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RESEARCH ARTICLE

Implementation of Artificial Intelligence in Agriculture

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Abstract: Agriculture has a significant contribution to the economy. Agricultural automation is a major cause of concern and a relatively new phenomenon throughout the world. The world's population is quickly growing, resulting in increased demand for food and labor. Farmers' customary techniques were insufficient to achieve these goals. As a result, new automated techniques were developed. These creative initiatives met food demands while also providing work opportunities for a large number of people. Agriculture has changed as a result of artificial intelligence (AI). This strategy has shielded agricultural production from a variety of threats such as weather, population growth, labor rights, and food security concerns. The major issue of this is the numerous applications of AI in agriculture, such as irrigation, weeding, and spraying with different sensors or other ways implanted in robots and drones. These technologies limit the use of water, pesticides, and herbicides, preserve soil fertility, and help in the effective use of labor, resulting in increased output and quality. Many researchers make efforts to gain a quick overview of the present state of automation in agriculture, including weeding systems using robots and drones. Two automated weeding strategies as well as several soil water sensing technologies are explored. The drones are employed for the numerous methods for spraying and crop monitoring. In this paper, we also discuss how AI should be combined with other technologies and applications of AI for solving farming challenges.

Keywords: artificial intelligence, herbicide, pesticide, automation, irrigation, machine learning, anomaly detection, computer vision, natural language processing, conversational AI

1. Introduction

Crop varieties, irrigation, soil detection, crop scouting, weeding, and crop establishing in the agricultural industry all benefit from artificial intelligence (AI)-based solutions that help boost efficiency in all domains and handle problems faced by many organizations. Agricultural robotics are being developed in order to give high-value AI applications in the aforementioned industry. The agriculture industry is in peril as the world population expands, but AI has the potential to give a long-term solution. Farmers can create more output with less input, improve the quality of their product, and assure a faster time to market for their harvested crops owing to AI-based technological solutions (Figure 1; Abdullahi et al., 2015).

Figure 1
Vertical farming

Vertical farming is a type of agriculture in which food is grown on top of one another rather than in horizontal rows. Growing vertically frees up space, leading to a higher crop yield per sq. foot of area utilized. The worldwide human population is rapidly growing, with 9.9 billion people estimated by 2050, and food consumption is expected to rise by 35% to 56%. However, everyone is leaning toward building their own homes and owning property, as well as doing large-scale undertakings. Farmers have a tendency to think of AI as something that only applies in the digital world. They may be unable to see how it can assist them in working the real land. This is not because they are fearful of the unknown or conservative. Their resistance stems from a lack of awareness of how AI tools can be applied in the real world (Ahir et al., 2020).

Because Agri Tech vendors fail to adequately explain why their solutions are valuable and how they should be implemented, new technologies sometimes appear complex and unduly expensive. This is what occurs in agriculture when AI is used. Although AI can be beneficial, technology companies must still do a lot of work to assist farmers in properly implementing it (Ahirwar et al., 2019).

Agriculture entails a variety of processes and phases, the majority of which are performed manually. AI can help with the most complex and routine jobs by supplementing existing technology. When integrated with other technology, it can gather and evaluate massive data on a digital platform, determine the best course of action, and even initiate that action (Aitkenhead et al., 2003).

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2. Using Artificial Intelligence to Tackle Farming Problems

As previously said, AI cannot exist without the use of other technologies such as big data, sensors, and software. Similarly, AI is required for the proper operation of other technologies. In the case of huge data, for example, the data is not especially valuable. What matters is how it is processed and whether or not it is useful (Al-Ali et al., 2015).

When it comes to AI recommendations based on a collection of data, the time, place, and selection criteria all play a role. To make AI technology work, it is also critical to have excellent data engineers and data analysts. Let us take a closer look at how AI is used in agriculture (Albaji et al., 2010).

2.1. Big data as a tool for making well-informed decisions

The real purpose of data collection and production is to put it to good use. Data analytics in agriculture can result in large production gains and significant cost reductions. Farmers can acquire credible recommendations based on well-sorted real-time information on crop needs by merging AI and big data. As a result, guesswork will be eliminated, allowing for more exact farming methods such as irrigation, fertilization, crop protection, and harvesting (Anand et al., 2015).

2.2. AI helps people make smarter decisions

Predictive analytics has the potential to be a game changer. Farmers can collect and process substantially more data using AI than they could without it, and they can do so much faster. Farmers may use AI to handle critical difficulties including analyzing market demand, projecting pricing, and deciding the best time to sow and harvest (Anthony et al., 2014).

However, AI can also acquire information about soil health, make fertilizer suggestions, check the weather, and track the readiness of product. All of this helps farmers make better judgments at every stage of the crop-growing process (Arvind et al., 2017).

2.3. Artificial intelligence reduces costs

Precision agriculture, a type of farm management, can help farmers grow more crops with fewer resources. Precision agriculture aided by AI could be the next big thing in agriculture. Precision farming combines the greatest soil management practices, variable rate technologies, and data management strategies to assist farmers increase yields while reducing costs (Figure 2; Bak et al., 2003).

Farmers can use AI to get real-time insights into their fields, allowing them to spot areas that require irrigation, fertilizer, or pesticide application. In addition, novel farming techniques such as vertical agriculture may assist improve food output while reducing resource consumption. As a result, herbicide use is reduced, harvest quality is improved, earnings are increased, and significant cost savings are realized (Bakker et al., 2006).

2.4. Artificial intelligence can help with workforce shortages

Agricultural work is difficult, and labor shortages are nothing new in this business. With the use of automation, farmers can address this problem. Farmers can save money by using driverless tractors, smart irrigation and fertilization systems, smart spraying, vertical farming software, and AI-based harvesting robots. AI-driven farm tools are faster, tougher, and more accurate than any human farm worker (Bendig et al., 2012).

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3. Farming in Future

Another option comes from AI technology. Due to AI, the agriculture industry is undergoing a new era of transition, that is, for everything from employing from yield and soil monitoring to disease diagnosis and data modeling, computer vision technology has a wide range of applications (Bhaskaranand & Gibson, 2011).

Agriculture is one of the the world's oldest professions. As the world's population rises, so does the demand to cultivate and produce more, better crops of the highest quality. AI and deep learning are examples of new technology. People in rural areas will be able to access the same tools as city dwellers to tackle agricultural challenges such as low productivity, language barriers, and water scarcity. Because of Alexa and Siri, a voice-style smart assistant programmer, people who do not understand or speak English will be able to communicate with them. AI, machine learning, internet-of-things, cloud, and blockchain are buzzwords these days. We will experience an innovative shift after the web, sometimes referred to as

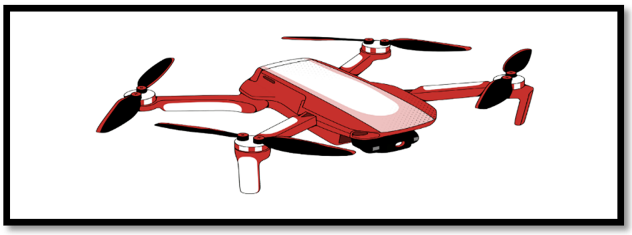
Figure 2
Future scope in artificial intelligence

the "Fourth Industrial Revolution," as a result of the method and acceptance of these improvements. Blockchain and AI are the true capabilities of such new technologies. The information recorded in blockchain databases is scrambled. AI and blockchain have a lot to offer in the commercial realm. Many businesses are attempting to determine what these are and how to implement them (Birrell et al., 1996). In this context, creating a blockchain AI business necessitates expertise and rigorous research. Blockchains are excellent for storing personal data if properly prepared, and they may unlock a wealth of value and ease in our lives. Intelligent medical solutions frameworks that make appropriate judgments based on our clinical studies and data, or Amazon and Netflix's proposal engines that suggest what we might like to purchase or watch right now should be considered. Difficulties in farming are as follows:

1. Water accessibility.
2. The time it takes for a rainstorm to pass.
3. Natural compost is readily available.
4. Availability of transportation to transfer the produce/reap.
5. Production capacity is easily accessible.
6. Market value variety and popular produce decrease.

Supply chain, smart farming, autonomous transportation, and smart retail are all areas where AI can be used in the agriculture industry. By recognizing weather conditions, temperature, water consumption, and soil, AI assists farmers in making better decisions about how to produce and yield fruitful crops. In precision horticulture, AI frameworks are employed to improve harvest quality and precision. Accuracy agriculture uses AI to help identify plant ailments, irritations, and helpless plant nutrition on ranches. Weeds may be detected and targeted using simulated intelligence sensors, which can then be used to identify which herbicides to administer in the appropriate buffer zone. Pesticides and other potentially harmful substances are kept out of our food by prohibiting their misuse (Figure 3; Blasco et al., 2002).

Figure 3
Image of drones'



To improve horticultural precision and efficiency, farmers employ AI to construct irregular forecasting models. These models can forecast future climate patterns over a lengthy period of time, helping small farmers to make more informed decisions. Because knowledge is sparse in nonindustrialized nations, small farms need to anticipate events on a regular basis. Because small farmers provide 70% of the world's harvests, it is vital to maintain these smaller homesteads running and developing tiny yields (Bond & Grundy, 2001).

Agriculture drone applications are as follows:

- Planting seeds.
- Analysis of the soil and the field.
- Spot spraying and harvest spraying.
- Mapping and surveying of harvests.
- Monitoring and management of the water system.
- Ongoing livestock surveillance.

The most promising new AI technologies for revolutionizing agriculture are as follows:
1. Crop and soil monitoring.
2. Observing crop maturity.
3. Detection of insect and plant diseases.
4. Intelligent spraying.
5. Automatic weeding.

4. How Artificial Intelligence (AI) Can Help Agriculture

Agriculture entails a variety of processes and phases, the majority of which are performed manually. AI can help with the most complex and routine jobs by supplementing existing technology. When integrated with other technology, it can gather and evaluate massive data on a digital platform, determine the best course of action, and even initiate that action (Figure 4; Buchanan, 1989).

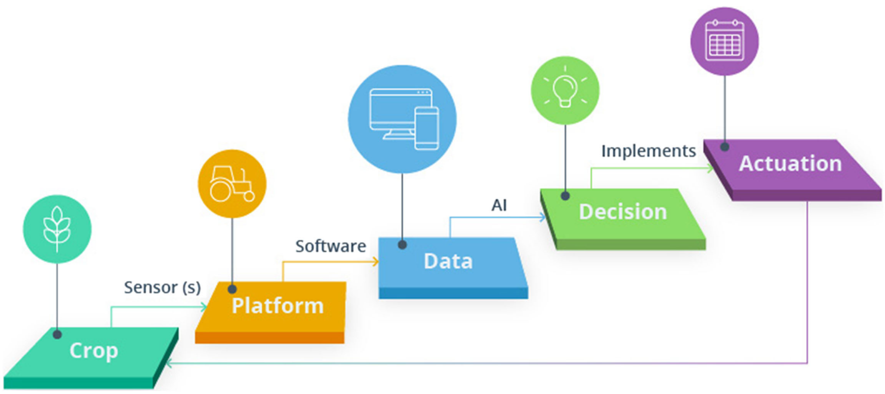
The following processes could benefit from combining AI with agriculture:

AI can simplify crop selection by analyzing market demand and assisting farmers in identifying the most profitable product.

Risk management

Forecasting and predictive analytics can help farmers reduce errors in business processes and lower the chance of crop failure.

Figure 4
The function of artificial intelligence (AI) in the agricultural information management cycle



Seed breeding

AI can assist develop crops that are less prone to disease and better adaptable to environmental conditions by gathering data on plant growth.

Monitoring soil health

AI systems that monitor soil health can conduct chemical soil analysis and provide precise estimations of missing nutrients.

Protecting crops

AI can monitor the health of plants in order to detect and even predict diseases, identify and eradicate weeds, and offer appropriate pest control.

Crops that are fed

AI can help in determining the best irrigation patterns and fertilizer application times, as well as predicting the best agronomic product mix.

Harvesting

It is possible to automate harvesting and even predict the ideal time for it using AI.

5. Crop and Soil Monitoring

Crop vitality, production amount, and quality are all affected by soil micronutrient and macronutrients. Human's sight and judgment were used to measure the quality of the soil and crop health.

Rather than collecting aerial image data and training computer and sense of direction models to use it for insightful crop and soil monitoring, we can now employ drone technology (UAVs) to capture aerial picture data and train computer and sense of direction models to use it (Figures 5 and 6). An Unmanned Aerial Vehicle (UAV) This data can be analyzed and interpreted by visual sensing AI to:

- Keep tabs on crop health.
- Predict yields with accuracy.
- Identify crop deficiency far more quickly than humans.

AI technologies can alert farmers to particular problem regions, allowing them to take rapid action (Chang & Lin, 2018).

6. Observing Crop Maturity

Researchers can learn more about crop maturity by collecting alternate years and doing timely experiments on them. They will learn about the crop ripeness from time to time, but this information may not be correct. It is like putting on a show for wheat (Figure 7).

This vision-based idea was discovered to surpass human objective observation in properly recognizing crop (wheat) growth stages, eliminating the requirement for farmers to visit the fields on a regular basis to monitor their crop (Figure 8; Choudhary et al., 2019).

Farmers used to check the ripeness of tomatoes by visiting the field everyday and checking them with their hands to see how they were developing, but today they must and-check the maturity of fresh

Figure 5
Farming by water sprinkling method in a large land drip irrigation system

Figure 6
Visual sensing AI

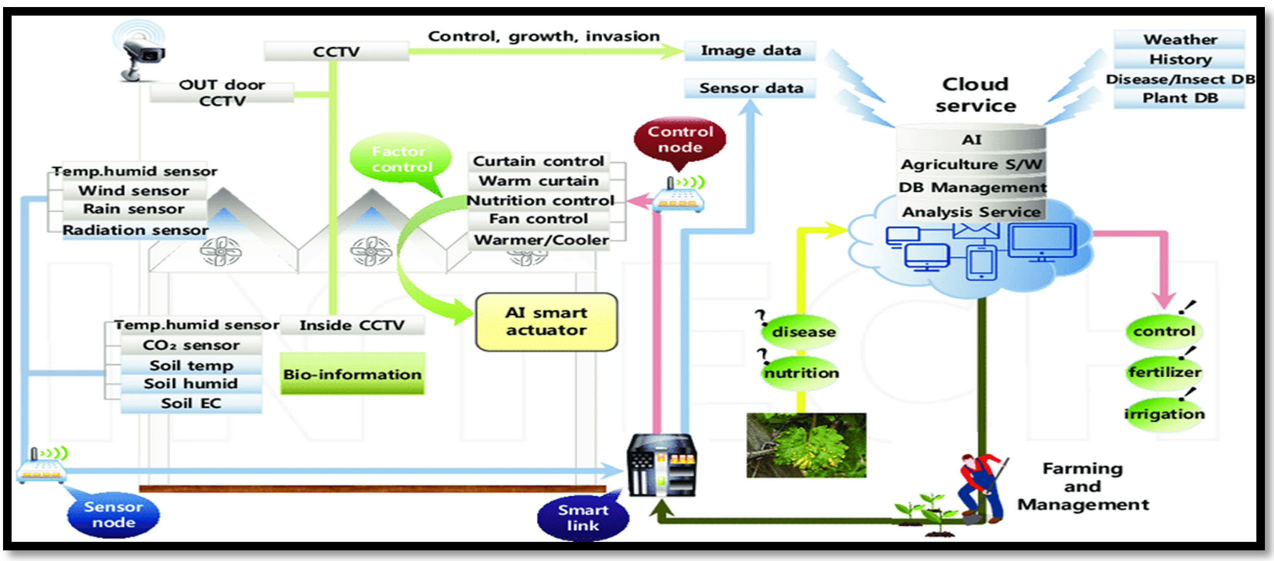


Figure 7
Ripening of tomatoes

Figure 8
Stages of growth of wheats

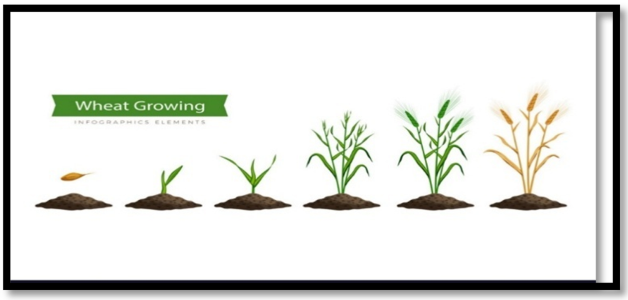
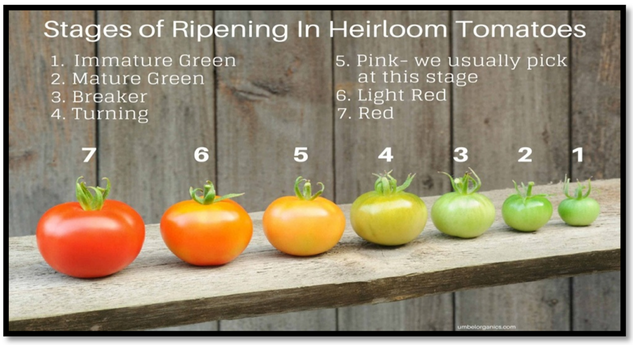


Figure 9
Stages of ripening of tomatoes in a farm



tomatoes on an industrialized level. Computers, on the other hand, have made life easier in every way. Machines, for example, can check for waste and ripeness in factories; in the field, various AI technologies allow farmers to assess the freshness of tomatoes without touching them (Figure 9; Chung et al., 2016).

7. Hitting the Ground with Computer Vision

Farmers must collect soil samples and transport them to a research facility for time-consuming and energy-intensive analysis. Instead, the researchers decided to investigate if picture-relevant data from a ridiculously low easily portable scanning electron microscope could be used to create training model to perform the same thing. For monitoring insect and plant diseases, deep learning-based image identification technology can be used to identify plant pathogens and pests. This technique builds systems that can "keep an eye" on plant condition by utilizing categorization, detection, and picture segmentation methodologies (Artificial Neural Network Based Segmentation) (Cillis et al., 2018).

As shown in Figures 10 and 11, the insecticides can be verified using AI method in farm to protect plants from harmful insects.

The investigators utilized a sticky pit to capture six different organisms of flying insects and take a picture of them in real-time basis. They utilized YOLO object recognition for detection and coarse counting and support vector machines (SVMs) having worldwide features for the data and fine counting. After that, their computer vision model correctly detected and counted bees, flies, mosquitoes, moths, chafers, and fruit flies with 92.5% and 90.18% accuracy, respectively. Cattle Eye is a great example of a farming company that prioritizes AI. Cow health and activity are monitored using overhead cameras and computer vision algorithms. This implies that a cattle farmer does not have to be right next to the cow always to notice a problem (Costa et al., 2012).

Alternatively, the cattle may be remotely viewed and tracked in real time, alerting farmers as soon as an issue emerges. This can be used to:

- Count animals, detect sickness, spot aberrant behavior, and keep track of major events like births.
- Gather information from cameras and drones (UAVs).
- Combine with other technology to keep farmers up to date on animal health, food and water availability, and so on.

8. Intelligent Spraying

Pesticides and fertilizer can be sprayed equally throughout a field using UAVs equipped with computer vision AI. The computer vision system's accuracy allows it to spray with such precision that collateral damage to crops or the environment is avoided. Farmers found it easier since when they used to spray by hand, and they sprayed differently or more or less in regions that were harmful to them. We should not always use chemicals; instead, we should utilize manure and cow dung, as well as kitchen trash. Chemicals are extremely harmful to humans, so we must consider them (Figure 12; De Oca et al., 2018).

9. Automatic Weeding

Physical weed removal not only saves the farmer time and effort, but it also decreases the need for chemicals, making the entire agricultural process more ecologically friendly and sustainable (Figure 13; Dela Cruz et al., 2017).

A group of scientists is striving to make this a reality by designing agricultural robots capable of detecting weeds and soil moisture levels.

10. Farmers as AI Engineers: The Future of AI in Agriculture

Agriculture has employed technology throughout history to enhance efficiency and lessen the amount of hardwork human labor required in farming. People and agriculture have developed since the beginning of agriculture, from improved ploughs through irrigation, tractors to present AI. Another big step forward in this field is the expanded and more inexpensive availability of computer vision (Figure 14).

Figure 10
Insecticides using AI method in farm

Figure 11
Insecticides using AI method in farm

Figure 12
Researches in farm testing of insects

Figure 13
With the help of AI and drone checking for the weeds at an exact place

Figure 14
Anup Patil, a 28-year-old engineer, who quit his IT job to do farming in a village

AI has the potential to revolutionize agriculture in the twenty-first century, given substantial changes in our climate, environment, and global food needs by:

Improving time, labor, and resource efficiency.

- Improving the long-term viability of the environment.
- Improving resource allocation's "smartness."
- Providing real-time monitoring to improve the quality and health of crops.

As a result, changes in the agriculture business will be necessary. Farmers' "field" expertise will need to be converted into AI training, which will need more technological improvements. Education costs a lot in the agriculture industry. Agriculture, on the other hand, is no stranger to innovation and adaptability. Computer vision and agricultural robotics are two recent examples of how farmers may use new technology to fulfill rising global food demand and improve food security. AI's future hope is our next generation, which has the power to build chemical-free agriculture. Society's thinking need to change as sending their children into technological and medical professions has promise, but we also needed to consider agriculture. Many engineers choose the agricultural business after graduation, and with the help of AI, they are revolutionizing the future of agriculture, making it easier and more ecologically friendly while still earning revenue.

11. Conclusion

In the agricultural business, issues include a lack of suitable irrigation systems, weeds, crop height-related difficulties with plant care, and harsh weather conditions. However, with the assistance of technology, performance may be enhanced, and so these concerns can be remedied. It might be enhanced with the use of AI-driven technology such as remote sensors for measuring soil moisture content and GPS-assisted automatic watering. Farmers were concerned about whether precision weeding techniques could compensate for the significant amount of crops lost during the weeding procedure. Not only can these self-driving robots increase productivity, but they also reduce the usage of unnecessary pesticides and herbicides. Aside from that, farmers may effectively employ drones to spray pesticides and herbicides on their fields, and plant monitoring is no longer a concern. Human brain power, for example, might be utilized to analyze resource and job limitations in agriculture. Traditional methods required a large amount of work to get agricultural data such as plant height, soil texture, and content, which demanded time-consuming physical testing. Quick and non-damaging high-throughput phenol typing would be possible with the help of the different technologies investigated, with the added benefit of flexible and favorable activity, on-demand access to information, and spatial goals (Doherty & Rudol, 2007).

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

References

Abdullahi, H. S., Mahieddine, F., & Sheriff, R. E. (2015). Technology impact on agricultural productivity: A review of precision agriculture using unmanned aerial vehicles. In *Wireless and Satellite Systems: 7th International Conference, 2015,* 388–400.

Ahir, K., Govani, K., Gajera, R., & Shah, M. (2020). Application on virtual reality for enhanced education learning, military training and sports. *Augmented Human Research, 5*, 7. https://doi.org/10.1007/s41133-019-0025-2

Ahirwar, S., Swarnkar, R., Bhukya, S., & Namwade, G. (2019). Application of drone in agriculture. *International Journal of Current Microbiology and Applied Sciences, 8*, 2500–2505. https://doi.org/10.20546/ijcmas.2019.801.264

Aitkenhead, M. J., McDonald, A. J. S., Dawson, J. J., Couper, G., Smart, R. P., Billett, M., Hope, D., & Palmer, S. (2003). A novel method for training neural networks for time-series prediction in environmental systems. *Ecological Modelling, 162*, 87–95. https://doi.org/10.1016/S0304-3800(02)00401-5

Al-Ali, A. R., Qasaimeh, M., Al-Mardini, M., Radder, S., & Zualkernan, I. A. (2015). ZigBee-based irrigation system for home gardens. In 2015 International Conference on

Communications, Signal Processing, and Their Applications, 2015, 1–4. https://doi.org/10.1109/iccspa.2015.7081305
Albaji, M., Shahnazari, A., Behzad, M., Naseri, A., Boroomand Nasab, S., & Golabi, M., (2010). Comparison of different irrigation methods based on the parametric evaluation approach in Dosalegh plain: Iran. *Agricultural Water Management, 97*(7), 1093–1098. https://doi.org/10.1016/j.agwat.2010.02.015
Anand, K., Jayakumar, C., Muthu, M., & Amirneni, S. (2015). Automatic drip irrigation system using fuzzy logic and mobile technology. In 2015 IEEE Technological Innovation in ICT for Agriculture and Rural Development (TIAR), 2015, 54–58. https://doi.org/10.1109/tiar.2015.7358531
Anthony, D., Elbaum, S., Lorenz, A., & Detweiler, C. (2014). On crop height estimation with UAVs. In 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems, 2014, 4805–4812. https://doi.org/10.1109/iros.2014.6943245
Arvind, G., Athira, V. G., Haripriya, H., Rani, R. A., & Aravind, S. (2017, April). Automated irrigation with advanced seed germination and pest control. In 2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR), 2017, 64–67. https://doi.org/10.1109/tiar.2017.8273687
Bak, T., & Jakobsen, H. (2004). Agricultural robotic platform with four wheel steering for weed detection. *Biosystems Engineering, 87*(2), 125–136. https://doi.org/10.1016/j.biosystemseng.2003.10.009
Bakker, T., van Asselt, K., Bontsema, J., Müller, J., & van Straten, G. (2006). An autonomous weeding robot for organic farming. In *Field and Service Robotics: Results of the 5th International Conference, 2006,* 579–590.
Bendig, J., Bolten, A., & Bareth, G. (2012). Introducing a low-cost mini-UAV for thermal-and multispectral-imaging. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 39,* 345–349.
Bhagyalaxmi, K., Jagtap, K. K., Nikam, N. S., Nikam, K. K., & Sutar, S. S. (2016). Agricultural robot: irrigation system, weeding, monitoring of field, disease detection. *International Journal of Innovative Research in Computer and Communication Engineering, 4*(3), 4403–4409. https://doi.org/10.15680/IJIRCCE.2016.0403235
Bhaskaranand, M., & Gibson, J. D. (2011, November). Low-complexity video encoding for UAV reconnaissance and surveillance. In *2011 Military Communications Conference, 2021*, 1633–1638.
Birrell, S. J., Sudduth, K. A., & Borgelt, S. C. (1996). Comparison of sensors and techniques for crop yield mapping. *Computers and Electronics in Agriculture, 14*(2-3), 215–233. https://doi.org/10.1016/0168-1699(95)00049-6
Blasco, J., Aleixos, N., Roger, J. M., Rabatel, G., & Molto, E. (2002). Robotic weed control using machine vision. *Biosystems Engineering 83*(2), 149–157. https://doi.org/10.1006/bioe.2002.0109
Bond, W., & Grundy, A. C. (2001). Non-chemical weed management in organic farming systems. *Weed Research 41*(5), 383–405. https://doi.org/10.1046/j.1365-3180.2001.00246.x
Buchanan, R. A. (1989). Bush regeneration: Recovering Australian landscapes. The Open Training and Education Network, 242–246.
Chang, C. L., & Lin, K.-M. (2018). Smart agricultural machine with a computer vision-based weeding and variable-rate irrigation scheme. *Robotics, 7*(3), 38. https://doi.org/10.3390/robotics7030038
Choudhary, S., Gaurav, V., Singh, A., & Agarwal, S. (2019). Autonomous crop irrigation system using artificial intelligence. *International Journal of Engineering and Advanced Technology, 8*(5), 46–51. https://www.ijeat.org/wp-content/uploads/papers/v8i5S/E10100585S19.pdf
Chung, S., Choi, M., Lee, K., Kim, Y., Hong, S., & Li, M. (2016). Sensing technologies for grain crop yield monitoring systems: A review. *Journal of Biosystems Engineering*, *41*(4), 408–417. https://doi.org/10.5307/JBE.2016.41.4.408
Cillis, D., Pezzuolo, A., Marinello, F., & Sartori, L. (2018). Field-scale electrical resistivity profiling mapping for delineating soil condition in a nitrate vulnerable zone. *Applied Soil Ecology*, *123*, 780–786. https://doi.org/10.1016/j.apsoil.2017.06.025
Costa, F. G., Ueyama, J., Braun, T., Pessin, G., Osorio, F. S., & Vargas, P. A. (2012). The use of unmanned aerial vehicles and wireless sensor network in agricultural applications. In 2012 *IEEE International Geoscience and Remote Sensing Symposium, 2012,* 5045–5048. https://doi.org/10.1109/igarss.2012.6352477
De Oca, A. M., Arreola, L., Flores, A., Sanchez, J., & Flores, G. (2018). Low-cost multispectral imaging system for crop monitoring. In *2018 International Conference on Unmanned Aircraft Systems, 2018, 443–451.* https://doi.org/10.1109/icuas.2018.8453426.
Dela Cruz, J. R., Baldovino, R. G., Bandala, A. A., & Dadios, E. P. (2017). Water usage optimization of smart farm automated irrigation system using artificial neural network. In *2017 5th International Conference on Information and Communication Technology, 2017*, 1–5. https://doi.org/10.1109/icoict.2017.8074668
Doherty, P., & Rudol, P. (2007). A UAV search and rescue scenario with human body detection and geolocalization. In AI 2007 20th *Australian Joint Conference on Artificial Intelligence, 2007,* 1–13. https://doi.org/10.1007/978-3-540-76928-6_1

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