Use Case: AI-Powered Agricultural Extension Chatbot in Lesotho

Overall Objective

To support agricultural development and food security in Lesotho by deploying a mobile-friendly, AI-powered chatbot that enhances the capacity of extension workers and provides farmers with timely, localized, and actionable information—ultimately improving productivity, resilience, and access to markets across the agricultural value chain.

Rationale

Agriculture and subsistence farming play a critical role in the socio-economic well-being and livelihoods of the population of Lesotho. Almost one-third (29%) of all workers in Lesotho are employed in agriculture, and most rural families depend heavily on subsistence farming for both food and income. This underscores the sector's significant contribution to household food security and national economic stability.

Despite its importance, the agriculture sector in Lesotho faces persistent challenges including limited access to updated farming knowledge, low availability of extension services in rural areas, and barriers to accessing markets and government schemes. Extension workers, who are responsible for delivering technical support and training to farmers, are often overstretched and unable to reach all communities effectively.

An AI-powered agricultural extension chatbot offers a scalable, mobile-friendly solution to expand the reach of advisory services. Accessible via smartphones, the chatbot can support real-time farmer engagement, deliver tailored information, and reinforce knowledge through continuous interaction. This system complements national priorities for digital agriculture and rural development and can significantly improve knowledge dissemination, service delivery, and feedback collection at scale.

Personas

- **Extension Worker:** Mpho, 38, is an experienced agriculture extension officer working in Berea District, Lesotho. She has over 12 years of experience advising smallholder farmers on crop production, livestock health, and sustainable practices. Mpho is passionate about improving food security in her region but is often overwhelmed by the number of farmers she supports and the diversity of their needs. She is proficient in basic mobile technology and uses WhatsApp and SMS to communicate with colleagues and farmers. However, she struggles to access timely, localized information about crop varieties, weather forecasts, pest control, and government services. Mpho wants to use technology to improve her outreach but lacks advanced digital tools or up-to-date agricultural databases. Mpho is responsible for hundreds of farmers spread across a wide area, limiting the time she can dedicate to each one. She often relies on outdated printed materials or has to wait for feedback from central offices, making it difficult to provide timely or customized advice. Mpho doesn't have easy access to data about current climate patterns, disease outbreaks, market prices, or updated seed varieties. Farmers regularly ask questions about pest management, fertilizer use, crop calendars, and animal health—many of which require up-to-date and context-specific knowledge that she may not have on hand. With limited access to transport, research stations, or labs, Mpho finds it hard to refer farmers for services like soil testing or veterinary support.

- **Smallholder Farmer:** Thabo, 46, is a smallholder farmer grows maize and sorghum on a small plot to support his family of six, but his yields are highly vulnerable to late rains, drought, and other adverse weather. Thabo struggles to access affordable and timely farming inputs such as improved seeds and fertilizers, and he has limited awareness of modern, high-yield practices — relying mostly on traditional methods. Eager to improve productivity, he wants to optimize scarce resources like water, fertilizer, and labor but lacks the technical knowledge and guidance to do so effectively. Extension services are hard to reach, and travel to seek advice or inputs costs both time and money. While he owns a basic mobile phone, Thabo has never had access to a reliable source of agricultural information through it. He wishes for a simple, trusted way to learn about planting schedules, new seed varieties, use of fertiliser and pesticides, and managing the impact of diverse weather conditions on his crops to improve his family's resilience and livelihood.

- **Agriculture Ministry Admin:** 'Masechaba, 34, is an agricultural officer at the Ministry of Agriculture in Maseru, Lesotho. She oversees farmer support programs and is responsible for ensuring that agricultural advice is accurate, accessible, and widely distributed. With limited staff and resources, she struggles to reach the large number of smallholder farmers who need timely guidance. While comfortable using digital tools, 'Masechaba lacks efficient

systems to communicate at scale and often depends on slow, fragmented channels. She sees the chatbot as a way to centralize agricultural content, reach farmers directly through mobile phones, and monitor performance. Importantly, the chatbot also allows her to collect valuable data on the questions and issues farmers raise most often—insights that can help the Ministry adjust its services and policies.

Key Features (Minimum Viable Product)

- **Mobile-Friendly and Accessible:** The chatbot is optimized for mobile use—via SMS, WhatsApp, or other messenger apps—ensuring accessibility for farmers with basic or smartphones.
- **Real-Time Advisory Support:** Farmers and Extension Workers can ask questions and receive responses in real time. Example queries the chatbot can handle include:
    - "What fertilizer should I use to improve soil health?"
    - "What are the best maize or sorghum varieties for the dry season?"
    - "When should I start preparing for winter cropping?"
    - "Where can I access soil testing services near me?"
    - "Can I use herbicides four weeks before harvest?"
    - "What are the best medications to treat animal diseases?"
    - "When is the next scheduled dipping for livestock in my area?"
- Feedback and Continuous Improvement Mechanism: Farmers or Extension Workers can rate the chatbot's responses and submit suggestions or corrections. This feedback helps improve the system over time and informs the Ministry of Agriculture's decisions on content updates and extension strategies. Feedback can be addressed either via automation (there are a number of technical options) or handled manually by Admins.

Optional Features

- **Push Notifications and Timely Nudges:** Admins (specifically people from the Ministry of Agriculture - TBD) can schedule alerts to be sent to users (Farmers and Extension Workers) on topical events such as climate patterns, planting dates, livestock dipping, radio programs, or government schemes.

- **Multilingual Capability:** Supports both English and Sesotho, and is also able to cater its outputs to varying literacy levels.
- **Content Management System (CMS):** A structured backend CMS supports the creation, localization, and delivery of reliable content in sync with cropping calendars, geographic needs, and seasonal trends. Content is aligned with Lesotho's national priorities and can be customized at the district level.
- **Extension Worker Training and Support (LMS):** Include a built-in Learning Management System (LMS) that offers self-paced training modules for extension workers (leveraging the CMS). Topics include climate-smart agriculture, gender inclusion in agriculture, digital literacy, and FPO (Farmer Producer Organization) development. Training is linked to certifications and performance incentives.
- **Community Practice Sharing and Local Innovation Promotion:** Enables sharing of farmer-led innovations and success stories through short videos—promoting localized, peer-to-peer learning and amplifying what works in real farming contexts (leveraging the CMS).

Expected Benefits

- **Improved Access to Agricultural Information:** Bridges the information gap between rural and urban farmers by providing always-available, mobile-accessible advisory services.
- **Enhanced Extension System Reach and Efficiency:** Supports extension workers with continuous learning and digital engagement tools, allowing them to assist more farmers, more effectively.
- **Strengthened Climate Resilience and Food Security:** Promotes timely adoption of sustainable and climate-smart farming practices, reducing crop loss and improving resilience to climate variability.
- **Increased Market Readiness and Farmer Income:** Empowers farmers with information on crop management, grading, and post-harvest practices, while linking them with markets through advisory on FPOs and buyer access.
- **Evidence-Based Decision Making for Policy Makers:** Aggregated data on usage trends, and system feedback supports data-driven planning and policy formulation at both local and national levels.

Your First Step: Review the Technical Resources and Data Sets

Before developing your proposal, visit the GenAI for Good Confluence workspace—the central repository of technical resources supporting this year's Challenge. There, you'll find documentation on the GENIE.AI framework, guidance on data integration, and access to relevant data sets needed to inform and strengthen your application.

Access the Confluence Repository ›

Access the Use Case Data Resources ›