GENERATIVE AI FOR AGRICULTURE ADVISORY

Locations	India, Kenya
Dates	15/04/2024 - 31/12/2024

Summary

Generative Artificial Intelligence (GenAI) technology offers enormous potential by addressing information asymmetries and rapidly advancing research. In the agriculture sector, it can localize digital advisory messages and increase the accessibility of such messages to reduce the digital divide compared to traditional, non-AI communication methods. Using natural language processing (NLP) and large language models (LLMs) offers new potential to disseminate complex scientific information more widely, in local dialects and through various formats, transforming accessibility. This project will explore the potential to deliver advisories based on CABI's highly curated and expert-validated resources to plant doctors and other agriculture advisors via Generative AI chatbot technology, and the data governance and licensing necessary to ensure the quality of such advisories.

The problem

Access to reliable, effective agricultural advice is challenging for many farmers in low- and middle-income countries where face-to-face extension services have limited capacity and reach, leaving farmers with little support.

Many digital tools exist to try to combat this problem by delivering advice via mobile devices, but these can be challenging to access due to the digital divide – access to digital devices, language and digital illiteracy can cause barriers.

GenAI has the potential to bridge the gap through more streamlined and accessible access to the vast amount of information and tools that are often siloed and difficult to access. However, there are significant unknowns and risks related to exclusion, bias, transparency and potential misuse of AI. More investigation, evaluation and testing are required to understand these implications.

This project will explore GenAI use cases in agricultural advisory. CABI's role will be to investigate how the use of our comprehensive range of crop health content and products, such as the PlantwisePlus Knowledge Bank, can be integrated into GenAI chatbots, both through investigations via our networks of plant doctors and agricultural advisors, and partnerships with other organizations within the project team.

We will explore the governance and licencing arrangements needed to prevent misuse of AI and put in place measures to ensure transparency in message outputs, enabling users to verify the quality of advice.

What we are doing

The overarching goal of this project, Generative AI for Agriculture Advisory (GAIA), is to enhance the efficacy, reliability and contextual relevance of AI-generated agricultural advisories.

The project will deliver three primary outputs:

1. A reference architecture of a new open-source Retrieval-Augmented Generation (RAG) framework designed to provide digital farmer services, such as extension services, with accurate, contextually relevant, practical, and equitable information.
2. An open-sourced RAG framework accompanied by technical documentation to implement the framework in a new environment for other use cases. Some of the vector databases will also be made publicly available for others to access and utilize in their generative AI applications in agriculture.
3. A collection of case studies taken from the RAG framework implementations for five use cases, detailing the process of practical implementation of the framework for these use cases for addressing different types of advisory services and their performances.

CABI will carry out the following activities:

1. Share selected CABI content with partners for testing in partner use cases and develop short-term licensing agreements to define how this content can be used in GenAI.
2. Make governance recommendations to the project regarding FAIR (Findable, Accessible, Interoperable, Accessible) for AI and longer-term licensing recommendations for commercially sensitive and proprietary content.
3. Undertake user engagement with agriculture advisors to understand their perception of AI technology and the information they would like agricultural advisory chatbots to be able to address.
4. Pilot the development of a CABI agricultural advisory chatbot in Kenya and India.

Results so far

So far, CABI has conducted user engagement research with plant doctors in Kenya and India and identified their priority information needs for a GenAI-powered agricultural advisory tool. These have been mapped against CABI's extensive agricultural information resources.

Licensing agreements have been drafted for sharing CABI content with other use case partners and the technical options for delivery of content to partners. RAG-based systems are being defined.

The project, GAIA, will likely contribute to the following expected outcomes:

- Address the potential risk of using LLMs in agricultural advisory services and provide more nuanced, context-aware, and reliable agricultural advisories grounded in up-to-date information.
- Enhance the overall agricultural productivity and sustainability of small-scale producers in low and middle-income countries.

Donors

Bill & Melinda Gates Foundation

Partners

	International Food Policy Research Institute (IFPRI), Hugging Face, SCiO, International Institute of Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), AfricaAI, Digital Green, Dalberg, Viamo, International Rice Research Institute (IRRI)
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