ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 13, Issue, 04, pp. 62482-62485, April, 2023
https://doi.org/10.37118/ijdr.26627.04.2023

RESEARCH ARTICLE OPEN ACCESS

AI IN AGRICULTURE

***Indar M Vinay, Hrishikesh, Noor Saiba, Junaid B, Jeevan H, Jyotirgagan, Dr. Shruthi Bekal and Mr. Maheshwaran Jayapaul**

Faculty- Center for Management Studies, Jain (Deemed-to-be University)

ARTICLE INFO

Article History:
Received 20th February, 2023
Received in revised form
03rd March, 2023
Accepted 14th March, 2023
Published online 27th April, 2023

KeyWords:
Agriculture, AI, Technology in Agriculture.

****Corresponding author: Indar M Vinay,***

ABSTRACT

The importance of sustainable and efficient food production has driven the need for applying increasingly advanced approaches in farming and agriculture. To keep up with this need, farmers and future farmers need to be trained in the ways of precision agriculture. With the widespread use of artificial intelligence across all industries, it is not surprising to find AI at the heart of precision agriculture. While AI has brought a lot of promise, it has also brought a lot of dread, due to the lack of understanding about what it is and what it can do. To help farmers buy into applying AI, a new educational program is needed. To this end, we have developed a simple active learning system to illustrate AI, particularly, machine learning. We present an overview of the system and discuss how it can contribute to future farmers' understanding of how AI works.

Citation: ***Indar M Vinay, Hrishikesh, Noor Saiba, Junaid B, Jeevan H, Jyotirgagan, Dr. Shruthi Bekal and Mr. Maheshwaran Jayapaul. 2023.*** "AI in agriculture". *International Journal of Development Research*, 13, (04), 62482-62485.

INTRODUCTION

Introducing AI (Artificial Intelligence) in farming can bring about numerous benefits, including increased efficiency, productivity, and sustainability. Here are some ways AI can be implemented in farming:

Precision Agriculture: Precision agriculture involves using technology to analyse data and make decisions based on that data. With AI, data can be collected from various sources, such as weather sensors, soil sensors, and satellite imagery, and analyzed to optimize farming practices. For example, by analyzing data from soil sensors, farmers can determine the precise amount of fertilizer needed for each part of their field, rather than applying a uniform amount throughout the entire area. This can reduce costs and prevent over-application of fertilizers, which can harm the environment. Similarly, by analyzing weather data, farmers can adjust irrigation practices to ensure that crops receive the right amount of water at the right time. This can reduce water usage and improve crop yields.

Crop Monitoring: AI-powered drones or robots can be used to monitor crops, identify pests and diseases, and assess crop health. This can help farmers identify issues early on, allowing for quick action to prevent crop loss. For example, drones equipped with cameras and sensors can fly over crops to collect data on plant health, detect pests and diseases, and identify areas of the field that need attention. This data can then be analyzed by AI algorithms to provide recommendations to the farmer on the best course of action.

Autonomous Machinery: AI can be used to develop autonomous tractors and other farm machinery, reducing the need for human intervention and increasing efficiency. For example, autonomous tractors can be programmed to perform tasks such as plowing, seeding, and harvesting without the need for a human driver. This can reduce labor costs and improve efficiency, as the tractor can work around the clock without needing breaks or rest.

Supply Chain Management: AI can be used to optimize supply chain management, from predicting demand to monitoring inventory levels, to ensure that farmers have the right products at the right time. For example, AI algorithms can analyze sales data and market trends to predict demand for certain crops, allowing farmers to adjust their planting schedule and production accordingly. Similarly, AI can monitor inventory levels of inputs such as fertilizer and seed to ensure that farmers have enough supplies on hand to meet their needs. In summary, AI can be used in various ways in farming, from optimizing farming practices to monitoring crops, to developing autonomous machinery, and improving supply chain management. By using AI, farmers can improve efficiency, sustainability, and profitability, making it a promising technology for the future of agriculture.

Objectives: Help finding labour force: A LinkedIn for farmers to help find labour for harvest or cattle force or tractor and even equipment by using their location and identifying seasonal farmers who can work on fields.

Informing any weather changes or expectancy of rain: informing changes in weather or notify storms or heavy or little rainfall

Voice assistant in their regional language: Finding labour or equipment or knowing the weather by just asking in your language.
Crop and soil health: identify the nutrient deficiencies in soil including plant pests and diseases by which farmers can also get an idea to use fertilizer which helps to improve harvest quality by using image recognition.

Detecting 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 like the locust, grasshopper, etc. And send alerts to farmers to their smartphones so that farmers can take required precautions and use required pest control.

Fertilising: by using the size of land and spacing between seeds how much of which fertiliser is required per square foot.

Storage: helps locate warehouses and transporting and storing goods after harvesting.

Reporting: days required by calculating weather conditions, humidity level, atmosphere temperature etc. labour force and yield percentage, how much irrigation is required and suggesting ways to reduce cost.

Distribution: helps find people to distribute goods and to find which district has need of which commodity and which excess of something hence distributing the goods evenly throughout the country.

Scope

Weather & price Forecasting: As we have discussed in challenges that it is difficult for the farmers to take the right decision for harvesting, sowing seeds, and soli preparing due to climate change. But with the help of AI weather forecasting, farmers can have information on weather analysis, and accordingly, they can plan for the type of crop to grow, seeds to sow, and harvesting the crop. With price forecasting, farmers can get a better idea about the price of crops for the next few weeks, which can help them to get maximum profit.

Health Monitoring of Crops: The quality of crop widely depends on the type of soil and nutrition of the soil. But with the increasing rate of deforestation, the soil quality is degrading day by day, and it is hard to determine it. To resolve this issue, AI has come up with a new application called Plantix. It was developed by PEAT to identify the deficiencies in soil, including plant pests and diseases. With the help of this application, farmers can get an idea to use better fertilizer which can improve the harvest quality. In this app, AI's image recognition technology is used by which farmers can capture the images of plants and get information about the quality.

Agriculture Robotics: Robotics is being widely used in different sectors, mainly in manufacturing, to perform complex tasks. Nowadays, different AI companies are developing robots to be employed in the Agriculture sector. These AI robots are developed in such a way that they can perform multiple tasks in farming. AI robots are also trained in checking the quality of crops, detect and controlling weeds, and harvesting the crop with faster speed compared to a human.

Intelligent Spraying: With AI sensors, weed can be detected easily, and it also detects weed affected areas. On finding such areas, herbicides can be precisely sprayed to reduce the use of herbicides and also saves time and crop. There are different AI companies that are building robots with AI and computer vision, which can precisely spray on weeds. The use of AI sprayers can widely reduce the number of chemicals to be used on fields, and hence improves the quality of crops and also saves money.

Disease Diagnosis: With AI predictions, farmers can get knowledge of diseases easily. With this, they can easily diagnose diseases with proper strategy and on time. It can save the life of plants and farmer's time. To do this, firstly, images of plants are pre-processed using computer vision technology. This ensures that plant images are properly divided into the diseased and non-diseased parts. After detection, the diseased part is cropped and send to the labs for further diagnosis. This technique also helps in the detection of pests, deficiency of nutrients, and many more.

Precision Farming: Precision farming is all about "Right place, Right Time, and Right products". The precision farming technique is a much accurate and controlled way that can replace the labour-intensive part of farming to perform repetitive tasks. One example of Precision farming is the identification of stress levels in plants. This can be obtained using high-resolution images and different sensor data on plants. The data obtained from sensors is then fed to a machine learning model as input for stress recognition.

Statement of problem: Traditional farming methods have some significant problems that can impact the environment, crop yields, and overall agricultural productivity. Here are some common problems with traditional farming methods:

Soil Degradation: Traditional farming methods often involve intensive plowing and tilling of the soil, which can lead to soil erosion, nutrient depletion, and decreased soil quality over time.

Water Usage: Traditional farming methods often involve inefficient irrigation practices, resulting in water waste and increased costs. Additionally, traditional farming practices can contribute to water pollution from runoff of fertilizers and pesticides.

Pesticide Use: Traditional farming methods often rely on the use of chemical pesticides to control pests and diseases, which can have negative impacts on the environment and human health. Pesticides can harm beneficial insects, birds, and other wildlife, and can contaminate soil and water sources.

Energy Use: Traditional farming methods can be energy-intensive, relying on fossil fuels for machinery and transportation. This can contribute to greenhouse gas emissions and climate change.

Limited Crop Yields: Traditional farming methods can be less efficient than modern agricultural practices, resulting in lower crop yields and decreased agricultural productivity.

Labor-Intensive: Traditional farming methods often require a significant amount of manual labor, which can be costly and time-consuming for farmers. Overall, traditional farming methods can be unsustainable and can contribute to environmental degradation, decreased crop yields, and decreased productivity. By adopting modern technologies such as AI, farmers can optimize their farming practices, reduce costs, and improve sustainability, making it a valuable technology for the future of agriculture.

RESEARCH METHODLOGY

Descriptive research: Descriptive research is an appropriate choice when the research aim is to identify characteristics, frequencies, trends, and categories.

Literature review: This paper discusses the opportunities and challenges of using AI and machine learning in agriculture. The authors provide examples of successful applications, such as crop monitoring and yield prediction, and also discuss challenges such as the lack of data and the need for specialized skills, an overview of the current status and future prospects of AI in agriculture

Data analysis and Interpretation

- According to a report by MarketsandMarkets, the global market for AI in agriculture is expected to reach USD 4.0 billion by 2026, growing at a CAGR of 22.5% from 2021 to 2026.

- A study by the International Food Policy Research Institute found that precision agriculture technologies, such as AI-powered sensors and drones, can increase crop yields by 10-20% and reduce water usage by up to 50%.
- A report by the World Economic Forum found that the use of AI in agriculture can reduce pesticide use by 90%, improve crop yields by 70%, and reduce water usage by 50%.
- A study by the United Nations Food and Agriculture Organization found that AI-powered crop monitoring technologies can increase crop yields by up to 30% and reduce fertilizer usage by up to 20%.
- A report by Grand View Research found that the use of AI in precision irrigation can reduce water usage by up to 30%, while improving crop yields and reducing costs.

Overall, the data on AI in farming suggests that these technologies have the potential to significantly improve agricultural productivity and sustainability, while reducing costs and environmental impact. As more data becomes available, it is likely that the use of AI in farming will continue to grow.

FINDINGS

Our Findings: Problems faced by Farmers using traditional Methods

Irrigation: Although India is the second largest irrigated country of the world after China, only one-third of the cropped area is under irrigation. Irrigation is the most important agricultural input in a tropical monsoon country like India where rainfall is uncertain, unreliable and erratic India cannot achieve sustained progress in agriculture unless and until more than half of the cropped area is brought under assured irrigation.

Lack of mechanisation: In spite of the large scale mechanisation of agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and conventional tools and implements like wooden plough, sickle, etc.

Agricultural Marketing: Agricultural marketing still continues to be in a bad shape in rural India. In the absence of sound marketing facilities, the farmers have to depend upon local traders and middlemen for the disposal of their farm produce which is sold at throw-away price.

And others being

- Cope with climate change, soil erosion and biodiversity loss
- Satisfy consumers' changing tastes and expectations
- Meet rising demand for more food of higher quality
- Invest in farm productivity
- Adopt and learn new technologies
- Stay resilient against global economic factors

How AI helps with these problems: Using AI for intelligent spraying of chemicals – Brings in cost savings.

Using AI for predictive analytics – Enables right decision-making

Predicting the best time to sow the difference between a profitable year and a failed harvest is just the timely information on a simple data point of timing of sowing the seed. To combat this, scientists of ICRISAT used a predictive analytics tool to arrive at a precise date for sowing the seeds to obtain maximum yield. It even gives insights on soil health and fertilizer recommendations in addition to a 7-day weather forecast.

Crop yield predictions and price forecasts For many farmers, the biggest worry is the price fluctuation of the crop. Due to unstable prices, farmers are never able to plan a definite production pattern. This problem is highly prevalent in crops like tomatoes that have very limited shelf time. Companies are using satellite imagery and weather data to assess the acreage and monitor crop health on a real-time basis. With the help of technologies like big data, AI and machine learning, companies can detect pest and disease infestations, estimate the tomato output and yield, and forecast prices. They can guide the farmers and governments on the future price patterns, demand level, type of crop to sow for maximum benefit, pesticide usage etc.

CONCLUSION

Artificial Intelligence in agriculture not only helping farmers to automate their farming but also shifts to precise cultivation for higher crop yield and better quality while using fewer resources. Companies involved in improving machine learning or Artificial Intelligence-based products or services like training data for agriculture, drone, and automated machine making will get technological advancement in the future will provide more useful applications to this sector helping the world deal with food production issues for the growing population. Reality vs expectations of artificial intelligence for sustainable farming The benefits of AI in agriculture are undeniable. Smart farming tools and vertical farming systems can perform small, repeatable, and time-consuming tasks so farm workers can use their time for more strategic operations that require human intelligence. However, it's important to realize that unlike a tractor, one can't just buy AI and start it. AI is not something tangible. It's a set of technologies that are automated through programming. Farmers first need a technology infrastructure. It will take some time, possibly even years, to develop that infrastructure. But by doing so, farmers will be able to build a robust technology ecosystem that will stand the test of time. For now, technology providers need to think about a few things: how to improve their tools, how to help farmers address their challenges, and how to easily and understandably convey that machine learning helps solve real struggles, such as reducing manual work. The future of AI in agriculture is bound to be fruitful.

By:

1. Junaid B -21BBAR0285
2. Indar M Vinay - 21BBAR0261
3.Jeevan H-21BBAR0280
4.jyotirgagan-21BBAR0286
5. Noor saiba- 21BAJR0038
6.Hrishikesh-21BBAR0256

REFERENCES

Agrawal A and Arya MK 2018 Optimize and customize irrigation mechanism and crops prevention from pests *JPP* 17-19

Bhatta NP and Thangadurai N 2019 Utilization of IOT and AI for Agriculture Applications *IJEAT* 8 2731-2735

David S, Anand RS and Sagayam M 2020 Enhancing AI based evaluation for smart cultivation and crop testing using agro-datasets *JAIS* 2 149-167

Divya R and Chinnaiyan R 2019 *Reliable AI-Based Smart Sensors for Managing Irrigation Resources in Agriculture—A Review, in ICCNCT* (Singapore: Springer) 263-274

Joseph F J J 2019 A Review of IoT Implementations in Environment and Agriculture *JARES* 6 1-5

Kambar Praveen S 2018 A Study on the role of E-Technology to take over Agriculture Distress in India *IJCAS* 8 335-341

Kumar S 2019 Artificial Intelligence in Indian Irrigation *IJSRCSEIT* 5 149-167

Kumar S, Chowdhary G, UduTalapally V, Das D and Mohanty SP 2019 gCrop: Internet-of-Leaf-Things (IoLT) for Monitoring of the Growth of Crops in Smart Agriculture, in *IEEE*

Kumari D, Pandita R and Mittal M 2018 An Agricultural Perspective in Internet of Things *IJCSE* 6 107-110

Patil V and Pathade S 2019 IOT based Agribot for Irrigation and Farm Monitoring *OAIJSE* 4 9-13

Puranik V, Ranjan A and Kumari A 2019. Automation in Agriculture and IoT, in *IEEE*

Singh S *et al* 2019 A Systematic Study on Big Data in IOT and Agriculture *JTGRS* 21 566-572

Sinwar D, Dhaka VS, Sharma MK and Rani G 2020 *AI-Based Yield Prediction and Smart Irrigation, in Internet of Things and Analytics for Agriculture* (Singapore: Springer) 2 155-180

Sivaganesan D 2019 Design and Development AI-Enabled Edge Computing for Intelligent-IOT Applications *JTCSST* 1 84-94

Vincent DR, Deepa N, Elavarasan D, Srinivasan K, Chauhdary SH and Iwendi C 2019 Sensors Driven AI-Based Agriculture Recommendation Model for Assessing Land Suitability *Sensors* 19 3667

****