Drones, Mobile Apps & Extension Agents: Optimizing Data-use for Improved Performance in Ghana

Essence of the Idea

Collecting data on agricultural production and yields in northern Ghana is important, but costly. iDE, in partnership with IFPRI and Farmerline, will compare alternative data collection methods to understand how efficiency of data collection can be improved in data-sparse environments. Our *Drones, Mobile Apps & Extension Agents* program will compare the use of drones to monitor crop health, crop yields, and pests, against the current standard of data collection via in-person interviews and field observation recorded with mobile devices. We will investigate the relative advantage of each methodology and recommend the most cost effective blend for data collection, performance management, and real-time decision making for a group of approximately 160 smallholder farmers, with an average of 500m^2 per household.

An Unconventional and Creative Approach

It is common to ask what data drones can collect. However, we believe it is more important to ask, do drones collect better data, more efficiently, and under what circumstances should organizations deploy them? We will test whether drones can provide more accurate information, more frequently, and at a lower cost. If successful, farmers - as well as private-sector extension agents - will be provided with more relevant, and timely information and support. Drones will not replace human interaction, but facilitate more meaningful and proactive agricultural advice, by allowing for data collection to occur between interactions rather than during.

Hypothesis and Keys to Success

The integration of drone-collected data with in-person interviews and field observation will enhance the quality of information available, while also improving efficiencies in the data collection process, thereby optimizing the interaction between farmers and Farm Business Advisors (FBAs), and improving the yield/quality of farmers' harvests. FBAs act as private sector extension officers, using mobile devices to collect data via in-person interviews and field observations. FBAs also market, sell, and provide training for agricultural inputs, as critical component of iDE's development model in Northern Ghana. By leveraging iDE's existing FBA model, we are able to take advantage of existing relationships with farmers to examine how motivated private-sector extension agents can utilize a new data source. We envisioned that data collection using drones will enable FBAs to spend more time discussing the data at hand with the farmer rather than spending time collecting the data on the farm.

Implementation Plan

This research will be conducted using iDE Ghana's Korsung agricultural business model in Northern Ghana. Korsung is a contract-farming model developed by iDE Ghana to deliver a package of agricultural inputs and technologies to farmers, matched with targeted knowledge and training, which is forward-financed, allowing farmers to pay for the package in-kind with a portion of their harvest. There will be two groups of Korsung Farmers included in this trial. We plan to run a control group of farmers which will continue have impact assessment and performance measurement conducted via an FBA using the TaroWorks app on a mobile

device, while treatment group FBAs will utilize the combination of data provided from remote data sensing drones supplied by Ghanaian company Farmerline, and in-person analysis of farmers' plots. To ensure quality, the study protocols will be submitted to IFPRI's Institutional Review Board prior to in-field application. IFPRI will play a pivotal role by providing technical support in the research study design phase, and improving the actionable findings for advising farmers by integrating finding from existing agricultural research in Northern Ghana and available CGIAR data sets. In addition, IFPRI will assist iDE in equipping FBAs with more timely and effective performance management data, combining currently collected data and Farmerline's drone data.

Budget and Timeline

Descriptions	Estimated Budget ($)	%
IFPRI-research and guidance	$20,000	20%
iDE-in-country research and project management	$40,500	40%
iDE-implementation	$15,000	15%
Farmerline drone data	$24,500	25%

Activities	Gantt Chart (Months)											
	1	2	3	4	5	6	7	8	9	10	11	12
Research Set-Up	IFPRI											
Implementation & data collection		iDE (1 Supervisor; 2 FBA Managers; 4 FBA's; 160 Famers)										
Analysis										iDE & IFPRI		

Essential Data Generated

iDE's FBAs currently collect: client/customer information (such as demographic data and GPS), Input information (types and quantities), crop information (crop types, harvest and sales information), and trainings conducted (attendance, knowledge retention). This data allows for robust impact assessment and performance measurement when working with farmers, and their inputs and outputs, seasonally. Farmerline's drones use multi-spectral sensors which is able to take pictures across red, green, red-edge, and NIR bands. These enable index maps through nitrogen and biomass distribution can be determined across a plot. This helps in early detection of problematic areas on the field (due to low nutrient intake, pest/weed infestation, etc.) and enable quick and timely actions to be taken. We will calculate the cost of the two data-gathering methodologies, and the outcomes for farmers in terms of yield and profitability. The hard data will be combined with qualitative feedback of FBAs and farmers to understand which agronomic aspects most benefit from data generated from Drones. After a final analysis, recommendations on the most cost-effective method per aspect and best blend of methods will be made, in order to inform future program design.

Next Steps

As part of our commitment to the values behind the Inspire Challenge and The Platform for Big Data in Agriculture, we will produce a lessons learnt document and a user guide to allow other implementers and CGIAR centers to continue the study of crop productivity and health for smallholder farmers. Assuming the pilot program confirms our hypothesis in the initial 12 month period, we will have identified an optimal blend of in-person and remote drone-based data collection practices. This newly established blend will be used by iDE Ghana's Korsung business model during its scale up phase, to a projected 6,000 farmer over 2 years, and will be implemented in other iDE country programs as appropriate (11 in total).