Team name	
Choose a descriptive / creative / innovative name for your team	**AGRI-ASSISTANT**
University and country	
Name of university and country **List of participating universities:** Lukenya University, Wollo University, University of Abuja, Kathmandu University, University of Ghana, Makerere University, Esalq-USP, Anton de Kom Universiteit, Wageningen University & Research	**MAKERERE UNIVERSITY – UGANDA**
Team members	
First, last name and email addresses of all team members	GROUP MEMBERS Rugambwa Matthew matthewrugambwa463@gmail.com Gasasira Joshua gasasiraj013@gmail.com Obwora Bruno brunoobwora@gmail.com Juoch Duol Chol juochduol890@gmail.com
Problem definition & Why	
- *Please provide a problem definition of the problem your project is addressing.* - *What is the purpose of this project? What do you want to achieve? Why do you want to do it?* - *Briefly explain how it links to innovation in food systems.*	Small Holder Farmers face significant challenges due to limited access to crucial information, advise and recommendations across various agricultural scenarios like crop management, soil health, weather forecasting, market prices and sustainable practices. Consequently, this leads to low yields, bigger post-harvest losses due to weather uncertainty and in the end, less food in markets and of lower quality. According to the 2018 Annual Agricultural Survey by Ministry of Agriculture, Animal Industry and Fisheries(MAAIF) and Uganda National Bureau of Statistics(UBOS) in collaboration with the Food and Agricultural Organisation (FAO) 38% of the 7.1 million agricultural households are operated by the youth between 15 to 30 years of age with this percentage expected to up over the next decade. About 80% of these households engage in crop and animal production for both home consumption and income generation with about 79% of the farmers operating about one or two hectares of land automatically qualifying them as small holder farmers. The publication further states that the annual yields per hectare for the four main staple crops that is maize, beans, cassava and millet are way below the potential yields with the loss of soil fertility from Ugandan soils stated to of the highest according to the Uganda National Fertiliser Policy leading to 32% of the households heavily depending on artificial inputs and fertilizers for production. The publication also highlights the challenges due to low penetration of extension services into the communities. It is very clear by the above facts and statistics that the Small Holder Farmer in Uganda is under a lot of pressure and very disadvantaged today. It is also true that the Small Holder farmer is the heart of the food and agricultural system of the country and without them the whole burden falls to the Large Scale Farmer who cannot meet this demand hence the whole system will collapse. This shows that there is need to provide leverage for the Small Holder Farmer to keep them in the industry. Given the large scale of the problem I think the best way to tackle it is with sustainable IT solutions.

The Food Systems Innovation	
Describe the innovation you want to implement.	This team thus came up with the idea of **Home Farm**. This is an AI driven application that will shape and direct the future of agriculture in the country as well as create a leverage for the Small Holder Farmers as through provision of cheap and accessible services like information on inputs, market and sustainable agricultural practices this will lead to increased agricultural productivity, resource optimization, and environmental stewardship. Join us on this journey as we unveil the transformative potential of AI in shaping the future of agriculture.
Goals and objectives	
- *What are your goals and objectives of your project?*	PROGRAM GOALS AND OBJECTIVES • Increase access to agricultural information and resources for farmers across Uganda, particularly those in remote areas where most of the crop growing and animal production takes place. • Enhance farmers' knowledge and adoption of modern agricultural techniques, sustainable farming practices, and climate-resilient strategies especially carbon farming, regenerative agriculture and agro ecology. This will protect the soils from rapid exhaustion and reduce the need to use inorganic fertilisers for farmers hence cutting down the costs for production. • Improve crop yields, income levels, and food security among the Small Holder Farmers • Empower women and youth farmers by providing them with equal access to agricultural information, resources, and opportunities for skill development as required by SDG 5 • Measure and track the usage and effectiveness of the remote agricultural assistance platform, including the number of active users, frequency of interactions, and user satisfaction levels. • Collaborate with local government agencies, agricultural organizations, and other stakeholders to ensure the sustainability and scalability of the project beyond the initial implementation phase.
Impact | National pathways to sustainable food systems	
- *In which way will your project contribute to the national food systems pathways of the country where it will be implemented (if available)*	Localized Expert Advice that will involve a voice enabled question answering system to allow small holder farmers to ask queries in their local language, provide expert opinions on crop management and sustainable practices and address specific challenges faced by farmers such as soil health and post-harvest handling will help the farmers increase their yield per hectare and protect the soils from degradation. Crop Disease Diagnosis which will enable farmers to upload photos of their crops directly through the app will help to diagnose diseases, nutrient deficiencies so that timely recommendations can be given to the farmers to prevent huge losses. Weather driven insights will be provided by the app through integration of weather data and forecasts in the app from accurate and reliable sources to advise farmers on optimal planting times, irrigation schedules and post-harvest handling in order to minimise the effect of climate change on the farmers Market Access and pricing service will be offered on the app with provision of real-time market information including crop prices and demand which will facilitate fair trade and better income opportunities for the farmers.
Impact | Ecological Sustainability	
- *In which way and to what extent does your project contribute to*	Through promotion of environmentally conscious practices like carbon farming, regenerative agriculture and agro ecology will help in maintaining a balanced ecosystem. Carbon farming will mainly focus on carbon capture and storage through key practices like cover cropping, reduced tillage and rotational grazing all

ecological sustainability?	encourage by the app with information and tutorials available on how to carry out these practices. Regenerative agriculture on the other hand will focus on improving soil health and creating ecosystem resilience through teaching farmers through material available on the app on how to farm in a way that mimics the natural ecosystems with key practices including reduced tillage, crop rotation and so on.
Impact | Nutrition / healthy diets	
- *In which way and to what extent does your project contribute to nutrition/healthy diets?*	The application will promote indigenous crops because they are well suited to the climate and soils hence more likely to have good nutritional benefit on the people in the country. Since the app traces the foods entire produce supply chain, this will help consumer to gain confidence in the quality and safety of the food as information like shelf time and inputs used during production will be availed to the consumer so that they can make their decisions from an informed point of view.
Impact | Social Inclusion	
- *In which way and to what extent does your project contribute to social inclusion?*	We intend the application to have localized content in the different local languages in the country for example Luganda, Lunyakitara, Luo, Kiswahili and many others in order to cater for all the audience. Gender disparities will be addressed by actively involving women in app development, data collection and decision making. Community engagement through creation of digital communities in the app where farmers can share knowledge and experiences that will encourage collaboration and peer learning. Through collaborations and partnerships with local organisations, universities and government agencies we hope to increase our reach and hopefully befit more people.
Impact | Food and water security	
- *How does your project relate to food and water security?*	Sustainable practices like crop rotation, agroforestry and organic farming will contribute to long-term food security and environmental health hence the soils will be able to give good yields per annum for a longer time. The focus on reaching small holder farmers for make for the biggest potion of food production in the country will protect the country's food system as well as lead to production of better food in terms of quality and quantity. AI driven insights will help farmers make informed decisions about fertilizer application, pest control and soil management mitigating losses in the food production.
*The following part of the Concept Note is more practical. Here you address **how** you are going to implement your Food System Innovation and what is needed to achieve your goals and objectives. In this part, you thus address what you will be doing when you are selected to participate in this student challenge.*	
Project plan | Planning	
- *Please provide a preliminary timeline of preparations and project itself.*	After being shortlisted we intend to embark of the project preparation activities to break the ground for the commencement of the project that we expect to take about 4 weeks and will be described below. The implementation plan is set to commence after the preparations and will go on till the final competitions and will be left to continue even after the competition and will be broken down below.
Project plan | Design & First steps	
- *What steps need to be taken prior to implementation?*	**Preparation Phase.** As part of the preparation we intend to attend and actively participate in the physical seminar of the Integration of AI into agriculture to be conducted at our School of Food Technology, Nutrition and Bioprocessing scheduled for 13th March 2024.

	Stakeholder Assessment and Needs Assessment (1 weeks): During these two weeks we will engage famers and communities in order to best understand and know their requirements and expectations. Team Skill Assessment and work allocation (1 week): After the needs assessment we will share the work burden amongst ourselves since the group is multidisciplinary and everyone will receive tasks based on the personal skillset.
Project plan | Implementation	
- *What is your plan towards implementation of your Food Systems Innovation?* *With implementation, we mean the actual uptake of your food system innovation at your site, in other words: which actions are you going to undertake?*	**Implementation phase** App development and Testing (6 weeks): During this time we will develop the app algorithms, user interface and its backend structure as well as test the app rigorously for functionality, security and usability. Data collection and model training (3 weeks): We will gather relevant agricultural data for the app like weather data, soil quality and crop health and train the models to do tasks like disease detection. Pilot deployment and Feedback (6 weeks): The app will be deployed at a small scale to a group of well sampled farmers and feedback collected in order to refine the app and address any issues. Scaling up and deployment: During this period the apps accessibility will be increased.
Project plan | Monitoring and evaluation	
- *How will you monitor the process and make sure your goals and objectives are met?* - *How will you evaluate your project?*	With the remote agricultural assistance platform, I intend to achieve affordable information and advice for all small holder farmers. Indicators of positive progress of the program will be the number of farmers reached, adoption rates of recommended practices and improvements in crop yields. Data Collection Methods in order to ensure proper monitoring and evaluation of the program will be interviews and usage analytics from app platform database. Will you use statistical analysis for the data from the platform which will give us a clear picture of where the program is at. This assessment will be done every two weeks during the implementation phase of the program Feedback Mechanisms will be set up to gather feedback from user and stakeholders in form of feedback forms, suggestion boxes, or regular check-in meetings. The findings of our evaluation and monitoring will be reported to our supervisor Doctor Fildah and the various stakeholders
Project plan | Scalability	
- *Explain the ability of your project to adapt, particularly in regard to growth and increased demand.*	Current State: As of today the project is yet to start but we expect an audience of about 1000 persons to be directly with the app by the close of the competition at the end of September. Future goals: We hope to reach 10000 persons by the close of 2025 Scalability strategies: We intend to achieve these future goals on expansion without compromising on the quality of service by creating more partnerships and collaborations with both NGOs and government agencies. For scalability, we're are looking at mainly one major solution, Smart Infrastructure Basically we're planning on using a cloud based server composed of individual micro-services, this allows us to have as much flexibility as possible since allocation of resources is made easy and readily available at our finger tips. We're looking at Google cloud for this particular project as it seems to have better offer in relation to its counter parts like AWS. The project can be broken into 3 distinct parts, the mobile app, the back-end (Server side) and the website.

	The website and mobile app are not to be worried about as the scaling is done automatically for the mobile app by the various hosting services like Google Play Store and Apple Store On the other hand, the Server is to be broken into individual micro-services and each uniquely developed and containerized and deployed alone. We're then to use Kubernetes to manage the individual and all the containers in terms of resource allocation and so on. We're also to use API gateways for communication and these also come with load balancers to avoid overwhelming the servers in cases such as too much traffic. The load balancers can limit server requests, redirect users to free servers in cases where one is being over whelmed and also implement security
Project plan | Personal development	
- *What do you want to get out of the project for yourselves?* - *What will you learn from it?* - *How will the project help you to develop?*	For the personal development section, each group member has their own personal lessons and expectations as written below Rugambwa Matthew: I expect to learn to work in a group and with professionals in both the agriculture and AI fields to achieve set goals. Juoch Duol Chol: I look forward to handling agricultural is going to improve and sharpen my data literacy skills. Bruno Obwora: I am taking on this Innovation Challenge in order to develop an innovation mind-set, be able to experiment with new ideas and embrace failure as a stepping stone to innovation. Gasasira Joshua: I hope to gain a deeper understanding of sustainable agricultural practices and how AI can be leveraged to minimise environmental impact.
Project plan | Partnerships	
- *What stakeholders are you (planning to) partnering with?* - *How will this partnership be?* - *Are you considering collaborating with other sponsors, NGOs, a state subsidy, or grant?*	We intend to partner with Makerere University Innovation Pod (UNIPOD) which is a safe space for all innovators in the university to come and develop their ideas and also receive support in terms of finance and other resources like machinery. This will be done mainly in the development stages of the program. World Food Programme (WFP) and Food and Agricultural Organisation of the United Nations are the other NGOs we want to contact for a possible partnership will be for technical assistance, capacity building and financial support as we try to sustain the project.
Project plan | Continuation	
- *How will you disseminate knowledge?* - *How will the project be sustained after the challenge?*	The challenge will see this project through its development, pilot deployment and the first weeks of full scale deployment so the project will be in yet another critical stage. So after the challenge we intend to keep on doing the work on the project and maintain the existing partnerships as we look to form newer ones all in the best interest of the project's growth and expansion
Budget: Include a budget in this document Specify how you will spend the budget up to €2500 if you are selected.	
BUDGET **Product Development:** Software Development: €1500 • Covering development costs if you're building the app yourself. • Costs associated with software tools or platforms necessary for development. • Design and User Experience (UX/UI): €500 • Hiring a graphic designer to create appealing visuals and user-friendly interfaces.	

- Purchasing design assets or software licenses.

Marketing and Promotion:

Digital Marketing: €300

- Setting up and running targeted online advertising campaigns on platforms like Facebook, Google Ads, or LinkedIn to reach farmers.
- Allocating budget for social media promotion and content creation.

Website and Landing Page: €200

- Building a professional website or landing page to showcase the app and capture leads.
- Covering domain registration and hosting fees.

Print Materials: €100

- Printing flyers, brochures, or business cards to distribute at agricultural events or local markets.

Operational Expenses:

Cloud Services: €200

- Subscribing to cloud hosting services like AWS, Azure, or Google Cloud for app hosting and data storage.

Communication Tools: €100

- Purchasing subscriptions for communication tools like Slack or Zoom for team collaboration and meetings.

Miscellaneous:

Contingency: €200

- Setting aside a portion of the funds for unforeseen expenses or adjustments to the project plan.

Total: €**2500**

Resources & Relevant links

Documents and Articles:

"AI in Agriculture: A Review" by Kamble et al. (2018)
Link (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6129701/)
"Applications of Artificial Intelligence Techniques in Agriculture" by Mohanty et al. (2018)
Link (https://www.frontiersin.org/articles/10.3389/fpls.2018.01908/full)
"AI in Agriculture: Present and Future Applications" by Cui et al. (2020)
Link (https://www.sciencedirect.com/science/article/pii/S2095254620301530)

Videos and Webinars:

"How AI and Machine Learning Are Transforming Agriculture" –
Link (https://www.youtube.com/watch?v=C0dJRmW8Psw)
"AI in Agriculture: How Farmers Are Using Artificial Intelligence"
Link (https://www.youtube.com/watch?v=x1UD1SmxRi4)
"The Future of Agriculture: AI, Robotics, and Big Data"
Link (https://www.youtube.com/watch?v=DEPOHyYhVnc)

Pictures & Quote

Add a team picture and some pictures of your project site. Add a quote about why you are excited about implementing your idea. This quote + your team photo can be used to introduce your team on social media channels from the organizers.

How About an AI powered solution?

We agree to the Terms and Conditions	**YES**


WAGENINGEN
UNIVERSITY & RESEARCH


NFP
Netherlands
Food Partnership


WAGENINGEN
UNIVERSITY & RESEARCH


NFP
Netherlands
Food Partnership