

**International Journal Of Emerging Multidisciplinary Research And Innovation
(IJEMRI)****Integrating Ai-Driven Forecasting With Agricultural Practices To Combat Food Insecurity In Climate-Vulnerable Regions****Dr. Baye yemataw adane**Assistant Professor, Department of Computer Science,
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Email: y.w.baye@gmail.com**ABSTRACT**

Since people in climate-change risk areas experience food shortages often, experts are now using technology to strengthen crop production. This investigation investigates how farmers can use AI forestry tools to deal with weather conditions, lower their expenses and understand the yields from their crops. The study uses environmental science, machine learning and agronomy together to explore if AI can solve problems related to hunger and environmental agriculture. They also looked into merging climate data, forecasting what to grow, designing easing warning systems and executing precision farming. For our study, we use existing data, try out models to simulate different situations and question individuals working in farming areas mostly hit by droughts and floods. According to the reports, AI helps decrease problems caused by climate change in agriculture because it can give farmers guidance immediately. Yet, there are still problems with infrastructure, not knowing enough about digital technology and concerns over bias in AI. Finally, the paper recommends ways to make AI valuable for farmers, support their development and foster teamwork among different parts of the agricultural community.

Keywords: Food insecurity, the use of artificial intelligence, climate change, forecasting for farming and precision farming are topics here.

DOI: AWAITING**Introduction**

Because climate change is increasing food insecurity globally, those who are vulnerable now face more risks and should develop innovative ways to cope (Reichstein et al., 2024). Because of temperature changes, uncertain weather and lack of resources, farming according to our usual seasons is becoming less reliable (Devendra, 2012). The poorest regions of the planet are especially hit since they have to deal with high-priced healthy foods for their populations (Dhal & Kar, 2024). People in the Global South such as those in sub-Saharan Africa and South and Southeast Asia, face serious problems due to

climate change and the way we control food, as they mainly manage climate-reliant sectors like agriculture, health and education (Alemaw & Simalenga, 2015; Fanzo et al., 2018). Unlike many farmers, family farmers depend on rainfall and usually lack the resources to deal with climate change (Chimi et al., 2023).

As a result, more are realizing the ways technology such as artificial intelligence, could help food systems adjust to climate changes and thrive. Food security and climate change challenges can be addressed with machine learning, deep learning and natural language

processing, all based on artificial intelligence (Taddeo et al., 2021). Artificial intelligence is vital in agriculture for making crops grow well and helping to protect nature (Aijaz et al., 2025). Since the number of people in the world is expected to reach nearly 9 billion in 2050, the agri-food sector must increase its food production by 70% to keep up, yet doing so is made difficult by the loss of farm resources and environmental challenges. Consequently, improved farming sustainability is necessary and artificial intelligence can help people use resources more wisely, waste less and get better results (Naresh et al., 2020).

Information about the study background

Technology, artificial intelligence and agriculture can support areas likely to experience hunger due to climate change through a new method of resource management (Dhal & Kar, 2024). The age of the Fourth Industrial Revolution has enhanced the precise use of resources in farming. Using input from satellites, IoT devices, historic weather records and AI, we are able to aid food security when planning agriculture (Kumar et al., 2023). They help produce more food, defend crops and ensure there is enough to eat as climate change and a rising population affect us (Javaid et al., 2022; Naresh et al., 2020). AI provides tools that let people easily manage their what they like when they shop for food. The initial measurement of carcass quality uses AI, mass spectrometry and hyperspectral imaging and proves to be highly effective (william, 2025). AI makes it less difficult for stakeholders to plan, use their resources economically and choose actions for sustainable farming and greater food security (Almoselhy & Usmani, 2024; Taddeo et al., 2021).

Because of climate issues, several smallholder farmers in Sub-Saharan Africa, South Asia and Latin America are immediately in need of support

Justification

The unpredictable weather of today demands that everyone make sustainability and technology-based changes to food systems (Taddeo et al., 2021). These projects help to feed people today, however, they will not be able to feed them in the future without improving further (Dhal & Kar, 2024). This situation can be managed well if we use the latest artificial intelligence forecasting (Aijaz et al., 2025).

Recognizing problems with food early with the help of AI could prevent waste and up to now different technologies, including hyperspectral imaging and mass spectrometry, have shown high rates of correctly assessing the quality of meat. Using machine learning supports better food production and transport and smart seeds and blockchain technology improve the ability to identify and trace ingredients (Aijaz et al., 2025). Artificial intelligence allows farmers to review detailed weather data and other farm details and choose the best times for planting, watering and picking their crops (Sidhu et al., 2021).

to help many people (Aijaz et al., 2025). Artificial intelligence can raise the tolerance of crops to changes in their environment (Khan et al., 2022). Through AI, nutrition problems in plants are found and solved which supports better production of crops and reduces food waste (according to Aijaz et al. in 2025). When data is involved, AI in agriculture can lead to greater productivity, better care for the environment and stronger farm resilience to changes in the climate. As a result, taking care of your animals becomes much easier (Sidhu et al., 2021). AI tells small scale farmers when to plant, how to save on water and how to deal with pests—all these choices save resources and help produce more food. Thanks to AI, farmers are able to use useful financial services, study market trends and receive guidance on how to improve their farming. The use of AI improves waste management which plays a big role in safeguarding both sustainability and resources. When data from waste streams is handled by artificial intelligence, sorting is improved, collection happens less and better routes are planned, saving money and helping the environment (Naveenkumar et al., 2023).

will meet future food needs since we are expecting 9 billion people on the planet by 2050 (Ayed & Hanana, 2021). As we ask farmers to grow more food because more people need it and weather patterns are changing, they have to come up with better ways to farm (Aijaz et al., 2025). By using machine learning, computer vision and predictive analytics, manufacturing food becomes more environmentally friendly and less likely to waste anything (Agrawal et al., 2025).

Objective

1. To find out if using AI for forecasting fits well in agricultural activities now affected by climate change.
2. To learn how CE models support managing problems related to climate on farms.
3. To learn what challenges make it difficult for some fields to use AI because of limited resources.
4. To create ways to use AI that are both ethical and available to all in the farming industry.

Literature Review

Researchers have discovered that with smart irrigation, forecasting the next harvest and detecting both unwanted weeds and pests, AI can help farmers work more efficiently (Kamilaris & Prenafeta-Boldú, 2018). In studies done last year, Zhang and his colleagues found that LSTM (Long Short-Term Memory) networks and regression trees perform well for climate change

Material and Methodology

Various techniques are used by the authors to understand how artificial intelligence can help agriculture cope with climate change in Kenya, Bangladesh and Peru (Introduction, n.d.). Data points for our calculations come from the World Bank, along with reports from the Food and Agriculture Organization and with the help of remote sensing (Mehryar et al., 2024). FlowChart uses gathered information to look for patterns in crop climates and helps pick how to adapt, using TensorFlow and Scikit-learn (Senoo et al., 2024). With planning finished, we arrange all the

Result and Discussion

Thanks to AI, farming can be improved and earnestly contribute to sustainability, aside from conditions related to increasing temperatures and population sizes (Aijaz et al., 2025). Farmers can now rely on predictive models from artificial intelligence to determine both droughts and their crop yields, allowing them to decide the best actions early on (Aijaz et al., 2025; Naresh et al., 2020). They use historical crop and weather data, as well as data about soil, to spot patterns that predict how the following year's farming will be (Aijaz et al., 2025). Consequently, farmers come up with the most effective use of water, plant their crops differently and add treatments meant to be more resistant to changes in the weather and improve harvest. Aijaz et al. (2025) explain that

Limitations

It's important to recognize the boundaries of the research to see the results objectively and appreciate more thorough study of the findings. While this work is useful, some points should be given thought. The main reason for these problems is that the study was not conducted on a large scale or across many places (Lechtenberg,

predictions and planning agricultural schedules. It is noticeable as well, that AI from private companies such as IBM and Microsoft has the potential to greatly assist in both private and public agriculture. Books and researchers argue that technology ought to be applied when it fits the region and when everyone knows how to deal with it.

different dependencies that are necessary (Rashid & Sodhi, 2024). We will speak to experts, farmers and officials from multiple nations as part of our 25 stakeholder interviews. The purpose of doing case studies is to understand both the process and the motivations for using AI in farming. The research topic is more clearly defined thanks to the numerical and explanatory data provided (n.d.). Its objective is to find a way to tell apart the kinds of material crafted by humans and generated by AI in agriculture (Rashid & Sodhi, 2024).

AI helps farmers raise their yield by 20–30% on average. Thanks to helpful and accurate advice from AI, farmers decide how best to fertilize, manage pests or take other actions in farming (Magesh, 2025). Apart from predicting future harvests, AI helps with farming by allowing precise watering, automatic harvesting and managing diseases through disease control (Ganeshkumar et al., 2023) (Mana et al., 2024). AI looks at data from devices and drones that is streamed during farming to spot the status of crops, detect problems and point out areas requiring attention. At present, AIs use hyperspectral imaging and mass spectrometry to assess the quality of food items and can predict the qualities of meat with high accuracy

2013). Limiting the research to one topic can blind us to differences in actions, opinions or experiences in other parts and may not help others with the research. "The present analysis finds the sample suitable, though its power may not be enough to detect small changes or conduct deep investigations of subgroups (Kumar et al.,

2016). It also matters that secondary data may include special challenges and may limit what you can study. Many datasets give a lot of

Future Scope

It is very important for the future of research to develop affordable AI tools that suit various local languages and cultures, as this helps make AI usable in more places (Akinwande et al., 2024). Adapting AI for different languages can help more people take part and make use of its technologies (Vasallo et al., 2024). Since there are not many ways to reach high quality in low-resource languages and data is often very limited, developers have to be sensitive to culture when designing methods for languages and use expensive resources (Markowitz et al., 2023). Then, taking care of these challenges requires trying out high-resource language-based transfer

Conclusion

Using AI to predict our food supply might address the problem of more food insecurity in places affected by climate change. If early studies seem positive, continued progress needs better

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information, but they may not exactly match the research's goals, leading to variations in how variables are set up (Carrasco, 2021).

learning, using machine learning strategies that need few hand-labeled samples and discovering the right models for operating on less powerful computers. Semantic analysis in NLP makes it possible for computers to find meaning in text, thanks to grammatical research and reviewing the context (Akinwande et al., 2024). More work is required to build applications that can support tone and typical expressions of languages spoken locally (Akinwande et al., 2024). In this area, language processing must understand and respond correctly to differences in communication styles across cultures (Akinwande et al., 2024).

education and ethics, as well as better infrastructure. To make a difference for the hardest-hit farmers, all stakeholders must cooperate.

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