



The role of artificial intelligence in agriculture and its engineering: a review

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Summary

Artificial intelligence (AI) is quickly changing agricultural engineering, offering creative solutions for resource saving, managing the crop, and smart farming. AI-generated solutions are being included in some agricultural phases, like crop monitoring and soil preparation, to harvesting and supply chain management by utilizing machine learning, computer vision, and data crunching. Smart irrigation systems, disease spotting, autonomous machinery, and predictive analytics for yield forecasting are some of the major advancements that are meant to increase sustainability and efficiency. The need to solve the problem of stable food supply, human resource shortages, and climate-related risks is the main problem behind the launch of AI in agriculture. Research has shown that AI use, particularly in large-scale farms, can significantly improve agricultural yields, minimize the resource waste, and improve profit of farmers. The use of AI remains finite by because that include information privacy, high cost, and confined access to innovation in developing nations. Future studies will focus on improving the process for monitoring the health of plants and soil, developing low-cost AI solutions, and developing robotics for various field applications. AI has the potential to completely change agricultural methods, making them more productive, sustainable, and help recover the crop due to environmental stresses.

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Introduction

Collaborative action to end hunger and lack of food are facing major difficulties due to world events and climate change that are effect force chains and decaying of food systems. The Food and Agriculture Organization (FAO) published a report that by 2050, food demand will increase by 70, taking inventive ideas to ameliorate crop yield and distribution. Artificial intelligence AI gives a strategic approach for resolving these issues by ameliorating agrarian processes. By use AI in agriculture, it can increase crop yields, reduce waste, and ameliorate food chains, which can increase the overall strength of food systems. By using AI, we can make sustainable and more productive husbandry styles that will reduce the impact of climatic and world disturbances and fulfil the world's expanding food requirements.

AI data analysis capabilities captured attention to use in its agricultural operations. With the preface of robotization and robotics in agriculture 3.0, conventional styles were converted by advanced outfit that could plant, spot, and crop on its own. With perfection husbandry aimed at optimizing the use of

water, toxins, and phytosanitary products, Agriculture 4.0 farther boosts effectiveness through intelligent granges and networked systems. This system resolves issues like increasing resource efficiency and climate change adaption in confluence by genetic modification and information analysis. With the help of technical methods used in agriculture AI has grown, which is driven by Assiduity 4.0 principles. This has use in the agrifood industry to increase profit and smooth the running of operations. AI position in modern agriculture and world food security is linked to development in agricultural equipment, which not only satisfies the food demand of the world but also increases employment and positive results in artificial area. ChatGPT and other natural language processing (NLP) tools have revolutionized agricultural technology. By incorporating virtual sidekicks into smart agrarian ecosystems, growers can receive timely input on complex issues like soil operation and pest control. Complex agrarian knowledge can also be made simpler with the help of NLP models, enabling growers with varying levels of experience more fair access to pivotal data. AI have features which can remove the gap between farmers and technology and create a more responsive and modern agricultural ecosystem by offering quick advice, fixing problems, and strategic ideas (Figure 1).

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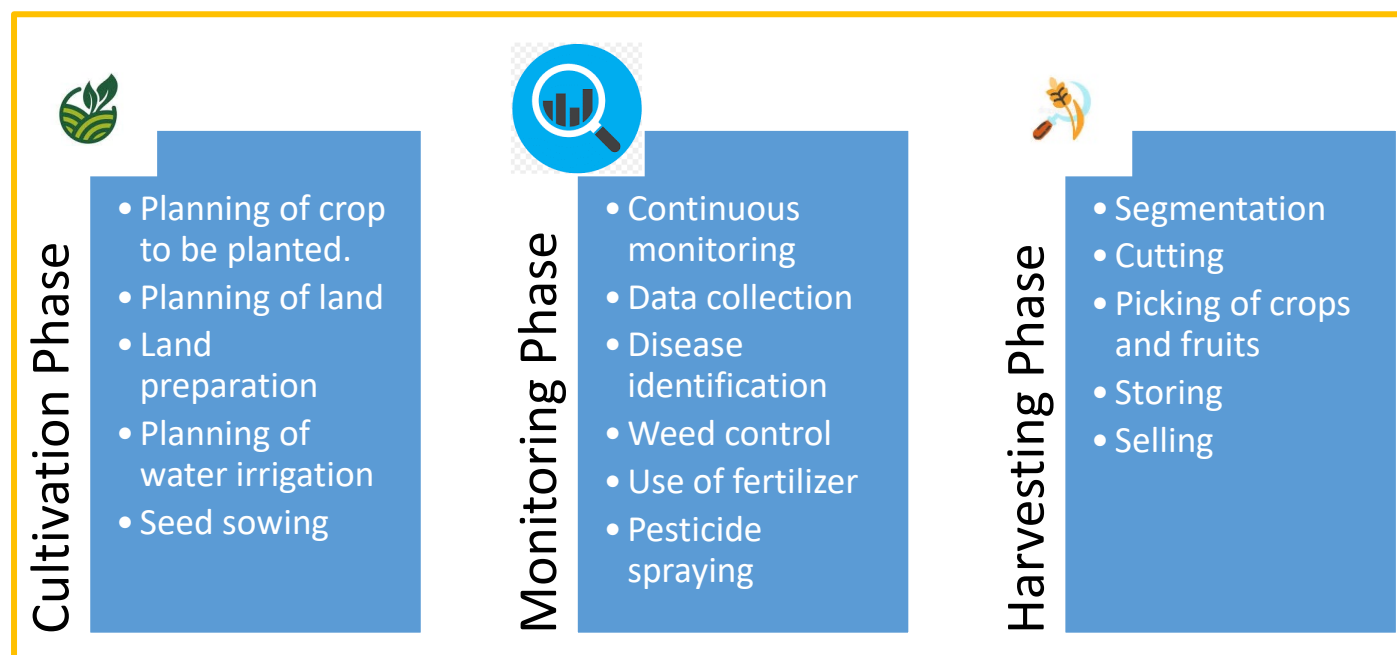


Figure 1. Implementation of an artificial intelligence technique

A. Applications of AI in Agriculture

Some of the technologies that will allow artificial intelligence to be implemented in agriculture include big data analysis, robotics, the Internet of Things (IoT), low-cost sensors and cameras, drones, and even internet connectivity in remote regions. Using data such as temperature, weather conditions, soil quality, moisture levels, and past performance, the AI system can predict which crops should be grown during a specific season, as well as the optimal times for sowing and harvesting. The AI will increase the crop yield and reduce the use of water for irrigation, fertilizers, and pesticides. Through the applications of AI technology, the impact on natural ecosystems may be lessened, and worker safety can be improved. This will help to maintain low food prices and increase food production to fulfil the needs with population growth.

Table 1. AI in Soil Management

References	Techniques	Strength	Limitations
[5]	MOM (Management-oriented modeling)	Boosting output while reducing nitrate leaching.	It requires time. exclusively nitrogen-limited.
[6]	DSS (Decision Support System)	Minimizes sedimentary yield and erosion.	Requires big data for training
[7]	ANN (Artificial Neural Network)	Able to forecast the activity of soil enzymes. anticipates and categorizes soil structure accurately.	Only quantifies a small number of soil enzymes. It takes into account more classification than enhancing soil performance.

2. Crop Management

Crop planting is the initial stage of an agricultural management process that encompasses monitoring development, harvesting, storage, and distribution. Sowing is a fundamental practice that directly contributes to increased agricultural productivity and development. Ultimately, crop yields will truly flourish

1. Soil Management

Soil management is a necessary agricultural operation. Crop yield will be increased, and soil resources will be protected from overuse through a deep understanding of the different types and conditions of soil. It is the application to enhance soil productivity. A traditional soil survey can be used to identify impurities in soils. By applying manure and humus, the porosity of the soil is increased. High aggregation indicates that organic components are present in soil, which are important in preventing the formation of the upper layer soil. Minimum tillage can be used to stop the weakening of the soil. By applying organic materials in soil enhancing the condition of the soil. Many soil-borne diseases can be controlled through soil management and have a major impact on the yield of vegetables and other crops (Table 1).

only when there is a precise understanding of different crop categories and their specific timing and soil requirements. In order to maximize profitability and guard the terrain, perfection crop operation, or PCM, is an agrarian operation system that targets crop and soil inputs grounded on field conditions. Lack of timely, widely circulated information on crop and soil

conditions slows down PCM. In order to deal with water poverty brought on by soil, rainfall, or limited irrigation, growers must mix different crop operation methods. Decision-rule-based, adaptable crop management systems ought to be favoured. Understanding rainfall takes a key for making opinions and achieving high crop yield. PROLOG assesses a ranch system's functional act by using meteorological data, and it also projects net profit, total profit, and crop yield for both individual fields and the entire ranch. By detecting some soil factors and atmospheric parameters, we can predict the crop type. Factors such as soil type, pH, organic carbon, calcium, magnesium, sulfur, manganese, iron, nitrogen, phosphate, potassium, soil depth, soil temperature and moisture (Table 2).

Demeter is a computer-controlled speed-rowing device that has a global positioning sensor for navigation and

Table 2. AI in Crop Management

References	Techniques	Strength	Limitations
[9]	PROLOG	Eliminates less-used farm equipment from the property.	Location-specific
[10] [11]	ROBOTICS-Demeter	Has an 80% crop harvesting success rate and can gather up to 40 hectares of crop.	Expensive: Uses a lot of fuel. Slow picking speed and accuracy.
[12]	FUZZY Cognitive Map	Estimate cotton production and enhance crop quality for better decision-making.	It is relatively slow.

3. Disease Management

Disease control is essential in agriculture for maximum output. Diseases of plants and animals are a significant barrier to yield growth. These diseases, which affect both plants and animals, are influenced by a number of elements, such as genetics, soil type, rain, dry weather, wind, temperature, etc. Managing the impacts is delicate because of these rudiments and the erratic character of some ails' unproductive influences, particularly in large-scale husbandry. A planter should

Table 3. AI in Disease Management

References	Techniques	Strength	Limitations
[13]	FL Web-Based, Web-Based Intelligent Disease Diagnosis System (WIDDS)	Good accuracy. Responds swiftly to the nature of crop diseases.	Limited usage as it requires an internet service. Its potency cannot be ascertained as only 4 seed crops were considered.
[14]	FL & TTS converter	Resolves plant pathological problems quickly.	Requires high speed internet. Uses a voice service as its multimedia interface.
[15]	Expert system using rule-base in disease detection	Faster treatment as diseases are diagnosed faster. Cost effective based on its preventive approach.	Time consuming. Needs constant monitoring to check if pest has built immunity to the preventive measure.

4. Weed Management

Minimizing weed development in the field directly correlates with increased crop yields and higher profits. Research indicates that if weeds remain uncontrolled, dry bean yields can drop by 50%, while wheat yields can decrease by 48% due to weed competition. Under severe conditions, these losses can even reach up to 60%. Similarly, a study evaluating the impact of weeds on soybean production found that yield losses ranged from 8% to 55%. Furthermore, studies show that weed

Table 4. AI in Weed Management

References	Techniques	Strength	Limitations
[18]	ANN, GA	High performance. Reduces trial and error.	Requires big data.

two video cameras. It can organize harvesting conditioning for a whole field, also carry out its plan by mowing crop rows, rotating to cut posterior rows, shifting positions in the field, and seeing unlooked-for obstructions. Cucumber harvesting using AI involves a number of attack and software factors, analogous as the robot's independent vehicle, manipulator, end-effector, two computer vision systems for fruit discovery and 3D imaging, and a control system that creates movements for the manipulator that avoid collisions while harvesting. For every point, rainfall variables and downfall data applicable to the field can be used. The precision of rice yield forecasts is impacted by changing ANN parameters. In order to optimise the model, smaller data sets needed fewer hidden nodes and lower learning rates.

use an integrated control and operation approach that incorporates physical, chemical, and natural measures in order to effectively control pests and reduce losses. To give textbook- to- talking stoner interface functionality, a textbook- to- speech (TTS) motor is employed. It offers a very powerful web-based interactive user interface for real-time interactions. This system is based on rule that help in finding disease type and recommend treatment (Table 3).

competition can decimate 50% to 75% of a sesame crop. Weeds impact ecosystems in both positive and negative ways. According to data from the Weed Science Society of America (WSSA), certain invasive weeds can exacerbate flooding during hurricanes by blocking water flow, while others act as fuel that paves the way for rampant wildfires. Furthermore, some toxic weeds cause liver damage in livestock when ingested, while others directly compete with crops for sunlight, water, and vital nutrients (Table 4).

[19]	Optimization using invasive weed optimization (IVO), ANN	Cost effective, enhanced performance.	Adaptation challenge with new data.
[20]	Support Vector Machine (SVM), ANN	Quickly detects stress in crop that will prompt timely site- specific remedies.	Only detects low levels of nitrogen.

B. Use of AI in Agricultural Engineering

The main end of this is to collect the colourful operations of AI in agrarian engineering, similar as irrigation, weeding, scattering, and other ways integrated into robots and drones. The AI is use for saving water, decrease the overuse of fungicides, maintaining soil fertility, increasing output per employee, increasing yield, and enhancing quality.

1. AI in Irrigation Systems

An independent irrigation system that can transfigure into a hassle-free smart agrarian system by exercising Artificial Intelligence (AI) and the 6G- enabled Internet of effects (6G- IoT). An intelligent system that can wash the field according to the external terrain is developed by the designed independent irrigation system, which is completely grounded on a vaticination algorithm developed in a microprocessor. The algorithm utilizes the rainfall history information from the Internet of effects to identify and prognosticate the downfall and any changes in the climate. To give the needed quantum of water to the crops, the designed system measures the soil's water content as well as the

environmental conditions. Under controlled conditions, the designer of AI and 6G- IoT- modern agriculture irrigation system achieved an accuracy of 86.34%, sensitivity of 89.34%, and improvement of 91%. For the welfare and contentment of farmers, irrigation needs and crop yields must be predicted in a timely manner. A major factor in reducing product costs and adding agrarian yields is forecasting. Before farmers actually sell their crops to the market, the government can design numerous programs, transportation needs, purchasing mechanisms, storage facilities, and the liquid position of the economy with the use of accurate agricultural yield predictions. This recognizes previous innovations as well as new AI-based precision agricultural methods, particularly for yield forecasting and intelligent irrigation. An AI- grounded system provides acceptable information regarding crop product at an early stage, and the intelligent irrigation operation system that comes on with it assists growers in conserving coffers similar as energy and water (Figure 2).

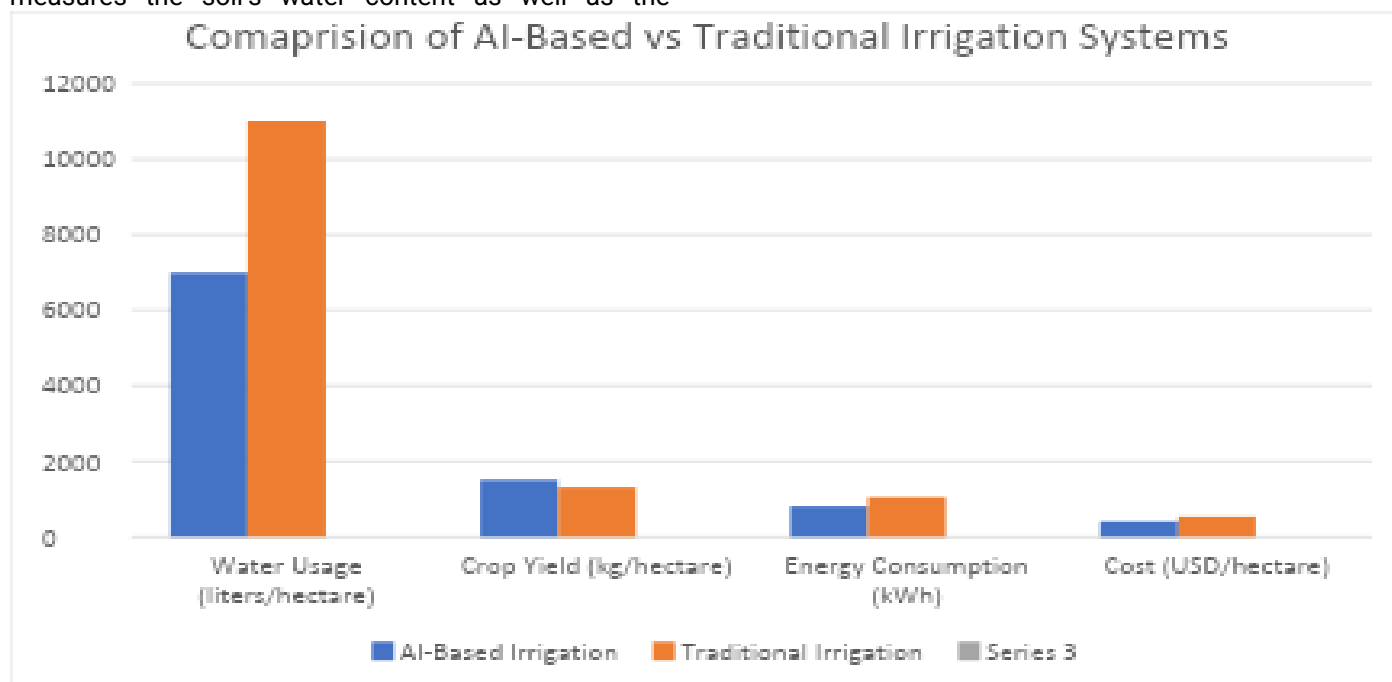


Figure 2. Comparison of AI-based vs traditional irrigation systems

AI has the potential to significantly ameliorate irrigation systems by improving their effectiveness, reducing water waste, and adding agrarian affair. In an irrigation system AI can use for:

- Data-Driven Decision-Making exercises detectors and Internet of effects technology to offer data on temperature, sun, moisture, and soil humidity. Likewise, with the help of remote monitoring, we can also exclude the need for point visits by allowing growers to cover irrigation systems from a distance.

- To modify the irrigation schedule we can use forecast rainfall, change in humidity, or drought conditions, Predictive analysis and weather forecasting are used.
- Smart resource allocation of irrigation based on soil moisture sensor data, weather forecasts, crop and soil types.
- AI can be used to improve irrigation system, particularly in regions with high cost of energy or a reason with insufficient resources.
- AI increase efficiency of disease prevention and crop health monitoring.

2. AI in Weeding and Spraying Machines

AI used for weeding and spraying in agriculture it can increase accuracy, decrease labour costs, and using less amounts of pesticides. AI can use in weeding and spraying machines to utilize some key technologies:

- **Computer Vision and Sensors:** AI use in high quality data and photos captured by help of cameras and sensors to differentiate between weeds and crops. High quality images are used to identify plants even in their early phases of growth.
- **Machine Learning Algorithms:** A large number of crop photos are used to train algorithms, which

allow them to recognize weeds and categorize various plant species. As these models are exposed to a wider variety of datasets, they get better over time.

- **GPS and Autonomous Navigation:** These devices can use to target weeds in a field because with help of GPS and LIDAR, which enable automatic field navigation system.
- **Robotic Arms and Nozzles:** In order to decrease waste, the machines are use the robotic arms or nozzles which can apply herbicides or pesticides just where require.

Table 5. Performance Metrics

Method	Precision in weed detection (%)	Cost per Acre (\$)	Pesticide Reduction (%)	Time efficiency (hrs./acre)	Labor Requirement (hrs./acre)
Manual	60-70	High	0	3-4	2-3
Machinery-Based	75-85	Medium	10-20	2-3	1-2
AI-Driven Systems	90-98	Low	30-90	1-2	0.5-1

Advantages of AI in Weeding and Spraying

- Precision in weed detection
- Reduce pesticide usage
- Cost Efficiency
- Time Efficiency
- Environmental Benefits

Challenges and Limitations

- High initial costs
- Data Requirements for AI Training
- Weather and lightning conditions
- Maintenance and skill requirements

Figure 2. Advantages and Limitations of AI in Weeding and Spraying

3. AI in robots and drones

By easing independent decision- timber, inflexibility, and sophisticated problem- working, artificial intelligence (AI) greatly improves robotic systems. The ability of AI-

enabled drones to fly autonomously, collect data, and perform sophisticated analytics is revolutionizing a number of industries.

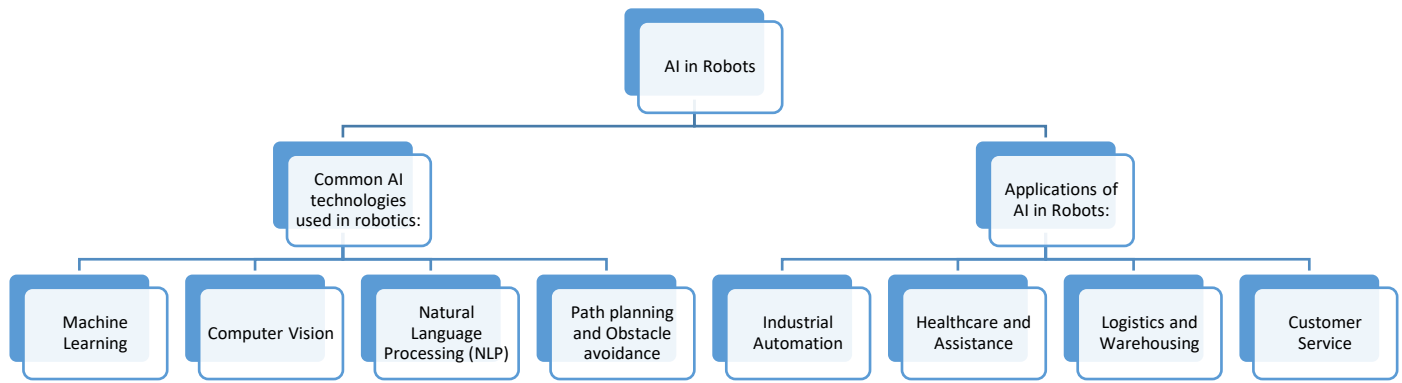


Figure 3. AI in Robots

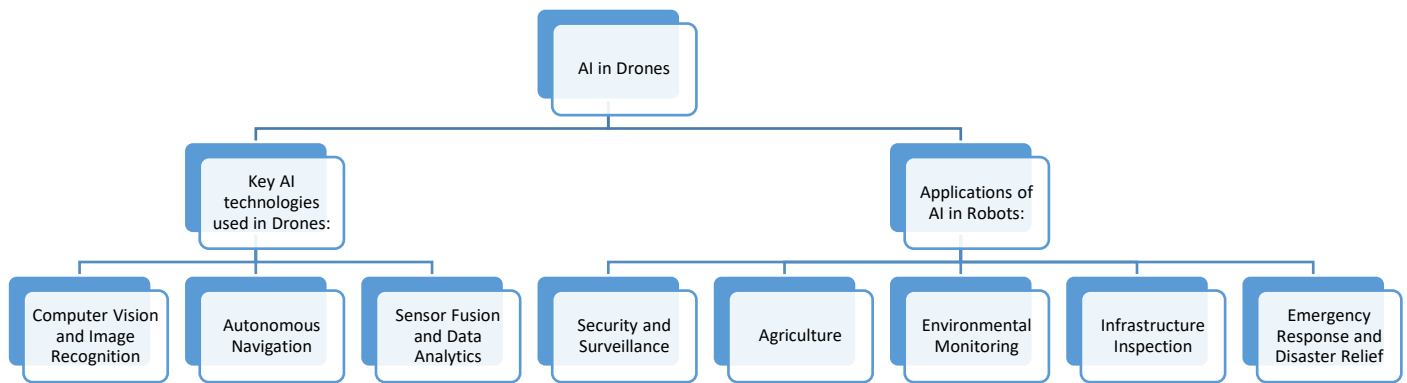


Figure 4. AI in Drones

Future Trends of AI in Robots and Drones:

- **Edge AI Processing:** Drones and robots may formerly serve autonomously in remote areas without taking internet connectivity thanks to the growing processing of AI models directly on the outfit.
- **Swarm Robotics and Drones:** When several drones or robots unite, they can cover further ground more snappily, which can help with large- scale planting, harvesting, and crop monitoring.
- **Integration with IoT:** A smart agrarian ecosystem can be created by combining AI- driven robots and drones with IoT-connected detectors on fields. The AI can enable real- time data collecting system, analysis system, and automatic responses system.

C. AI's Measurable Effect on Yield and Cost Saving

Research shows that AI can improve growth conditions and identify location where the issues is creating and increasing yields by 10% to 20%. The applications of AI, like saving labor cost and spraying its required and can reduce operating cost by up to 30%. AI-powered

precision agriculture could save roughly 20–40% on water uses with data-informed irrigation and cut chemical expenditures by 50–90% through selective application techniques.

Targeted application of spraying systems is based on AI have been shown in a study to reduce the chemical use by as important as 90%, which can help in reduction of costs. also, the cost of labour can be lowered by 20% to 30% through AI- grounded robotization of conditioning similar as planting, weeding, and harvesting, which in turn leads to a substantial reduction in the problems associated with labour dearth in agriculture. farther exploration also reveals that the operation of AI technology in prophetic conservation can reduce the cost of repairing outfit by as important as 25%, which in turn leads to an increase in the life of outfit and overall effectiveness of operations. Taken together, the findings above emphasize the significance of AI technology in adding agrarian product and reducing costs, making it an integral part of sustainable husbandry practices in the future.

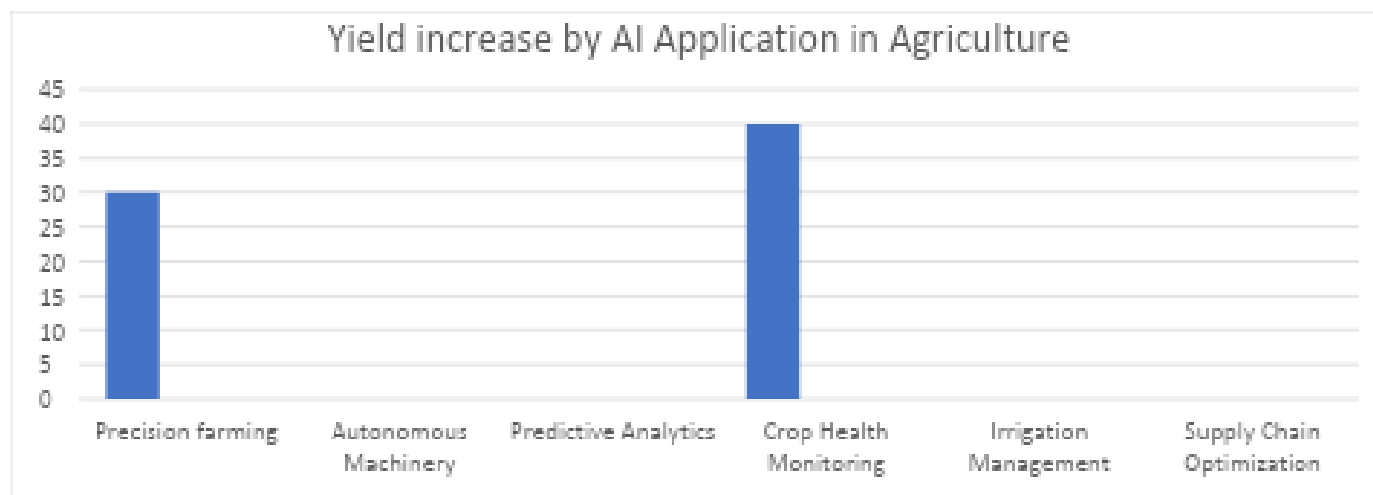


Figure 6. Quantified Impact of AI on Crop Yield

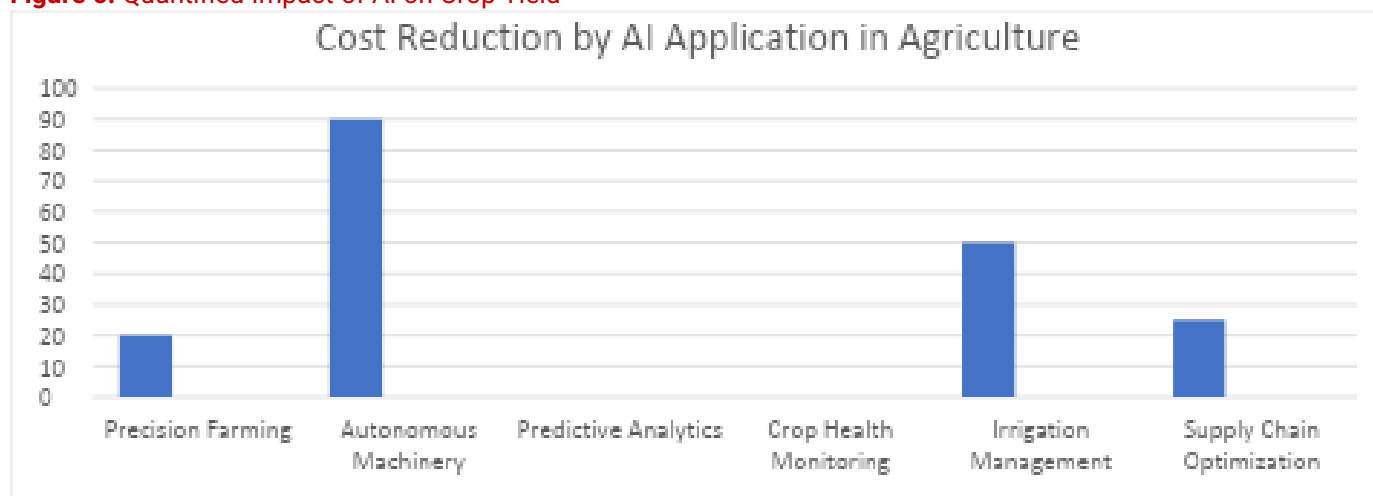


Figure 7. Quantified Impact of AI on Cost

D. Soil Health and Management

- I. We can take analysis of Soil Composition and test the soil. The AI take dissect data from soil samples, like pH situations, moisture content, organic matter, and nutrient content (such as nitrogen, phosphorus, and potassium). Similar data can be snappily anatomized by machine literacy algorithms, which give a complete analysis of the soil condition. Automated Soil Testing growers can conduct soil testing using AI-powered bias and detectors, which give immediate results on soil composition without demanding any lab analysis. This facilitates targeted nutrient applications and expedites the decision-making process.
- II. Targeted Nutrient Application: With the help of analysed soil data, AI systems produce nutrient maps in which it highlights region that need of certain nutrients. This Technology reduces nitrogen runoff and the impact on the environment by applying fertilizers only where necessary.
- III. With the help of IoT and AI sensors which can monitor the moisture level of soil and forecast when or where irrigation is required. This takes moisture levels at which point where crop give high yield and avoids over-irrigation, the higher and lower irrigation from requirement both are critical for soil health and nutrient absorption.

- IV. With the help of drone and satellite photos analysis by AI to calculate soil health parameter which including erosion, compaction, and organic matter content in the soil. By help of these Farmers are better able to understand and react according to the soil health across fields.
- V. Soil Erosion Detection: By the help of machine learning we can identify that area where the soil erosion takes place and then farmers can take required action for save the soil with the help of mulching.
- VI. By the use of Artificial Intelligence, we can identify the area where indicates a shortfall in the necessary amount of nutrients in Crops. AI generated image identification can identify symptoms of crop nutrient shortages, such discolouration (for phosphorus deficiency) or yellowing of the leaves (for nitrogen deficit).

Conclusion

Artificial Intelligence (AI) is visionary in agriculture, it can offer creative solutions to problems and improve the farming methods like sustainability, productivity, and efficiency. The main areas where AI and agricultural engineering work together to great effect have been highlighted in this overview, ranging from automated systems and smart irrigation technology to precision agriculture and predictive analytics. Machine learning, computer vision, and Internet of Things-grounded systems are some of the AI technologies that

have helped growers make optimal decisions and minimize the negative effects of those decisions on the terrain. The growth of modern agriculture technology has decreased the use of fungicides, pesticides, and water, while increasing crop yield, hence it is addressing the issue of food security. In conclusion, agricultural engineering and agriculture could go through a major restructuring thanks to artificial intelligence. AI will play a big role in sustainable agriculture as technology develops, opening up possibilities for a strong and cost-efficient agricultural industry. To guarantee a balanced and sustainable approach to AI-driven agriculture, future research should concentrate on creating scalable models for both small and large farms, as well as on creating inexpensive, user-friendly AI solutions and tackling ethical and environmental issues.

Declarations of interests

All authors of this manuscript declare that they have no conflict of interest.

Data sharing

All relevant data are within the manuscript.

References

- Chlingaryan A, Sukkarieh S & Whelan B. 2018. Machine learning approaches for crop yield prediction and nitrogen status estimation in precision agriculture: A review. *Computers and Electronics in Agriculture* 151: 61–69.
- Jha K, Doshi A, Patel P and Shah M. 2019. A comprehensive review on automation in agriculture using artificial intelligence. *Artificial Intelligence in Agriculture* 2: 1–12.
- Srbínovska M, Gavrovski C, Dimcev V, Krkoleva A and Borožan V. 2014. Environmental parameters monitoring in precision agriculture using wireless sensor networks. *Journal of Cleaner Production*.
- Shamshiri RR, Kalantari F, Ting KC, Thorp KR, Hameed IA, Weltzien C, Ahmad D and Shad ZM. 2018. Research and development in agricultural robotics: A perspective of digital farming. *International Journal of Agricultural and Biological Engineering* 11(4): 1–14.
- Li M and Yost R. 2000. Management-oriented modelling: Optimizing nitrogen management with artificial intelligence. *Agricultural Systems* 65(1): 1–27.
- Montas H and Madramootoo CA. 1992. A decision support system for soil conservation planning. *Computers and Electronics in Agriculture* 7(3): 187–202.
- Tajik S, Ayoubi S and Nourbakhsh F. 2012. Prediction of soil enzymes activity by digital terrain analysis: Comparing artificial neural network and multiple linear regression models. *Environmental Engineering Science* 29(8): 798–806.
- Wakchaure M, Patle BK and Mahindrakar AK. 2023. Application of AI techniques and robotics in agriculture: A review. *Artificial Intelligence in the Life Sciences* 3: 100057.
- Lal H, Jones JW, Peart RM and Shoup WD. 1992. FARMSYS—A whole-farm machinery management decision support system. *Agricultural Systems* 38(3): 257–273.
- Pilarski T, Happold M, Pangels H, Ollis M, Fitzpatrick K and Stentz A. 2002. The Demeter system for automated harvesting. *Autonomous Robots* 13(1): 9–20.
- Van Henten EJ, Hemming J, Van Tuijl BAJ, Kornet JG, Meuleman J, Bontsema J and Van Os EA. 2002. An autonomous robot for harvesting cucumbers in greenhouses. In: *Autonomous Robots* 13(3): 241–258.
- Papageorgiou EI, Markinos AT and Gemtos TA. 2011. Fuzzy cognitive map-based approach for predicting crop production as a basis for decision support system in precision agriculture application. *Applied Soft Computing* 11(4): 3643–3657.
- Kolhe S, Kamal R, Saini HS and Gupta GK. 2011. A web-based intelligent disease-diagnosis system using a new fuzzy-logic based approach for drawing the interferences in crops. *Computers and Electronics in Agriculture* 76(1): 16–27.
- Kolhe S, Kamal R, Saini HS and Gupta GK. 2011. An intelligent multimedia interface for fuzzy-logic based inference in crops. *Expert Systems with Applications* 38(12): 14592–14601.
- Munirah, M.Y., Rozlini, M. and Siti, Y.M. (2013). An expert system development: Its application on diagnosing oyster mushroom diseases. In: *Proceedings of the 13th International Conference on Control, Automation and Systems*, Gwangju, South Korea, October 20–23, pp. 1–5.
- Gupta, G. and Pal, S.K. (2025). Applications of AI in precision agriculture. *Discover Agriculture*, 3: 61.
- Aker, J.C. and Fafchamps, M. (2015). Mobile phone coverage and producer markets: Evidence from West Africa. *World Bank Economic Review*, 29(2): 262–292.
- Tobal, A.M. and Mokhtar, S.A. (2014). Weeds identification using evolutionary artificial intelligence algorithm. *Journal of Computer Science*, 10(8): 1355–1361.
- Moallem, P. and Razmjoooy, N. (2012). A multi-layer perception neural network trained by invasive weed optimization for potato color image segmentation. *Trends in Applied Sciences Research*, 7(6): 445–455.
- Karimi, Y., Prasher, S.O., Patel, R.M. and Kim, S.H. (2006). Application of support vector machine technology for weed and nitrogen stress detection in corn. *Computers and Electronics in Agriculture*, 51(1–2): 99–109.
- Sattari, M.T., Avram, A., Apaydin, H. and Matei, O. (2020). Soil temperature estimation with meteorological parameters by using tree-based hybrid data mining models. *Mathematics*, 8(9): 1407.
- Aijaz, N., Lan, H., Raza, T., Yaqub, M., Iqbal, R., and Pathan, M.S. (2025). Artificial intelligence in agriculture: Advancing crop productivity and sustainability. *Journal of Agriculture and Food*

- Research, 20: 101762. <https://doi.org/10.1016/j.jafr.2025.101762>
23. Sekar, S., Rajesh, S., and Sekar, S.D. (2024). Artificial intelligence and machine learning approaches for smart agriculture. In: Rodino, S. and Dragomir, V. (eds.), *Agrarian Economy and Rural Development – Trends and Challenges: International Symposium, 15th Edition*. The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 24–31.
24. Kolikipogu, R., Darak, V., Yennapu, R., Reddy, S., Sureddi, R.M.K., and Kuchipudi, R. (2023). Agriculture recommender system for precision farming using machine learning (ARS). In: *Proceedings of the 3rd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA 2023)*, Bengaluru, India, pp. 921–927. IEEE. <https://doi.org/10.1109/ICIMIA60377.2023.10426510>.