

## INNOVATION FUND

**Digital soil mapping for optimal agricultural yield and sustainable soil biodiversity management in southwest Nigeria using artificial intelligence (SmartSoil)****Parent project: Accelerating inclusive green growth through agri-based digital innovation in West Africa (AGriDI)****PROJECT COORDINATOR**

Federal University of Agriculture, Abeokuta (FUNAAB), Nigeria

**LOCATION**

Southwest Nigeria

**PERIOD**

March 2022 – March 2024

**EU FUNDING**

EUR 261,424.52

**SECTOR**

Agriculture

**KEYWORDS**

Digital soil mapping, Artificial Intelligence, digital agriculture, agri-based digital innovation, youth, women, ICT for Agricultural Development

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**CHALLENGE**

The majority of Nigerian farmers either overlook the importance of soil fertility and its effect on crop performance and yield or lack access to soil fertility information such as low-cost soil analysis tools and information platforms. Farmers' inability to investigate or estimate correctly the inherent nutrient levels in their parcels of land or receive extension services on the suitability of available land for specific crop production affect agricultural productivity, household income and livelihood.

**PERSPECTIVES**

Digital Soil Mapping (DSM) and Artificial Intelligence (AI) techniques will be used for the development of a soil fertility predictor app 'SmartSoil' (android and mobile web versions). With this app, the capacity of farmers, extension agents, researchers, Micro, Small and Medium Enterprises (MSMEs) in the agri-food sector, farmer cooperatives and associations will be strengthened on sustainable soil management, soil biodiversity management and climate-smart agriculture.

**JUSTIFICATION**

A soil information platform that is user-friendly, accessible and affordable to millions of Nigerian farmers and other users, such as policy makers and researchers, is important to guide them on efforts to improve soil fertility and biodiversity, crop yields and agricultural productivity.



Collection of data from farmers during a baseline survey.

**METHOD**

Planning / diagnostic phase: Project area selection, identification of farmer fields, baseline survey, target soil attributes requirements (soil pH, Nitrogen, Phosphorus, Potassium and Soil Organic Carbon), technological requirements (mobile and web platform applications for final users).

Implementation phase:

- Legacy data collection (secondary data collection and aggregation) and standardisation of secondary data (i.e. standardise aggregated secondary data collected from different sources to a format for easy data processing and analysis), metadata design, SmartSoil information system design.
- New soil data collection, data harmonisation, AI algorithm selection, model accuracy and certainty level, digital soil maps visualisations, SmartSoil information system implementation.

Validation phase: Validation and verification of digital soil map prediction of fertility information in the field.

App delivery, information dissemination and feedback phase: Multi-channel access to the system (app, web) onboarding of system users, system user sensitization and feedback from users.





### INNOVATIVENESS

The SmartSoil app will be the first in the region to provide information on soil fertility, crop suitability and soil nutrient status, The SmartSoil platform will link farmers, policy makers and crop and soil experts.

### EXPECTED RESULTS

#### Impact

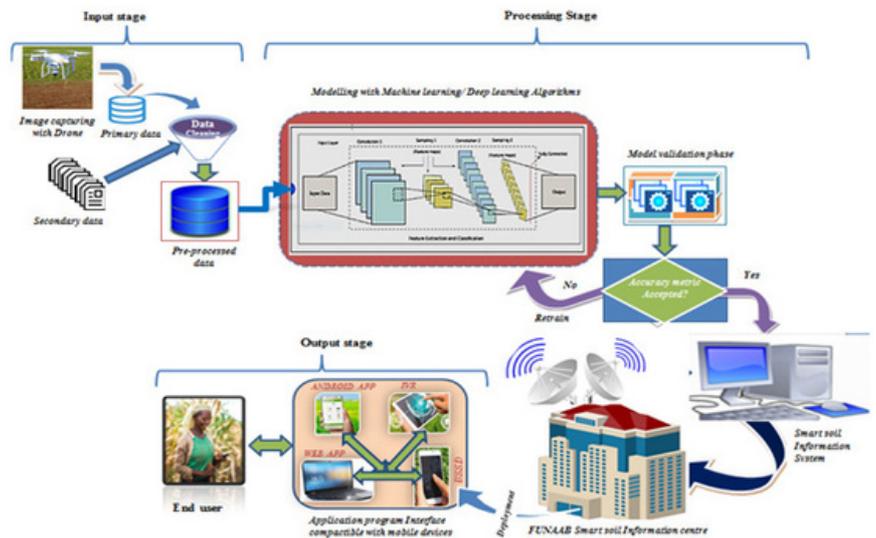
- Improved sustainable soil management for agricultural production in Southwest Nigeria.

#### Outcomes

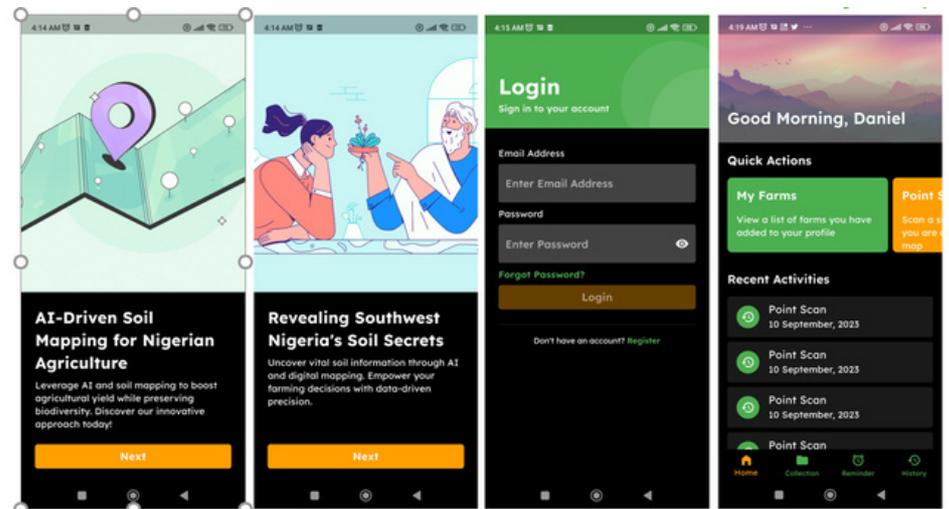
- Farmers and extension agents using digital soil mapping information for sustainable soil management.
- Improved decision-making capacities of policy makers on promoting sustainable soil management.
- Researchers at FUNAAB able to develop digital innovation tools for sustainable soil management.

#### Outputs

- SmartSoil app developed for Southwest Nigeria.
- Farmers and extension agents capacitated in the use of the SmartSoil app.
- Evidence of soil fertility status provided to the Ministry of Agriculture in Southwest Nigeria.
- FUNAAB researchers capacitated on the development and use of the SmartSoil app.



Schematic diagram of implementation of FUNAAB SmartSoil information system



Snapshot of the interface of the SmartSoil app.

This SmartSoil project is one of 9 supported by the ACP Innovation Fund project: AGriDI, a project implemented by the International Centre of Insect Physiology and Ecology (icipe) in Kenya, in partnership with the University of Abomey-Calavi in Benin, Gearbox Pan African Network in Kenya and Agropolis Fondation in France.

Contributing to a conducive environment for agri-based digital innovations, especially for women and youth farmers, and accelerating inclusive green growth in West African countries, AGriDI has selected 9 (third-party) projects that are implemented by academic and research institutions, ministries and government agencies responsible for ICT or science, technology and innovation, farmer cooperatives, MSMEs, and civil society organisations in Benin, Burkina Faso, Ghana and Nigeria.

AGriDI supports the development and scaling of the use of digital technologies for agricultural development, such as in the areas of soil mapping, agro-inputs, crop management, marketing, and policy making.

