COSA
Committee On Sustainability Assessment

Report for the

FORDFOUNDATION

Using Mobile Phone Technology with Small Farmers

Synthesis Report 2013

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Executive Summary

The increasing use and availability of mobile telephony in the rural areas of developing countries is beginning to drive the development of a suite of new uses for the technology in agricultural development applications. One particular area of interest for COSA is the use of mobile tools for multi-directional Monitoring and Evaluation tasks. COSA already knows that the high cost of getting reliable data from rural areas of developing countries hampers our ability to understand the situation and to address it effectively. Further, the traditional methods of data gathering (surveys and professional observations) tend to foster a one-way communication when the data is taken out of the field and then processed and discussed elsewhere. This diminishes both the ability to validate the information and its interpretation and also to make it directly and promptly useful for the subjects of study. Telephony could open the communication beyond a monologue to at least a dialogue and probably a "multilogue" with diverse interested stakeholders contributing and benefiting from the information.

Switching to mobile M&E tools is an iterative process, one that requires time and testing that goes beyond just the functionality of the technology itself to also better integrate the participation of farmers. COSA would like to explore the use of a mobile data collection tool to initially serve as the basis for Performance Monitoring – a small survey a few indicators that is used with farmers as data is required or available. This can be done weekly or monthly for certain very concise data (yields, food security, or biocide applications) and reduce the burden of spending time on surveys.

The data quality can be audited against a more thorough survey done at baseline to determine how accurate it likely is. The low cost of mobile communication permits a back and forth between subjects and the data collectors. The data captured from farmers can quickly feed into reports, can be assessed for the farmers and fed back, and can be timely enough to influence choices such as design, investment, and management decisions. Ideally, the incentive for farmer participation will be to receive feedback of processed data as knowledge (e.g. average yields or costs relative to other farmers) and even new information that is relatively low cost to generate but can be of considerable value to remote farmers (e.g. weather, disease control, or market information). Market actors that value knowledge about the farmers in a region might even pay for the data in the form of simple fees or SIM card payments that go directly to farmers and avoid a complicated system or infrastructure.

COSA recognizes that even telephones or other mobile data collection tools continue to perpetuate the one-sided conversation that researchers have with farmers, and has started to experiment with ways to empower farmers to participate in a “conversation”, with new tools and methods. Two recent pilots are discussed. One is an app for semi-smart phones designed even for unsophisticated users to enter data intuitively without the need to key in information in the manner of SMS messages. Another is the application of voice systems to communicate more naturally than the use of apps or keypads.

Since the evaluation necessarily also entailed a considerable exploration of different options and software is at the core of these, the report also offers a brief a review of different software options for data collection, highlighting the differences between open source and licensed software. This is particularly important because, while there are many options emerging, most are not adapted to the situations of remote rural areas and semi-skilled farmers. The thorough evaluation and testing of options is critical if COSA is to provide our clients and partners with necessary features such as offline data collection and reliable programs for rural environments.

Introduction

One of the biggest concerns facing smallholder farmers globally is the need to increase their agricultural productivity and their production efficiencies. This holds true both for smallholders producing for the market or purely for self-consumption. The productivity and profitability of smallholder farmers are often limited by a number of factors that are out of their control: the increasingly erratic vagaries of climate; global commodity prices; and policies. All of these factors are further compounded by the relative lack of technical and financial services and by limited information (e.g., about prices, market requirements).

The use of "big data" and analytics is changing all global industries in incredible ways. Farming is not immune to these changes, especially in market driven agricultural systems. While traders and vendors of agricultural goods have data that allows them to minimize risks and maximize profits, farmers often are unaware of anything other than today's spot price. But it is not just about access to price data, as the use of modern inputs in agriculture also requires information and analysis (e.g., timing fertilizer application, matching fertilizer components to physiological needs of the plant, timing pesticides for greatest efficacy, etc.) in order to capture the greatest benefit from their use.

The model of increasing productivity via agricultural intensification is not relevant for many small farmers; rather, future gains in productivity in agriculture will come through efficiency and timely production management decisions that are informed by reliable data. It is not just the production side that requires more data and analysis - all levels of the value chain are becoming more dependent on the collection and the analysis of timely information - from the farmer (when to apply pesticides, what are local prices) to the trader (tracking volumes, improving price risk management) and the final buyer (lot traceability, communication of market requirements). However, it is smallholders who are getting left behind during this data transformation – as they do not have access to information, nor do they know how to make the most of the information that is currently available to them.

The Committee on Sustainability Assessment (COSA) is a global organization facilitating the measurement of social, environmental, and economic impacts of sustainability and other development initiatives in agriculture. COSA adheres to the tenet that in order to manage and improve agricultural sustainability, it must be measured. COSA measures impact through its research partners in developing countries using a set of pre-vetted indicators. Currently, the data about farmers and their conditions is gathered by dispatching a researcher or surveyor who uses a browser-based application that runs on tablets or laptops, or if the hardware is not available, via paper surveys. Surveyors enter data directly into the tablet or laptop while observing a farm and interviewing a farmer, and then connect to the Internet to upload the survey data to the COSA server. COSA is exploring how using mobile data collection tools may complement or

supplant, to some extent, the current approach that is costly and time-consuming. Telephony also holds the promise of improving the current process and can offer ways to have the farmers participate more actively in the exchange of information.

Information and Communication Technologies in agriculture

Information and Communication Technologies (ICT) are seen as revolutionary agents of change in the field of agriculture, providing a number of tools that can help the smallholder farmer, primarily through improving the quality and quantity of information available to them. More specifically, many of the tools and those that perhaps hold the greatest promise are those that utilize mobile technologies. Mobile adoption in the developing world is occurring rapidly: while the overall number of mobile devices per capita is lower, the rate of increase in the developing world has been greater than that of the developed world, as shown in Figure 1 (International Telecommunications Union, 2013). Additionally, looking at mobile broadband, the developing world illustrates an emerging growth trend similar to the developed world (Figure 2). As access to mobile telephones and the Internet becomes more commonplace in the developing world, especially in rural areas, appropriate tools and platforms are beginning to emerge to serve this group.

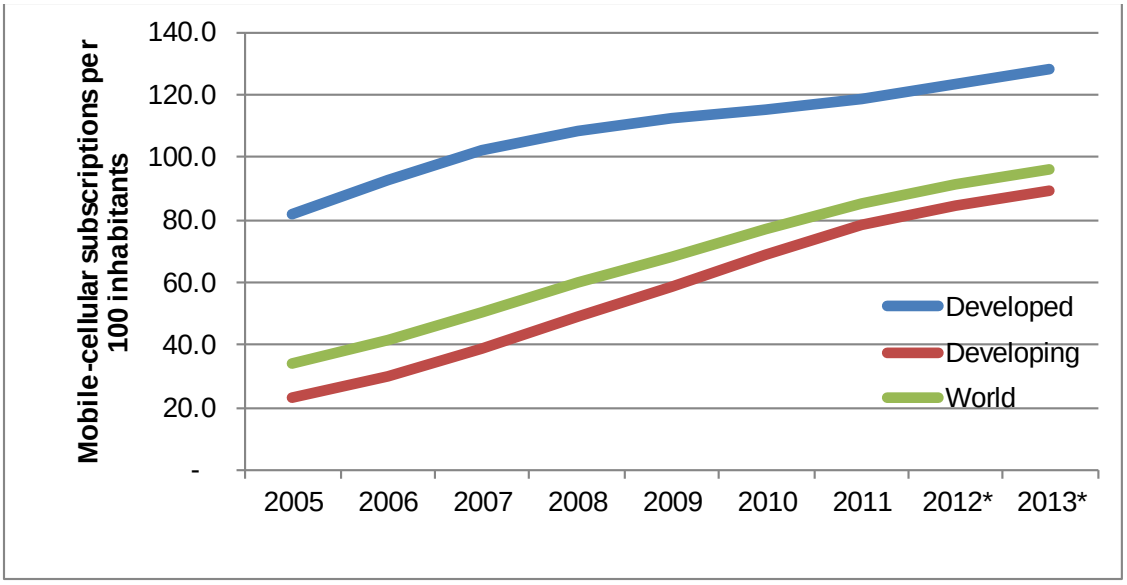

Figure 1: Global growth of the penetration of mobile telephony, 2005- 2013. Data from ITU.

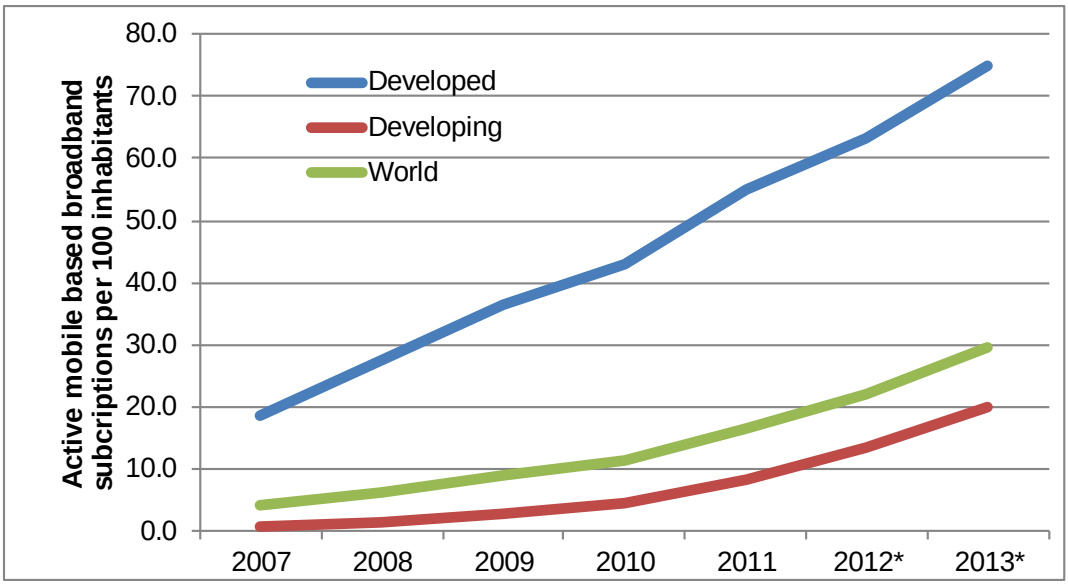

Figure 2: Rise in penetration of mobile broadband subscriptions per 100 inhabitants, 2007 - 2013

The true power of ICTs is in their role to collect, process and exchange information. Of the various ICT tools in use for agricultural development projects and initiatives (radio, telephones, television, personal computers, the Internet, etc.), mobile tools are currently the focus for many groups for a number of reasons. The portability and wide coverage for mobile ICT tools provides the ability to extend the reach of information to rural areas that do not have access to conventional ICT tools and platforms. The nature of the mobile telephone market in the developing world, often the only phone option, will allow an overall larger segment of the population access to mobile telephone services. In many countries where competition is permitted, there are a number of vendors competing and that is currently driving prices down and thus allowing even more penetration (World Bank, 2011). Additionally, air time minutes can to be purchased as discrete packages, available in very small monetary units, and this is fueling the increased use of mobile services among the lowest income sectors of the population and to rural populations.

A very recent study in Nigeria found that 83% of the information used by farmers to make decisions about selling their produce came from cell phones (Oyeyinka & Bello, 2013). While not all countries are currently as connected as Nigeria, this study demonstrates the potential that mobile ICT tools have for changing the power dynamic of information along the supply chain, revolutionizing how farmers interact with the market.

Within the agricultural value chain, each actor has different needs for managing and gathering information. A recent review of mobile applications by Fritz Brugger of the Syngenta Foundation (Brugger, 2011) utilized a typology to classify the different types of mobile ICT tools for agriculture, based on the function of the information in the farming process. These are

1. Extension services – These are tools that facilitate the exchange of knowledge and experience among farmers and between farmers and agricultural technicians.
2. Market information and interaction – These tools facilitate access to markets by providing transparency for price and market requirements and strengthen the position of the farmers.
3. Support services and systems – These tools track quality or assist in operational or logistical processes for farms, traders or farmer groups.
4. Data collection – Data inform the processes for many groups, extension agents, policy makers, and agricultural development donors and implementers.

A number of recent papers have discussed how ICT can improve and strengthen the information economy of smallholder agriculture (McNamara, 2009; World Bank, 2013). This report is focused on the fourth category, the use of mobile tools to collect data from smallholder farmers to support agricultural development. The conditions are clearly amenable to the sorts of investments that COSA is undertaking in this area.

ICT for Monitoring & Evaluation of agricultural initiatives

The quick capture and use of data to support agricultural development initiatives is of paramount importance, especially with recent concerns about climate change and change in land use management both of which require copious amounts of data to measure change over time. There is also increasing pressure to find scalable projects and solutions, which need to be validated with data. Gathering reliable data from the field in a timely fashion is notoriously difficult. The distances are great, the travel time is long, and the terrain is difficult. For years, nearly all data was collected with paper surveys, which offered quick deployment and a familiar format. Yet, the process is slow, data entry introduces possible errors and costs, there are few opportunities to validate data in the field without cumbersome manual calculations, and tracking the deployment of thousands of surveys is a difficult endeavor. Data collection with mobile tools is a promising improvement over paper, as they offer the ability to gather data in a faster, more efficient manner, with the ability to assess and evaluate results in the field and providing input for management decisions in real-time.

Switching from paper surveys to mobile tools is a process that requires time and detailed planning. Figure 3 shows the idealized feedback loop for an ICT implementation. In the rest of this report, we follow a similar pathway. First, the

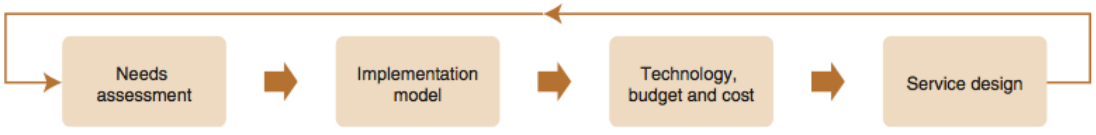

Figure 3: Simplified use of ICT in data collection and M&E. Adapted from ICT for Data Collection & Monitoring and Evaluation a report by the World Bank (2013).

COSA use case for mobile data collection tool is discussed. Then we take mobile ICT tools to the next step, and explore an example where the data collection paradigm is shifted, and the farmers are providing data to researchers and extensionists. In the penultimate selection, we review a number of open-source and proprietary mobile data collection tools that are available. The final section suggests a plan for piloting a mobile data collection tool for COSA.

Incorporating a mobile data collection tool – A COSA use case

A critical, yet often overlooked, step in the adaptation and use of new ICT tools - especially mobile tools - is articulating the exact needs of the project and users. The following section discusses the needs for a mobile data collection tool for COSA and its research partners and the constraints.

COSA currently uses a suite of tools to evaluate the impact of sustainability initiatives and projects on the lives and communities of smallholder farmers. The main tool is a farm level survey. The base survey is similar for every location, yet is customizable to add appropriate indicators and to ensure that local weights, measures and vocabulary are integrated. For use as an evaluation tool or as part of an impact assessment, this survey is deployed prior to an intervention or project and serves as the baseline for evaluating the initial condition. This baseline is used for assessing the subsequent change (if any) in the survey's indicators after experiencing at least a year or two of any intervention.

COSA believes that a good impact assessment effectively combines tested quantitative methods with the insight of qualitative methods. COSA combines standardized indicators that provide easier comparability and faster cumulative learning about best practices with multi-stakeholder workshops to initially help focus the country research and then again to discuss findings at the end. These ensure that important contextual factors are understood and that the findings are validated by local experience.

Impacts are best understood when measured over time because important factors, such as environmental and social indicators, can be slow to register significant change. COSA attempts to develop longitudinal datasets from repeated data collection efforts with its research Partners.

COSA's impact assessments use a mixed-method approach that better captures and assesses the diverse conditions found in the field. While basic scientific principles must underlie all sustainability analyses, needs and perspectives vary. The main component of the approach is the use of two standardized surveys: one administered to farmers, and another conducted with cooperatives or the community level organization that interacts with farmers. This process is informed and bolstered by the integration of useful secondary data gathered from key stakeholders prior to the assessment.

Additionally, COSA has developed a streamlined, low-cost Performance Monitoring approach that helps partners to gather simple supplemental data which can improve the tactical and day-to-day decisions that management must

take in order to keep a project on course or to meet their goals. Figure 4 details the distinctions of the in-depth Baseline and Final assessments compared to the ongoing and less detailed Monitoring that ensures necessary management input and trains local partners and project participants on the basics of sustainability metrics.

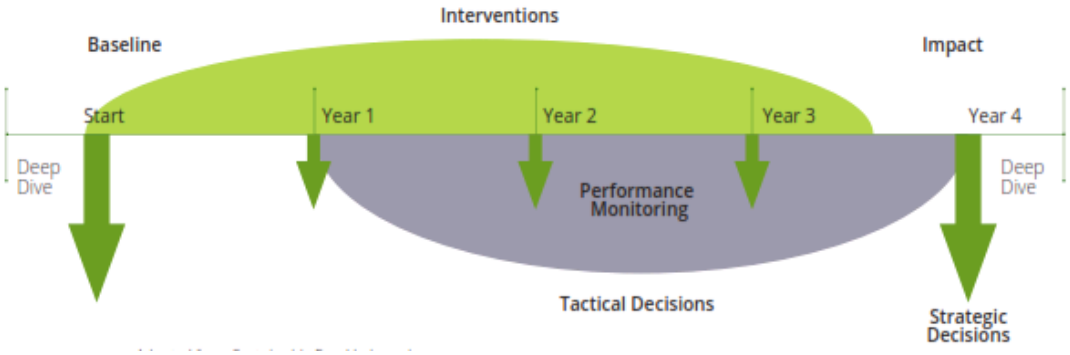

Figure 4: Use of Performance Monitoring to inform management decisions during a project lifecycle. Adapted from The COSA Measuring Sustainability Report.

Presently, this field data is captured through our current COSATouch application. COSATouch is a web-based application for data collection the administration of complex surveys. Since COSA's Performance Monitoring is simplified and much less complex than a typical survey, it would be a logical starting place for the use of a mobile phone tool. Performance Monitoring is typically applied by larger numbers of staff and requires less training. The mobile phone data collection application would have pre-loaded questions for the indicators of interest. By incorporating this work into a mobile phone, it could facilitate surveys and more readily make this an integral part of the organizations workflow. The mobile phone would also eventually permit more proactive information flow coming from farmers without the need to have an intermediary.

From COSA's point of view, the mobile data tool can also facilitate the accuracy or quality of data by integrating validation functions into the software. It would also be able to provide quick access to the results for supervisor checks. These questions are adapted or taken directly from the COSA producer survey that was applied during the baseline. This allows for straightforward comparison to the more in-depth work done in the region, it can therefore serve as an audit or checking function for the Performance Monitoring work. Perhaps best of all, the tool could easily evolve to provide nearly instant feedback to the participants and thus provide an incentive for farmers to participate.

One of the more substantial challenges for electronic data collection is the need to quickly and regularly transmit the data from the collection tool (i.e. telephone) to a secure server. This is important for three reasons: data checks must occur while the surveyor or participant is still active (not when they return home); malfunctions or equipment loss can result in the loss of many surveys so

uploading at least once daily is a necessary protocol; hand-held units can have modest memory to hold information. Despite advertised mobile coverage in many rural areas, we have found that this is, in fact, spotty or sometimes nonexistent. To avoid regular trips to a town or urban area, data requirements must be very lean and software must accommodate poor reception and dropped calls. Clearly, the mobile application must allow capture of data both offline and in areas with poor or no network connection. The data is stored on the phone or on external memory (such as an SD card), and then is uploaded when the mobile phone has reestablished network connectivity. It also requires that some metadata is automatically generated for each survey (e.g. when and where the data was collected) in order to track and manage the fieldwork.

To summarize the use case for the COSA mobile tool for Performance Monitoring:

- **Problem**: Utilizing the current COSATouch application to run shorter versions of the COSA producer survey requires the use of tablets or laptop computers. This limits the broad usefulness and flexibility of the COSA surveys. The five year old technology of COSATouch also is not automatically stable on all devices and is not useable on mobile devices.
- **Proposed Solution**: COSA seeks a mobile application that can be readily utilized by research partner organizations and other clients for Performance Monitoring of their projects or initiatives. The mobile application will initially utilize questions and indicators adapted from COSA's basic survey.
- **Benefits:** Allowing more clients to use COSA analytics and intelligence to inform their tactical managerial decisions; more intuitive user interface allows for less training of users; broader uptake will reach a greater number of farmers.
- **Intended Data:** The data would consist of answers to survey questions, plus farm GPS coordinates, and potentially photos (biodiversity, erosion, soil management methods) that supplement or validate some of the data.
- **Technology Users**: Primary researchers, extension agents, technicians from implementing organizations, lead farmers
- **Implementation team:** One COSA team member to establish the study area, select the target farmers, help select indicators and set up the micro-survey, and then to monitor or help assess the data. COSA or member of partner organization to train users on technology and survey techniques and questions. One IT specialist to manage the inputs and technical needs of an implementation
- **Business model:** Needs to be provide reasonably reliable data at a very low cost per farmer, data needs to be easily integrated into almost any existing client management system.

Sample questions for micro-survey:

Renovation

- Did you replant [name crop] during the past (x) months? (Y/N)
- How many new plants do you now have?

- How much of your land was renovated? (simple % or fractions)
- Which varieties did you plant? (options listed)
- Will you renovate more in the next (x) months? (Y/N – and if N, then why not – check basic list of 5 options)

Fertilizing

- Did you apply fertilizer to [name crop] during the last (x) months? (Y/N)
- Which fertilizers did you apply? (options listed)
- How much fertilizer did you apply? (expected options listed for total volume and costing)

Disease tracking

- Has your farm been affected by [pest or disease]? (options listed)
- What percentage of your plants is seriously affected? (range of percentages)
- What measures are you taking to combat [pest or disease]? (options listed)

Review of data collection tools

With the above considerations in mind, we review eight current mobile data gathering systems, briefly, and then consider a future in which the technicians who would initially collect data could be replaced by farmers reporting data directly.

The landscape for mobile data collection tools is a complex and quickly changing ecosystem. In a recent survey of data collection systems in the health sector, over 30 different platforms were identified, many of which are gradually being adapted for use in agriculture[1]. Bare-bones open source tools compete with highly polished, privately-backed applications. Generally speaking, the open source tools allow for high levels of customization and are free to work with, but the tradeoff is the greater time required for set up and the limited support options that then have later costs than can be quite substantial. A recent review by Thakkar and the JPAL lab (Thakkar, 2013) summarizes the basic tradeoffs between using open source tools versus building-owning the software or licensing it.

	Custom Built	**Licensed**	**Subscribed (Open)**
Ownership	You can own it and change it	You can own it, but you can't change it	You rent it

[1] Dr. Alain Labrique of Johns Hopkins compiled data for these platforms. Details here: http://tinyurl.com/nlyokd6

Set Up Time	Long	Short	Short
Set Up Cost	High	High	Low
Ongoing Costs	Medium	Low	Low
Customizability	High	None	Low
Upgradability	Low	None	High
Stability	Low	High	High

Of course, the choices noted above are generalized and are rarely as clear-cut. There are trade-offs at each level of choice. In some cases, requiring particular features may limit the choice considerably. For example, five years ago as COSA was developing its field tools, the only viable choice was to develop and own the software.

Here, we review a few different tools, recognizing that this is not a complete census. We recognize the fluidity in this landscape and acknowledge that while this information was accurate at the time of writing this report, the information changes from month to month. We provide the websites of each of the tools and some additional resources that continue to list and aggregate other tools. While all of the tools listed share some basic functions that we think are critical for this work (native form creation, offline data collection, data extraction), the specifics, product features and the technical details differ substantially.

Open source tools:

These suite of tools are open source and freely available for download, along with their source code, for those with the time and expertise to modify the code directly. Communities of coders, users and others, who take time to interact with each other via list serves or forums to aid in technical assistance or to share new lines of code or features, use a wiki-type approach to providing continuity to their tool. However, it must be understood that while these tools are available at no cost, the time required to keep up with the features and fixes can be very substantial.

Openxdata - http://www.openxdata.org/

Openxdata is open-source platform for mobile data collection that utilizes java-enabled phones. A server application is needed to design the forms using a visual form designer. Within the forms, there is the possibility of adding key features such as skip logic, answer validation and dynamic selection and calculation in the forms. Users load the surveys on to their phones via a log-in and administrators can give differential access to the users for heightened security. Data export is somewhat limited, as a .csv file for analysis.

At present, most of the implementations have been in the health sector. Discussions conducted with some known users suggest that use of Openxdata requires a high level of technical expertise and some programming skills to make good use of the application. In addition, phones that run Java are becoming somewhat scarce, as it was primarily part of Nokia handsets.

Open Data Kit - http://opendatakit.org/

Open Data Kit (ODK) is an open-source platform that allows for designing, deploying and managing mobile data collection solutions. There are a number of tools which have different discrete functions that need to be combined in order to allow for overall data control. ODK Build is required for building each form or survey. ODK Collect is an Android based application that can be used to load the form onto Android mobile telephones, collect data via the forms offline (even using skip logic and data validation), and send the saved forms to the server. ODK Aggregate is the server and data repository and is required for the backend data management.

The ODK platform also requires a high level of technical ability to customize it to your needs, but it's flexibility and considerable features available for ODK Collect and Aggregate make it a popular choice. Presently there are deployments of ODK in over 36 countries.

Formhub - http://formhub.org/

Formhub builds onto the ODK platform, by improving the form-building tool to create complex forms in multiple languages. The Modi research group at Columbia University built Formhub as part of their own ODK mobile data collection in response to the limited features of the ODK Build or Forms. Formhub improves on ODKForms and allows for quicker and easier survey creation, through using xls2xform syntax. Utilizing the syntax, the forms are created in Excel. The excel form is uploaded to the Formhub site (or to your hosted instance of Formhub) and uploaded to your cell phone with ODK Collect. Using xls2xform, allows users to easily upload new prompts and questions to the forms such as for photos and GPS coordinates.

When surveys are uploaded via the cell phone or tablet, the user can go to Formhub and visualize the datapoints on a map, or export the data as .csv, .xls or .kml for use in the preferred analytical software. Within the ODK landscape there are a number of tools that potentially can integrate with Formhub. This flexibility makes it a favorite for many groups.

It is worth noting that open-source software will provide greater challenges, especially given the varied levels of support available. These tools have only been tested for a particular application or adaptation and new innovative uses will require additional testing. Such software also tends to require ongoing time investment to keep up with its evolution.

Proprietary tools:

These tools are off-the-shelf solutions to data gathering. They are licensed for use for a period of time. Most of these offer a very limited entry-level trial for free, then require a subscription to access higher levels of functionality and increase the number of users. There is limited flexibility in these tools, yet many come with user and project management function. The license fee can be up to $12,000 annually for large projects, with many users.

Nokia data gathering NDG - https://nokiadatagathering.net/login

Nokia offers a two-module approach to mobile data collection – the server and the mobile phone application. Nokia's system works on Java-enabled phones or on windows phones, with the data and server hosted by the client organization. The Server Module is used to create and send surveys to mobile phones, receive interview results, administer users, questionnaires and responses, map data using GPS-based data, graph results and export data. The server can receive interview results in near real-time, provided the field personnel are within range of a mobile voice or mobile data network. Mobile Phone Application: The Mobile Phone Module is the only part of the system that is visible to the field personnel. It is this software that appears on their mobile phone, presented as an easy-to-fill questionnaire.

The service is free to use and the source code can be downloaded from Nokia, although this tool is not considered open source. The front-end simplicity is appealing as are the available features. However, the limited inter-operability and the declining popularity of Nokia products could prove to be a rapid dead-and and this risk reduces the likelihood of its adoption

iForms - https://www.iformbuilder.com/

iFormBuilder is a universal, cloud based mobile data collection platform allowing for data collection on mobile devices. There are 27 different types of form elements that can be included on the forms, including photos and signatures. Initially built for the Apple universe, there now exist versions for every mobile platform available. The iFormBuilder Data Viewer, allows users and administrators to view data via multiple data views (list, html, map, graph, pdf and xls) and data feeds (xls, XML, XML Post, JSON, ATOM and RSS) with no customization. iForms has various levels of pricing, from $1,200 a year to $10,000 a year, the most costly offers a custom database with a unique URL.

While the features are considerable and iForms is available on both major mobile OS systems, the cost for using this is tool especially when applied on a global scale, with diverse partners, costs can be considerable. This is a major consideration for eventual roll out to farmer groups.

Magpi - http://www.datadyne.org/magpi-mobile/

Magpi (formerly EpiSurveyor) claims to be the most widely used mobile data collection tool in the international development sector, with over 25,000 registered users in 170 countries. Magpi is an evolution of an early tool developed by the Kenyan arm of DataDyne, a social enterprise based in the United States, whose mission is to create new tools for international development and global health.

This is a cloud-based system, like the other options listed previously – meaning that the forms and the data are housed on Magpi's servers, with a downloadable application to run the surveys on mobile phones. While it is optimized to utilize Android smartphones, Magpi does work on simpler Nokia phones as well. Once the form is built on the site, it gets synchronized to the phones linked to the form. The forms allow for skip logic and for data calculation in the form.

For a limited number of users and uploads, Magpi is free. After building 20 forms, or 6,000 uploads a year, you must pay a subscription to use the service. The subscription starts at $5,000 a year for 10,000 uploads and goes up for more uploads.

CommCare - http://www.commcarehq.org/home/

CommCare is platform created by Dimagi, a privately held social enterprise. CommCare is principally designed for healthcare and agricultural extension workers and the management of this workforce. The CommCare platform includes registration forms, checklists, surveys and educational prompts with audio, image, and video clips. CommCare runs on locally available, inexpensive, Java-enabled phones or higher-end Android phones and handles multiple languages. CommCare submits data from each use to a central cloud server, CommCareHQ, where it can be made accessible to all relevant stakeholders with multiple levels of granularity.

CommCare is free for small projects and for a small number of users. However, customization, full use of features, such as managing mobile users and support incur additional fees. For larger numbers of mobile phones deployed, an annual subscription is also needed. Subscriptions start at $1,200 a year for 100 mobile users and increases up to $12,000 a year for 1,000 mobile users.

TaroWorks - http://taroworks.org/

TaroWorks is a product of the Grameen Foundation and is platform for mobile technology tools designed for use by field staff working in remote areas. It is built on the Salesforce customer relationship management platform and accessed in the field with Android devices. TaroWorks offers similar functionalities to the tools listed here (data collection, delivery of multimedia information, dashboard monitoring), but has additional features that focus more on managing the project from the operational side such as assigning tasks to field staff and managing

their performance.

TaroWorks is available through a paid licensing fee through Grameen. Although they do not make the price public at this time, there are low-cost options for non-profit organizations.

At the pricing level of these tools, the annual cost for projects or multi-country users can become an obstacle in of itself. Upon reviewing the various tools, it is clear that COSA users require continuity and thus a greater level of ownership and flexibility for the M&E tool. The ODK platform appears to provide the optimal level of function and flexibility that is desired, but it will come at the cost of the time and resources needed to adapt the tools in order to be able to provide our clients and partners reliable necessary features for rural environments such as offline data collection.

Reversing the paradigm of data collection – farmers sending data to researchers

Data collection in the field is a time consuming and difficult task. Yet, it remains one of the only ways to gather reliable data from rural communities. Through the use of ICT, there are an emerging number of models by which farmers (or other beneficiaries) might be able to send data, rather than having surveyors continue to ask questions and extract data. COSA has started to investigate two distinct methods in collecting farmer data directly.

Interactive Voice Recognition – using Labor Link in Colombia

The first option has been to explore the use of IVR (Interactive Voice Recognition). IVR is technology allows a computer to interact with humans directly through the use of the dialpad or through voice prompts. One of the leading users of IVR is Labor Link, a program of Good World Solutions, an organization that was originally formulated to help the Fair Trade system to manage factory workers conditions. Labor Link uses this technology to provide clients with real-time data about labor conditions in global supply chains and is just beginning to expand to agriculture. The idea is fairly simple. Each participant is given a log-in number and a toll-free phone number to call. The participant calls the number, hangs up, waits for an automated return call, then answers a survey using a touchpad or through his voice. However, there are some limitations to the types of data one can collect via voice and this is particularly true as linguistic nuance, pronunciation variants, and accents reduce the range of applications. Therefore other platforms have arisen to help meet these needs.

COSA attempted to pilot this service with our Research Partner, CRECE in a recent implementation in Colombia in September 2013. CRECE gathered

farmers and distributed phone numbers, but there were some technical issues that were not resolved that resulted in an unsuccessful test. COSA, CRECE and Labor Link are committed to trialing the IVR service with rural farmers and have tentatively scheduled a follow up to coincide with data collection in April of 2014. The pilot will ask a subset of farmers the same questions as they were asked on a traditional COSA farmer survey, so that the answers may be compared.

Rural farmers input data using touchscreen phones

COSA recently participated in a pilot study using smart phones (touchscreen enabled mobile devices) with cacao farmers in Indonesia. The pilot was a small part of a larger, more comprehensive assessment and design of a farmer-centered mobile platform, which would provide more complex levels of information between farmers and the other parts of the value chain. The World Bank's Tina George (PREM), Nokia (dropped out half-way through as the firm was put up for sale), Archer-Daniels-Midland, and Swisscontact were the other participants in what was also a PhD project (Delft University).

One important part of the field pilot was to see if the technology of the mobile devices would be a barrier to farmer participation in this platform. The overall goal is the development of an appropriate application which would capture both condition and transaction data that is of interest to firms in the value chain, but also to be utilized for the empowerment of smallholder farmers who would receive diverse forms of information in exchange.

A generic form asking about cacao sales and farm practices was created and then coded in the local Bahasa language. The design was centered around the user, using an approach that would allow a semi-literate farmer to work on the smartphone. The survey was tested with 120 farmers in 3 different locations. In each location, two villages or groups were identified to serve as a control and a treatment group respectively. Each group was given the same survey.

In order to test for resistance to the technology or difficulty in understanding it, the treatment group received training on how to use the application, while the control group received no training. For this test, the answers for each question were predetermined and this was a test of how the farmers would use the tool, the time needed for familiarity, and the overall accuracy of each group.

Users were tested with a pretest and a post test, looking at the perception of the technology and their behavioral intentions of working and using the application. While both groups were able to complete the task successfully, the emotional response and the perception of the utility of the application were different between the groups. The group that received the training was calm and they went about their task, whereas the control group was typically agitated and chaotic in their participation. Not surprising, the group that received training also identified a higher potential utility for the application. However, each group quite interestingly showed a similar level of accuracy for answering the questions, suggesting that more sophisticated responses from farmers are quite feasible even in the absence of specific training. Perhaps in the near future, applications

that are appropriately designed may change the data collection paradigm to one where farmers are in control of their data.

Conclusions and Next steps

There is no question that a mobile application has the potential to aid in the rapid and low-cost collection of data for fast feedback. However, given the levels of commitment required for any of the plethora of options available, it makes sense that the software choice needs to be part of a larger plan and process.

The World Bank has taken a great interest in mobile ICT tools and has recently published a number of reports and hosted forums for comment and shared learning. The most important conclusion of these forums is that the technology alone is insufficient. Investing in the technology is only one piece of the puzzle and each technological choice has significant ramifications for both immediate and future functionality. Users need to understand how different technologies can assist them to incorporate the M&E tasks into their workflow and to consider the trade-offs between features and local adoption of technologies.

To this end, COSA needs to proceed slowly with implementation and needs to ensure that the right personnel and plans are in place to maximize the benefits of this technology. COSA has elected to currently pilot ODK with Formhub as a mobile data collection tool. The open source tool allows COSA to host its own instance of Formhub on its own server to allow for the retention of several important features that it has developed. At this point, it is possible to also add a number of new dashboard features and other functionalities that it has explored but this will require some additional formulation and investment.

COSA currently has an agreement with CRECE to trial ODK and Formhub as an M&E tool for an upcoming project in Colombia. CRECE has never employed electronic data gathering and this is an opportunity to work with COSA's IT team on the implementation to reduce its cost and risks. Formhub will be hosted by COSA and the form developed in conjunction with CRECE's team. The survey will be conducted on tablets and mobile phones. The results of the pilot will help determine the extent to which ODK and Formhub are functional (a number of features are employed) and reliable in terms of stability in the difficult conditions of rural areas where connectivity may be lacking for days and technical assistance can be minimal. The pilot will therefore serve as an important input to COSA's determination of whether it can migrate its technology toward these new open source tools.

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