better decision making using artificial intelligence. Using ICT tools, the data like climate conditions, leaf chlorophyll content, soil moisture content, NPK values in soil, pest and disease images of crops can be collected. Wireless sensor networks are used for collecting such data with the help of different types of sensors and storing it on computers. With advent of Cloud Computing technologies, storing, retrieval and processing of large amounts of data has become easier. The collected data is then processed using AI techniques. The extracted knowledge then can be used for precise and on time actions.

For pest and disease control, early detection of pests and diseases can be done by capturing images of crop leaves and other parts of crops and processing these images using AI techniques. Plant images can be captured using fixed camera sensors in fields or manually by farmers using smartphones. Drone cameras are also used sometimes for large fields. Weed identification with this method will help to reduce application of herbicides. Not just pest and disease detection but nutrition deficiency detection also can be done by processing captured images using deep learning techniques. Soil health monitoring is being automated using AI techniques. More accurate nutrition deficiency identification can help farmers to decide the appropriate quantity and type of fertilizer application.

By collecting historical data on crops grown in the specific area, weather conditions and soil properties, AI can recommend the appropriate type of crop to be grown in future and optimum planting method. Some companies are providing AI based agricultural robots which can do farming tasks with faster speed than humans. Tasks like weed picking and crop harvesting can be done by such robots.

Precision agriculture demands optimized solutions in all tasks of agriculture like irrigation, fertilizer application, land allocation, pest and disease diagnosis and crop growth monitoring. Decision making is a crucial factor in any type of business. Artificial intelligence provides various traditional optimization techniques like linear programming, quadratic programming, tabu search. Advanced optimization techniques like genetic algorithms, particle swarm optimization, ant bee colony algorithms, Jaya and simulated annealing are very much useful for finding optimized solutions for said problems. With the advent of hardware technologies in terms of low cost and high performance, such techniques can be easily used for making better decisions in agriculture. Such decisions can be made faster by parallel execution of parts of AI algorithms on high performance computing machines.

Crop production cost should be reduced to minimize risk and burden on farmers. The major part of cost comes out of resources like land, water, seeds, fertilizers, insecticides and pesticides. AI helps farmers to increase crop yield, improve quality of crop yield and reduce production cost by providing predictions and alternatives for better utilization of such resources. Along with harvesting, post harvest processing and marketing can also be made much better with AI technologies and tools.

AI based agricultural services are becoming popular. Many startups are coming up with mobile apps and other customized solutions for automation in agriculture. All these services use AI techniques for decision support. AI will be of utmost importance in agriculture to help fulfill the food requirement of growing population. AI based automation will be common practice in the future for almost all tasks and decisions in agriculture.