Jafar Azizi / Int.Artif.Intell.&Mach.Learn. 4(2) (2024) 83-91
https://doi.org/10.51483/IJAIML.4.2.2024.83-91 ISSN: 2789-2557

SvedbergOpen
DISSEMINATION OF KNOWLEDGE

International Journal of Artificial Intelligence and Machine Learning

Publisher's Home Page: https://www.svedbergopen.com/

Research Paper Open Access

Application of Artificial Intelligence (AI) In-Farm

Jafar Azizi[1]*

[1]Associate Professor, Department of Economic, Islamic Azad University, Tehran North Brach, Tehran, Iran. E-mail: J.azizi@iau-tnb.ac.ir

Article Info

Volume 4, Issue 2, July 2024
Received : 21 April 2024
Accepted : 15 June 2024
Published : 05 July 2024
doi: 10.51483/IJAIML.4.2.2024.83-91

Abstract

AI plays a crucial role in agricultural management by enabling precise agricultural practices. By leveraging technologies such as IoT, data mining, machine learning and deep learning, it helps farmers make data-driven decisions for optimal crop health and productivity. These technologies, such as seasonal prediction models, AI sensors for herbicide optimization, and AI-powered drones for real-time monitoring, contribute to improved agricultural safety, lower toxin levels in food, and higher crop yields. Additionally, AI bots address labor shortages by efficiently harvesting crops and controlling weeds, ultimately increasing productivity. Integrating AI into operations not only increases efficiency, but also ensures sustainable practices, profitability and environmental protection. To further strengthen trust in AI solutions for precision agriculture, measures on transparency, accountability, fairness and data security are recommended. This technology improves decision-making through data-driven insights into weather patterns, soil conditions and plant health. This results in better yield prediction, timely pest and disease control interventions and overall improved crop management. This results in higher yields, lower operating costs and better risk management for farms. Ultimately, it helps increase profitability and sustainability in the long term.

Keywords: *Artificial intelligence, Agriculture, Productivity*

1. Introduction

It is predicted that the world population will reach 10 billion people by 2050 and due to population growth; agricultural land will become houses and roads. As the population increases, the amount of food needed worldwide will also increase by 50%, while about 37.7% of the entire earth's surface is used for the production of agricultural crops and there are daily production constraints such as climate change and pests are increasing. And diseases are increasing. The only way to address this challenge is to use automation and artificial intelligence, which can increase productivity and production of products. Artificial intelligence has been used in many areas in recent years to increase productivity and efficiency (Azizi, 2024a).

* *Corresponding author: Jafar Azizi, Associate Professor, Department of Economic, Islamic Azad University, Tehran North Brach, Tehran, Iran. E-mail: J.azizi@iau-tnb.ac.ir*

Artificial intelligence is one of the latest software and hardware technologies in the world that simulates and performs intelligently and automatically many processes that must be done by humans using calculations. The basis of technology is mathematical calculations and the use of new algorithms that can completely simulate humans. This technology is used in industries and has many applications, among which the agricultural industry can be mentioned. Artificial intelligence in the agricultural industry will improve the quality, increase the quantity of products, reduce costs, etc. (Eskandari *et al.*, 2022).

Artificial intelligence transforms traditional ways of doing things into a more efficient and better way. The use of new technology in agriculture increases productivity and significantly reduces negative environmental impacts. This technology is predicted to grow at a compound annual growth rate of approximately 25% from 2023 to 2031. It is predicted that the use of AI in advanced agriculture will increase crop yields by 20 to 30 percent. Studies have shown that artificial intelligence in irrigation systems has helped reduce water consumption by 25% (Azizi, 2024b).

Similarly, artificial intelligence-based fertilizer and pesticide application solutions have led to more efficient and reduced use of these inputs. The use of this technology helps farmers provide valuable information by analyzing and comparing the obtained data on temperature, precipitation, wind speed and solar radiation over time to achieve the desired results. Artificial intelligence is a real game changer for the food and agriculture sector (Nikzadi Panah *et al.*, 2021).

Artificial intelligence (AI) plays a critical role in agricultural management by optimizing resources, increasing productivity and addressing challenges such as climate change and food security. This technology, including machine learning, convolutional neural networks, IoT, big data, robotics and computer vision, are being used extensively in agriculture to improve crop management, disease prediction and pest control. By analyzing soil moisture levels, weather patterns and real-time data, AI algorithms can optimize irrigation and fertilizer application, resulting in higher crop yields, lower costs and sustainable agricultural practices. Integrating AI into agriculture not only increases efficiency but also enables farmers to make informed decision-making, ultimately revolutionizing the industry (Azizi, 2001).

In this study, the author examines the studies conducted by the researchers in a review and, based on the categorization of the topics, presents the different areas that can be influenced by artificial intelligence in the agricultural production process.

2. Literature Review

Artificial intelligence (AI) plays a crucial role in farm management by optimizing various aspects of farming. AI applications in agriculture include optimizing irrigation and fertilizer use under adverse climatic conditions, increasing crop yields, reducing waste, and promoting sustainable agricultural practices (Azizi and Yazdani, 2007). AI enables precision agriculture by providing farmers with actionable insights through technologies such as agricultural vision, natural language processing, and robotics. In addition, AI models can predict the impact of extraordinary events on crop yield, helping to manage uncertainties in agricultural production. These AI models help monitor crop health, identify hidden patterns, and implement Variable Rate Application (VRA) techniques, resulting in higher farm profitability and reduced environmental impact (Azizi *et al.*, 2022). Additionally, AI in farm management includes the development of intelligent IoT-based systems for real-time data collection and monitoring in aquaculture, helping in predicting fish growth and optimizing aquaculture operations. Additionally, AI models such as Random Forests are used to transform field data into actionable insights, enabling early problem detection and cost reduction in crop management (Bayat *et al.*, 2012).

The basic concept of AI is to develop technology that works like a human brain (Parekh *et al.*, 2020), considering the way the brain thinks, how humans learn, make decisions, and work to identify the best way to solve a problem (Talaviya *et al.*, 2020). From these studies, software and intelligent systems are developed, and later, they are fed with data to start generating useful information. In the agricultural sector, AI main applications are in crop management, pests, diseases, seeds, land use, irrigation, and harvest prediction (Bannerjee *et al.*, 2018). Therefore, producers in their daily activities can find AI support to face the adversities imposed by the environment, whether related to pests and diseases or climatic factors that are not under their control (Ogunu-Ebiye and Obiani, 2021).

In general, based on the literature review, we can determine the use of artificial intelligence in the agricultural sector as follows:

- Artificial intelligence offers more efficient ways to produce, harvest and sell market-important products (Azizi, 2007).
- The use of artificial intelligence will particularly help in investigating defective products and improving the potential for producing healthy agricultural products.
- The use of artificial intelligence will strengthen farms and make them more efficient.
- Artificial intelligence will help in applications such as the automatic setup of equipment for Predicting or identifying weather and plant disease pests (Zarei Nasibeh and Azizi Jafar, 2024).
- Artificial intelligence can improve crop management practices and help many technology companies invest in algorithms that are useful in agriculture.
- AI solutions have the potential to solve the challenges faced Farmers face challenges including climate change, pest infestations and weeds that reduce yields.

3. Results and Discussion

Artificial intelligence is used in various fields of agriculture in the farm. According to the studies, these uses in the farm are categorized as follows.

3.1. Intelligent Robots Replace Labor in the Farm

3.1.1. Worker Robots in the Process of Planting, Planting, and Harvesting

Working robots are increasingly being developed to assist with agricultural tasks such as planting, pruning and harvesting. The aim of these robots is to increase work efficiency, address labor shortages and improve productivity in the agricultural sector (Azizi, 2023). Various designs and configurations are explored, including the use of deep learning for image recognition, robotic manipulators for selection actions, and various mechanisms for navigating complex vegetation. Security concerns have also been raised regarding the use of intelligent harvesting robots, highlighting the importance of protecting these systems from potential threats. Research shows that using multiple harvesting and transport robots in tandem can significantly increase labor efficiency in smart greenhouses compared to using a single robot, highlighting the potential benefits of collaborative robotic systems in farms. Examined shows, agricultural robots for sowing and weeding work. The robot outperforms conventional machines in terms of operational efficiency by 9%.

3.1.2. Worker Robots in Livestock and Poultry Farms

Work robots are increasingly being used in livestock and poultry farms to increase efficiency and address labor shortages. These robots are designed to perform various tasks such as patrolling, removing dead chicks, collecting eggs, turning litter, weighing birds and collecting environmental data. Technologies such as ultra-wideband networks and real-time kinematic GPS systems are being integrated to improve robot localization in both indoor and outdoor environments. In addition, advances in autonomous navigation systems, motion modules and information acquisition modules have led to the development of robots capable of autonomously perceiving information about livestock and poultry, creating global maps and improving the detection of the breeding environment. These innovations not only increase operational efficiency, but also reduce risks to workers and improve overall safety in agricultural practices. For example, robotic systems are becoming routine on dairy farms, with a focus on improving safety and reducing occupational hazards for workers. In addition, the introduction of digital technologies such as robotic milking systems aims to reduce physical strain on workers while increasing productivity. Path planning algorithms are also being developed to optimize the energy consumption of feeding robots to reduce labor and improve operational efficiency in poultry farms.

3.2. Artificial Intelligence Controller and Planner of the Use of Objects in the Agricultural Production Process

Artificial intelligence (AI) plays a crucial role in improving agricultural operations by enabling intelligent control functions, path planning and decision making in the agricultural production process. AI applications

in digital agriculture include monitoring environmental parameters, using cloud technologies, and implementing management decisions using robotic means. In addition, AI can provide recommendations on soil conditions and pesticides and automate tasks such as milking and fruit picking, contributing to sustainable production in agriculture. As technology advances, AI will redefine agriculture by increasing efficiency and performance while reducing the need for manual labor, leading to a trend toward diversification in the agricultural sector. Integrating AI controllers and planners into agricultural robots is critical for optimizing tasks, ensuring safe obstacle avoidance, and improving overall efficiency in the agricultural production process. The following types of controls have been used so far:

- Irrigation system controller in agriculture and horticulture
- Food ration controller in farm and water and feed management in farm
- Pest and disease controller in farm • Electricity and production capacity controller
- Controller and management of collection of objects in production system

3.3. Artificial Intelligence Decision-Maker and Decision-Maker in the Production Process (Precision Agriculture)

Artificial intelligence (AI) acts as a key decision maker across industries and supports complex decision-making processes. Integrating AI into business decision making has transformed processes and improved efficiency, accuracy and innovation. The concept of explainable AI highlights the importance of linking AI decision-making with human decision-making and emphasizes the human condition and responsibility in accepting AI's reasoning results. Additionally, the emergence of Decision Intelligence (DI) shows the potential for integrating artificial and human intelligence to optimize decisions for improved business outcomes and efficiency, and provides a framework for successful decision making across various industries. Overall, the role of AI as a decision maker is crucial for dealing with huge amounts of data, managing complex scenarios and driving corporate success.

The term "smart agriculture" refers to the use of technologies such as the Internet of Things, sensors, positioning systems, robots and artificial intelligence with the aim of managing operations in such a way that the quality and quantity of products are increased and the efficiency of agriculture Human resources used in the farm are optimized. Called. Smart agriculture can assist the farmer in the areas of cultivation, irrigation, pesticide spraying and crop harvesting. Smart agriculture can measure soil and air moisture, water levels, sunlight, etc. using sensors and use artificial intelligence to use this information to help farmers find the best time to irrigate to conserve their water resources. The quality of the products can be increased slowly, also by analyzing the soil nutrients (nitrogen, phosphorus, potassium).

3.3.1. Optimum Decision-Making in the Conditions of Using a Huge and Diverse Amount of Data

In the field of AI-driven decision making amidst vast and diverse data, companies are faced with the challenge of efficiently gaining valuable insights. The use of cyber-physical systems can help with data aggregation, enrichment and automated decision-making, improving decision suggestions by up to 90%. Deriving optimal decision trees from large data sets is complex and often requires heuristic approaches due to NP-completeness. Nevertheless, novel methods such as incremental generation of Boolean formulas are promising in terms of scalability. Developing agents capable of making optimal decisions through data fusion from diverse sources is critical, especially in scenarios requiring behavior tracking and security compliance, with convex solutions achievable under appropriate assumptions. Data-driven decisions in stochastic optimization problems can be statistically optimal, with an emphasis on minimizing out-of-sample risk while managing disappointment, requiring Pareto-dominant decisions within defined ambiguity sets (Davari Farid *et al.*, 2019).

3.3.2. Decision Making in Terms of Predicting Different Production Risks

Research using AI includes that of Batarseh. It shows how data science can help formulate public policies in the agricultural sector in the United States. Expert systems have been used to determine agricultural water and land use, agricultural production, climate impacts, and public policy in the agricultural sector. It shows the importance of maps in the agricultural sector; In this application, the noise is removed from maps and the noise is replaced with the right data. This data can be used by various knowledge-based systems in decision-

making and policy making in different sectors. While the research conducted by Mangalampalli developed an agricultural production decision-making system using data mining as a decision-making tool, this article conducts detailed research to develop an architectural model for implementing high-quality agricultural information system. This information system uses the latest technologies, intelligent systems, data mining, data warehousing and high performance computer networks (HPC).

Climate change poses significant risks that require effective risk control measures. Various studies highlight the importance of risk perception and collective efficacy in addressing climate change risks. Vulnerable communities demonstrate increases in collective efficacy following interventions, highlighting the need for targeted risk control strategies. In addition, the impact of climate change on operational risk is considered, with potential losses caused by changes in human behavior, economic metrics and physical impacts. Early action is crucial to limit economic consequences and operational risk losses. Furthermore, communicating climate change risks can influence individuals' perceptions and behavior, with climate change information potentially leading to ideological defense mechanisms. Tailoring climate communication to individuals' worldviews can improve risk control efforts and promote realistic attitudes toward climate change (Azizi, 2018).

3.4. Documentary Artificial Intelligence (Gathering and Analyzing Large Amounts of Agricultural data)

Documentary artificial intelligence (AI) plays a crucial role in collecting and analyzing large amounts of agricultural data. This technology uses advanced algorithms to process and interpret agricultural information and supports decision-making processes to optimize agricultural practices and address challenges related to food production and climate change. By using AI, researchers can extract structured information from scientific publications to build metadatabases, analyze dependencies based on pedo-climatic contexts, and provide recommendations for appropriate agricultural management practices. In addition, AI in agriculture includes precision agriculture, intelligent agriculture and intelligent sustainable agriculture, highlighting the use of information technologies and machine learning in this area. Overall, integrating AI into agriculture represents a transformative approach to increasing productivity, sustainability and resilience in the agricultural sector (Azizi and Yazdani, 2006).

3.4.1. Creating a Database and Recording the Details of the Production Process

One of the key applications of artificial intelligence in this area is soil health analysis. By interpreting data from soil sensors, AI can provide insights into moisture levels, nutrient levels, and other critical soil parameters. This information enables more informed decisions about irrigation, fertilization and planting. Additionally, AI is adept at weather forecasting. By analyzing historical weather data and current trends, AI algorithms can accurately predict weather conditions.

3.4.2. Summarizing and Creating a Management System Dashboard in the Farm

AI and dashboard systems play a crucial role in modernizing agriculture. Integrating artificial intelligence (AI) into agriculture aims to increase productivity and efficiency by addressing challenges such as soil treatment, disease control and data management. In addition, the use of intelligent agricultural technologies such as: B. IoT-based systems, the automated monitoring and control of various parameters such as temperature, humidity and energy consumption in agricultural operations. These systems enable data collection, analysis and decision-making remotely, ultimately leading to better crop yields and less manual intervention. Additionally, the development of dashboard systems provides farmers with real-time insights into their agricultural processes, facilitating informed decision making and improving overall farm management (Azizi and Aref Eshghi, 2011).

Crop management begins with sowing and continues with monitoring growth, harvesting, and storage and distribution of the crop. Activities that improve the growth and yield of agricultural products are summarized. A deep understanding of the crop class in terms of its timing and the type of soil that thrives will certainly increase the yield of the crop. Precision Crop Management (PCM) is an agricultural management system designed to align crop and soil inputs according to agricultural needs to optimize profitability and protect the environment. Farmers must combine different crop management strategies to address water shortages

caused by soil, weather or limited irrigation. Flexible product management systems based on decision rules should be preferred. Timing, severity and predictability of droughts are important characteristics for selecting crop alternatives. Optimizing storage, supply chain and market sales.

- Detect early signs of disease or animal stress.
- Documentation (compilation and analysis of large amounts of agricultural data).
- Optimal decision making on farm different risk conditions monitoring plant growth and plant health in artificial intelligence:

3.5. Artificial Intelligence Warning and Risk Control

Artificial intelligence plays a crucial role in alerting and risk control across various sectors. In the financial industry, AI is used to develop early warning systems for corporate financial risk management, increasing risk prediction accuracy to over 90% and facilitating rapid response to risk events. In internet finance, AI applications focus on intelligent risk control and early warning in decision making, and address security risks such as hacker attacks and data breaches through deep learning algorithms. Similarly, in engineering projects, AI algorithms are used to create early warning models of safety risks, reducing the likelihood of injury to construction personnel and improving the overall effectiveness of risk control. Additionally, AI helps manage massive transaction data in banking and enables timely risk responses and system monitoring through semantic trees, ETL technology and UML modeling.

3.5.1. Predicting the Probability of Effective and Risky Incidents in the Production Process

AI models are increasingly being used to predict the likelihood of effective incident management and risky incidents in IT operations. These models aim to automate incident prediction and resolution, improving user experience and productivity. In addition, machine learning techniques have been used to prevent incidents and occupational risks in the workplace, thereby improving the accuracy of risk prediction and the effectiveness of incident prevention. By analyzing past incidents using logical regression and classification methods, AI can significantly improve the identification of risks and help prevent incidents, highlighting the potential of AI in improving incident management and workplace safety can be seen in the following areas:

- Advanced predictive analytics
- Advanced precision agriculture
- Drone and robotic innovations
- Improved product condition imaging
- Product sorting based on product quality
- Nutrient injection and circulation systems
- Autonomous machines
- Smart irrigation systems
- Efficiency optimization algorithms
- Supply chain optimization, etc.

3.5.2. Taking Appropriate Measures to Control the Production Risk

Artificial intelligence-based software can analyze soil moisture content, predict future rainfall, and adjust irrigation accordingly to provide water needs for agricultural crops. This saves water and ensures plants are neither over-watered nor under-watered, promoting healthier growth and higher yields. And in fact they increase the value of the final production of water and make production more economical. Such smart irrigation systems significantly improve water use efficiency, which is an important factor for sustainable agricultural practices. Imagine a Rayton garden with an artificial intelligence-based irrigation system. Sensors constantly monitor soil moisture and weather patterns are regularly monitored using AI. The system can then automatically adjust the amount of water delivered to each tree. Then each plant receives exactly the amount it needs for optimal growth and production.

Artificial intelligence (AI) plays a crucial role in controlling agricultural risks by leveraging advanced technologies to improve decision-making processes. AI applications in agriculture include providing recommendations on soil conditions, pesticides, and automated farming equipment that contribute to sustainable production. Additionally, AI helps model uncertainty and assess risk levels using rich textual data, enabling better understanding of potential threats. In addition, AI technologies such as machine learning are used to predict extreme weather events and thus reduce their impact on agriculture and society. By addressing ethical challenges and ensuring transparency, fairness and accountability in AI systems, the agricultural sector can effectively manage risks and optimize operations. Overall, integrating AI into agriculture is critical to mitigating risks and ensuring sustainable production in the face of uncertainty.

3.6. Artificial Intelligence that Estimates the Amount of Product Production and Analyzes the Growth Chart

Drones equipped with artificial intelligence fly over fields and photograph agricultural products. Machine learning algorithms then process the images to detect abnormalities such as discolored leaves, signs of possible disease, or nutrient deficiencies. This technology allows early detection of pests or diseases and their control, improving management. AI-based technologies analyze data from various sources. Based on this, farmers gain great new capabilities, including:

- Assessing nutrient deficiencies
- Monitoring water stress
- Growth tracking
- Pest detection
- Environmental impact analysis
- Automatic data collection
- Weed identification
- Diagnostics

Artificial intelligence (AI) plays a crucial role in estimating the growth of agricultural products by leveraging advanced technologies such as machine learning (ML) and the Internet of Things (IoT). AI algorithms can predict crop yields, soil properties, disease detection in crops, and even predict the cost of agricultural products. In addition, AI helps optimize cold chain logistics to preserve agricultural products, with a focus on energy efficiency and quality preservation. In addition, AI is used to quickly and accurately classify the quality of agricultural products, improving the evaluation process. In addition, AI-based techniques such as deep learning are used to estimate crop production by taking into account factors such as neighboring countries' crop data and local climate conditions, improving forecasting capabilities for future years. Overall, AI is revolutionizing agriculture by providing intelligent solutions to increase productivity and ensure food security.

3.7. Artificial Intelligence for Research and Genetic Modification Based on Genetic Algorithms

Artificial intelligence (AI) and genetic algorithms are revolutionizing research and agriculture. AI, particularly through neural networks and genetic algorithms, is improving various areas such as epidemiology, drug development and agriculture. Genetic algorithms optimize AI systems for better results in growing horticultural crops, resulting in higher productivity and quality in greenhouse environments. The synergy between AI and genetic algorithms drives innovation in genetic engineering and enables the identification and isolation of desirable genes in genetic material with minimal experimental effort. This integration not only improves the efficiency of research processes, but also transforms agricultural practices by enabling precise modifications of metabolic pathways for optimal results with minimal input. Overall, AI and genetic algorithms are reshaping research and agriculture by providing advanced solutions for genetic modification and optimization.

References

Azizi, J. (2001). Sustainability of Agricultural Water. *Journal of Agricultural Economics and Development,* 9(36), 137-113, (In Persian).

Azizi, J. (2007). Economic Evaluation of Rice Marketing Strategies in Guilan Province. *Journal of Agricultural Sciences*, 12(4), 715-728, (In Persian).

Azizi. J. (2018). Analysis of Food Consumption Model and Food Insecurity Border of Rural Households of Guilan Province. *Journal of Rural Economic Research,* 4(8), 35-50. http://ruraleconomics.kiau.ac.ir/article_536261_en.html

Azizi, J. (2023). Investigating the Role and Effectiveness of Local Water Use Association (WUAs) in Managing Water Resource. *International Journal of Water Resources and Arid Environments,* 12(1), 56-66. https://www.psipw.org/attachments/article/3023/IJWRAE_APR_2023_vol12_1_56-66.pdf

Azizi, J. (2024). A Review of Food Supply Chain and Food Security's Indicators. Available at SSRN: https://ssrn.com/abstract=4737374 or http://dx.doi.org/10.2139/ssrn.4737374

Azizi, J. and Aref Eshghi, T. (2011). The Role of Information and Communication Technology (ICT) in Iranian Olive Industrial Cluster. *Journal of Agricultural Science*, 3(1), 228-232. https://doi:10.5539/jas.v3n1p228

Azizi, J. and Yazdani, S. (2004). Determination of Comparative Advantage of the Main Horticultural Products in Iran. *Journal of Agricultural Economics and Development,* 46(2), 41-72.

Azizi, J. and Yazdani, S. (2006). Investigating Export Market of Iran Apple Emphasized on the Principle of Comparative Advantage Export. *Journal of Construction and Research in Agriculture and Horticulture,* 73, 145-155.

Azizi, J. and Yazdani, S. (2007). Investigation Stability Income of Export Date of Iran. *Iranian Journal of Agricultural Science*, 13(2), 2-19.

Azizi, J., Zarei, N. and Ali, S. (2022). The Short- and Long-Term Impacts of Climate Change on the Irrigated Barley Yield in Iran: An Application of Dynamic Ordinary Least Squares Approach. *Environ Sci Pollut Res,* 29, 40169-40177. https://doi.org/10.1007/s11356-022-19046-9

Azizi, Jafar (May 11, 2024). The Prospect of Food Security with Artificial Intelligence. Available at SSRN: https://ssrn.com/abstract=4825112 or http://dx.doi.org/10.2139/ssrn.4825112

Azizi, Jafar and Rahmani, Seyed Mehdi Klateh (2024). Analysis of the Data Flow Diagram in the Market of Agricultural Products. Available at SSRN: https://ssrn.com/abstract=4825687 or http://dx.doi.org/10.2139/ssrn.4825687

Bannerjee, G., Sarkar, U., Das, S. and Ghosh, I. (2018). Artificial Intelligence in Agriculture: A Literature Survey. *International Journal of Scientific Research in Computer Science Applications and Management Studies*, 7(3), 1-6.

Bayat, V., Paknejad, F., Ardakani, M.R., Vazan, S., Azizi, J. and Mafakheri, S. (2012). Effect of Methanol Spraying on Physiological Characteristics, Oil and Protein Yields of Soybean (CV. Williams) Under Deficit Irrigation. *Ann Biol Res,* 3, 871-883.

Davari Farid, R., Azizi, J., Allahyari, M.S., Damalas, C.A. and Sadeghpour, H. (2019). Marketing Mix for the Promotion of Biological Control among Small-Scale Paddy Farmers. *International Journal of Pest Management*, 65(1), 59-65. https://doi.org/10.1080/09670874.2018.1459927

Eskandari, S., ZeraatKish, Y., Moghaddasi, R. and Azizi, J. (2022). Determinant Factors Energy Efficiency and Emission of Pollutants CO_2 & SO_2 in Iran's Agricultural Sector. *Int. J. Environ. Sci. Technol.,* 19, 1717-1728. https://doi.org/10.1007/s13762-021-03583-w

Masoumi, H., Azizi, J., Masoumi, M. and Rahimi, M.K. (2014). Effects of Different Levels of Water Deficit Stress on the Morphologic Properties of Root, Antioxidants Activity and the Seed Yield in Five Cultivars of Soybean (*Glycine max L.*). *Int. J. Agric. Innov. Res.*, 3, 2319-1473.

Nikzadi Panah, M., Azizi, J. and Zeraatkish, Y. (2021). Investigating the Effecting Factors on the Adoption of Agricultural Supplemental Insurance (Case Study on Alborz Province Farms). *Agricultural Economics Research*, 12(48), 1-22.

Parekh, V., Shah, D. and Shah, M. (2020). Fatigue Detection Using Artificial Intelligence Framework. *Augmented Human Research*, 5(1), 1-17.

Ogunu-Ebiye, U.G. and Obiani, A. (2021). Agribusiness Risks Management and Mitigation Strategies. *College of Education Academic Staff Union Journal*, 4(1), 17.

Talaviya, T., Shah, D., Patel, N., Yagnik, H. and Shah, M. (2020). Implementation of Artificial Intelligence in Agriculture for Optimisation of Irrigation and Application of Pesticides and Herbicides. *Artificial Intelligence in Agriculture*, 4, 58-73.

Zarei, Nasibeh and Azizi, Jafar (2024). Correlation Between Food Security, Climate Change, and Women Role. Available at SSRN: https://ssrn.com/abstract=4737380 or http://dx.doi.org/10.2139/ssrn.4737380

Cite this article as: Jafar Azizi (2024). Application of Artificial Intelligence (AI) In-Farm. *International Journal of Artificial Intelligence and Machine Learning*, 4(2), 83-91. doi: 10.51483/IJAIML.4.2.2024.83-91.