A Monthly publication of the SMARTSOIL Project

SMARTSOIL DIGEST

Volume 1, Issue 3

September, 2022

SMARTSOIL PROJECT RECEIVES MONITORING TEAM FROM AGriDI

Inside this issue:

The AGriDI project monitoring team made a courtesy call to the Vice-Chancellor, Federal University of Agriculture, Abeokuta, Prof Felix Kolawole Salako, who was on an official assignment and was ably represented by the Deputy Vice Chancellor, Development, Prof. Olusola Babatunde Kehinde.

The visiting team later visited the SmartSoil Project office located inside the Prof Oluwafemi Balogun Ceremonial Building, FUNAAB where the team among others interacted with all SmartSoil Project staff and researchers, assessed progress made in implementing planned activities of SmartSoil Project work plan, listened to the key constraints faced by the FUNAAB SmartSoil project team and offered advice on how to improve the SmartSoil Project result framework..

The project monitoring team then visited one of the SmartSoil adopted agrarian villages at Alabata, Odeda Local Government, Ogun State where they interacted with over 100 rural farmers.

FUNAAB VC ably represented by Deputy Vice Chancellor (Development) Prof. O. B. Kehinde (in suit) with AGriDi monitoring team and SmartSoil Team while receiving the AGriDi Team on a courtesy visit to the Vice Chancellor.

Group photograph of AGriDi monitoring team and SmartSoil Team members after technical interaction at the project office located inside Prof. Oluwafemi Balogun Ceremonial Building, FUNAAB

A 3-man project supervising team from AGriDi and ICIPE, Nairobi Kenya visited SmartSoil Project, Nigeria on September 6, 2022. Visitation team members are Dr Michael Kidoido, Dr Jonas Mugabe & Mr. Thierry Romuald Hounkpatin. The AGriDI project monitoring team made a courtesy call to the Vice-Chancellor, Federal University of Agriculture, Abeokuta, Prof Felix Kolawole Salako, who was on an official assignment and was ably represented by the Deputy Vice Chancellor, Development, Prof. Olusola Babatunde Kehinde.

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The project monitoring team then visited one of the SmartSoil adopted agrarian villages at Alabata, Odeda Local Government, Ogun State where they interacted with over 100 rural farmers. In the village, the team witnessed presentation of SmartSoil Project to the farmers in local language (Yoruba) which was simultaneously translated to English language. The team interacted with the farmers and listened attentively to the challenges faced by rural farming communities in adopting digital innovations and proffered practical solutions how to surmount them.

Dr Jonas Mugabe and Dr Michael Kidoido assured the farmers that the aims and objectives of AGriDi Project is to deepened the adoption of agri-based digital innovation in West Africa thereby helping farmers to improve their productivity and livelihood.

Digital Soil Mapping: The SMARTSOIL Approach

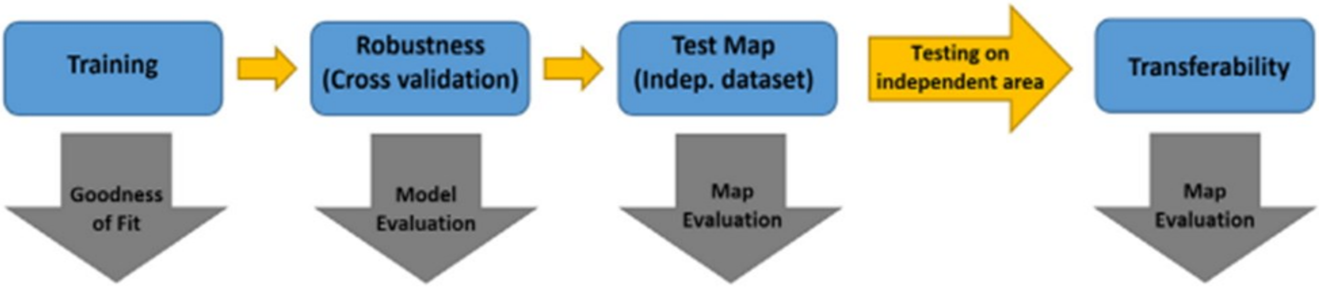

Figure 1: Conceptual View of Assessing Model and Map performance in DSM. (Khaledian & Miller, 2020)

Digital Soil Mapping (DSM) is a computer-assisted creation of digital maps of soil type and properties. It typically suggests using numerical and statistical models that consolidate data from soil perceptions with the information contained in correlated environmental variables Dobos 2006. Recently, soil science has experienced significant expansion in DSM activities: this is achieved with the use of numerical or statistical models to combine information about soil-forming factors obtained from spatial data layers (environmental covariates) with point soil data to estimate soil features for a map. Wadoux *et al.,* 2020 DSM can be a choice to choropleth soil maps for providing the crop model soil input values, it is also an option in contrast to traditional soil surveys for mapping soil properties at confined costs Lagacherie *et al.,* 2022. The obtaining of accurate soil nutrient distribution data is a significant stage for precision agriculture application, and digital soil mapping is a viable innovation Dong *et. al.,* 2018

In DSM, different Artificial Intelligence techniques can provide more accurate predictions and solutions. These include fuzzy logic, decision trees, expert knowledge, machine learning algorithms, deep learning methods, and others Bodaghabadi *et al.,* 2015. Generally, there are four main steps for assessing the model and map performance in DSM as depicted in Figure 1. The first step requires training the model with the dataset (that is, the goodness of fit), the second process involves testing the model performance with cross-validation (to ensure robustness), and the third step is testing the map validation inside a similar geographic degree with an independent dataset, and the fourth step is testing the adaptability of the model in an alternate geographic region with a second independent dataset Khaledian & Miller, 2020 .

"The Smart soil digital solution framework consists of the soil data collection and the Smart soil information system modules as shown in Figure 3. The data collected by the actors in the soil data collection module will be used to develop the Smart soil information system. The two main actors are GIS Experts and Soil Scientists; the GIS expert and the Soil Scientist are saddled with the responsibility of providing the primary data such as land cover, land use, soil texture, soil map, climate data, and many more. For the secondary data, the soil scientist will provide the existing data such as soil map, soil texture, climate data, etc. The dataset is then preprocessed and validated by computer scientists; the processed dataset serves as input into the Smart soil information system module.

Despite the high increase in the utilization of digital soil mapping at the global level, the use of digital soil mapping and other digital tools is still limited in6 the African community which is one of the factors affecting high productivity in Agricultural Systems in Africa. Hence, in this research, the main goal is to develop and deploy a Smart soil information system for South-West Nigeria to enhance agricultural productivity using DSM and other digital innovative solutions. The proposed SmartSoil digital solution will improve crop production in Nigeria and enhance food security for smallholder farmers and resource-deficient women farmers in remote communities by providing accessible and user-friendly soil nutrients information.

The illustration of the proposed SmartSoil digital application showing the properties of the Soil properties in a specific location is given in Figure 2.

Figure 2: SmartSoil Application Output Depiction

The SmartSoil digital solution framework consists of the soil data collection and the Smart soil information system modules as shown in Figure 3. The data collected by the actors in the soil data collection module will be used to develop the Smart soil information system. The two main actors are GIS Experts and Soil Scientists; the GIS expert and the Soil Scientist are saddled with the responsibility of providing the primary data such as land cover, land use, soil texture, soil map, climate data, and many more. For the secondary data, the soil scientist will provide the existing data such as soil map, soil texture, climate data, etc. The dataset is then preprocessed and validated by computer scientists; the processed dataset serves as input into the Smart soil information system module.

There are four actors in the Smart soil information system module; the first actor in this section is the computer scientists, and their duties are to determine the appropriate machine and deep learning algorithms for the system, develop the Soil mobile and web applications, and host and deploy the digital soil solution. The second actor in the soil information system module is the farmers (the primary users of the application). The system will provide a user-friendly interface for farmers for easy navigation through the Smart soil

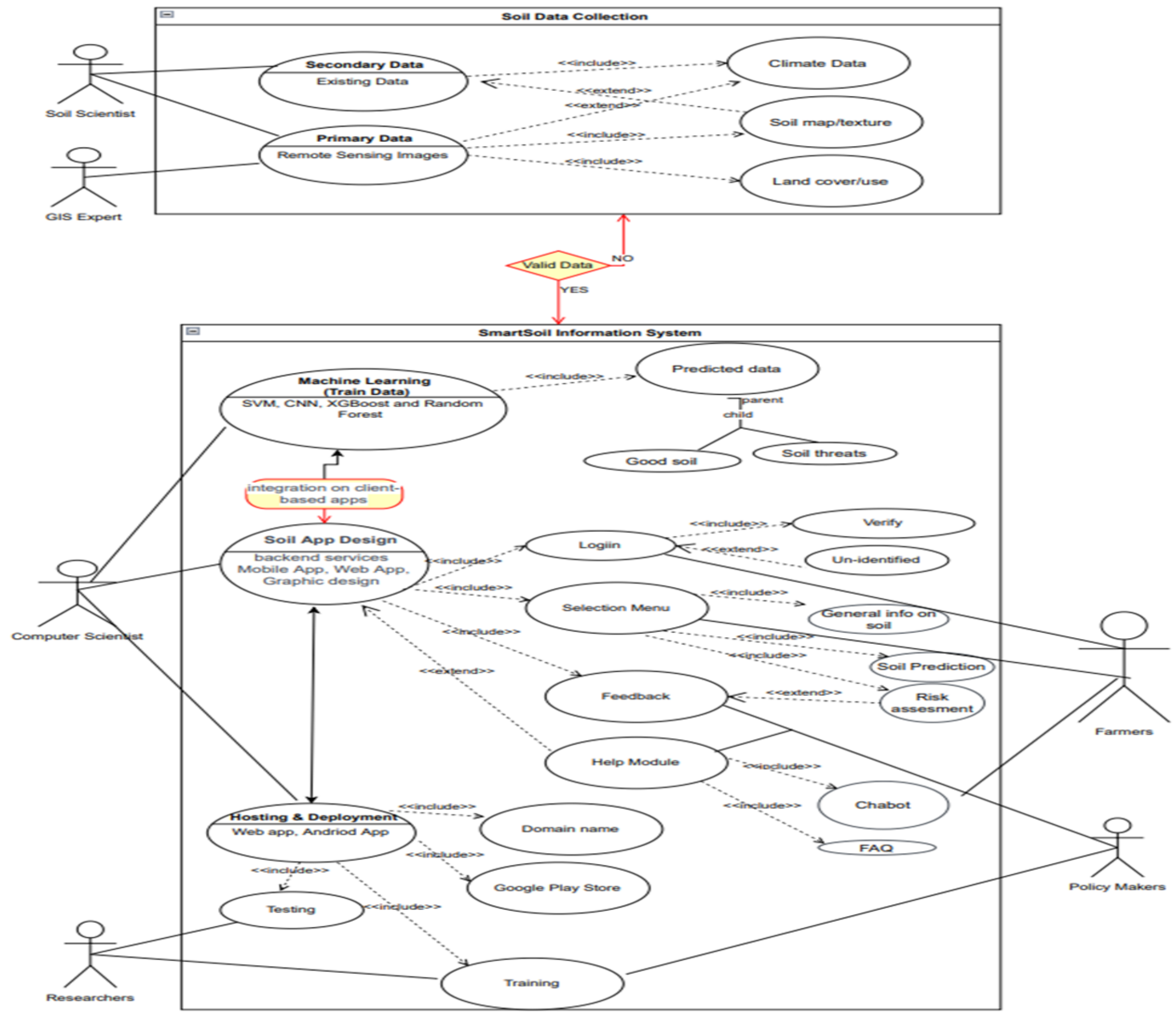

Figure 3: Proposed SmartSoil Information System Flow Chart

application by selecting the appropriate menu; the application will also provide an avenue to get feedback from farmers and other end-users. The third and fourth actors in the soil information system are policy-makers and researchers.

In conclusion, this research will improve agricultural productivity in Nigeria and other African Communities by equipping the farmers with the appropriate digital solutions that provide reliable hyper-local soil information. It will also foster links among the research community, policymakers, and farmers; and create an avenue to train young researchers with new soft skills in Agro-informatics.

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Article by SmartSoil Computer Science Sub-group Coordinated by Dr. Oluwafolake Ojo







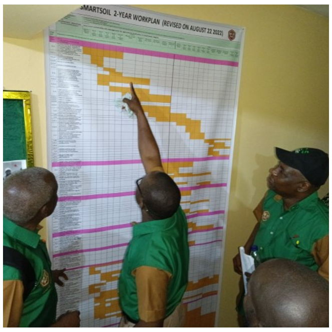


SmartSoil Project
Target Beneficiaries

SmartSoil
Project
Development Objective
Specific Objective






SMARTSOIL 2-YEAR WORKPLAN