

Mumias Sugar Company

Business Case for Farmer SRM

Objective

1. To provide a Supplier Relationship Management (SRM) system for farmer self-service and query management and to complement this web-based platform with a number of innovative cell-phone services that will be rigorously assessed using a randomized control trial approach in partnership with Innovations for Poverty Action (IPA).
2. To provide a faster and cheaper way for farmers to access crop-related information and services, and to assess the relative effectiveness of different types of cell-phone service.

Problem Statement

Farmers have to physically come to MSC offices to gain access to information or records have to be physically transported to field offices to avail information and this costs MSC highly on shuttling and printing services while the farmer suffers delays and incurs travel costs. MSC operations are negatively affected via the following mechanisms:

1. Printing overheads and manual transfer of information.
 2. Time to move personnel from field offices to ODS offices eats into productivity time.
 3. There is manual transfer of documents which exposes the documents to the risks of loss, susceptibility to damage by water/rain, data insecurity and compromise on data integrity.
 4. Poor communication between Extension and farmers results in productivity time diverted into the solving of problems that arise.
 5. Accessibility of information by farmers has been expensive in terms of distance and time.
 6. Untimely, incomplete or inaccurate information lead to farmer frustrations and decreasing faith and trust levels.
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Proposal

To implement a web-based Farmer SRM solution that will be available on browser-enabled terminals and to develop and rigorously test a number of innovative cell-phone services among a pilot group of farmers. This can in future be extended to the entire outgrower scheme and outsourced Agriculture services providers like contractors.

- Take advantage of the existing MSC website to provide a farmer portal with information on field, crop, productivity, operations, payments, query lodging and extension services
- To test an SMS-based query handling system and menu-driven application to allow farmers access data, information and lodge queries
- To test an Interactive Voice Reponse Service (IVRS) to allow telephonic enquiries by farmers
- To test a paperless query logging and management system using SMS input from farmers
- To test a paperless query logging and management system with input from a Mumias Sugar Customer Service Hotline/shortcode to test the effectiveness of an SMS-alert service, triggering farmers at critical stages of the crop cycle (eg fertilizer delivery) such that they are aware and/or available at their plots to receive, witness, monitor or participate in activities they have been alerted to.

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Value Proposition

Tangible benefits

- Online information enabling fast, location-independent access
- Improved staff efficiency due to streamlined feedback mechanisms
- Improved agronomic practices leading to increased cane availability
- Identification of system and process weaknesses
- Active monitoring of quality among third-party contractors
- Improved transparency between MSC management and field staff
- Increased data accuracy and integrity
- Improved production efficiency
- Transparency of MSC operations to farmers
- Improved accountability to farmers

- Significant reduction in farmer information costs (transport costs) and cheaper access to services by farmers
- Improved customer satisfaction leading to improved farmer loyalty
- Ability to select the most successful and cost-effective services to roll-out to the entire scheme

Intangible benefits

- Motivated employees through faster service to farmers
- Enhanced employee loyalty and improved supervisory process as a result of automated monitoring system
- Improved teamwork among employees
- Effective communication between MSC and farmers
- Increased faith and trust from farmers
- Cheaper access of service to farmers

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Measuring Success

- Mumias Sugar Company will partner with Innovations for Poverty Action to conduct a randomized control trial, via funding secured from the United States Agency for International Development (USAID). The trial will evaluate the demand for services and the impact on farmers of the cell-phone services listed above
- Effectiveness of information transmission via MSC-initiated SMS messages
- Effectiveness of advanced SMS interaction
- Request for farmer SMS confirmations at the completion of critical cropping tasks (e.g. fertiliser application)
- Request for farmer SMS feedback on quality of services provided by third-party contractors
- Farmer demand for personalized plot-level information via cell-phone menus
- Farmer demand for personalized plot-level information via interactive voice menus and Mumias Sugar Hotline
- Cell-phone services will be randomly allocated to small pilot groups
- Effectiveness and cost-efficiency of services among different groups will be tracked over the course of the cane cycle
- Scale-up of services can be selected based upon performance in the trial stage

Alternatives

- 'Do Nothing' - this option will mean the business will not be able to adapt to the growing demand and will not be able to satisfy Supplier and stakeholder needs.
- The business will not advantage of available communication and cell-phone systems resources
 - Farmer access to information will remain very slow
 - Lack of a communications solution will continue affecting farmer productivity

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Risk

No	Major Risk	Probability	Impact	Mitigation
1	Disruption of operations during implementation	Low	Low	<ul style="list-style-type: none"> Implementation to be carried out on phased schedule to avoid total halt of services
2	Disruption of operations during staff training	Low	Low	<ul style="list-style-type: none"> Training is carried out to staff in a phased approach
5	Information security for the external access	Low	High	<ul style="list-style-type: none"> Enforcing of strong passwords Encryption/decryption by use of SSL and SSL certificate
6	Resistance to Change	High	High	<ul style="list-style-type: none"> Stakeholder engagement sessions - section heads and with team leaders Training of Field Staff Farmer education on system benefits and use Printed materials detailing the solution Solution Support Desk
8	Literacy levels among farmers.	High	Low	<ul style="list-style-type: none"> Options of internet, voice-guided and SMS-based information access to be tested

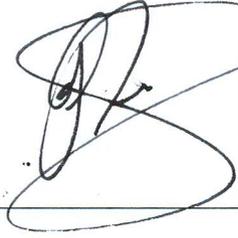
Plan

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- Approval by Management
 - Project will be managed by the Senior Business Systems Analyst. Resources shall include internal project team drawn from ICT, Agriculture, Finance, Corporate Affairs and solution provider with research support from Innovations for Poverty Action
 - Will be done in phases with web portal phase estimated to take 4 months beginning end January 2012; Full implementation including cell-phone interventions will take up to 12 months. On-going monitoring of take-up and impact of cell-phone based interventions shall extend throughout a full growing cycle.
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Mumias Sugar Company Business Case for Farmer SRM

Monitoring

- Senior Business Analyst will monitor the project and make periodic reporting to DoICT and DoA
 - Innovations for Poverty Action (IPA) will provide on-going evaluation feedback to SBA, OSM and DoA
 - PIR will be done three months after implementation.
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	Signature	Date
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PRELIMINARY

Implementation Plan

Mobile Phone Agricultural Extension: Using ICT to reduce Outreach and Monitoring Costs

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

Submission date: February 15, 2012



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Executive Summary

Innovations for Poverty Action (IPA), in collaboration with Mumias Sugar Company (MSC) Kenya, is implementing the project, “Mobile Phone Agricultural Extension: Using ICT to reduce outreach and monitoring costs”. Agriculture has the potential to be a driving force for growth within sub-Saharan Africa. However, limited access to agricultural extension services negatively impacts upon the productivity of smallholder farmers in the region.

Agriculture directly accounts for 25 percent of Kenya’s GDP and indirectly contributes a further 25 percent. Mumias Sugar Company, as the largest sugar mill in Kenya, is responsible for 40 percent of the nation’s sugar supply. In partnering with Mumias Sugar Company, Innovations for Poverty Action will target 20,000 of the 90,000 farmers currently contracting with the company.

Mobile phone penetration in Kenya is 67 percent and piloting among Mumias Sugar farmers reveals that 70 percent of the 1000 farmers targeted were willing to register for a free SMS service. Despite the proliferation of mobile initiatives for development there have been few rigorous evaluations of such services. This project will apply randomized evaluation techniques to test the effectiveness of various types of cell phone extension offered to Mumias Sugar farmers. If successful this project has the potential to be immediately scaled-up to the 90,000 farmers contracted to Mumias Sugar Company and to other contract farming schemes in East Africa.

This pilot study is funded by Mumias Sugar Company and by a USAID Development Innovation Ventures award. Final data for the study will be collected at the completion of a full cycle of cane growth, from November 2013 to March 2014.

Agriculture, ICT, and Smallholder Farmers

Agriculture provides the backbone for most of the economic growth amongst countries in the developing world. In spite of the development of innovative methodologies such as Farmer Field Schools (FFSs) and Training and Visits (T&V), agricultural extension workers reach only a small portion of rural producers in Sub-Saharan Africa (Davis, 2008). At the same time, evidence shows that well-designed agricultural extension can play a key role in increasing technology adoption and agricultural productivity (Birkenhauser, Evenson, & Feder, 1991). Increasing the number of producers reached by extension activities has the potential to provide a first order impact on the growth and productivity of the agriculture sector in the region and the rest of the developing world. One of the major obstacles faced by extension initiatives in the past has been in the impact evaluation: it is notoriously

difficult to link cause and effect in a quantitative manner (Purcell & Andersen, 1997). Our evaluation methodology, in the form of a randomized controlled trial using administrative data, seeks to overcome the shortcomings of past evaluations.

The ratio of extension workers to farmers is typically low in sub-Saharan Africa. In 2008, there were an estimated 5,000 agricultural extension officers employed in the Kenyan Ministry of Agriculture (GoK, 2008). At the same time, there are close to 3 million hectares of land allocated to cropping (ASDS, 2010). Extension services are offered privately within the sugar industry via commercial milling companies. However, extension-to-farmer ratios within this industry remain low at approximately 1:1,500. The dramatic increase in the penetration of cell phones in Sub-Saharan Africa presents a major opportunity for improved efficiency in extension services. Mobile penetration in Kenya was 67.2 percent in September 2011 and 11.2 percent higher than the same period in the previous year (Communications Commission of Kenya (CCK), 2011). Furthermore, the use of SMS has undergone significant growth with volumes more than doubling from the first quarter of 2010/11 to the same period in 2011/12 (CCK, 2011). The mobile phone market in Kenya is extremely competitive leading to a pricing scheme of between \$0.01 and \$0.02 per text message.

There has been a proliferation of mobile initiatives for development across the health, education, and agriculture sectors in recent years. However, despite the increase in interest and activity in this area, there have been few rigorous evaluations of the effectiveness of such initiatives (Payne, 2010). Mobile initiatives for agriculture commonly focus on the opportunities presented by improved access to pricing information among differentiated markets (Jensen, 2010). Aker (2010) finds reduced price dispersion and an increase in traders' profits in response to expanded mobile coverage across Niger from 2001 to 2006. In a similar vein, Muto and Yamano (2009) find positive impacts on the sales of perishable commodities as mobile coverage extended throughout rural Uganda from 2003 to 2005. In Kerala, India, the findings among fishermen and wholesalers were consistent with these studies as mobile coverage expanded from 1997 to 2001 (Jensen 2007). On the other hand, a recent randomized evaluation of a large commercial SMS information service in India found no evidence of impact on farmers' prices or cultivation practices. Reuters Market Light provides market and weather information via a subscription service to 25,000 farmers (Fafchamps, 2011).

Sugar cane farming is the main source of income for approximately two hundred and fifty thousand farmers in Kenya alone with an estimated 6 million individuals connected directly or indirectly to the sugar cane value chain. Mumias Sugar Company is Kenya's largest sugar mill and accounts for 40 percent of Kenyan sugar supply, producing 230,000 tonnes of sugar in 2010-2011. While there is strong demand within national and international markets, cane productivity among the company's smallholder suppliers has been declining over time. Farmers in the trial are smallholder farmers exclusively contracted to the company, and based on our pre-testing, more than 50 percent of the farmers are in possession of cell phones whilst the nearly 90 percent have access to one via a neighbor or relative.

The Mumias Sugar model is unique among previous studies in that farmers are contracted with the company for a four year period and prices are relatively stable. The company provides farmers with services including land preparation, provision of seedcane and fertilizer, harvesting and transport, and in return, farmers commit to exclusively supply the company with raw cane. As such, the objectives of this study are i) to assess demand and utilization of phone services of varying technical difficulty and the influence that differential pricing can have on demand, ii) to determine if the provision of services improves the effectiveness of the existing extension system in terms of farmer productivity. The study will focus on the following mechanisms:

1. Improved farmer knowledge via the provision of agronomic information, and assessment of behavioral changes with and without follow-up prompts
2. Improved efficiency of service delivery at critical stages of the cropping cycle: Farmers will be prompted to participate in an SMS feedback service whereby farmers rate their satisfaction with company services known to affect cane yields (for example, the timely delivery of fertilizer).
3. Improved farmer knowledge via a non-technical, farmer-initiated hotline service. We seek to explore the relative effectiveness of a traditional customer hotline service. This hotline will require no knowledge of SMS functionality or written text. The study will focus on the impact that differential pricing has on take-up of this service.

If successful this project has the potential to be immediately scaled-up to 90,000 farmers contracted to Mumias Sugar Company. With its central role in the regional agri-business sector, Mumias Sugar has the potential to be a model for other companies operating in the industry, particularly to other firms that employ contract farming schemes. The immediate return in terms of profits provides a clear incentive to these firms to adopt models that have proved to be successful in similar contexts.

Preparation of the Implementation Plan

The implementation plan has been developed in conjunction with key Mumias Sugar Company representatives:

Anthony Abuga

Project Coordinator: Farmer SRM initiative

Senior Business Systems Analyst

IT Department

Mumias Sugar Company

Moses Nyongesa

Outgrower Services Manager

Department of Agriculture
Mumias Sugar Company

The content of the report incorporates inputs from senior representatives of the following Agriculture Units. Feedback was obtained via consultation rounds from October 2011 to February 2012.

	October, 2011	November, 2011	December, 2011	January, 2012	February, 2012
Agronomy	Initial planning			Review of interventions	
Fertilizer and seedcane supply	Initial planning			Review of interventions	
Training and extension		Initial planning			Review of interventions
Agricultural engineering		Initial planning			Review of interventions
Harvest and transport		Initial planning		Review of interventions	
Outgrower development services	Initial planning	Phone number collection	Phone number collection	Phone number collection	Review of interventions

The implementation plan is accompanied by an approved Mumias Sugar Company business case outlining the planned scale-up of cell-phone pilot activities to 20,000 farmers. The scale-up will occur as part of a broader Mumias Sugar Company initiative to develop a Farmer Supply Relationship Management (SRM) system. Farmer SRM will redefine the communication pathways between the company and its farmers through the introduction of a series of technology-based systems. IPA will evaluate a cell-phone extension component of this program.

The business case was first submitted for review in October 2011 and was approved in principle the following month. On February 6th 2012, the Managing Director of Mumias Sugar Company formally endorsed the program.

Consultation with Outgrower Development Services (ODS), the extension unit within the company, commenced in October 2011. ODS services 90,000 farmers and the intent of early consultation rounds was to develop an efficient system for the collection of phone numbers from 20,000 farmers. Approximately 100 staff will be responsible for the collection of numbers across different growing regions. A series of workshops was convened in November and December 2011 to sensitize staff to the intent of the program and to seek feedback on new processes for the collection of numbers. Eighty percent of these staff were present at the workshop launches and with few exceptions, all staff have now been approached.

General consultations around the proposed interventions were convened in the latter part of 2011 and have intensified in February 2012 in response to the final project approval. These consultations were conducted with each of the business units responsible for cropping services offered by the company. The purpose of the consultations was to seek feedback on the specific content of information that would be sent to farmers, timing of messages, two-way communication between the company and farmers, and barriers to adoption of and responsiveness to the service.

Initial consultations with the IT service provider commenced in late 2011. Further consultations have been delayed until February 2012, as the MSC IT Department awaited final approval of the business case. The content of messages will be drawn from the Company's existing Agricultural Management System (AMS). The AMS was developed by Amity Software Inc. in 2006 and is a comprehensive historical electronic database of 90,000 farmer accounts. It is also a live process management system that facilitates the scheduling of services, allocation of services to contractors, printing of invoices, monitoring of deliveries and payment of farmers. Modifications will be made to the AMS to allow for outgoing and incoming messages and to interface the content with farmers' mobile handsets. The company has an ongoing contract with Amity Software for the Management and Maintenance of the AMS system and for modifications to the system. Negotiations with Amity are currently active and a draft timeline for deliverables have been incorporated into this report.

Implementation Plan

Collection of phone numbers

Sampling frame

The study will target farmers from among the 90,000 smallholder cane farmers currently contracted to Mumias Sugar Company. Farmers are organized into 15,000 active fields within 100 sublocations among eight zones. Each plot averages 0.5 hectares. Plots are contracted to individuals or to farmers who manage the plot jointly. All company services and payments are administered at the plot level. The company operates in and around the Mumias district and employs and contracts more than 12,000 staff. Sugar production is the primary economic activity in the region.

Farmers are contracted to the company for an initial plant cycle (16-22 months), followed by two ratoon cycles (14-17 months). All farmers who enter Plant, Ratoon 1, or Ratoon 2 cycles from April 2012 will be eligible for the study. All farmers entering the plant cycle are required to sign a contract with the company. A phone services registration form has been

appended to every contract printed in the 2012 calendar year. Planting for these farmers will commence in April 2012 at the beginning of the wet season.

Furthermore, all farmers are required to review their payment invoice after harvest has been processed. A phone registration form has been attached to all Plant and Ratoon 1 payment invoices, from January 15, 2012. Farmers in the January-April collection will be eligible for pilot services offered during this period. All farmers who register thereafter will be eligible for the main intervention.

Registration

Mumias Sugar Company has introduced a phone registration form for all farmers eligible for the phone services. This registration form outlines the responsibilities of the company and of the farmers. Information on gender, year of birth, field, and plot is collected for all farmers. If a farmer agrees to the service, a phone number is recorded, along with the identity of the phone holder. Farmers may provide their own number or that of an immediate family member. If the farmer does not own a phone, and he/she is unable or unwilling to nominate a family member to receive messages on his/her behalf, then the farmer may choose to decline the service. This is recorded on the registration form.

For those who accept the service, Mumias Sugar staff will request additional information on whether the farmer is a block leader, and whether he/she has made use of messaging services in the preceding one week. Additional details on the location and identity of the staff member who administered the form are recorded for tracking and monitoring purposes.

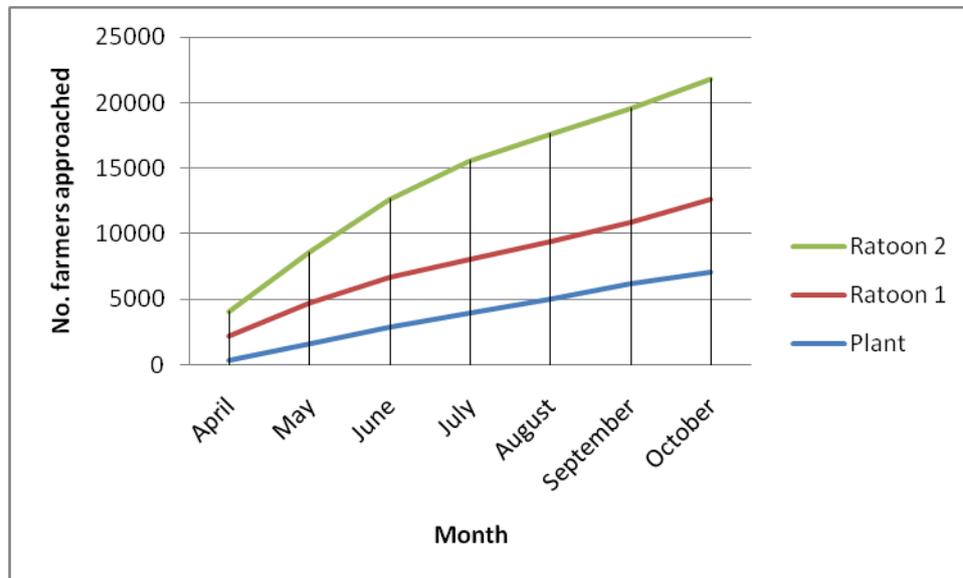
Data entry

All data collected from the phone registration forms will be entered onto the Agricultural Management System database. Any changes to the phone number or other account details will be recorded on the database. Innovations for Poverty Action routinely saves a weekly report of farmer details and will monitor any changes over time.

Expected timeframe for collection of phone numbers

Farmers who register from April 2012 will be eligible for randomization into the phone services treatments. Farmers will be recruited on a rolling basis as cane matures and a new

cycle commences. By October, 2012, we expect to have approached more than 20,000 farmers. Plant fields recruited in October 2012 are due to mature in March 2014.



Risks

Low approach rates: All farmers in the target sample will have access to a registration form. There is some risk that the Mumias Sugar Company staff will not fill the form or will not return the form to the central extension office. This risk is higher in the January-March collection phase when staff awareness is lower. However, the risk is deemed to be low. The forms are stapled to documents that *must* be returned to the central extension office as part of the company's core business.

Services poorly communicated: There is some risk that farmers will decline the service if they are not aware that they can nominate a family member, or the service is poorly explained. This is a moderate risk during early stages of collection but this should decrease over time. Awareness among staff members will be monitored at existing weekly staff meetings and any issues that arise will be dealt with at these forums. The company is actively promoting the service to farmers through existing farmer field days. Note that the information provided is of a very general nature and there is no mention of specific treatments.

Low levels of phone ownership: While there are a number of illiterate farmers within the scheme, data from our piloting shows that up to 90 percent of households have access to a mobile phone.

Interventions

Randomization schedule

Farmers will be registered for phone services on a rolling basis according to the cropping cycle. As such, randomization will occur in waves as a critical mass of farmer accounts enter a new cycle. We estimate randomization waves to occur approximately on a monthly basis, targeting farmers that are about to enter a new harvest cycle. The exact timing of randomization will be contingent upon the successful piloting and roll-out of IT infrastructure for outgoing and incoming messages. Negotiations are underway with the IT provider, Amity Software Inc and a tentative rollout date of March 31 has been set for four out of the five interventions. The final intervention, a farmer-initiated cell phone query system, will be available from July/August 2012 and farmers will be randomized into this treatment group at that time.

Randomization will occur at the individual level, except where the randomization design calls for explicit field-level treatment comparisons (for example, where the service is offered to the most productive farmer in a field). Where spillover between treatments is a concern, for example where farmers in close proximity could be offered paid and unpaid hotline services, randomization will occur at the field level.

Field-level randomizations will be contingent upon adequate approach and take-up rates. Details on take-up and approach and associated changes to the randomization design will be a feature of ongoing quarterly reports.

Interventions

1. Base SMS service

Farmers will be provided with information on the following:

Company Services

- contract approval
- land preparation (ploughing, harrowing, furrowing)
- land survey
- seedcane delivery
- fertilizer delivery
- harvesting
- transport of cane
- payments

Agronomic advice

- preparation (intercropping, trashlining, firebreaks)
- management of weeds
- cane germination
- disease control

2. SMS service with follow-up prompts

Farmers will be assigned specific deadlines for the completion of tasks and will be prompted to provide follow-up information on their progress. These messages will target those activities that are strongly linked to cane yields and are the direct responsibility of the farmer: intercropping, trashlining, building firebreaks, replanting in areas of low germination, weeding, application of fertilizer, removal of cane smut.

3. SMS feedback prompts (farmer satisfaction with services)

The company offers a number of services to farmers, often via third-party contractors, and this intervention seeks to improve the company's ability to respond to areas of inefficiency, while improving working relationships with its farmers. Farmers will be prompted to respond to binary yes/no questions about timing and quality of services. Feedback from farmers will be forwarded to the relevant extension staff for further action.

4. Farmer hotline (with differentiated call rates)

Farmers will have access to a hotline service where they may call and ask any question regarding the management of their plot or the status of their account. The hotline will be staffed by Mumias Sugar professionals who are familiar with company processes and are trained in the agronomic management of cane. Hotline services will be offered at standard call rates and as a free service, depending upon treatment group.

5. Farmer-initiated query system (via cell-phone drop-down menu)

Farmers will access account information via a cell phone drop-down menu. The frequency and type of information requested will be determined by the farmer on a user-initiated basis. The type of information available will be similar to that offered in the baseline SMS intervention, including information about company services and scheduling of agronomic activities.

Outcome variables and sample size

The Base SMS treatment will be offered independently and in conjunction with follow-up prompts, feedback prompts, and a paid and unpaid hotline service (Column B). We are

interested in how each of these service packages has the capacity to independently improve farming outcomes.

In addition, farmers in Column A treatment groups will be offered a hotline/feedback service only, independently of the agronomic information supplied in the Base SMS treatment. The farmer query drop-down cell menu (Column C) will be offered as an isolated treatment as the content of this service will cover many of the same areas as the SMS-push notifications and prompts.

Columns D and E are stand-alone services in which only the largest or most productive farmers are targeted for the service. These farmers will be offered the combination package of Base SMS, follow-up prompts and feedback prompts. The focus of comparisons here will be the potential for spillover effects within a field.

The main outcome variable for the evaluation is yields, or tonnage of cane per hectare, as measured by the Mumias Sugar administrative data. In addition, for treatments that require farmers to initiate the communication with the company, we will also monitor service use and demand.

We performed preliminary power calculations to determine sample size. These estimates are subject to revisions as we gather further administrative data and better estimates of take-up rates and intra-cluster correlation. We use yields as the main outcome variable and target a minimum detectable effect of 0.15 s.d., with power of 0.8, assuming a take-up rate of 0.70 among targeted plots. The table below reports the distribution of plots across treatment groups according to these preliminary calculations.

	A. No SMS	B. BASE SMS	C. FARMER QUERY, DROP DOWN CELL MENU	D. LARGEST FARMER ONLY SMS	E. MOST PRODUCTIVE FARMER ONLY SMS
1. NO HOTLINE	(1250 farmers) + Feedback (1250 farmers)	(1250 farmers) +Feedback (1250 farmers) +Follow-up (1250 farmers)	(1250 farmers)	(1250 farmers)	(1250 farmers)
2. PAID HOTLINE	(1250 farmers)	(1250 farmers)			
3. FREE HOTLINE	(1250 farmers)	(1250 farmers)			

Heterogenous impact analysis

We will study the heterogeneous impact of the treatments across several baseline characteristics of the farmers. Twenty-five percent of the farmers who have registered for phone services to date are female. We will explore the difference that gender has upon take-up of the various services and on changes in productivity.

Mumias Sugar Company also possesses historical records of the productivity of plots contracted to the company and current records of the contractual status of the plot. We will thus explore heterogeneity in the program impact by baseline level of productivity. Similarly, we will be able to assess whether the program impact varies by plot size. Finally, as the administrative data include information on whether the plots are contracted individually or in conjunction with other farmers, we will explore heterogeneity along this dimension, too.

Risks

Incomplete registration/low take-up: Our pilot studies show that take-up among all farmers approached for an existing pilot SMS service was approximately 70 percent. Systems for approach and return of registration forms are being trialed presently and blockages are being identified and dealt with.

Technical delays in the query system with drop-down menu: This service is due to be available by August 2012 and can be incorporated into later randomization waves.

Delays in IT infrastructure: This is considered to be low to moderate risk. Amity Software developed and maintain the company's agricultural database and have been doing so for more than five years. Furthermore they have been involved in a number of other large and complex company projects. The proposed changes to the system to incorporate SMS messages are within the core capabilities of the company.

IT Infrastructure

Negotiations with Amity Software Inc. have commenced and will be finalized in February, 2012. Discussions have been ongoing throughout 2011 and early 2012 in relation to the Farmer SRM and other Mumias Sugar projects that are operating in parallel.

Amity will provide modifications to the existing AMS to allow for improved input of phone registration data, to enable the triggering of SMS messages in response to existing live processes, to send outgoing messages and to store incoming messages, and to forward incoming messages to relevant Mumias Sugar Company staff.

Piloting of service: March/April 2012

Randomization of services: Commencing April/May 2012

Development of query-based drop-down menu: July/August 2012

Revisions to the original design

There are a number of revisions, in response to feedback from company staff, on the feasibility and potential for impact of each of the proposed treatments. A more detailed outline of the revised treatments is provided in the previous section. Here, we focus on elements of the original proposal that have been subsequently omitted from the study.

Timing of the study: Collection of phone numbers is dependent upon a number of features of the Mumias Sugar Company operations. Planting commences at the beginning of the wet season in March and April and intensifies thereafter. Recruitment rates for the study will reflect the distribution of planting and progression into the ratoon cycles over the next year. We expect to have collected 20,000 phone numbers by October 2012. Plant fields collected in October 2012 will be due for harvest in March 2014.

Timing of messages: All SMS messages sent as part of this service will be triggered from underlying processes in the company's Agricultural Management System. Consultation with company staff reveals that for services where timing may be important, for example delivery of fertilizer, it will be difficult to monitor the timing of messages sent. The time between allocation of fertilizer to a transporter, the trigger for a message, and delivery of fertilizer to the field is not uniform across plots. It depends upon a range of factors such as distance, road conditions, and weather. Furthermore, allocation generally occurs within a 12 to 48 hour window prior to delivery so advance notification to farmers is not possible using the existing AMS database.

Farmers targeted: Extended consultation with company extension officers reveals that it will be difficult to vary the number of farmers targeted in each field. There is an average of six farmers per field across the entire growing scheme and literacy rates, and thus take-up, will vary across these fields. Field staff have a strong prior belief that varying the number of farmers within a field receiving messages is unlikely to significantly impact upon cane productivity.

Furthermore, current phone registration patterns indicate that there are a non-trivial number of farmers within each field for whom phone numbers are missing. Collection of phone numbers involves the participation of approximately 100 Mumias Sugar Company staff members in diverse locations and monitoring of staff effort is a concern. As a result, there have been major changes to the process of phone number collection during January 2012. If phone number collection remains low, treatments that randomize services to the most experienced or most productive farmers will not be feasible. We await further data from the initial data collection and are confident that early setbacks will not be a permanent feature of the study.

Type of message: The IT infrastructure required to provide an Interactive Voice Response Service will not be available before August 2012. There is scope for randomization at this point in the study, however, this will affect study duration as the cane growing cycle is typically 14-22 months.

Decision-making process: Due to privacy concerns, Mumias Sugar Company is unwilling to implement an automated AMS response to 'requests for services' made via SMS messaging. However, the revised treatment schedule will allow for a more general 'feedback' treatment where any requests will be sent directly through to company personnel where they will be dealt with on a case by case basis.

References

Aker, J. (2010) Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger, *American Economic Journal: Applied Economics* 2, 3, 4659

Birkenhauser, D., Evensen, R., Feder, G. (1991). The Economic Impact of Agricultural Extension: A Review, *Economic Development and Cultural Change*, 39, 607-650

Communications Commission of Kenya (2011). Quarterly Sector Statistics Report: 1st Quarter July-Sept 2011/12, Communications Commission of Kenya, accessed February 10 2012 http://www.cck.go.ke/news_2012/ICT_Sector_Statistics

Davis, K. (2008). Extension in Sub-Saharan Africa: Overview and Assessment of Past and Current Models and Future Prospects, *Journal of International Agricultural and Extension Education*, 15(3), 15-28

Fafchamps, M. (2011). Impact of SMS-Based Agricultural Information on Indian Farmers, University of Oxford, England

Government of Kenya (2010). Agriculture Sector Development Strategy 2010-2020, Republic of Kenya, accessed February 6 2012 www.ascu.go.ke

Jenson, R. (2007). The Digital Divide: Information (Technology), Market Performance, and Welfare in the Southern Indian Fisheries Sector, *Quarterly Journal of Economics*, 127(3): 879-924

Jensen, R.T. (2010). Information, Efficiency, and Welfare in Agricultural Markets, *Agricultural Economics*, 41, pp. 203-216

Muto, M., Yamano, T. (2009). The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda, *World Development*, 37(12), 1887-1896

Office of the Permanent Secretary (2008). The Ministry at a Glance, Ministry of Agriculture, Republic of Kenya, accessed February 6 2012 <http://www.kilimo.go.ke>

Payne, J., Woodard, J. (2010). ICT to Enhance Farm Extension Services in Africa, Fostering Agriculture Competitiveness Employing Information Communication Technologies (FACET) Briefing Paper, Maryland

Purcell, D.L., Anderson, J.R. (1997). Agricultural Extension and Research: Achievements and Problems in National Systems. The World Bank, Washington D.C.

Progress Report

Mobile Phone Agricultural Extension: Using ICT to reduce Outreach and Monitoring Costs

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

June 2012



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1 Registration of MSC farmers for phone services

- More than 14,500 farmers have completed the phone services registration form since January 2012.
- 11,797 (80 percent) have provided a phone number
- 22 percent of the sample are women

A sample registration form is included as an appendix. The form collects farmer characteristics such as gender and current familiarity with SMS, farmer phone numbers, and other details used for tracking purposes.

All phone numbers and registration details are stored in an electronic database that can be linked to the Mumias Sugar Company Agricultural Management System.

2 Piloting of phone services

- More than 500 farmers recruited into piloting activities
- 2 months of hotline piloting among a sample of 36 fields. Of the 323 farmers in these fields, 209 had completed a registration form.
- Testing of interactive farmer feedback mechanisms among 200 farmers using i) a mobile survey platform (mSwali), ii) basic cell-phone functionality including SMS and 'flash' phone calls

Among the 209 hotline farmers who had provided a phone number, 77 percent could later be contacted on this number. If a farmer was able to be contacted, 90 percent were willing to participate in the hotline service.

Among the farmers selected to participate in the SMS mobile survey, we had an average response rate of 20 percent with little to no training of farmers.

3 Mumias Sugar Partnership

Notice of change to Mumias Sugar Company senior management

In April 2012 Evans Kidero was replaced by Peter Kebati as CEO of Mumias Sugar Company. The transition had flow-on effects to a number of senior management positions across the company, including key positions within the Agriculture Department. Paul Murgor, formerly Head of Agriculture, is

now the Company's Commercial Director. The Outgrower Services Manager, Moses Nyongesa, with whom we have worked closely for several years, was promoted to the position of Head of Agriculture.

Staff Appointments

Mumias Sugar has employed a senior field clerk to manage the Farmer SRM hotline full-time.

Amity IT consultants

A final technical design document for the development of triggers that can be activated from within the Agricultural Management System was submitted to Amity in May. Work is underway.

4 Revisions to the February 2012 Implementation Plan

SAMPLE SIZE

The sample size for the study has decreased from 20,000 farmers to 10,000. Due to delays in the Farmer SRM program, most farmers recruited during the April/May/June planting season will not be eligible for randomization. Treatments will only be offered to farmers between 0 and 1 month of age at the time of randomization.

TREATMENTS OFFERED

Provision of a farmer-initiated query system via a cell-phone drop-down menu will not be feasible within the timeframes of this study. Mumias Sugar is planning to test this intervention but it will not be available until late 2012 or early 2013.

SMS feedback prompts on farmer satisfaction with services will not be feasible within the timeframes of the study. The company offers land preparation services to farmers via third-party contractors. Early piloting has revealed that there can be significant delays between initial allocation of contractors and subsequent planting dates, up to a year. The time between initial allocation to a land preparation contractor and harvesting can thus be up to 30 months

5. Ongoing areas of uncertainty

TOLL-FREE LINES AND SHORT-CODE

Mumias Sugar is in the process of registering for toll-free lines and an SMS shortcode to administer the treatments. The approval process in Mumias Sugar can take time. If there should be delays during early July, IPA has the capacity to set up alternative phone lines.

FARMER DEMAND AND CAPABILITIES

Early piloting gives some indication of the quality of phone numbers provided and the demand for services. We will be monitoring this closely through the early rounds of randomization. There may be significant changes to the treatment protocol in subsequent waves based on the feedback on farmers demand and utilization from early waves.

CLOSE OF FACTORY FOR MAINTENANCE

The factory routinely closes for maintenance in July/August every year for approximately 3-4 weeks. Phone numbers will not be collected for payments during this time. There have been some discussions around extending this period to six weeks and this could have a negative impact on the sample size during this period.



PHONE SERVICES REGISTRATION FOR MUMIAS SUGAR COMPANY OUTGROWERS

(one form per farmer on joint plots)

PAYMENTS CONTRACTS {MSC Personnel: Please TICK appropriately if form filled at payment processing or contract signing}

Mumias Sugar Company is committed to continuous and improvement in its delivery of services and is trialing a number of pilot programs to test cell-phone extension and communication platforms.¹ These services will give you better access to your account information and to professional advice on improved cane management, via your mobile phone. Please sign below and complete the short survey to be considered for these services. *It is important that you complete all sections of the form; otherwise you may not be eligible.*

NAME OF FARMER (same as on contract/statement): _____

GENDER: **Male** **Female** (Please circle) **YEAR OF BIRTH:** |__| |__| |__| |__|

SUBLOCATION: _____ **AMS FIELD NO:** |__| |__| |__| |__| |__| |__| |__| |__| |__| |__|

NATIONAL I.D. NO. |__| |__| |__| |__| |__| |__| |__| |__| |__| |__| **(Field Number/Plot Number)**

Are you willing to receive these services **YES** **NO** (Please Circle)

FARMER'S SIGNATURE: _____ **DATE:** __/__/_____

In this section, please provide us with your **PERSONAL** mobile number and an **ALTERNATIVE** mobile number (eg spouse). Take into consideration that some of the messages that you receive may contain sensitive and private information, for example, information about payment. You must select one number to provide.

Do you have a *personal* Mobile Number? **YES** **NO** (Please circle)

If **YES**, Number: |__| |__| |__| |__| |__| |__| |__| |__| |__| |__|

NO (please circle), I do not have a personal Mobile Number that I can provide.

Do you have an *alternative* Mobile Number (eg spouse)? **YES** **NO** (Please circle)

If **YES**, Number: |__| |__| |__| |__| |__| |__| |__| |__| |__| |__|

Relation: _____

Is this a joint plot? **YES** **NO** (Please circle)

NUMBER OF FARMERS ON CONTRACT (If the plot is joint): |____|

Are you the block leader in your field? **YES** (if YES, skip next question) **NO** (Please circle)

NAME OF BLOCK LEADER IN YOUR FIELD (If farmer knows): _____

Are you a telephone farmer? **YES** **NO** (Please circle)

How many text messages, from any source, have you received in the past one week? |____| Write **0** for none

How many text messages have you sent in the past one week? |____| Write **0** for none

FOR OFFICIAL USE:

WITNESSED BY (ON BEHALF OF MSC) _____

DESIGNATION: **FIELD CLERK** **ODS OFFICE CLERK** **F/ASSISTANT**

FIELD OFFICE NAME (TO BE FILLED BY FIELD CLERKS) _____

SIGNATURE: _____ DATE: __/__/_____

¹ By confirming your number and providing information on your current cell phone usage, you agree that you may or may not be selected for such programs, you understand that Mumias Sugar reserves the right to use this information in the evaluation of such programs, and that they may employ a third party research provider to undertake such evaluations.

Revised Implementation Plan

Mobile Phone Agricultural Extension: Using ICT to reduce Outreach and Monitoring Costs

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

June 2012



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Executive Summary

Innovations for Poverty Action (IPA), in collaboration with Mumias Sugar Company (MSC) Kenya, is implementing the project, “Mobile Phone Agricultural Extension: Using ICT to reduce outreach and monitoring costs”. Agriculture has the potential to be a driving force for growth within sub-Saharan Africa. However, limited access to agricultural extension services negatively impacts upon the productivity of smallholder farmers in the region.

Agriculture directly accounts for 25 percent of Kenya’s GDP and indirectly contributes a further 25 percent. Mumias Sugar Company, as the largest sugar mill in Kenya, is responsible for 40 percent of the nation’s sugar supply. In partnering with Mumias Sugar Company, Innovations for Poverty Action will target 10,000 of the 100,000 farmers currently contracting with the company.

Mobile phone penetration in Kenya is 67 percent and piloting among Mumias Sugar farmers reveals that 70 percent of the 1000 farmers targeted were willing to register for a free SMS service. Despite the proliferation of mobile initiatives for development there have been few rigorous evaluations of such services. This project will apply randomized evaluation techniques to test the effectiveness of various types of cell phone extension offered to Mumias Sugar farmers. If successful this project has the potential to be immediately scaled-up to the 100,000 farmers contracted to Mumias Sugar Company and to other contract farming schemes in East Africa.

This pilot study is funded by Mumias Sugar Company and by a USAID Development Innovation Ventures award. Final data for the study will be collected at the completion of a full cycle of cane growth, from November 2013 to June 2014.

Agriculture, ICT, and Smallholder Farmers

Agriculture provides the backbone for most of the economic growth amongst countries in the developing world. In spite of the development of innovative methodologies such as Farmer Field Schools (FFSs) and Training and Visits (T&V), agricultural extension workers reach only a small portion of rural producers in Sub-Saharan Africa (Davis, 2008). At the same time, evidence shows that well-designed agricultural extension can play a key role in increasing technology adoption and agricultural productivity (Birkenhauser, Evenson, & Feder, 1991). Increasing the number of producers reached by extension activities has the potential to provide a first order impact on the growth and productivity of the agriculture sector in the region and the rest of the developing world. One of the major obstacles faced by extension initiatives in the past has been in the impact evaluation: it is notoriously

difficult to link cause and effect in a quantitative manner (Purcell & Andersen, 1997). Our evaluation methodology, in the form of a randomized controlled trial using administrative data, seeks to overcome the shortcomings of past evaluations.

The ratio of extension workers to farmers is typically low in sub-Saharan Africa. In 2008, there were an estimated 5,000 agricultural extension officers employed in the Kenyan Ministry of Agriculture (GoK, 2008). At the same time, there are close to 3 million hectares of land allocated to cropping (ASDS, 2010). Extension services are offered privately within the sugar industry via commercial milling companies. However, extension-to-farmer ratios within this industry remain low at approximately 1:1,500. The dramatic increase in the penetration of cell phones in Sub-Saharan Africa presents a major opportunity for improved efficiency in extension services. Mobile penetration in Kenya was 67.2 percent in September 2011 and 11.2 percent higher than the same period in the previous year (Communications Commission of Kenya (CCK), 2011). Furthermore, the use of SMS has undergone significant growth with volumes more than doubling from the first quarter of 2010/11 to the same period in 2011/12 (CCK, 2011). The mobile phone market in Kenya is extremely competitive leading to a pricing scheme of between \$0.01 and \$0.02 per text message.

There has been a proliferation of mobile initiatives for development across the health, education, and agriculture sectors in recent years. However, despite the increase in interest and activity in this area, there have been few rigorous evaluations of the effectiveness of such initiatives (Payne, 2010). Mobile initiatives for agriculture commonly focus on the opportunities presented by improved access to pricing information among differentiated markets (Jensen, 2010). Aker (2010) finds reduced price dispersion and an increase in traders' profits in response to expanded mobile coverage across Niger from 2001 to 2006. In a similar vein, Muto and Yamano (2009) find positive impacts on the sales of perishable commodities as mobile coverage extended throughout rural Uganda from 2003 to 2005. In Kerala, India, the findings among fishermen and wholesalers were consistent with these studies as mobile coverage expanded from 1997 to 2001 (Jensen 2007). On the other hand, a recent randomized evaluation of a large commercial SMS information service in India found no evidence of impact on farmers' prices or cultivation practices. Reuters Market Light provides market and weather information via a subscription service to 25,000 farmers (Fafchamps, 2011).

Sugar cane farming is the main source of income for approximately two hundred and fifty thousand farmers in Kenya alone with an estimated 6 million individuals connected directly or indirectly to the sugar cane value chain. Mumias Sugar Company is Kenya's largest sugar mill and accounts for 40 percent of Kenyan sugar supply, producing 230,000 tonnes of sugar in 2010-2011. While there is strong demand within national and international markets, cane productivity among the company's smallholder suppliers has been declining over time. Farmers in the trial are smallholder farmers exclusively contracted to the company, and based on our pre-testing, more than 50 percent of the farmers are in possession of cell phones whilst the nearly 90 percent have access to one via a neighbor or relative.

The Mumias Sugar model is unique among previous studies in that farmers are contracted with the company for a four year period and prices are relatively stable. The company provides farmers with services including land preparation, provision of seedcane and fertilizer, harvesting and transport, and in return, farmers commit to exclusively supply the company with raw cane. As such, the objectives of this study are i) to assess demand and utilization of phone services of varying technical difficulty and the influence that differential pricing can have on demand, ii) to determine if the provision of services improves the effectiveness of the existing extension system in terms of farmer productivity. The study will focus on the following mechanisms:

1. Improved farmer knowledge via the provision of agronomic information, and assessment of behavioral changes with and without follow-up prompts
2. Improved farmer knowledge via a non-technical, farmer-initiated hotline service. We seek to explore the relative effectiveness of a traditional customer hotline service. This hotline will require no knowledge of SMS functionality or written text. The study will focus on the impact that differential pricing has on take-up of this service.

If successful this project has the potential to be immediately scaled-up to 100,000 farmers contracted to Mumias Sugar Company. With its central role in the regional agri-business sector, Mumias Sugar has the potential to be a model for other companies operating in the industry, particularly to other firms that employ contract farming schemes. The immediate return in terms of profits provides a clear incentive to these firms to adopt models that have proved to be successful in similar contexts.

Mumias Sugar Company Partnership

FARMER SRM PARTNERSHIP

IT DEPARTMENT

On February 6th 2012, the Managing Director of Mumias Sugar Company formally endorsed the Farmer Supplier Relationship Management (SRM) program. This program, an initiative of the Department of IT, will redefine the communication pathways between the company and its farmers through the introduction of a series of technology-based systems.

The Department of IT will experiment with three technology platforms:

- Farmer Web portal
- Cell-phone services incorporating farmer hotline & SMS services
- Interactive Voice Response System

IPA is working together with the IT Department and the Department of Agriculture to evaluate the Cell-Phone Services platform.

The Farmer SRM was officially launched in March 2012, via a series of joint meetings with Business Units across the Department of Agriculture and the Department of Marketing & Corporate Affairs. However, the Farmer SRM program has experienced substantial delays in infrastructure development in the face of competing company priorities.

Nevertheless, the core requirements for the cell-phone services platform are in place: an electronic record of farmer phone numbers, trained hotline staff and the underlying database of company activities. Piloting has been ongoing throughout 2012. The main research interventions can commence for the cell-phone services platform, using a modified study design, from July 2012.

DEPT AGRICULTURE: OUTGROWER DEVELOPMENT SERVICES

Outgrower Development Services (ODS), the extension unit within the company, have led efforts to develop an efficient system for the collection of phone numbers from Mumias Sugar farmers. Approximately 100 staff from different growing regions are involved in this collection. Farmer phone numbers have been collected for more around 14,500 farmers over the past five months and have been stored electronically.

AMITY SOFTWARE INC.

Mumias Sugar has an ongoing service contract with the developers of the company's Agricultural Management System (AMS), Amity Software Inc. The AMS was developed by Amity in 2006 and is a comprehensive historical electronic database of 100,000 farmer accounts. It is also a live process management system that facilitates the scheduling of services, allocation of services to contractors, printing of invoices, monitoring of deliveries and payment of farmers. The company has an ongoing contract with Amity Software for the Management and Maintenance of the AMS system and for modifications to the system.

Information currently stored on the AMS will be downloaded from the system daily and filtered. Farmers will receive messages that coincide with their current agronomic activities.

PRIMARY CONTACTS

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Implementation plan

Collection of phone numbers

Sampling frame

The study will target 10,000 farmers from among the 100,000 smallholder cane farmers currently contracted to Mumias Sugar Company. Farmers are organized into 15,000 active fields within 100 sublocations among eight zones. Each plot averages 0.5 hectares. Plots are contracted to individuals or to farmers who manage the plot jointly. All company services and payments are administered at the plot level. The company operates in and around the Mumias district and employs and contracts more than 12,000 staff. Sugar production is the primary economic activity in the region.

Farmers are contracted to the company for an initial plant cycle (16-22 months), followed by two ratoon cycles (14-17 months). All farmers who enter Plant, Ratoon 1, or Ratoon 2 cycles from April 2012 will be eligible for the study. All farmers entering the plant cycle are required to sign a contract with the company. A phone services registration form has been appended to every contract printed in the 2012 calendar year. Planting for these farmers will commence in April 2012 at the beginning of the wet season.

Furthermore, all farmers are required to review their payment invoice after harvest has been processed. A phone registration form has been attached to all Plant and Ratoon 1 payment invoices, from January 15, 2012. Farmers in the January-April collection will be eligible for pilot services offered during this period. All farmers who register thereafter will be eligible for the main intervention.

Registration

Mumias Sugar Company has introduced a phone registration form for all farmers eligible for the phone services. This registration form outlines the responsibilities of the company and of the farmers. Information on gender, year of birth, field, and plot is collected for all farmers. If a farmer agrees to the service, a phone number is recorded, along with the identity of the phone holder. Farmers may provide their own number or that of an immediate family member. If the farmer does not own a phone, and he/she is unable or unwilling to nominate a family member to receive messages on his/her behalf, then the farmer may choose to decline the service. This is recorded on the registration form.

For those who accept the service, Mumias Sugar staff will request additional information on whether the farmer is a block leader, and whether he/she has made use of messaging services in the preceding one week. Additional details on the location and identity of the staff member who administered the form are recorded for tracking and monitoring purposes.

Data entry

All data collected from the phone registration forms will be entered onto the Agricultural Management System database. Any changes to the phone number or other account details will be recorded on the database. Innovations for Poverty Action routinely saves a weekly report of farmer details and will monitor any changes over time.

Collection rates & progress

Almost 14,500 farmers across the scheme have completed a phone services registration form since January 2012 with 80 percent of these farmers providing phone numbers. Many of these farmers have already entered the cane cycle and will be ineligible for selection into the study.

At present there are close to 2000 farmers who are less than one month into the cane cycle and eligible to receive services from early July 2012. We expect to recruit approximately 2000 farmers per month from early July to early November giving a total of 10,000 farmers in the study.

Interventions

Randomization schedule

Randomization will occur in waves as a critical mass of farmer accounts enter a new cycle. Randomization waves will occur on a monthly basis, targeting farmers that are about to enter a new cane cycle. Randomization of farmers into the study will commence early July 2012 and will continue until November, 2012.

Interventions

1. Base SMS service

Farmers will be provided with information on the following:

Company Services

- seedcane delivery
- fertilizer delivery
- harvesting
- payments

Agronomic advice

- preparation (intercropping, trashlining, firebreaks)
- management of weeds
- cane germination
- disease control

2. SMS service with follow-up prompts

Farmers will be assigned specific deadlines for the completion of tasks and will be prompted to provide follow-up information on their progress. These messages will target those activities that are strongly linked to cane yields and are the direct responsibility of the farmer: intercropping, trashlining, building firebreaks, replanting in areas of low germination, weeding, application of fertilizer, removal of cane smut.

3. Farmer hotline (free service)

Farmers will have access to a hotline service where they may call and ask any question regarding the management of their plot or the status of their account. The hotline will be staffed by Mumias Sugar professionals who are familiar with company processes and are trained in the agronomic management of cane. Hotline services will be offered as a free service.

4. Farmer hotline (paid service)

As above. Hotline services will be offered at standard call rates.

Outcome variables and sample size

The randomization design has been simplified to account for the reduction in sample size. The change in design has also been chosen to allow for flexibility in the interventions over time.

We expect to see a cumulative increase in general awareness of phone services among staff and farmers over the next five months. As farmer awareness increases, and further modifications are made to the AMS infrastructure, we may be able to modify aspects of existing interventions to maximize impact among these groups. In particular, feedback from earlier waves might affect intervention and evaluation design of subsequent waves.

We performed power calculations using our revised sample sizes. We use yields as the main outcome variable and target a minimum detectable effect of 0.2 s.d., with power of 0.8, assuming a take-up rate of 0.70 among targeted plots.

	WAVE 1- JUL	WAVE 2- AUG	WAVE 3- SEP	WAVE 4- OCT	WAVE 5- NOV
1. CONTROL	400 farmers				
2. PAID HOTLINE	400 farmers				
3. FREE HOTLINE	400 farmers				
4. SMS	400 farmers				
5. SMS WITH FOLLOW-UP	400 farmers				

Heterogenous impact analysis

We will study the heterogeneous impact of the treatments across several baseline characteristics of the farmers. Twenty-five percent of the farmers who have registered for phone services to date are female. We will explore the difference that gender has upon take-up of the various services and on changes in productivity.

Mumias Sugar Company also possesses historical records of the productivity of plots contracted to the company and current records of the contractual status of the plot. We will thus explore heterogeneity in the program impact by baseline level of productivity. Similarly, we will be able to assess whether the program impact varies by plot size. Finally, as the administrative data include information on whether the plots are contracted individually or in conjunction with other farmers, we will explore heterogeneity along this dimension, too.

Ongoing risks

Low registration rates: Registration rates have stabilized over the past three months and we expect to see similar rates of registration for the remainder of the planting season.

Changes to farmer phone numbers: This is considered to be moderate risk. Farmers may provide a cell-phone number and later obtain a replacement number. We shall monitor the quality of numbers in our registration log, particularly in the hotline groups where operators will be speaking directly with farmers. Should we find systematic evidence of low quality numbers, we shall consider modifications to our interventions in subsequent waves.

Low take-up of services: Reasons for low take-up will be monitored closely throughout each randomization wave. There is a moderate risk that farmers' lack of exposure to the program, via trusted company representatives, may diminish their trust in the services being offered. It is likely that this will be more pronounced in early waves of intervention.

References

Aker, J. (2010) Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger, *American Economic Journal: Applied Economics* 2, 3, 4659

Birkenhauser, D., Evensen, R., Feder, G. (1991). The Economic Impact of Agricultural Extension: A Review, *Economic Development and Cultural Change*, 39, 607-650

Communications Commission of Kenya (2011). Quarterly Sector Statistics Report: 1st Quarter July-Sept 2011/12, Communications Commission of Kenya, accessed February 10 2012 http://www.cck.go.ke/news_2012/ICT_Sector_Statistics

Davis, K. (2008). Extension in Sub-Saharan Africa: Overview and Assessment of Past and Current Models and Future Prospects, *Journal of International Agricultural and Extension Education*, 15(3), 15-28

Fafchamps, M. (2011). Impact of SMS-Based Agricultural Information on Indian Farmers, University of Oxford, England

Government of Kenya (2010). Agriculture Sector Development Strategy 2010-2020, Republic of Kenya, accessed February 6 2012 www.ascu.go.ke

Jenson, R. (2007). The Digital Provide: Information (Technology), Market Performance, and Welfare in the Southern Indian Fisheries Sector, *Quarterly Journal of Economics*, 127(3): 879-924

Jensen, R.T. (2010). Information, Efficiency, and Welfare in Agricultural Markets, *Agricultural Economics*, 41, pp. 203-216

Muto, M., Yamano, T. (2009). The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda, *World Development*, 37(12), 1887-1896

Office of the Permanent Secretary (2008). The Ministry at a Glance, Ministry of Agriculture, Republic of Kenya, accessed February 6 2012 <http://www.kilimo.go.ke>

Payne, J., Woodard, J. (2010). ICT to Enhance Farm Extension Services in Africa, Fostering Agriculture Competitiveness Employing Information Communication Technologies (FACET) Briefing Paper, Maryland

Purcell, D.L., Anderson, J.R. (1997). Agricultural Extension and Research: Achievements and Problems in National Systems. The World Bank, Washington D.C.

Progress Report

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Executive Summary

Innovations for Poverty Action (IPA), in collaboration with Mumias Sugar Company (MSC) Kenya, is implementing the project, “Mobile Phone Agricultural Extension: Using ICT to reduce outreach and monitoring costs”.

There is widespread interest in the adaptation of information technologies to address development challenges. Kenya’s market provides a particularly interesting testing ground, with mobile phone penetration at 67 percent. One key challenge in this move towards ICT-enhanced growth is to understand the effectiveness of such initiatives among those who are most economically disadvantaged. To this end, we focus attention on the application of mobile phone services among a subset of farmers in sub-Saharan Africa.

The agriculture sector continues to dominate the economies of sub-Saharan Africa. In Kenya, the agriculture sector accounts for 25 percent of Kenya’s GDP and indirectly contributes a further 25 percent. Mumias Sugar Company, as the largest sugar mill in Kenya, is responsible for 40 percent of the nation’s sugar supply. In partnering with Mumias Sugar Company, Innovations for Poverty Action will have direct access to electronic information on 100,000 farmers contracted to the company.

The company has successfully registered phone numbers for farmers on 17,728 plots in the Mumias Sugar Scheme. This sample is drawn from a base of approximately 44,000 plots invited to register for phone services. Among the 22,000 accounts for which a registration form was completed 80 percent belonged to farmer(s) who were willing and able to register a phone number.

From July 2012 to October 2012 researchers will randomly select a subsample of 10,000 farmers with a registered phone number in the early-stages of the cane cycle. The study uses randomized evaluation methodologies to rigorously assess the effectiveness of a range of phone services. Attention is given to the following research themes: the uptake of services under different conditions and incentives, whether phone services can act as a mechanism for increased efficiency in the contract-farming scheme, and the capacity for the services to have a direct impact on farmer productivity.

Randomization waves from July-September have led to the selection of 10,360 farmers in 1,316 fields, 5,300 of whom have a registered phone number.

This pilot study is funded by Mumias Sugar Company and by a USAID Development Innovation Ventures award. Final data for the study will be collected at the completion of a full cycle of cane growth, from November 2013 to June 2014.

Key project milestones July-September 2012

- An additional 8,700 farmers registering their phone numbers with Mumias Sugar Company phone services program since June 30, 2012. This includes an additional 6,267 farmers who were interested in registering for Mumias Sugar Company phone services and were able to provide a phone number.

- The conclusion of eight weeks of extensive piloting with a sample of 500 farmers, prior to randomization
- MSC investment in a query-logging software platform to manage queries entered through the farmer hotline service
- New SMS software partners for the distribution of messages
- 10,360 farmers in 1,316 fields selected for the first two waves of randomization, 50 percent of whom have registered their phone number
- Hire of two additional hotline operators and training of 30 managers on operation of the new query logging platform

Phone registrations

Posters (below) were distributed to each of the field offices in late 2011. Farmer recruitment has continued throughout 2012 and 23,251 farmers from 22,000 accounts have registered their phone number with Mumias Sugar Company since January. More than 100 Mumias Sugar field staff have been involved in the systematic collection of these phone numbers at payment and contract signing.

MUMIAS SUGAR
MUMIAS SUGAR CELL PHONE AND INFORMATION SERVICES

OVERVIEW
Mumias Sugar Company is committed to providing improved services to its farmers and to providing a reliable and efficient communication system. This commitment is reflected in the introduction of a mobile phone service to its farmers. This service will provide farmers with a reliable and efficient communication system.

REGISTRATION OF FARMERS
Farmers are invited to register their mobile phone numbers with Mumias Sugar Company. This registration will enable farmers to receive SMS messages and to use the mobile phone service. The following information will be required for registration:

INFORMATION REQUIRED

1. Farmer's name and address
2. Farmer's mobile phone number
3. Farmer's identification card
4. Farmer's signature

PROCESS

1. REGISTERED FARMER
2. FARMER TO REGISTER
3. FARMER TO REGISTER
4. FARMER TO REGISTER
5. FARMER TO REGISTER

REGISTERED FARMER
2011/12/15 - 2012/01/15

FARMER TO REGISTER
2012/01/15 - 2012/02/15

FARMER TO REGISTER
2012/02/15 - 2012/03/15

FARMER TO REGISTER
2012/03/15 - 2012/04/15

FARMER TO REGISTER
2012/04/15 - 2012/05/15

Pre-piloting outcomes

The objectives of this study are: i) to assess demand and utilization of phone services of varying technical difficulty and the influence that differential pricing can have on demand, as measured by *farmer take-up of services*, and ii) to determine if the provision of services improves the effectiveness of the existing extension system in terms of farmer productivity, *as measured by cane yields*. Furthermore, the design allows for the assessment of heterogeneous treatment impacts along dimensions such as gender, contractual status of the plot, and baseline level of productivity.

Pre-piloting activities have thus been directed towards the following aims:

- testing various service features using different software providers and network services
- identifying take-up among the proposed interventions
- assessment of how different phone services are *actually* utilized by farmers and testing the validity of hypothesized behavioral changes.

Pre-piloting activities largely took place from May 2012 to July 2012 with some ongoing qualitative assessments continuing into August 2012.

Hotline Service

Testing service features

Free vs paid hotline service

Initial hotline piloting activities differentiated free and paying farmers by allowing farmers in the free group to 'flash' or make a short call to request an operator to call them back. There was no obvious difference in demand for services under this system. However, there were obvious logistical constraints to the effective delivery of a purely 'toll-free' service using this system.

Mumias Sugar Company has now submitted an application for a toll-free line in order to more effectively test demand for services under differential pricing conditions. The application has been submitted and the line is expected to be available during the month of September 2012. In the meantime, farmers offered the hotline in randomization waves 1 and 2 have been offered the service under the conditions of 'standard call rates'. Randomizations in subsequent waves will incorporate the toll-free hotline service.

Systems for responding to farmer queries

Two systems for the management of farmer queries were trialed during this period. The first relied upon existing Mumias Sugar Company protocols that combined electronic logging in Microsoft Excel with person-to-person requests for feedback from relevant managers within the Department of Agriculture.

The system was effective for the small number of queries being logged. Subsequent meetings with the Director of ICT Infrastructure at Mumias Sugar were led to the adoption of LANsupport, a custom-designed software for query logging. LANsupport has previously been adopted by a small number of

pilot Mumias Sugar users and is an extremely powerful system for managing and analyzing incoming queries. Users now include 30 management staff from relevant areas within the Department of Agriculture. Staff have undergone intensive training during the months of July and August in collaboration with ProSynergies consultants and Mumias Sugar IT Department.

Take-up of the service

The operators administered the pre-pilot service to 323 farmers from 36 fields from May 2012. Seventy percent of the farmers in these fields (228 farmers) had provided Mumias Sugar with a phone number. Of these, 155 (68 percent) accepted the offer to participate in the service when called by a hotline operator. When we take as our denominator the number of farmers *who could be reached* on the designated number, this figure increases to 93 percent. Among the 73 who did not accept, only 12 were able to be reached on the number they provided. Phone calls were made to these numbers at varying times and over the course of several weeks.

Utilization of the service

Among the queries logged during the pre-pilot service, 46 percent of the queries related to farmer requests for fertilizer and seedcane.

There were few requests for information relating to cane husbandry and agronomic practices, suggesting that access to the service may not be as strongly linked to improved farmer productivity as previously hypothesized. In contrast, it suggests that improved efficiency in the provision of Mumias Sugar Company service delivery is likely to be the primary outcome of the hotline service. Increases in cane productivity may emerge only as a secondary effect. The revised evaluation design incorporates these outcomes.

SMS service

Testing service features

Several SMS platforms were tested throughout the piloting phase. Frontline SMS, www.frontlineSMS.com, provides free, open-source software for bulk two-way communication via SMS. IPA has been using Frontline SMS for several years as part of an existing project assessing SMS reminders for Mumias Sugar farmers.

We have conducted more extensive testing using the mSwali platform, www.mswali.org. mSwali has the additional advantage of providing a toll-free service to farmers when they respond to an SMS. The service is primarily designed to administer client surveys via SMS.

The SMSVoices platform www.smsvoices.com, offered by Africa's Talking Ltd, combines desirable features of each of these platforms. It allows for grouping of farmers as "toll-free" or "paying", a research-compatible platform for storage of incoming data, and a facility to link with a four-digit shortcode exclusively allocated to Mumias Sugar Company.

Take-up of the service

More than 200 farmers were selected to take part in pre-pilot testing via mSwali. The objective was to test the likelihood that farmers would respond an SMS survey from Mumias Sugar via the mSwali

platform. The survey was tested under a range of conditions including the following:

- Messages were sent as part of a field-level training with IPA staff
- Messages were sent to farmers after a phone call had been made to the block leader for that field. The block leader is the nominated representative in a field and is primarily responsible for facilitating communication between MSC staff and farmers in the field. The phone call was made by one of three MSC representatives and this was varied among different fields:
 - o a senior manager from MSC outgrower services department,
 - o an area-level supervisor,
 - o a ground-level field assistant
- Messages were sent without any prior warning
- Messages were sent with an incentive payment of 50Ksh for completion of the survey

The striking finding from this exercise was that response rates were approximately 20 percent in all fields, regardless of the conditions under which messages were sent. The survey contained questions on general agronomic practices.

Further pre-pilot testing was conducted on the FrontlineSMS platform. Farmers were informed of an upcoming fertilizer delivery and were then requested to confirm if they had received the fertilizer. The 100 farmers in this group had all completed a phone services registration form in the past several months but were given no prior warning from MSC or IPA staff about these particular fertilizer messages. Response rates were slightly less for this group, at 16 percent.

Testing continued in wave 1 of the randomization. We sent two welcome messages to 602 unique phone numbers belonging to farmers in the wave 1 SMS group. Fifty-two farmers (9%) responded to the first message when requested to; 144 (23%) responded to the second. These figures are consistent with previous piloting exercises.

Qualitative assessments

Pre-piloting activities indicated that there were significant barriers to usage for both the hotline (25 percent of farmers could not be reached) and SMS services (80 percent of farmers did not respond to requests for feedback). Qualitative assessments were conducted during follow-up field visits to understand the determinants of these figures.



Figure 1: Pre-pilot hotline farmers in Northern zone

Farmers cited various reasons for their unwillingness/inability to participate and principal among them was the lack of credibility attached to the service. In the absence of personalized contact with MSC staff farmers were skeptical that the message did in fact come from Mumias Sugar Company. In some cases farmers were concerned about providing information that could either incriminate themselves or trusted MSC ground-staff with whom they interact most frequently. The welcome messages explaining the intent of the service went only so far to alleviate their concerns.

Farmers indicated willingness to pay for reply text messages to the company. All farmers were aware of the price of a text message and believed it to be relatively affordable. However, when pressed for more information it became apparent that a number of farmers were unable to reply because they had *zero credit* at the time the message was sent. The inconvenience of travelling to the closest recharge station was a more identifiable barrier than the price of the message.

It also came to light that phone numbers held on record with Mumias Sugar may in some cases not belong to the farmer on contract or an immediate member of his/her family, despite efforts to enforce this protocol. In a number of cases, farmers' phones were unavailable due to lack of battery charge. Delivery notifications for SMS messages and automated call failure messages for the hotline can be tracked to some degree.

As a result of this assessment, the project research team redefined the treatments and the outcomes. Starting with wave 2, the project evaluation will aim to identify ways to increase service usage, by targeting SMS costs and the “credibility” of the service providers.

Randomization

Wave 1

3,658 farmers (1,974 with registered phone numbers) were selected from 368 fields. Farmers were allocated to one of three treatment groups:

SMS: Farmers receive reminder messages on critical agronomic practices such as fertilizer delivery and weeding.

HOTLINE: Farmers received invitation phonecalls from Mumias Sugar Hotline operators to inform them of the service and to log and initial queries. They were invited to record the phone number and use it to log any future requests for information or complaints. Queries are processed by MSC with feedback provided to the farmer via a reply phone call.

CONTROL

Wave 2

6,706 farmers (3,331 with registered phone numbers) were selected from 948 fields. Additional treatment groups were introduced into the wave 2 randomization after monitoring wave 1 data and receiving additional feedback via qualitative assessments. Farmers were allocated to one of six treatment groups:

SMS (LONGCODE): Farmers receive reminder messages from a standard 07xxxxxxx phone number. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay to reply to the message.

SMS (SHORTCODE): Farmers receive reminder messages from a customized Mumias Sugar Company shortcode. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay to reply to the message.

SMS (FREE SERVICE - SHORTCODE): Farmers receive reminder messages from a customized Mumias Sugar Company shortcode. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers do not pay to reply to the message.

SMS (CREDIBILITY - SHORTCODE): Farmers receive a personalized business card from trusted and familiar field staff from Mumias Sugar Company. The card includes necessary details about the shortcode. Farmers then receive reminder messages on critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay to reply to the message.

HOTLINE: Farmers received invitation phonecalls from Mumias Sugar Hotline operators to inform them

of the service and to log and initial queries. They were invited to record the phone number and use it to log any future requests for information or complaints. Queries are processed by MSC with feedback provided to the farmer via a reply phone call.

CONTROL

Outcome variables

SMS usage will be measured as the number of responses received on the SMSVoices platform. (NEW)

Hotline usage will be monitored using LANsupport SQL reports. (NEW)

MSC administrative data has been sourced on the timeliness of seedcane and fertilizer deliveries. It will be used to determine the impact of the hotline service on the level of MSC efficiency in these areas. (NEW)

Farmer productivity and income will be measured using MSC administrative payments data

Mumias Sugar Company Partnership

Peter Kebati, CEO of Mumias Sugar since April 2012, met with the IPA research team to discuss the ongoing relationship between Mumias Sugar Company and IPA/Harvard University.

Introduction of new project partners within MSC

Margaret Makhungu, Director of ICT Infrastructure, joins the Farmer SRM leadership team and is providing infrastructure support for the hotline & SMS initiatives.

Samson Mangwana, Office Administrator at Outgrower Development Services, joins the Farmer SRM leadership team as manager to the growing hotline attendant team.

30 managers across Outgrower Development Services, Agricultural Engineering, Fertilizer and Seedcane Supply, Harvest & Transport, Payments have joined the Farmer SRM Implementation team. They will take primary responsibility for the electronic processing and resolution of queries.

External partners

ProSynergies Consultants have configured LANsupport, the electronic query-logging software, for use by MSC and are providing ongoing technical support.

Africa's Talking Ltd have configured a web-based SMS messaging platform for the distribution of bulk two-way communication. SMSVoices allows for the rapid distribution of toll-free and paid message services to a large number of clients.

Amity IT Consultants are providing ongoing support for all aspects of the Agricultural Management System (AMS) database. The AMS is a comprehensive historical electronic database of 100,000 farmer

accounts. It is also a live process management system that facilitates the scheduling of services, allocation of services to contractors, printing of invoices, monitoring of deliveries and payment of farmers.

Events

July 2012 randomization launch with 120 MSC field staff.



Figure 2: From left: Samson Mangwana (Outgrowers Administration Manager), Margaret Makhungu (Director of ICT Infrastructure), Gretchen Carrigan (IPA Evaluation Coordinator), Hezron Adoli (Outgrowers Services Manager), Moses Nyongesa (Director of Agriculture). Right: MSC Department of Agriculture Staff

Complete Baseline Assessment

Mobile Phone Agricultural Extension: Using ICT to reduce Outreach and Monitoring Costs

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

September 2012



1 Phone registrations

There are 114,410 farmers who have an active registration as a Mumias Sugar Outgrower. Farmers are initially contracted to the company for a period of three cycles (Plant, Ratoon 1 (R1), Ratoon 2 (R2)) with the possibility of extension into later ratoons.

Mumias Sugar has been systematically collecting phone numbers for farmers at harvest and contract signing. Collection commenced in January 2012 and has continued throughout the year. All farmers who have harvested Plant, Ratoon 1, or Ratoon 2 cane are requested to fill a phone registration form at the time of payment. Similarly, farmers moving from Ratoon 2 or Fallow into the Plant cycle are requested to fill a phone registration form at the time of contract signing. In some cases, Mumias Staff have independently requested farmers to fill forms in plots that are entering extension ratoons.

To date, 23,251 farmers have completed a registration form. All targeted farmers are requested to fill a registration form regardless of whether or not they can provide a mobile phone. Among farmers who completed the form, 80 percent provided a phone number and consented to receive the service.

2 Randomization sample (waves 1 & 2)

Eligibility criteria were further refined for each wave of randomization. Only fields in which a minimum proportion of farmers had registered were selected (20 percent and 30 percent in waves 1 and 2 respectively).

Age of the cane at time of randomization was an important factor. The hotline intervention targets activities at the commencement of the cane cycle. SMS treatments are relevant for farmers in the first 10 months of the cane cycle. Wave 1 limited selection to farmers within the first 2 months of the cycle. Wave 2 selections included farmers in the first 10 months of the cycle.

Some further restrictions were placed on plot size and number of farmers in the field for each of the waves.

A total of 10,364 farmers from 1,316 fields have been selected into the study from July 2012 to September 2012. 5,305 (52 percent) provided a phone number.

Missing phone numbers are attributable to missing registration forms in 80 percent of cases. Twenty percent of those with missing numbers did complete a phone registration form but were unable to provide a number.

3 Baseline characteristics among randomized fields

The below table presents descriptive statistics for the farmers that are currently participating to the program. The variables are grouped in three categories.

First, we describe field-level variables. Fields are groups of contiguous plots that the company treat homogeneously for input provision and harvesting. The table presents the distribution of current harvest cycle. In addition, we present a distribution of the ages at which the field entered the program.

Second, we present plot-level variables. The plot is the basic unit of cane production. It is typically contracted by an individual outgrower, although joint contracting can occur. The table presents summary statistics for plots that registered for the program (51% of the total number of plots in the target fields). It describes yields and income in the previous cycle, as well as plot sizes. The figure confirms the small-holder nature of the scheme. The median plot size is 0.37ha. The median net revenue from the previous cycle of cane production was Ksh39,191 (equivalent to \$455)

Finally, we use data collected in the registration forms to describe the population of registered farmers currently participating in the program in wave 1 and wave 2. First we describe gender and age composition. Male contract holders represent 76% of the total, although in many of these cases contract holders' wives manage the plot. Second, we present evidence about the baseline usage of SMS (sending and receiving) in the week before the registration occurred. The figures confirm that, even among those who registered a phone number, the usage rates are still fairly low. This motivates the component of the intervention that aims to increase take-up of the SMS interactive scheme.

Field level variables (N = 1,316)

	Wave 1	Wave 2	All waves
	(%)	(%)	(%)
Cycle			
Plant	35	20	25
Ratoon 1	38	34	35
Ratoon 2	27	26	26
Ratoon 3	0	20	14
Age			
0-2 months	100	14	37
2-6 months	0	57	42
6-10 months	0	28	21

Plot level variables (N = 5,167)

Yield in the previous cycle

<25 t/ha	3	3	3
25-50 t/ha	17	20	19
50-75 t/ha	23	24	24
75-100 t/ha	15	15	15
100-125 t/ha	7	6	6
>125 t/ha	10	9	9
Data unavailable	26	23	24

Net income in the previous cycle

<10,000 Ksh	7	6	7
10,000-30,000 Ksh	23	23	23
30,000-60,000 Ksh	25	25	25
60,000-90,000 Ksh	12	12	12
90,000-120,000 Ksh	5	6	6
>120,000 Ksh	8	8	8
Data unavailable	19	20	19

Plot area

< 0.2 ha	14	12	13
0.2-0.4 ha	40	41	41
0.4-0.6 ha	23	24	24
0.6-0.8 ha	11	11	11
0.8-1.0 ha	5	6	6
> 1.0 ha	7	6	6

Farmer level variables (N = 5,305)

Gender of registered farmer

Male	75	77	76
Female	25	23	24

Age of registered farmer

18-30	10	10	10
31-40	27	26	27
41-50	23	23	23
51-60	18	20	19
61-70	10	9	9
>70	5	4	4
Unspecified	7	8	8

Number of SMS messages sent in the past week

None	30	40	36
1-2	34	32	33
3-4	11	9	9
5-9	14	10	11
9-14	8	5	6
>15	4	4	4

Number of SMS messages received in the past week

None	26	35	31
1-2	28	27	27
3-4	11	9	9
5-9	17	13	15
9-14	12	9	10
>15	6	8	7

Mid-term implementation analysis

Mobile Phone Agricultural Extension: Using ICT to reduce Outreach and Monitoring Costs

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

March 2013



USAID
FROM THE AMERICAN PEOPLE

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Executive Summary

Innovations for Poverty Action (IPA), in collaboration with Mumias Sugar Company (MSC) Kenya, is implementing the project, “Mobile Phone Agricultural Extension: Using ICT to reduce outreach and monitoring costs”.

There is widespread interest in the adaptation of information technologies to address development challenges. Kenya’s market provides a particularly interesting testing ground, with mobile phone penetration at 67 percent. One key challenge in this move towards ICT-enhanced growth is to understand the effectiveness of such initiatives among those who are most economically disadvantaged. To this end, we focus attention on the application of mobile phone services among a subset of farmers in sub-Saharan Africa.

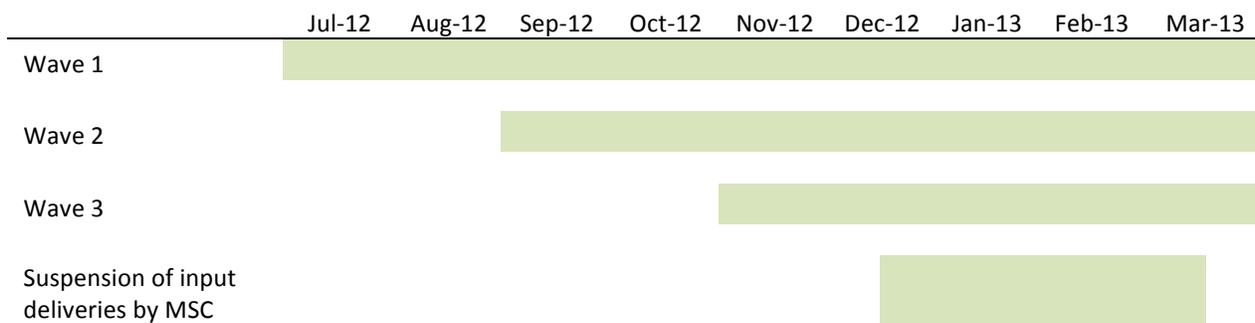
The agriculture sector continues to dominate the economies of sub-Saharan Africa. In Kenya, the agriculture sector accounts for 25 percent of Kenya’s GDP and indirectly contributes a further 25 percent. Mumias Sugar Company, as the largest sugar mill in Kenya, is responsible for 40 percent of the nation’s sugar supply. In partnering with Mumias Sugar Company, Innovations for Poverty Action will have direct access to electronic information on 100,000 farmers contracted to the company.

This study employs randomized evaluation methodologies to rigorously assess the effectiveness of a range of phone services offered to farmers within the MSC scheme. From July 2012 to November 2012 researchers randomly selected 13,798 farmers from 1,769 fields within the scheme. Around 50 percent these farmers had registered a phone number with Mumias Sugar Company. Randomization was suspended throughout the dry season (November to March) but will resume shortly, subject to the recommencement of input deliveries by MSC.

This pilot study is funded by Mumias Sugar Company and by a USAID Development Innovation Ventures award. Preliminary results are presented here for the initial waves of randomization. Final data for the study will be collected at the completion of a full cycle of cane growth, from November 2013 to June 2014.

Key project milestones: September 2012 to March 2013

- Sent 54,930 text messages to Mumias Sugar Farmers (from July 2012)
- Continued the development of SMS modules for farmer polls, and entered into partnership negotiations with Kenya Commercial Bank (KCB) and Kenya Sugar Board (KSB), ongoing.
- Introduced personalized elements into SMS messages (eg. „farmer names and account details)
- Improved monitoring systems for SMS field activities. Note that field staff promote the SMS service via delivery of business cards
- Logged 683 queries with the hotline service (from July 2012)
- Recruited a new hotline operator to accommodate the increasing number of farmers enrolled in the hotline group
- Conducted extensive staff training and developed robust monitoring systems for the LANsupport query logging and resolution system
- Organized an Outgrower Development Services 6-month hotline review seminar, led by the Director of Agriculture.
- Piloted automated voice-response services to integrate with existing operator activities
- Preliminary statistical analysis of the impact of SMS and hotline treatments on farmer replies and input delivery quality, respectively.



Research design

Wave 1

Timing: July 2012

Intervention arms: SMS service, Hotline Service

Primary outcome variable (SMS): yield

Primary outcome variables (hotline): fertilizer delivery before 6 months, seedcane redelivery

Randomization design

	# fields (n=368)	# farmers (n=3658)	
		consenting farmers with phone	total number of farmers in randomized fields
HOTLINE	123	626 (51%)	1221
SMS	122	588 (51%)	1160
CONTROL	123	706 (55%)	1277

SMS Intervention

Farmers in the SMS intervention arm received SMS messages designed to improve their productivity. These messages were developed in collaboration with Agronomy and have been piloted in a previous small-scale study. The messages are designed to remind the farmers to perform certain agronomic practices that crucial for proper cane development. These activities must be performed at a specified time in the cane growth cycle for good results, and because of this we trigger the messages around the time when these activities are to be done.

Type	Content	Time	Purpose	Cycle
Trash-lining	Please complete trash-lining at this time. Trash, if left unarranged may obstruct growth of young cane	Just after harvesting	Remind farmers to clear trash from previous harvest that may deter the growth of young cane if left covering the plot.	Ratoon
DAP	Your field/block is scheduled to receive DAP soon. Please apply it when you receive.	Before planting – 2 months – Ratoon	Notify farmers to be available to collect their fertilizer. Some farmers report cases of lost fertilizer because they were away at the time it was delivered	Ratoon & Plant
Intercropping	If you plant other crop besides cane on your plot, please plant only one or two lines of beans, soya-beans or	1-3months since planting	Most farmers plant food crops on the cane plot which usually causes competitions for nutrients that	Plant

	groundnuts. Do not plant maize!		affects cane growth. This message encourages good practice and warns farmers not to plant maize which affects cane the most.	
Gapping	If there are gaps on your cane plot please find cane stumps from your plot and plant wherever there are gaps.	3-4 months	Cane population on a plot determines the level of yield, therefore farmers should fill gaps around the plot that come about as a result of growth failure after planting or destruction at the time of harvesting.	Ratoon & Plant
Firebreak	It is advisable to plant crops like Napier grass around your cane plot so as to contain the spread of fire to your plot in case it occurs.	1-3 months	There are many cases of cane fires especially during the dry season. Planting Napier grass or other crop around cane could help contain spread of fire.	Ratoon & plant
1st Weeding	Your cane is now (no.) month according to our records. You should be weeding now for the first time. If you have not weeded please do this.	1 month	We remind farmers to weed at the right time. They should at least 5 times within the first 8 months after harvesting or planting	Ratoon & plant
2nd Weeding	Your cane is now (no.) months according to our records. You should be weeding now for the first time. If you have not weeded please do this.	2months-Plant 3months-Ratoon	We remind farmers to weed at the right time. They should at least 5 times within the first 8 months after harvesting or planting	Ratoon & plant
UREA	Your field/block is scheduled to receive DAP soon. Please apply it when you receive.	4 – 6 months	Notify farmers to be available to collect their fertilizer. Some farmers report cases of lost fertilizer because they were away at the time it was delivered	Ratoon & Plant
3rd Weeding	Your cane is now (no.) months according to our records. You should be weeding now for the first time. If you have not weeded please do this.	3months-Plant 5months-Ratoon	We remind farmers to weed at the right time. They should at least 5 times within the first 8 months after harvesting or planting	Ratoon & plant
4th Weeding	Your cane is now (no.) month according to our records. You should be weeding now for the first time. If you have not weeded please do this.	5months-Plant 7months-Ratoon	We remind farmers to weed at the right time. They should at least 5 times within the first 8 months after harvesting or planting	Ratoon & plant
5th Weeding	Your cane is now (no.) month according to our records. You should be weeding now for the first time. If you have not weeded please do this.	7months-Plant	We remind farmers to weed at the right time. They should at least 5 times within the first 8 months after harvesting or planting	Plant
Cane Fires	As your cane grows you should be	6-10 months	Warning to watch out for cane fires that sometimes occur due	Ratoon &

Warning	careful to avoid cane fires.		burning trash near cane plots in the dry season, and sometimes malicious practices.	Plant
Smut Removal	Check if you have smut on your cane plants, and if you do, pluck and throw them on the plot and cover with soil.	Sent every time a weeding message is sent so that farmers check for smut when they weed.	Smut is removed by hand by farmers. We remind farmers to check for these and remove.	Ratoon & Plant

HOTLINE intervention

The hotline service is a customer-care service offered to farmers. Farmers are able to call a designated hotline number and log queries with a MSC hotline operator.

How the service works

1. The Farmer Care Hotline Center

The center includes 3 landline phones manned by 3 staff members (operators)

The hotline staff members are responsible for calling farmers selected to receive the service. These farmers are invited to use the service (introduced to the service; in other words also 'recruited') and provided with the hotline number which they are asked save on their mobile phones or write down.

During invitation or recruitment calls the farmers may request assistance or 'log queries' which should be directed to the company personnel responsible for resolving them.

The hotline center in, simple terms, does the following;

1. Call farmers to introduce/invite them to the service
2. Log queries from farmers
3. Receive calls made by farmers and log their queries
4. Assign queries to the company personnel responsible
5. Receive resolutions from company personnel and inform farmers of progress or solutions
6. Resolve farmers' queries by checking for solutions on the Company Agricultural Management System

2. The Farmer Care Lansupport

Lansupport is a web based application; this means that all the PCs on the network can access the portal via this url link on the local network.

It provides a link through which queries raised by farmers via Hotline Center reach company personnel who then resolve through consultations on and off the Lansupport system. Final resolutions reach

farmers via the hotline center.

All queries are recorded in the Lansupport system and can accessed by all personnel who have been assigned licenses

Lansupport users

1. All company managers (25 managers) responsible for providing services to farmers or responsible for providing support to the departments that serve farmers directly.
2. The farmer care hotline center operators (3 staff)
3. Administrators/support (4 staff including staff from IPA and Mumias Sugar ICT Department)

3. The Agricultural Management System

The Agricultural Management System (AMS) is an integrated application for management of all operations in growing cane. It therefore provides a common view of data and reports for all the sections of Agriculture – from farmer application to payment. The hotline staff can find quick solutions for farmers' queries simply by accessing this system.

Waves 2 & 3

Wave 2

Timing: September 2012

Intervention arms: SMS service (4 treatment arms), Hotline Service

Primary outcome variable (SMS): number of SMS responses received from farmers

Primary outcome variables (hotline): fertilizer delivery before 6 months, seedcane redelivery

Randomization design¹

		field-level information (SMS: n=948) (HOTLINE: n=439)					farmer-level information (SMS: n=6706) (HOTLINE: n=3482) <i>consenting farmers with phone(all farmers)</i>		
		HOTLINE		not included in the HOTLINE intervention			HOTLINE		not included in the HOTLINE intervention
		also included in HOTLINE intervention					also included in HOTLINE intervention		
		hotline	control				hotline	control	
SMS INTERVENTION	control free service	77	71	166	SMS INTERVENTION	control free service	308 (613)	294 (611)	524 (1039)
	increased credibility	33	39	93		increased credibility	134 (275)	155 (308)	306 (604)
	Standard	38	39	82		standard	140 (288)	159 (313)	256 (502)
	long-code	33	37	82		long-code	117 (210)	144 (283)	290 (595)
		38	34	86			146 (322)	128 (259)	230 (484)

SMS Intervention

The SMS design changed from a single intervention arm in wave 1 to four separate intervention arms in waves 2 & 3.

SMS (LONGCODE): Farmers receive reminder messages from a standard 07xxxxxxx phone number. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested

¹ Note that SMS and hotline interventions were cross-cut. SMS farmers were not included in the hotline intervention if the cane had matured beyond the fertilizer delivery window.

A proportion of farmers within each field either had not registered their phone number for MSC phone services or had not consented to take part prior to randomization. The right-hand section of the table, farmer-level information, presents the number of consenting farmers with a registered phone and, in brackets, the total number of farmers in fields selected for the treatment group.

to provide feedback. Farmers pay to reply to the message.

SMS (SHORTCODE): Farmers receive reminder messages from a customized Mumias Sugar Company shortcode. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay to reply to the message.

SMS (FREE SERVICE - SHORTCODE): Farmers receive reminder messages from a customized Mumias Sugar Company shortcode. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers do not pay to reply to the message.

SMS (CREDIBILITY - SHORTCODE): Farmers receive a personalized business card from trusted and familiar field staff from Mumias Sugar Company. The card includes necessary details about the shortcode. Farmers then receive reminder messages on critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay to reply to the message.

In addition to the agronomic ‘push notification’ messages that were sent to wave 1 farmers, farmers in waves 2 and 3 were invited to participate in interactive SMS polls. These polls are designed to test farmers’ interaction with an SMS service, as measured by number of responses received from the farmers.

SMS polls have been developed in collaboration with Mumias Sugar Company. A list of completed polls is provided here. We are currently in negotiations with Kenya Commercial Bank and Kenya Sugar Board to incorporate additional polling modules that cover topics such as access to loans and finance.

Polls on Mumias Sugar Services

Content	Description
Jambo. Which information would you like to receive more among the following? A. Reminders on Agronomic Practices, B. Shares, C. Bank Loans, D. Company Services	Collecting opinion on which information farmers prefer the most
Jambo. According to our recent poll, most people said they prefer SMS about company services more than bank loans. Send A if you agree and B. If you disagree	This message is meant to Present results of the previous poll and also collect opinion on it.
Jambo. We would like to compare our records with the information you give for the following question. How many times have you received fertilizer in this cycle? A. 1, B. 2, C. Not Yet	We sent this to ascertain whether farmers will be more interested in questions about fertilizer supply.
Which of the following would do you want SMS information about? A. Fertilizer, B. Seed cane, C. Ploughing, harrow & furrow, D. Harvesting & Transport, E. All the above	Here we wanted to determine which of the Mumias Sugar Company services the farmers care about more.
Which two places is the company building weighbridges to help improve services to farmers? A. Bumula & Navakholo, B. Lureko & Shianda, C. Lubinu & Butere, D. Don't Know	Farmers complain about transport charges due to distance to the weighbridge located within the company premises. This message was meant to see if they are aware of the initiative

	by the company in resolving the distance problem and inform them that such an initiative is ongoing.
How would you like to receive SMS information about company services? A. When a service is about to be performed, B. As a confirmation message after it has been performed	Some farmer do not live near their plots and have other people managing their plots for them. This message ascertains how many would like to know in advance when a service to be delivered or simply confirm that it was done for accounting purposes.
What is your preferred method for receiving information about company services? A. In person, with info passed from FA to block leader to other farmers, B. Via phone calls to all farmers with a mobile phone, C. Via SMS to all farmers with a mobile phone, D. Via phone or SMS to the block leader only	Testing to see what type of communication the farmers prefer
Do you know the Field Assistant in-charge of your area? A. YES, B. NO	Testing if farmers know the Mumias Sugar Company Field Staff.

Hotline Intervention

The hotline intervention for wave 2 is identical to the service offered in wave 1

Wave 3

Timing: November 2012

Intervention arms: SMS service (4 treatment arms), Hotline Service

Primary outcome variable (SMS): number of SMS responses received from farmers

Primary outcome variables (hotline): fertilizer delivery before 6 months, seedcane redelivery

Randomization design

		field-level information (SMS: n=453) (HOTLINE: n=354)			farmer-level information (SMS: n=3434) (HOTLINE: n=2868) <i>consenting farmers with phone(all farmers)</i>			
		HOTLINE		not included in the HOTLINE intervention	HOTLINE		not included in the HOTLINE intervention	
		also included in HOTLINE intervention			also included in HOTLINE intervention			
		hotline	control		hotline	control		
SMS INTERVENTION	control free service	60	61	35	control (487)	192 (456)	94 (206)	
	increased credibility	28	30	15	free service (216)	129 (293)	39 (68)	
	standard	30	30	17	increased credibility (205)	107 (266)	58 (130)	
	long-code	29	32	14	standard (270)	117 (251)	26 (55)	
		29	25	18	long-code (251)	112 (173)	46 (107)	

SMS intervention

As per wave 2.

Hotline intervention

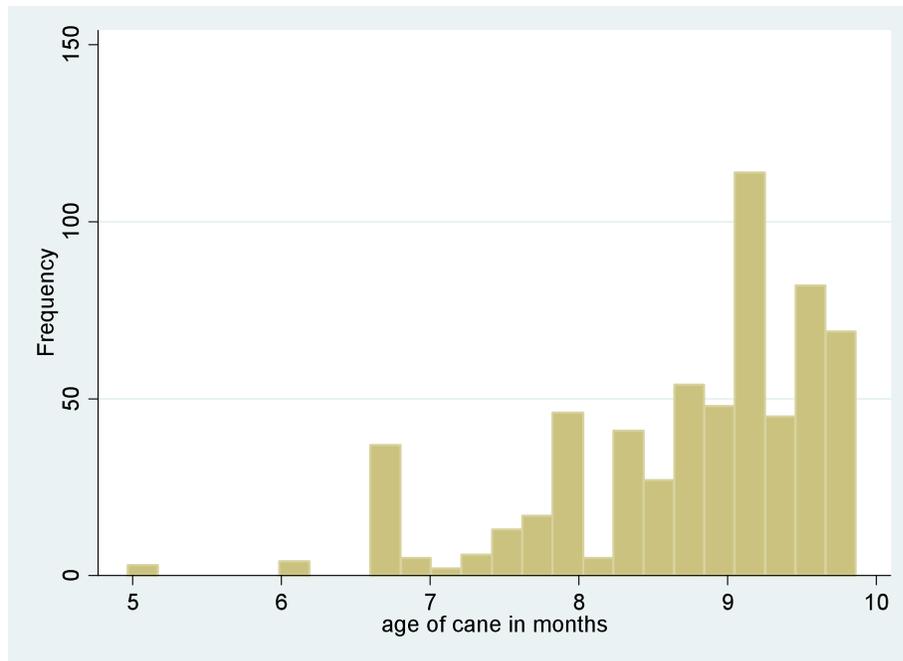
As per waves 1 & 2.

Preliminary Results

SMS Intervention

Wave 1

We have sent 8869 agronomic SMS messages to 588 farmers from July 2012 to March 2013. The current age distribution for these farmers is shown below.²

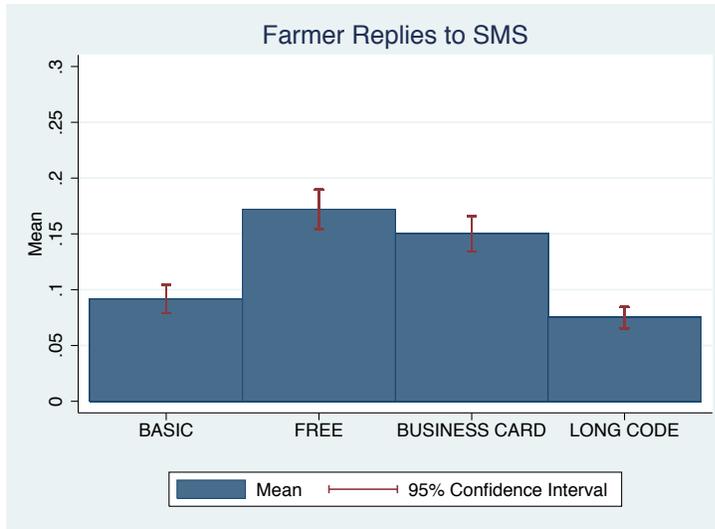


Waves 2 & 3

We have sent 19,677 agronomic messages to more than 3000 SMS treatment farmers in waves 2 & 3. In addition, we have sent eight unique polls to each of these farmers from September 2012 to March 2013.

The graph below presents preliminary take-up results from this initial set of polls. Both free service and business card delivery (increased credibility) substantially increased the response rate relative to the basic service, with the difference statistically significant at 95% confidence level. On the other hand, as expected, farmers in the *long-code* treatment show a lower level of replies, although the difference is fairly small.

² Harvesting typically occurs between 14 to 16 months for ratoon cycles and at 18 months for plant cycles.

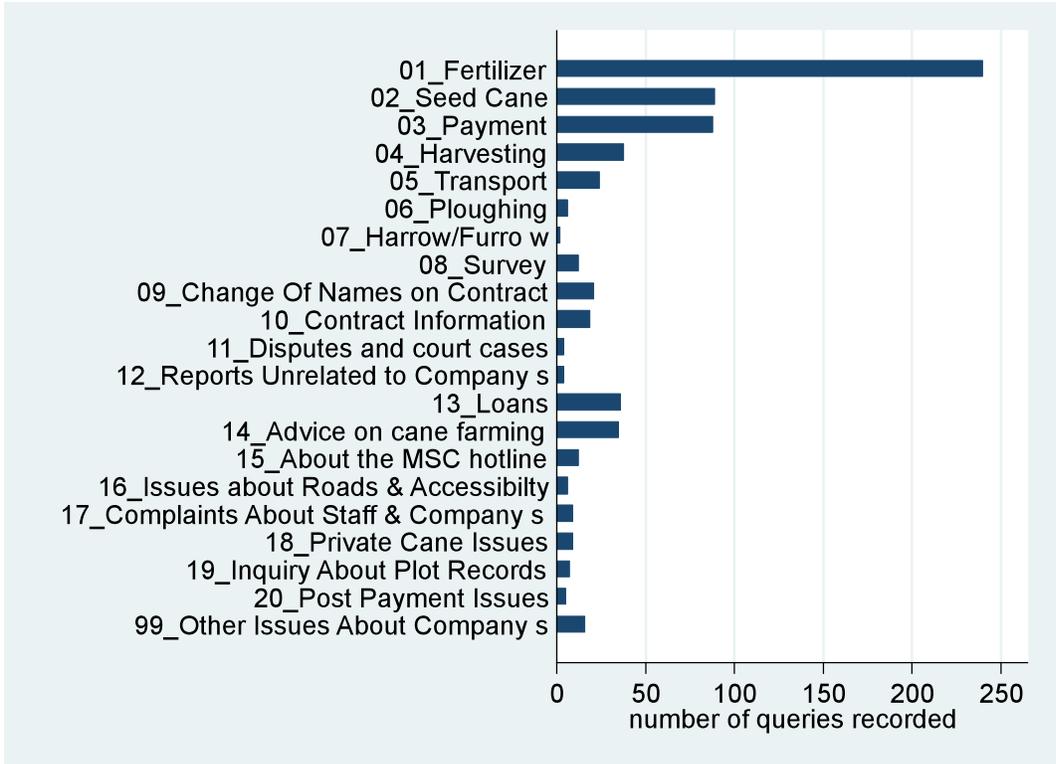


Hotline intervention

All waves

HOTLINE TREATMENT consenting farmers with a registered phone number	2133
Invitation call connected	1792 (84%)
Farmer accepted hotline service	1733 (81%)
Number of farmers logging a query	482 (23%)
Total queries logged	683

Queries are categorized as they are logged on the LANsupport system. The following figure illustrates the most common query types.



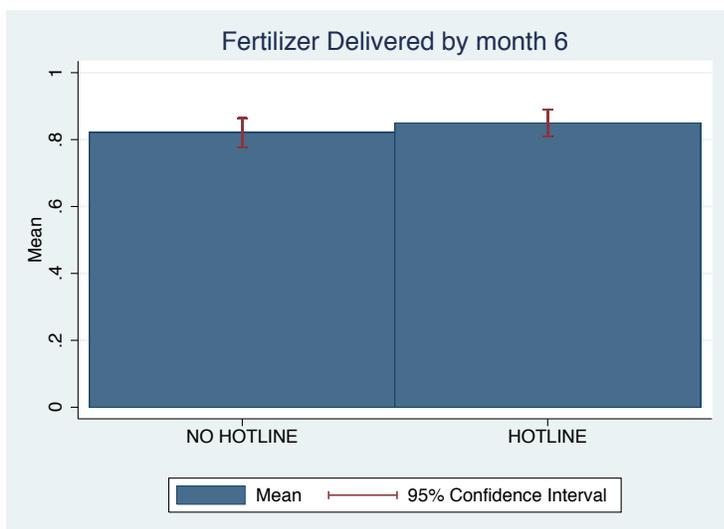
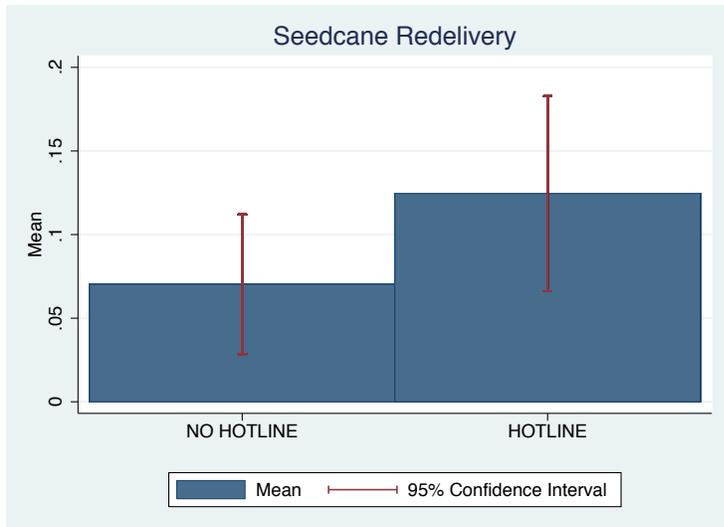
Fertilizer and seedcane queries dominate the list, however there are up to twenty query types that are logged. A brief description of the significance of each is provided below.

Subject	Description
01_Fertilizer	The company supply's fertilizer to farmers on credit twice within the cane cycle. Farmers report delays and also request early in the cycle.
02_Seedcane	Seedcane is also provided on credit at planting. Farmers report delays in supply as well as additional supply due to the common cases of undersupply.
03_Payment	Payments after harvest should be made within the first 2 weeks after harvest. Farmers report delays either in the transaction or actual payment. They also request update on the transaction process from harvesting to payment which usually includes clearances from various departments, perusal of physical farmer files and signing of interim statements.
04_Harvesting	Harvesting should be done around 14 – 18 months, or even later depending on type of seed and soil. Farmers report delays or request early harvesting. Issues about cane delivery notes also arise.

05_Transport	Harvested cane is at times left lying on the plots. Farmers call to report this.
06_Ploughing	Ploughing is done by the company on credit. Farmers report delays
07_Harrow/furrow	Harrow/Furrow is done by the company on credit. Farmers report delays
08_Survey	The company survey's all plots before providing inputs which must be provided according to plot sizes. Farmer call to request survey, report delays or request to know results of survey. They may also request re-survey if the results are unsatisfactory.
09_Change of names on Contract	Farmers' names may be recorded erroneously or contracts change from one farmer to another through sale of land or leases. There is usually a delay in effected changes on the files and/or on the Agricultural Management System used by the company to manage all activities and transactions. Therefore farmers call requesting correction on these.
10_Contract Information	Farmers call to report if they have not signed contracts yet or if they did sign but have not received their copies (farmers sign two copies and the area manager countersigns, one retained by the company and another sent back to the farmer).
11_Disputes and court cases	Cane farming activities on a plot may be stopped by court injunctions. Also ownership disputes among farmers are common. Therefore farmers call to report disputes and also seek advice.
12_Issues unrelated to company services	Farmers sometimes call on issues that may not be linked to a particular company service or staff member.
13_Loans	The company does not offer loans to farmers currently but has an agreement with two banks, Kenya Commercial Bank & Equity Bank and the Agricultural Finance Corporation to offer loans to farmers. Farmers call asking if they could acquire loans, we advise them about the banks the company is working with.
14_Advice on Cane Farming	Farmers calling about agronomic practices like diseases, pests, weeding practices
15_About the MSC Hotline	Since this is a new service, farmers call to ask what it is about and if this will attract a cost against their proceeds after harvest. The service only costs as much they pay on network airtime, unless they are selected for a toll-free group.
16_Issues about roads and	The company constructs roads to ensure that plots are accessible,

accessibility	therefore farmers complain about roads destroyed by company tractors or poor drainage due heavy rains.
17_ Complaints about staff and Company Services	This includes general complaints on staff conduct and company services. Farmer report current cases or some issue they have faced in the past that they feel should be addressed.
18_ Private Cane Issues	The company accepts `private cane' already developed independently by a farmers who decide to contract to the company in order to receive some of the services (on credit) they could afford in the course of the cycle. Farmers call to request contract
19_ Inquiry about plot records	Farmers call to inquire about age, names and other details as recorded on the company's agricultural Management System (AMS).
20_ Post-payment issues	Post-payment issues include erroneous charges on inputs provided by the company. For example seedcane overcharges, charges for ploughing or harrowing yet these were done by the farmer independently and not the company.
99_ Other issues about company services	This include issues that may not require the response of a particular manager and also do not refer to a case that is happening currently. For example a farmer calling to ask that the price of cane be increased, or the cost of transport be lowered, these are issues that are beyond one manager's jurisdiction and may require a collection of opinions to warrant consultation with senior management.

In terms of the influence that the query logging system has on the outcome variables of interest, the efficiency of fertilizer and seedcane deliveries, preliminary results are presented in the two figures below. Specifically, we focus on i) the likelihood that a plot receives a redelivery of cane (the measure is defined only for plan cycle plots); ii) the likelihood that a certain plot receives UREA fertilizer by the six month of the sugarcane cycle (according to the company guidelines, the optimal window for Urea delivery is 120-180 days into the cycle)



These preliminary results suggest that plots in the hotline treatment group experience a substantial increase in seedcane redelivery, although the difference is for now only marginally significant (p -value 0.15). On the other hand, there is no detectable impact on the timing of Urea fertilizer provision.

Further randomization waves will explore several alternatives to raise adoption of hotline services. In particular, one treatment arm will allow farmers to call the hotline at no cost (see next section).

Changes to documented design elements

In September 2012, Mumias Sugar Company had been in negotiations with Safaricom Ltd to set up a toll-free line that could be used to test farmers' sensitivity to price within the hotline intervention. At the time, Mumias Sugar's Finance Department and Safaricom Ltd were negotiating several other corporate agreements and the toll-free setup was delayed throughout 2012 and into 2013.

The preliminary results presented suggest that price sensitivity could be a significant factor in farmers' choices around service use. In March 2013, IPA negotiated a direct financial agreement with Safaricom Ltd to setup a toll-free line as an independent entity. This agreement should take effect in the coming months.

Progress Report

**Mobile Phone Agricultural Extension: Using ICT to
reduce Outreach and Monitoring Costs**

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

June 2013



- Key project milestones (March – June 2013)

- **6809** farmers registered their phone numbers with the Mumias Sugar Company phone services program since March 2013

- Installation of a toll free phone service through Safaricom Limited

- **2064** farmers in **296** fields selected for wave 4 of randomization

- **Change in shortcode number by Safaricom due to regulations by Communications Commission of Kenya (CCK).**

•[Phone Registration of farmers](#)

- More than 6,626 farmers have completed the phone services registration form since January 2013.
- From these we have collected about 7371 phone numbers. Some farmers provide multiple phone numbers.
- 23% (1, 498) percent of the sample are women

Mumias Sugar Company has continued to collect phone numbers from farmers, who have been filling out phone services registration forms at the time of signing their farming contracts, or after harvest, at the time of verification and signing of financial statements.

In an effort to increase the number of phone numbers we collect, especially for farmers who are beginning a planting cycle with Mumias Sugar Company, we have decided to include phone numbers collected by the company at the time of recruitment of new farmers into a planting cycle. A sample of the Replough/New Land Contract Signing List (used for collecting information for new farmers) is included as an appendix.

•[Randomization of farmers](#)

Subsequent randomization waves 4 have led to the selection of 2064 farmers in 296 fields, 947 of whom have a registered phone number.

Out of 1405 farmers selected into the hotline treatment in wave 4 of randomization, 640 accepted to participate in the study.

543 farmers were selected for SMS treatment in the wave 4 randomization

•[Hotline Services](#)

•[Toll Free hotline service](#)

In early piloting activities, we differentiated free and paying farmers by allowing farmers in the free group to 'flash' or make a short call to request an operator to call them back. In April we installed a toll-free phone service with Safaricom as the network provider. Farmers can now call directly to a toll free line. This is an alternative line within Mumias Sugar Company's telephone system set up by Safaricom, who already provides phone services to the company, but paid for by IPA.

•[Queries logged through the hotline service](#)

680 queries have been logged at the hotline since March 2013

78% (532) of these queries have been closed (fully resolved)

- [SMS Services](#)

- [Changes in the short-code numbers by service provider](#)

In May, Safaricom changed the shortcode 4-digit number to 5 digits due to changes in regulation by the Communications Commission of Kenya (CCK). We sent notification to the farmers informing them about this change via text message.

- [Mumias Sugar Partnership](#)

- [Notice of change to Mumias Sugar Company senior management](#)

In June, the Director of Agriculture Department Mr. Moses Nyongesa was replaced in acting capacity by Mr. Wesley Koech, who is also very supportive of the collaborative efforts between the researchers and the company.

- [Reports and meetings with Mumias Sugar managers on progress of hotline service](#)

The managers involved in resolving the queries logged at the hotline receive bi-weekly reports on the status of all queries logged in the period. This is usually followed by monthly meetings aimed at addressing issues coming up with the web-based query logging system used for recording and resolving queries (LANsupport), and also any other point of concern in provision of the service.

MSC/AGR/ODS/W1028

MUMIAS SUGAR COMPANY

OUTGROWERS DEVELOPMENT SERVICES

REPLOUGH/NEWLAND **CONTRACT SIGNING LIST**

Sublocation: _____ DATE: _____

PURCHASE CENTRE: _____

AMS FIELD NOAMS

PLOT NOPARCEL NOPLOT HAFARMER NAMESIDENTITY NOFARMER PHONE NOFARMERS AGENT

SIGN: _____ SIGN: _____

FIELD SUPERVISOR

ZONAL MANAGER

Progress Report

**Mobile Phone Agricultural Extension: Using ICT to
reduce Outreach and Monitoring Costs**

Mumias, Kenya

Innovations for Poverty Action

Grant No. AID-OAA-G-11-00057

December 2013



USAID
FROM THE AMERICAN PEOPLE

Executive Summary

Innovations for Poverty Action (IPA), in collaboration with Mumias Sugar Company (MSC) Kenya, is implementing the USAID funded project, “Mobile Phone Agricultural Extension: Using ICT to reduce outreach and monitoring costs”. Mumias Sugar Company, the largest sugar mill in Kenya, is responsible for 40 percent of the nation’s sugar supply and contracts more than 100, 000 farmers. The researchers, in collaboration with the Agriculture and the ICT departments of the partner company, have designed two pilot projects. First, they explore whether the development of an integrated mobile-based query system can improve the company's performance in the management of the provision of inputs to the company cane suppliers (the contracting farmers). Second, they test whether an interactive communication scheme via SMS can improve the company’s ability to monitor cane suppliers’ activity in the field. This study employs randomized evaluation methodologies to rigorously assess the effectiveness of the range of phone services offered to farmers within the MSC scheme.

Registration of farmers for phone services takes place when they sign their farming contracts for a plant cycle and at the time of verification of and signing of financial statements. The phone services registration forms are appended to contract documents and also attached to financial statements and have been filled by farmers since January 2012.

The pilot study is funded by Mumias Sugar Company and by a USAID Development Innovation Ventures award. This quarterly report details the activities that have taken place between June – December 2013.

Key project milestones (June - December 2013)

- More than **11, 900** farmers have completed the phone services registration form since June 2013.
- **18, 153** phone numbers have been collected since June 2013.
- **18%** of these have been collected at the time of recruitment of new farmers into a planting cycle. We introduced this in June.
- Sent 30 polls since June 2013
- 1814 farmers from 326 fields selected in wave 5 of randomization
- New Managers responsible for providing services to farmers were re-assigned within the agriculture department at Mumias Sugar Company. This increased the number of managers responsible for resolving farmers' queries to two for each of the 7 designated areas/zones. We have held meetings with each of these new managers to ensure they are properly informed about the evaluation.
- Hotline Service and LANsupport training was completed for the 10 new managers.

Registration of farmers for phone services

We have continued to register farmers for phone services when contracts are signed, as well as after harvest, and at the time of verification of and signing of financial statements. We have also been collecting farmers' phone numbers at the time of recruitment of new farmers into a planting cycle, which has increased the number of phone numbers collected by **3, 195 (24%)**. The forms used during recruitment of new farmers into a planting cycle are collected earlier than the phone registration forms, therefore giving us a better chance at providing services to the farmers at the beginning of a cycle when they are selected into the interventions.

More than **11, 900** farmers have completed the phone services registration form since June 2013. Of the 11,900 farmers, **9, 900** have registered at least one phone number. However, the total number of phone numbers collected from the farmers is **13, 095** since June 2013 including those collected from recruitment forms used at the time of recruitment of new farmers into a plant cycle.

25% of those who completed the phone services registration form since June 2013 are women.

So far about **52, 446** phone numbers have been collected by Mumias sugar from more than **62,000** farmers who have been filling the forms since January 2012.

Randomization of farmers into interventions

As cane suppliers in the scheme enter the new harvest cycle in a staggered fashion, the experimental design is implemented in waves. Approximately every 3 months, since late 2012, a subsample of cane suppliers are included in one of the randomization waves. Farmers are then selected to participate in either the mobile-phone based hotline or SMS-based interactive scheme using a randomization method. Randomization wave 5 took place in July 2013 and resulted in the selection of **1, 814** farmers in **326** fields, **1,239** of whom have a registered phone number.

Mobile Phone Based Hotline

The hotline intervention is a customer-care service offered to farmers. Farmers are able to call a designated hotline number and log queries with a Mumias Sugar Company hotline operator. Farmers are randomized into either the free hotline, within which farmers do not have to pay for the service, or the paid hotline. Standard local calling fees are applied to the paid hotline.

Wave 5 of randomization of farmers into the hotline service occurred in July 2013. A total of **1,257** farmers were selected into this service. Out of the **1,257** farmers selected, **572** farmers had phone numbers and **77%** accepted to participate in the study.

35% of those who accepted logged a query at the hotline at the time of introduction to the service.

Queries logged through the hotline service

279 queries have been logged at the hotline since June 2013. **95%** (267) of these queries have been closed (fully resolved).

Mumias Sugar qualitative observation of hotline queries

Queries logged at the hotline have accurately reflected farmers' issues and concerns about company services. Farmers are more concerned about fertilizer supply and payment according to Mumias Sugar Agriculture Department and these issues dominate discussions at farmers meetings and are reported frequently at the field offices.

40% of all queries logged since July 2012 are about fertilizer supply and **18%** about payments issues. However payment queries have increased recently as result of delays by the company to pay out after harvest. Since July 2013; **30%** of the queries are about payment and **38%** about fertilizer.

Management of farmer care LANsupport

LANsupport is the query-logging software platform to manage queries entered through the farmer hotline service. It is a web based application; this means that all the Computers on the company network can access the portal via a url link that the administrator of the system provides.

Mumias Sugar has increased the number of managers in charge of providing services to famers from one to two in each of the seven administrative zones. This has also increased the number of managers responsible for resolving farmers' queries at the hotline from one to two for each zone. This has improved the query resolution rates as seven more managers were provided with access to the Farmer Care LANsupport where all farmers' queries are logged.

SMS Services Intervention

Over the current reporting period, the SMS intervention has included 4 different treatment designs:

Treatment 1

STANDARD – SHORTCODE: Farmers receive reminder messages from a customized Mumias Sugar Company shortcode. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay normal network SMS rates to reply to the message.

See appendix (A) for message content for polls on Loans and Kenya Commercial Bank

Treatment 2

CREDIBILITY – SHORTCODE: Farmers receive a personalized business card from trusted and familiar field staff from Mumias Sugar Company. The card includes necessary details about the shortcode. Farmers then receive reminder messages on critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay normal network SMS rates to reply to the message.

Treatment 3

FREE SERVICE – SHORTCODE: Farmers receive reminder messages from a customized Mumias Sugar Company shortcode. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay normal network SMS rates to reply to the message.

Treatment 4

LONGCODE: Farmers receive reminder messages from a standard 07xxxxxxx phone number. Messages related to critical Mumias Sugar services such as fertilizer delivery and farmers are requested to provide feedback. Farmers pay normal network SMS rates to reply to the message.

Farmers in the SMS interventions arm have also been participating **in interactive SMS polls**. These polls are designed to test farmers' interaction with an SMS service, as measured by number of responses received from the farmers. SMS polls were developed in collaboration with Mumias Sugar Company.

Mumias Sugar Partnership Update

The relationship between the researchers and MSC continue to go well. In order to keep all parties updated on activities, regular reports (bi-weekly) detail the status of all queries logged in the period and are sent to MSC management staff involved in the project. Once a month a meeting with senior managers is also held to discuss progress of hotline services.

Mumias Sugar Company Agriculture Department

In August, the management team at the Outgrowers Development Services section of the Agriculture Department was re-organized. This occurred for a number of reasons: 1) the zones were changed for administrative purposes, and therefore required a new management structure; and 2) MSC wanted new managers to join the team. Subsequently, this directly impacted the management of the hotline services since these managers are responsible for resolving farmers' queries. Previously we had one manager per administrative zone, but due to the changes two managers were assigned to a zone each responsible for different services to the farmers.

Training of new managers on use of hotline service resources

We have conducted joint training with the ICT department for new managers responsible for providing services to the farmers. By the end of August all new managers had been trained and given access to the farmer care LANsupport.

Appendix A

Polls on Loans and Kenya Commercial Bank

Content	Description
Have you ever attempted to borrow money from a bank? Were you successful? A: YES, B: NO, C. Never tried to borrow from a bank	Testing farmers if farmers have access to banking services
When do you most need to borrow money? A: before planting, B: 1-6 months, C: 6-10 months, D: 10 months-harvest, E: it doesn't depend on certain period in cane growth	Testing when farmers are most likely to need loans
When farmers apply for loans how is their applications processed? A. Quickly, B: Always delays, C: Depends on the farmer/bank, D: Not processed at all.	Testing farmers experience with borrowing from banks
According to you, does MSC have an arrangement with any bank to provide loans to MSC farmers? A. YES, B. NO, C. DON'T KNOW	Some banks have made agreements with the company to provide loans to farmers. Testing if farmers know this
One of the banks that offers loans to MSC farmers is KCB. Would you like to know the requirements for acquiring a loan with KCB? A. YES, B. NO	Testing farmers interest in borrowing from Kenya Commercial Bank
To access a KCB loan; you must have an active account with KCB. Do you have an account with KCB? A. YES, B. NO	Testing to see the number of farmers in the sample who have accounts with Kenya Commercial Bank
Do you know the interest rates on Kenya Commercial Bank Loans? A. YES, B. NO	Testing farmers knowledge of Kenya Commercial Bank loans
Would you like to request a loan from KCB? A. YES, B. NO, C. I need more information about KCB Loans	Testing farmers interest in borrowing from Kenya Commercial Bank

Final Report for USAID-DIV Grant
AID-OAA-G-11-00057

Prepared by Dr. Lorenzo Casaburi
Submitted by Innovations for Poverty Action

EXECUTIVE SUMMARY

A growing literature highlights the importance of access to information and communication technologies on firm management practices and productivity (Garicano and Van Zandt, 2012; Bloom et al., 2010; Paravisini and Schoar, 2013). This study adds to the existing literature by providing rigorous evidence on the impact of innovations in the management information system of a large private sector company in Sub-Saharan Africa.

The research project, conducted in partnership with one of the largest agribusiness companies in Kenya, studied how innovations in management information systems affect firm performance. The partner company runs a 100,000 plot sugarcane contract farming scheme. In collaboration with the Agriculture and the ICT departments of the partner company, the team designed two pilot projects. First, they explored whether the development of an integrated mobile-based query system can improve the company's performance in the management of the provision of inputs to the company cane suppliers (the contracting farmers). Second, they tested whether sending farmers SMS with agricultural advice improved cane suppliers' productivity.

The two pilots were evaluated through a randomized controlled trial (RCT). The analysis relied on unique administrative data provided by the company which include detailed information input provision and cane suppliers' yields.

The mobile-based query system improved firm performance in input delivery. Specifically, it reduced by 54% the likelihood that a supplier did not receive fertilizer from the company (from 7.4% to 4%) and by 23% the likelihood that a supplier did not receive the fertilizer within the time window recommended by the company agricultural department.

There is evidence that the mobile-based query system induced positive geographic spillovers, since it induces the company to deliver inputs to several neighboring plots. On the other hand, the intervention had no statistically significant impact on cane suppliers yields, though the exploratory project had limited statistical power to detect such an effect.

The SMS intervention did not have an impact on yields. Further experimental variation points at the importance of credibility of the information source in shaping farmer response to the message.

The study implies that communication costs may be an important determinant of firm performance for large companies in developing countries. This is particularly relevant when they when they interact with a large number of suppliers, as it is the case of firms dealing with many small farmers that provide inputs. Reducing communication costs may therefore reduce frictions along the value chain, increasing their efficiency. The researchers and the partner company are currently exploring the option to scale up the intervention to the rest of the firm suppliers.

ACTIVITIES UNDERTAKEN

Background

The research described in this report was conducted in partnership with one of the largest agri-business companies in East Africa. The company runs a large sugarcane contract farming scheme, involving mostly smallholders with plot sizes less than one hectare. Following the establishment of five outgrower schemes between 1968 and 1981, sugarcane has become the most common cash crop in the region of study. High transport costs, combined with economies of scale in processing, thus give the factory substantial market power as a cane buyer.

Each harvest cycle lasts from 18 to 22 months. The company and the farmer sign a contract that typically spans for one replant cycle, made up of one planting and several ratoon harvests.¹ Planting and harvesting occur in a staggered fashion throughout most of the year, in order to provide a constant supply of cane to the processing mill. Sugar production processing requires high coordination across harvesting, transporting, and processing. Processing needs to occur shortly after harvesting as sugar content starts declining after the cane is cut. Each plot is typically matched to one parcel as defined by the Kenyan land registry. In addition, accounts are aggregated into *fields*, sets of plots that are usually treated homogeneously for land preparation, input provision, and harvesting, in order to exploit economies of scale in these activities.

Farmer Hotline

With support from PEDL we implemented three interventions in partnership with the company. We describe them below. The first intervention aimed at improving communication flowing from the farmers to the company. Farmers have information that is valuable for the company. Lower level managers and external contractors manage most of the delivery activities, often following interactions with lower level managers of the company. The monitoring of such activities is costly. For instance, while the company collects data on input deliveries, compiling and analyzing such data is a time-consuming task. In addition, higher-level manager time is often required to address problems in delivery timing and inputs.

Anecdotal evidence from field visits suggests that delays and low performance in input delivery are an important source of concern for the farmers. Field assistants face substantial time constraints and often delay in visiting the fields. As a result they also delay assigning them to fertilizer delivery. In some instances, a plots even fails to receive fertilizer at all during the harvest cycle. In certain cases, farmers find it worth to travel all the way to the company main offices to resolve their issues. This picture finds support in the company administrative data. Figure 1 presents the distribution of delivery dates for Urea fertilizer in the year before the study. According to the agronomy department guidelines, this type of fertilizer should be delivered between the fourth the sixth month of the cane. However, the figure shows that, in the year preceding the intervention, about 30% of the fields experience a delay relative to this optimal time window.

¹ Ratooning leaves the root and lower parts of the plant uncut at the time of harvesting. Yields typically fall across ratoons. A contract typically spans two or three ratoons.

A low ratio of field assistants to farmers and high transport costs between the fields and the company offices limit opportunities for the farmers to report problems with the company and contractors' performance. The farmer hotline enabled farmers to report delays or other problems concerning input delivery and other tasks (e.g. payments). The hotline service included two main components. First, farmers had the opportunity to make calls to a dedicated number during office hours. Second, farmers received periodic calls (approximately every two months) from the hotline operators in which they were explicitly asked to report any query they may have about the company services. Recorded queries were then channeled to the relevant company department.

Farmer SMS

The second intervention focuses on communication flowing from the company to the farmers. In this setting, mobile phones offer the opportunity to deliver personalized agricultural information to farmers at low cost and in a way that is tailored to their context and timed to coincide with the relevant part of the agricultural season. The company can also use SMS as a cheap tool to signal that it is monitoring the cane development in the field.

The intervention team compiled a list of messages to be sent to farmers subscribing for the service. The content of these messages was primarily based on the age of the cane and on the harvest cycle (i.e., plant vs. ratoon). The messages warned the farmer about the need to complete a task on the plot. For instance, with regards to weeding: "Hello Mr./Ms. {farmer name}. It is 12 weeks since you planted, your plot may have weeds by now from the last time you weeded your plot; Please remember to weed this week". Similar messages concerned other tasks such as trashlining (i.e. sorting of the leaf trash from the previous harvest), intercropping, and parasite controls. Other messages were prompted by the timing of delivery of company provided inputs, such as fertilizer: "Hello Mr./Ms. {farmer name}, fertilizer (UREA) will be delivered in your field/bloc shortly/soon. Please prepare to receive and apply in time because timely fertilizer application is essential for good cane growth."

Farmer Polls

The third intervention explored alternative strategies the company could use to improve the communication flow with the farmers. Specifically, we ran several polls via SMS. These asked questions about farmer preferences (e.g. "would you be interested in receiving chemical herbicides on credit from the company"), farmer information about company practices (e.g. "where are the company weigh-bridges?"), and farmer characteristics (e.g. "do you have a saving account"?). The goal of this last component of the project was to shed light the role of credibility in fostering communication patterns along the value chain. A subsample of farmers received the poll via SMS and had to pay a fee to reply. We introduce several variations of this basic treatment in order to shed light on the importance of credibility of the source. In one treatment, we deliver a company brochure about the survey to a subset of farmers. In another subsample, we increase the uncertainty about the source by sending SMS from a regular 10-digit number as opposed to the dedicated short-code. These long codes are more likely to be associated with less reliable and respectable sources. Finally, we waive the SMS cost to another subsample of farmers

METHODOLOGY

The main study covered a total of 8,414 farmers in 8,081 plots in 1,089 fields.² During the recruitment for the interventions, farmers of 4,041 farmers in 3,768 plots, out of the 8,081 included in the study, recorded their cell phone number and qualified as eligible for the service in the case in which their field was randomized into the treatment group. An additional 1,878 farmers in 1,801 plots were only eligible for the *Farmer Polls* intervention, as they entered the intervention in an advanced stage of the cane cycle. Of the 8,414 in the main sample, approximately 23% were women.

For logistical purposes, the recruitment targeted fields that had recently entered the new cane cycle, as opposed to fields that were about to harvest. The evaluation relies on a randomized controlled trial. Randomization occurred at the field level and was conducted in three waves with minor variations across the three waves. 4,361 (54%) plots accessed the hotline,³ 64% accessed the sms intervention system.⁴ The sms treatment plots were then randomized to the four farmer-poll treatments: basic treatment, business card, long code, fee waiving. Most fields had both eligible and non-eligible plots. Tables 1 and 2 show that the baseline balancing for the hotline and the sms, respectively, presenting separate tests for eligible and non-eligible farmers. The tables confirm the randomization achieved balance across most of the baseline outcomes. However, we note that the SMS group was more likely to be in the ratoon 2 cycle and to experience a delay in fertilizer delivery at baseline.

The analysis of the impact of the interventions uses administrative data from the partner company. We focus on three main outcomes. First we look at how access to the hotline impacted input delivery. Since, as mentioned above, the interventions started after a plot had already entered the new cycle, we focus our analysis on Urea fertilizer, typically delivered a few months into the cycle. We cannot study seedcane and DAP fertilizer deliveries, since most of the plots in our sample had already received these inputs by the time they entered the hotline treatment.

Second, we examine the impact of both the hotline and the SMS intervention on plot yields. One important concern related to the analysis of these first two outcomes is that we observe a substantial amount of attrition. Endline yield data are missing for about 25% of the sample. For the most part, this attrition comes from plots that decided not to renew their contract with the partner company at the end of the cycle that got completed before the intervention. The recording of such instances in the company data typically occurs with some delay. As such, these fields were initially included in the sample we used for the randomization. We verify that the attrition rate does not vary by treatment status.

² A pilot phase involved 3,658 farmers in 3,594 plots in 368 fields.

³ In wave 1 and 2, we allocated 50% of the fields to the hotline. Wave 3 featured three groups: paid hotline, free hotline, no hotline. We ignore the distinction in this report and just consider 2/3 of the fields as treated for this wave.

⁴ In wave 1 and 2, we allocated 2/3 of the fields to the SMS treatment and these were split across the four farmer-poll groups. For logistical purposes, we could not implement the long-code farmer-poll group in wave 4. Thus, in this wave, we allocated 60% of the fields to the SMS treatment, and then split them across the other three farmer-poll groups.

Finally, we focus on response rates in the farmer poll intervention. We study how the long-code, the business card and the fee waiver affected these rates when compared to the basic group.

RESEARCH FINDINGS

Hotline

Based on company records, about 13% of the eligible farmers in treatment fields reported a complaint through the hotline. In turn, this implied that 70% of the treatment fields had an entry logged in the system. About 38% of the reported issues concerned fertilizer deliveries, followed by queries on payments and harvesting. About 91% of the complaints were marked as resolved by the hotline operators.

First, we look at the impact of hotline on input delivery. Specifically, the analysis focuses on two main outcomes, obtained from the company administrative data: the likelihood that a plot does not receive the Urea fertilizer during the cycle and the likelihood that it does not receive Urea within the recommended time window (i.e. between the fourth and the six month of the cane cycle). Table 3 presents the results of the evaluation for the eligible plots (i.e., the plots whose farmers recorded their phone numbers). Column (1) shows that the likelihood that a plot does not receive fertilizer decreases by 3.8 percentage points among eligible plots in the treatment fields (compared to eligible plots in control fields), significant at 5%. This is equivalent to 36.5% of the control group mean. The coefficient is stable when we add the plot-level controls (Column 2). Column (3) focuses on the likelihood that the Urea fertilizer is not received within the optimal time window identified by the agronomy department. The treatment group average falls by 8.5 percentage points for eligible plots in treatment fields, 21.6% of the mean for eligible plots in control fields. Again, the coefficient is stable when adding plot-level controls.

Input delivery is highly clustered by field: contractor trucks typically deliver fertilizer to most plots in a given field in the same day. This generates an important scope for positive geographic externalities: a query reported by one farmer in a given field will likely affect the relevant input delivery outcomes for other farmers in the same field. Table 4 reports a similar analysis for neighbors of the targeted plots (i.e., comparing non-eligible plots in treatment fields vs. non-eligible plots in control fields). Columns (1) and (2) show that there is no significant impact on the likelihood that a plot does not receive fertilizer. However, in columns (3) and (4), we observe that non-eligible plots in treatment fields experience a reduction of 7.5 percentage points in the fertilizer delivery delays (19.8% of the average for non-eligible plots in control fields), significant at 5%.

Conversations with the staff in charge of the project suggest that access to the hotline enabled farmers to bypass multiple layers in the company hierarchy, represented in Figure 2. Specifically, through their complaints, farmers were able to communicate much faster with the high level managers of the outgrower service department and with the coordinators of fertilizer deliveries, instead of relying on (sporadic) interactions with lower level field assistants and with representatives of the input delivery contracting firms. This in turn generated positive geographic spillovers for those non-eligible farmers. These farmers,

while not included in the hotline intervention, benefited from the company response in input delivery, since this typically targeted most plots in a given field

Table 5 shows that these gains in input delivery did not lead to statistically significant gains in yield improvements. Given that the program had impact on input delivery both eligible and non-eligible plots in treatment fields, we pool the sample. The confidence intervals on the main coefficient of interest are quite large and prevent us from drawing conclusive evidence. One obvious explanation for this non-result is that the magnitude of the intervention “first stage” on input delivery. Delivery outcomes improve but only by a few percentage points. This is too small to pick an impact on yields.

Farmer SMS

In a previous round of the SMS Intervention (funded by another donor), we had found a large, though not always precise, impact of the SMS on yields. The PEDL grant allowed us to replicate the intervention on a larger sample. Table 6 shows that, in this new round, SMS have a positive but not statistically significant impact on yields (we focus only on eligible plots in treatment and control fields). Similarly, there is no impact on farmer revenues. We also look at whether the intervention induced heterogeneous impact by plot size or baseline productivity and find no evidence of such heterogeneity.⁵

We are currently investigating potential reasons for the difference in the results across the two rounds. One candidate is that combining the agronomic messages with the farmer-polls generated an overload effect that mitigated the farmer response. Second, in the previous round, all farmers (treatment and control) received a plot assessment during the cane cycle to look at the impact on farmer practices. It is possible there was a complementarity between the plot assessment and the SMS intervention. We are currently discussing with the partner company the option to run a third round to test these competing hypotheses.

Farmer Polls

Finally, Table 7 presents the results of the survey response trials. The comparison across the different treatments is presented in column (1). We find that providing farmers with a brochure increases response rates by 3.6 percentage points, or 51% of the basic group mean. This amounts to 64% of the increase we observe when waiving the SMS price to the farmer (5.6 percentage point). We argue that the brochure reduces uncertainty about the source. However, it could also affect response rates by inducing farmers to pay more attention to the messages (a “de-cluttering” effect). In addition, we find that sending SMSs from a long-code lowers response rates by 2.1 percentage points (relative to the standard short-code). Finally, for a subset of survey polls, we vary the nature of the question sent to different farmers. Specifically, in these polls, a subset of questions is labeled as confidential, as farmers were asked about their account, input charges and payment terms. In column (2) of Table 10, we show that the impact of the long-code on response rates is significantly more negative when the SMS surveys request the farmer to include confidential information in their response. We interpret the results from these trials as consistent with

⁵ Given the lack of an impact on yields of the targeted farmers, it is not surprising that the program did not affect yields of non-eligible plots that were neighboring eligible plots in targeted fields.

the hypothesis that credibility of the source is an important determinant of the volume of information flows across agents in the value chain.

SUMMARY OF POLICY IMPLICATIONS

The study implies that communication costs may be an important determinant of firm performance for large companies in developing countries. This is particularly relevant when they interact with a large number of suppliers, as it is the case of firms dealing with many small farmers that provide inputs.

Based on our pilot results, information communication technology can substantially decrease communication costs and in turn mitigate frictions along the value chain. Specifically, in our setting, the company responds to the reduction in communication costs with the supplier by improving performance in input delivery.

The researchers and the partner company are currently exploring the option to scale up the intervention to the rest of the firm suppliers. Intervention like the mobile-based query recording system have a fairly low marginal cost but may also feature a fixed cost component (system setup; phone number recording). The funding for these fixed costs may be an important opportunity for donors who are focusing on ICT and private sector growth in developing countries.

OUTPUTS, ACTIVITIES, AND POLICY OUTREACH

Please provide details of any outputs (publications, datasets, etc) produced since the beginning of the project.

Use the table below to list any dissemination activities you have engaged in through verbal communications such as:

- organisation of meetings to discuss or present the research to audiences of both academics and policy-makers;
- presenting the results at seminars, workshops or conferences organised by other people;
- further grant applications
- dissertation chapters, working papers, other written work
- communication with the media about your research.

Type of dissemination activity (e.g. workshop/conference)	Title	Date	Place	Website (if available)
Conference	<i>Management Information Systems and Firm Performance: Experimental Evidence from a Large Agribusiness Company in Kenya</i>	<i>Mau 2013</i>	<i>NBER</i>	<i>http://pedl.cepr.org/node/2141</i>
Conference	<i>"</i>	<i>Sep 2013</i>	<i>USAID Basis Meeting</i>	<i>http://basis.ucdavis.edu/?ai1ec_event=basis4-technical-committee-meeting&instance_id=179</i>
Conference	<i>"</i>	<i>Dec</i>	<i>IPA-</i>	<i>http://www.cepr.org/793</i>

		2013	SME/PEDL Conference London	
Workshop	"	Mar 2014	UC Davis	https://are.ucdavis.edu/en/department/seminars/2014/3/10/lorenzo-casaburi/?edit=&edit=&edit
Workshop	"	July 2014	IPA Kenya	Not available
Workshop	"	Jun 2014	U Washington	http://evans.uw.edu/about/events/2014/06/06/joint-seminar-development-economics-michael-kremer-harvard-university
Interview	Please remember to weed your plot	Sep 2013	Development Innovations Blog	https://www.devex.com/news/please-remember-to-weed-your-plot-81840
Grant application	Tailoring Contract Farming to Smallholders	June 2013	USAID Basis	http://basis.ucdavis.edu/2013/12/11/tailoring-contract-farming-to-smallholders-experimental-evidence-on-enrollment-impact-insurance-provision-and-communication-technologies/
Working paper (under review)	Harnessing ICT to Increase Agricultural Production	March 2013	N/A	http://web.stanford.edu/~casaburi/casaburi_et_al_ICT_Agriculture_20140306.pdf

Tables

Table 1: Randomization Balance: SMS Intervention

	Control	SMS	p-value	N
Plant Cycle	0.45 (0.50)	0.43 (0.49)	0.49	2327
Ratoon 1 Cycle	0.15 (0.36)	0.11 (0.31)	0.53	2327
Ratoon 2 Cycle	0.40 (0.49)	0.46 (0.50)	0.44	2327
Plot Size (ha.)	0.53 (0.39)	0.53 (0.45)	0.88	2327
Zone 1	0.24 (0.43)	0.32 (0.46)	0.22	2327
Zone 2	0.16 (0.37)	0.18 (0.39)	0.45	2327
Zone 3	0.21 (0.41)	0.18 (0.38)	0.68	2327
Zone 4	0.16 (0.36)	0.16 (0.37)	0.69	2327
Zone 5	0.23 (0.42)	0.16 (0.37)	0.23	2327
Leased Plot	0.03 (0.16)	0.02 (0.14)	0.33	2327
Telephone Farmer	0.18 (0.38)	0.18 (0.38)	0.81	2327
Baseline Yields	49.15 (27.36)	50.25 (26.37)	0.66	1898
Spoke to Company Staff in Last Month	0.31 (0.46)	0.30 (0.46)	0.67	1627
Agronomy Training in Last 12 Months	0.15 (0.36)	0.16 (0.36)	0.98	1643

Notes: All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * p<0.1, **p<0.05, ***p<0.01.

Table 2: Randomization Balance: Cash Advance Intervention

	Control	Conditional Cash Advances	p-value	N
Plant Cycle	0.45 (0.50)	0.43 (0.50)	0.47	2327
Ratoon 1 Cycle	0.11 (0.31)	0.15 (0.36)	0.15	2327
Ratoon 2 Cycle	0.45 (0.50)	0.42 (0.49)	0.11	2327
Plot Size (ha.)	0.53 (0.43)	0.52 (0.41)	0.88	2327
Zone 1	0.25 (0.44)	0.30 (0.46)	0.38	2327
Zone 2	0.19 (0.39)	0.15 (0.36)	0.60	2327
Zone 3	0.21 (0.41)	0.18 (0.38)	0.52	2327
Zone 4	0.15 (0.36)	0.16 (0.37)	0.83	2327
Zone 5	0.19 (0.40)	0.20 (0.40)	0.83	2327
Leased Plot	0.03 (0.16)	0.02 (0.14)	0.33	2327
Telephone Farmer	0.18 (0.38)	0.18 (0.38)	0.79	2327
Baseline Yields	49.90 (26.54)	49.52 (27.19)	0.45	1898
Spoke to Company Staff in Last Month	0.33 (0.47)	0.28 (0.45)	0.01**	1627
Agronomy Training in Last 12 Months	0.15 (0.36)	0.16 (0.37)	0.99	1643

Notes: All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Interventions Take-up

	SMS		Cash Advance	
	(1)	(2)	(3)	(4)
Take-up Rate	0.657*** [0.014]		0.580*** [0.015]	
Ratoon 1 Cycle		0.043 [0.051]		-0.038 [0.046]
Ratoon 2 Cycle		-0.025 [0.034]		-0.065* [0.034]
Plot Size (ha.)		-0.027 [0.031]		-0.042 [0.035]
Zone 1		-0.087** [0.042]		-0.124*** [0.040]
Zone 2		-0.081* [0.047]		-0.118** [0.049]
Zone 3		-0.080* [0.047]		-0.174*** [0.045]
Zone 4		-0.093* [0.048]		0.006 [0.046]
Baseline Yields		0.000 [0.001]		0.001 [0.001]
Telephone Farmer		-0.243*** [0.036]		-0.390*** [0.037]
Leased Plot		-0.108 [0.101]		-0.169* [0.100]
Observations	1172	1172	1145	1145

Notes: All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: : Entry into the Project Cane Cycle

	(1)	(2)
SMS	0.023 [0.029]	0.017 [0.027]
Cash Advances	0.049* [0.030]	0.036 [0.027]
Mean Y Control	0.793	0.793
Observations	2327	2327

Notes: All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Conditional Cash Advances: Yield Regressions

	Yields		
	(1)	(2)	(3)
SMS	3.354*	3.382**	3.374**
	[1.725]	[1.544]	[1.540]
Cash Advances	-0.959	-1.065	-1.057
	[1.698]	[1.495]	[1.492]
Plot Controls	N	Y	Y
Extra Controls	N	N	Y
Mean Y Control	42.560	42.560	42.560
Observations	1849	1849	1849

Notes: Yields are measured as tons per hectare. All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Yield Regressions Robustness

	With zeros	Winsor Top 99	Winsor Top 95	Log	Drop Plots <.2ha
	(1)	(2)	(3)	(4)	(5)
SMS	3.284*	3.154**	2.799**	0.059	3.099**
	[1.771]	[1.456]	[1.322]	[0.039]	[1.553]
Cash Advances	0.697	-1.196	-1.225	-0.043	-1.542
	[1.715]	[1.398]	[1.277]	[0.040]	[1.456]
Average Y Control	33.729	42.411	41.635	3.574	41.917
Observations	2327	1849	1849	1849	1714

Notes: Yields are measured as tons per hectare. All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * p<0.1, **p<0.05, ***p<0.01.

Table 7: SMS: Heterogeneity by Baseline Survey Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SMS	3.589*	3.867**	5.999***	5.381***		4.299**	4.588**	
	[1.909]	[1.749]	[2.128]	[1.943]		[2.073]	[1.865]	
SMS*Spoke to Company Staff			-8.402***	-5.579**	-6.057**			
			[2.929]	[2.583]	[2.623]			
Spoke to Company Staff			4.950**	4.722**	4.831***			
			[2.106]	[1.871]	[1.858]			
SMS*Agromony Training						-6.075*	-7.528**	-7.556**
						[3.374]	[3.048]	[3.014]
Agromony Training						2.107	2.848	2.773
						[2.373]	[2.275]	[2.258]
Controls	N	Y	N	Y	Y	N	Y	Y
Controls Interactions	N	N	N	N	Y	N	N	Y
Mean Y Control	41.871	41.871	42.124	42.124	42.124	41.885	41.885	41.885
p-value main coeff+interaction			.	0.938		.	0.303	
Observations	1391	1391	1343	1343	1343	1342	1342	1342

Notes: Yields are measured as tons per hectare. All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * p<0.1, **p<0.05, ***p<0.01.

Table 8: Plot Assessment Scores

	Plot Assessment 1		Plot Assessment 2		Plot Assessment 1 and 2	
	(1)	(2)	(3)	(4)	(5)	(6)
SMS	0.128 [0.438]	0.126 [0.411]	0.105 [0.292]	0.152 [0.291]	0.025 [0.304]	0.036 [0.288]
Cash Advances	1.529*** [0.451]	1.684*** [0.437]	0.508* [0.297]	0.556* [0.295]	0.896*** [0.301]	1.025*** [0.293]
Controls	N	Y	N	Y	N	Y
Mean Y Control	38.316	38.316	40.913	40.913	39.606	39.606
Observations	1818	1818	1804	1804	3622	3622

Notes: The dependent variable is the score assigned by the company field assistant to the plot assessment. The scale is 0-50. All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: MIWA Endline: Number of Times Task Performed

	Plant	Intercrop	Trashline	Weed	Apply Fertilizer	Gap	Smut Control	Firebreak
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SMS	-0.005 [0.017]	-0.006 [0.013]	0.038 [0.024]	0.148 [0.098]	-0.072 [0.051]	0.002 [0.026]	0.013 [0.025]	0.006 [0.021]
Cash Advances	-0.003 [0.018]	0.002 [0.012]	0.010 [0.024]	0.107 [0.102]	0.082 [0.051]	0.062** [0.026]	-0.072*** [0.026]	0.023 [0.020]
Mean Y Control	0.296	0.062	0.229	4.363	1.215	0.148	0.109	0.056
Observations	1701	1701	1701	1700	1700	1701	1700	1700

Notes: The dependent variables capture the number of times a certain activity was completed on the plot. All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10: Hours Worked

	plant	trashline	fertilizer	smut	firebreak	weeding
	(1)	(2)	(3)	(4)	(5)	(6)
SMS	-2.995	1.045	0.167	-0.134	-0.492	-10.819
	[2.219]	[2.569]	[0.803]	[0.476]	[0.548]	[13.755]
Cash Advances	-0.948	-0.816	0.368	0.242	-0.117	-10.338
	[2.072]	[2.569]	[0.812]	[0.462]	[0.472]	[13.073]
Mean Y Control	36.667	27.869	12.447	2.055	3.227	227.134
Observations	1687	1638	1669	1641	1678	1509

Notes: The dependent variables capture the total number of labor hours spent on a given task. These include both household labor and hired labor. All the regressions include field-level stratification dummies. Standard errors are clustered at the field-level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.