What's your idea?

Let's take Joseph, for example, a coffee farmer in Uganda. He lives with his wife and three children in a small village on Mount Elgon, Uganda and has less than 1 hectare of land to cultivate different crops including Arabica coffee. The area he lives in has been troubled with inconsistent and high intensity rains and has been plagued with low yields in the past 2 years. A few months back his coffee cultivation suffered from pests but he could cope by applying a tailored pesticide combined with targeted pruning. 500 km away from Joseph lives a farmer on the slopes of the Rwenzonri Mountains named Edward. He has a similar socio-economic background and similar biophysical conditions of the farm. His coffee was infected by the same pest but in contrast to Joseph, he doesn't know how best to tackle this issue, without losing much income, yet being environmentally friendly, within the limited access/availability of resources. Wouldn't it be great if Joseph could advise Edward what best can be done?

Both Joseph and Edward are part of a larger network of coffee farmers that are serviced by Olam, an agricultural supply chain company sourcing from the farm gate and supplying coffee roasting companies across the world. To date, Olam, through its Olam Farmer Information System (OFIS), has "digitized" over 100,000 of the 4.3 million farmers in its supply chain globally. OFIS contains oodles of socio-economic, management practices and production data of farmers and their farms. Sustainability has always been at the core of Olam's business model, and hence is investing intensively to leverage the OFIS system to provide eco-efficient agricultural practice advisory to their farmer network. Currently however, sustainable adoption of these practices has and continues to be a challenge. **To address this problem, we propose to develop a mobile application, which is essentially a learning system for extension services, and connect it to an "intelligent" OFIS database**. We will enrich the OFIS database by fusing household socio-economic, farm characteristics data with the biophysical conditions of the farm, and leverage artificial intelligence to profile, cluster and precompute farmer networks with similar characteristics registered in the database. Using the mobile application, the farmer can post a query or ask for a specific advice to the learning system, the system will send out the post to extension agents and farmers belonging to the same cluster, and returns a suggestion/answer to the posted query. **In simple terms, the farmer can use this application to solve a specific problem, by getting timely help from other farmers with similar conditions or extension experts through the learning system.** Through the development of a data driven, intelligent farmer learning system, we aim to improve the adoption of mitigation and eco efficient agro-practices among farmers. Several studies in the past have shown that adoption rates of mitigation strategies and eco-efficient practices is much higher through farmer to farmer learning alliances. Specifically, for Olam, such an application will not only promote sustainable adoption of eco-efficient agro-practices, but also will offer near "real-time" data on issues faced by their farmers, and enable provision of tailored advisories in an efficient manner. This will reduce the cost and labor involved in extension services, and build that all important trust within the farmer community from whom they source.

How will you pilot it?

In this project, we propose to tap into the potential of the existing OFIS database by specifically precomputing networks of a cohort of ca. 2,500 farmers in Uganda. Although the OFIS database has high quality data on the socio-economic conditions, farm size and production volumes of the registered farmers, it lacks biophysical (climate and soil) information about the farms itself. Hence, we aim to enrich the OFIS database, by combining it with existing biophysical data. The OFIS database enables this fusion

since farmers in the database are geocoded. Using machine learning, we will cluster these farmers based on socio-economic profiles and farm biophysical conditions. In the next step, we will develop and launch a mobile application (a learning system for extension services), that will connect farmers and extension experts within each cluster. The application is designed to provide a simple interface that will allow Edward to connect not just with Joseph, but several other farmers with same conditions and facing similar problems, and to extension experts who have the experience of solving such problems.

The first quarter of the year will be used to fuse the OFIS database with existing biophysical datasets, and to precompute farmer networks. These activities will be led by CIAT in collaboration with the International Institute of Tropical Agriculture (IITA) and University of Salzburg. The Department of Geoinformatics at the University of Salzburg will provide its expertise on geospatial near-real time analyses through a PhD student who is currently working in a joint project between IITA, CIAT and the University of Salzburg. CIAT and IITA are co-leading a global program on Climate Smart Agriculture (CSA) for coffee and cacao under the CCAFS CGIAR research program which will underpin this project. OLAM and IITA have been leveraging the OFIS database, to develop concepts and indicators for farmer segmentation and step-wise investments, to direct coffee intensification recommendations, adapted to the livelihood strategy of farmers in Uganda. IITA has an improved understanding of farmer profiles in the database, and in collaboration with CIAT, will work towards improving farmer segmentation by incorporating biophysical components of the farm. In addition, during the first quarter the development of the mobile application will also be initiated and will be co-led by CIAT and OLAM and with expertise from the University of Salzburg. The second quarter will be entirely dedicated to the development and testing of the mobile application in the field, which will be led by IITA and OLAM. In the remaining second half of the twelve months, the project team will focus on the evaluation of the platform adoption by farmers, including iterative improvements of functionalities and performance of the learning system. The platform will serve not only for the farmers, but also for its use as a big data source for OLAM, the CGIAR Bigdata Platform and the global science community as an open data source. This activity will be jointly led by CIAT and OLAM. A budget of 50,000 USD is estimated for development and testing of the mobile application. The remaining will be used to cover costs for travel and fieldwork.

Such a learning system offers immense potential not only to the farmers registered to the network but also to OLAM. The learning system can be used to gain insights into farmer behavior and factors that drive their decisions. Information exchange on this platform can be used to perform social network analysis that can contribute to current activities of IITA on step-wise investments, and OLAM's strategic initiatives in the future. The learning system could be bundled further with various other crucial services. In particular, gamification strategies can be incorporated, so as to reward farmers upon their interaction with and successful adoption through the learning system. High value information, such as a list of stores offering competitive prices of fertilizers etc. can be provided as a reward. Such an approach will not only keep the farmer engaged with the learning system, but will also facilitate sustained adoption of eco-efficient agro-practices.

The approach will be piloted on 2,500 farmers; however, it can globally be extended to the total amount of farmers registered in the OFIS database and hence, could catalyze to scale out to 4.3 million farmers worldwide, solving farmer problems and enable boosting of eco-efficient agro-practices at a larger scale through a single learning platform.