Your VCCA Launches Interactive Map to Identify Cold Room Locations in Nigeria

Caption for the image above: What can we do to improve food security, raise farmers' income, and cut food loss while striving to maintain a green imprint on the environment efficiently? These are the questions that inspired our answer: An interactive web map, designed to help stakeholders realise the potential for sustainable cooling solutions in Nigeria.

Even without the weight of recent events bearing down on the global economy, the demand for food has never been higher. To meet this need, attention has been directed towards digital technology as an efficient tool in addressing the current and future global food security issues. Access to actionable data is a key component needed for implementing digital solutions in the traditional agricultural value chain**.** However, there is a disconnect between the rising tide of information and the ability of most farmers (and other stakeholders) to use such tools to influence the agricultural supply chain. The Nigerian agricultural sector is no exception to these issues: although there are tangible amounts of agricultural-related data that are openly available and findable, they are difficult to distil or group in a ready-to-use form. The lack of access to such ready-to-use, easy-digestible data results in less-informed decisions that drive postharvest losses.

One way to solve this issue is to use web-based, visually engaging interactive maps and graphs targeting smaller sections of the supply chain, for instance—cooling service providers. **That is why teams from EMPA and BASE have created a multi-layer, interactive map of Nigeria (view here) using available agricultural data that were sourced openly to aid stakeholders (farmers, cold-storage providers, retailers and policymakers) with decision-making along the fresh food supply chain.**

"When we developed a similar map for India, we saw the excitement it generated amongst cold store providers, farmers, and other stakeholders in the fresh produce supply chain. These stakeholders are currently using the interactive map to make better decisions regarding their businesses," says Daniel Onwude, Scientist at Empa's SimBioSys Group and Project Lead. "Our goal is to replicate a similar if not higher impact than that of India. We hope that the smallholders, the cooling service providers, suppliers, retailers, and policymakers of Nigeria's fresh produce supply chain will use this tool to make decisions that will drive food loss reduction and improve wealth creation."

Nigeria is one of the world's largest producers of fruits and vegetables, and the production of this fresh produce is largely carried out by smallholder or marginal farmers who often grow them on farms under 2 hectares. Food losses are exceptionally high within this category of farmers, with more than 40% yearly postharvest losses, amounting to about 1.7 billion tons per year. This also results in more than 30% loss of income each year. This is exactly the challenge that the Your Virtual Cold Chain Assistant (Your VCCA) project, undertaken by **BASE** and **EMPA,** seeks to address. The project aims to reduce food loss and increase farmers' income by making pay-per-use cooling services more accessible to smallholder farmers. Together with mainstreaming the pay-per-use business model within the cold storage sector, the solution focuses on the development of a mobile application that digitalizes inventory management and provides pre- and post-harvest market intelligence, allowing farmers to better handle, store, and protect their crops.

Bringing together Open-Source Data in an Interactive Map

Given the lack of access to easy-to-use agricultural-related data in Nigeria, several attempts have been made to mitigate this issue. One notable example of this is the National Bureau of Statistics survey carried out along with the Federal Ministry of Agriculture and Rural Development annually. The National Agriculture Survey (NASS) was designed to assess the state of agricultural production in the country and understand how the statistics obtained from that observation tied into the National Agricultural Sample Census (NASC) conducted every 10 years. The data from this survey highlights information about crop production, livestock

management, land improvement, infrastructure development, rural electrification and other sources of development using conventional and non-conventional means. Despite this data being publicly available, the data is sparse and not distilled into a ready-to-use form. The data has to be processed into a geospatial format and analysed based on that visualisation to maximise its utility. That is where the interactive web map developed by Empa and BASE comes in: using Google Earth Engine and Google Cloud, the application offers synthesis by allowing the collation and visualisation of different geospatial data layers related to Nigeria's fresh produce supply chain. This means that relevant spatially distributed data like fruits and vegetables crop production, elevation, temperature, solar radiance, predicted electricity grid lines, roads, market location, land cover, agro-ecological zones, water scarcity, food insecurity, and mobile band coverage are all visualised at State level or Local Government Area (LGA) level via this map.
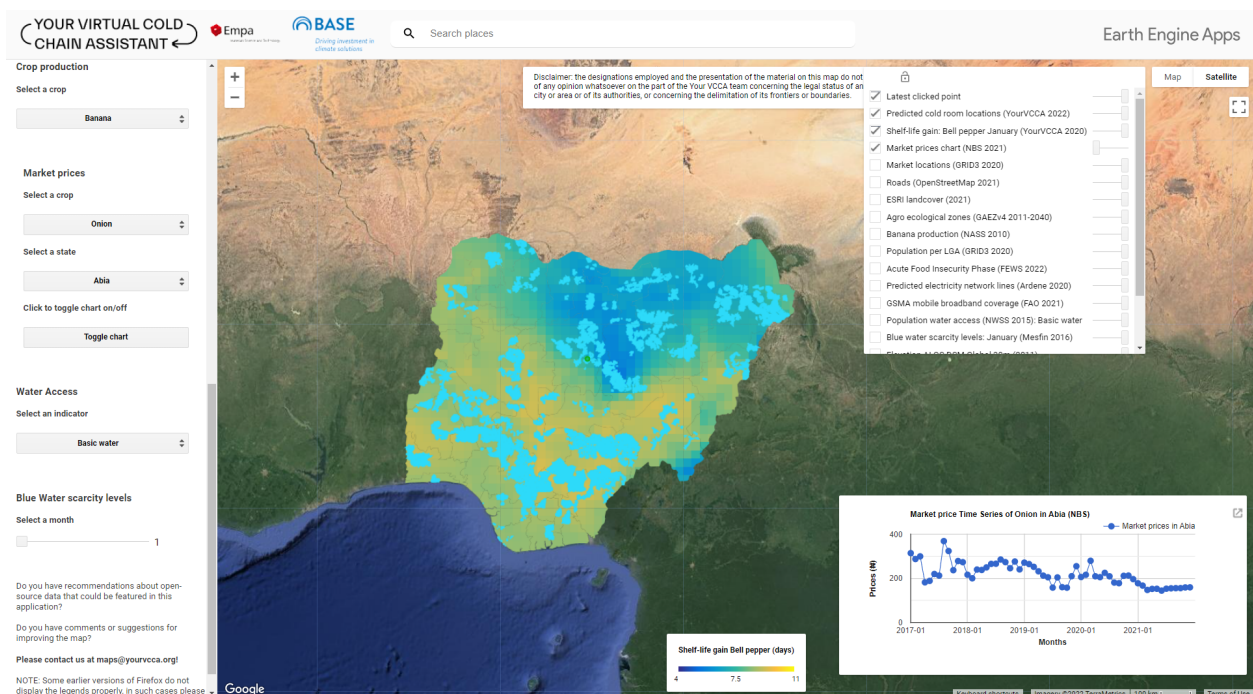
Caption for image: This web application has been designed as part of the Your VCCA Nigeria project. It is meant to help stakeholders realise the potential of sustainable cooling solutions throughout Nigeria. It features GIS layers showing open-source data relative to crop production, climate, infrastructure, as well as shelf-life gain maps and potential cold-room location maps which were developed by the Your VCCA project team.

What is the purpose of the map?

To help stakeholders in Nigeria's fresh produce value chain make better decisions! This is the simplest way to put it. The visual representation of the data layers will serve as an effective decision-making tool for stakeholders in the fresh food supply chain across the public or private sector. This includes cooling providers, farmer-producer organisations and other social enterprises, financial institutions, NGOs and government bodies.

"You look at Nigeria and you have to see potential," says Divinefavour Odion, Computer Scientist and Consultant for Empa's SimBioSys group, "Our goal is to collate and transform available open-source data to actionable geospatial insights for fresh food supply chains to drive food loss reduction not just in Nigeria, but around the world. We believe that this map is part of how we get there, by empowering cooling service providers with the necessary insights to grow their businesses."

For example, **the map shows locations in Nigeria with the largest cooling potential and identifies where future cold storage rooms could be placed**. The value of these rooms lies in their ability to preserve the economic value of fresh produce in-between transportation supply runs. Nonetheless, cold rooms can only provide adequate benefits when they are properly, conveniently placed and meet all criteria to properly preserve fresh food. Thus, the team brought some of these factors together and computed a map of promising site locations, leveraging open-source datasets and incorporating key input from our partners. The layer computed by the Your VCCA team is based on the following factors: no more than 2 km away from a market, at most 500 m off the road, and no more than 2 km away from cropland. This marks the first step towards an application where users can compute promising cold room sites by flexibly combining layers based on various thresholds.

A second example is the shelf-life gain layers computed by the YVCCA team. The shelf-life gain layers on the map display the number of shelf-life days gained by storing their fresh produce at colder temperatures compared to ambient temperatures. **By representing the shelf-life gain and historical market prices of several crops, including bell pepper, tomato, cabbage, green bean, and carrot on an embedded chart in the map, farmers can access interpretable information on the market dynamics of the crops they produce, such as seasonal trends or cross-state comparisons**. These tools provide them and other stakeholders with critical information on the benefits of using cold storage and on market linkage with actionable metrics.

This interactive map will complement the Coldtivate app, launched under the Your VCCA initiative, by bringing together information to help stakeholders better understand the need for

cooling across Nigeria, so that they can identify the best opportunity to positively impact farmers' livelihood across the country.