Private Enterprise Development in Low-Income Countries

Management Information Systems and Firm Performance: Experimental Evidence from a Large Agribusiness Company in Kenya

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A randomized experiment run in partnership with a large agri-business sugar company in Kenya shows that a mobile-based query system can improve the company's performance in the management of the provision of inputs to the company's cane suppliers and generate positive geographic spillovers. Given the limited sample size, it was not possible to confirm or to rule an effect on sugar cane yields. In another intervention, the company sent test messages with agricultural advice to cane farmers. In contrast to a previous trial, this treatment had no significant impact on cane yields. The research team is currently investigating the potential reasons for the different outcomes in response to the treatment.

Introduction

A growing literature highlights the importance of access to information and communication technologies on firm management practices and productivity[1]. This project 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 was based on collaboration with a large sugar producing company in Kenya, one of the largest agribusiness companies in East Africa. Working with the Agriculture and the ICT departments of the partner company, the research team designed two pilot projects targeting several thousand farmers who sell cane to the company and evaluated their impact on the efficiency and timeliness of the input delivery system and on cane yields, taking into account spillovers (i.e. benefits from the intervention that also non-treated units experience) across plots.

Intervention design

1. *Mobile-based query system (farmers' hotline)*

The development of an integrated mobile-based query system was aimed at improving the company's performance in the management of the provision of inputs (mostly fertilizers) to the farmers. Managing input delivery often requires information from the farmers, but company field assistants face substantial time constraints and delay in visiting the fields. This often results in them delaying assigning farmers to fertilizer delivery. In the year preceding the intervention, about 30% of fields experienced a delay relative to this optimal time window for fertilizer delivery, and in some instances, plots even failed to receive any fertilizer at all during the harvest cycle. Further, it is costly for senior management to monitor how effectively lower level managers and external contractors manage the delivery activities. The hotline system was therefore introduced to overcome and bypass the difficulties related to information and communication.

2. *Text messages with agricultural advice*

The intervention team compiled a list of messages to be sent to cane suppliers subscribing for the service in order to increase their productivity. The content of these messages was primarily based on the age of the cane and on the harvest cycle, and 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,

[1] Garicano, 2014; Bloom et al., 2014.

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.”

Evaluation Design

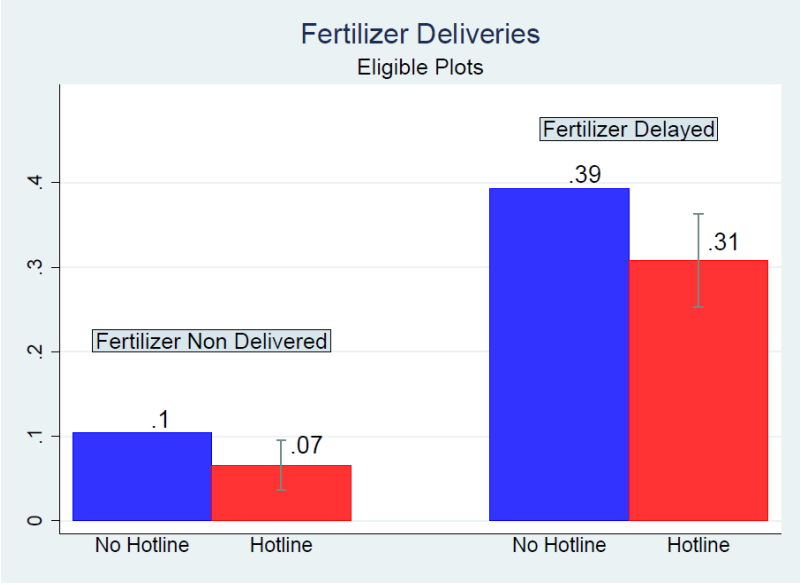
The pilot targeted 8,081 plots in 1,089 fields. During the recruitment for the interventions, farmers of 3,768 plots out of the 8,081 included in the study, recorded their cell phone number and qualified as eligible for the service in the case in which their field was randomized into the treatment group. Both pilots were evaluated through a randomized controlled trial (RCT). Randomization occurred at the level of the field, defined as a set of plots (typically, three to ten) that the company treats homogeneously in terms of planting cycle, input delivery, and harvesting. The analysis relies on administrative data provided by the company, including detailed information input provision and cane suppliers’ yields.

Results

1. The Farmer Query System Improved the Company Performance in Input Delivery…

The farmer hotline enabled farmers to report delays or other problems concerning input delivery and other tasks. 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.

Figure 1: Impact of hotline on fertilizer deliveries (eligible plots)



We find that 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 (Figure 1).

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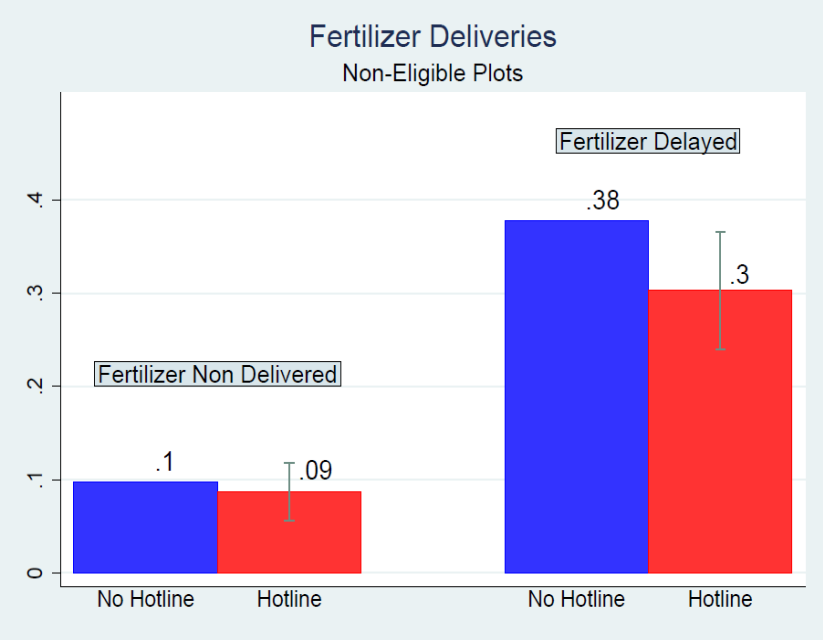
2. …and It Generated Positive Geographical Spillovers

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. Figure 2 reports a similar analysis for neighbours of the targeted plots (i.e., comparing non-eligible plots in treatment fields vs. non-eligible plots in control fields). There is no significant impact on the likelihood that a plot does not receive fertilizer. However, 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%.

Figure 2: Impact of hotline on fertilizer deliveries (non-eligible plots)



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. Specifically, through their complaints, farmers were able to communicate much faster with the high level managers 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 it typically targeted most plots in a given field.

3. The two interventions had no significant impact on yields

These gains in input delivery performance did not lead to statistically significant gains in yield improvements. One likely explanation for this non-result is that the magnitude of the intervention "first stage" on input delivery was too small. Delivery outcomes improve but only by a few percentage points. This is too small to pick a significant impact on yields (Figure 3A below).

Similarly, the SMS intervention did not have a statistically significant impact on yields (Figure 3B below). These results are in contrast to the findings from a previous pilot where we had found a large, though not always precise, impact of the SMS on yields. We are currently investigating potential reasons for the difference in the results across the two rounds.

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Figure 3A: Impact of hotline on cane yields

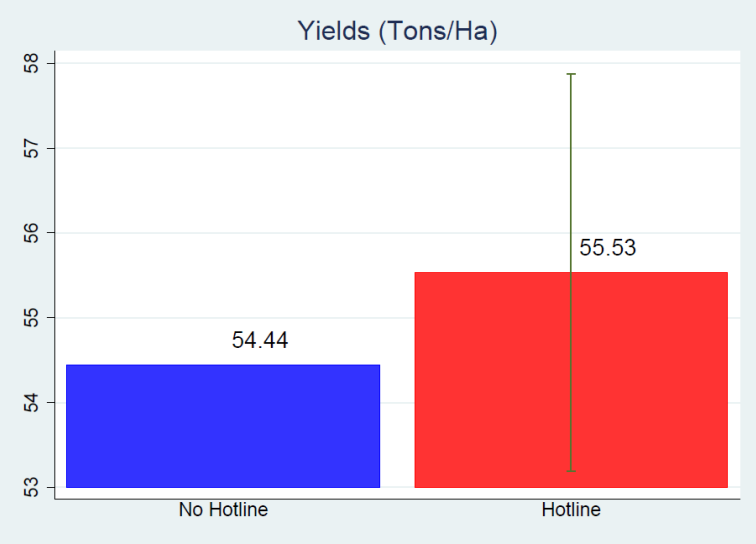
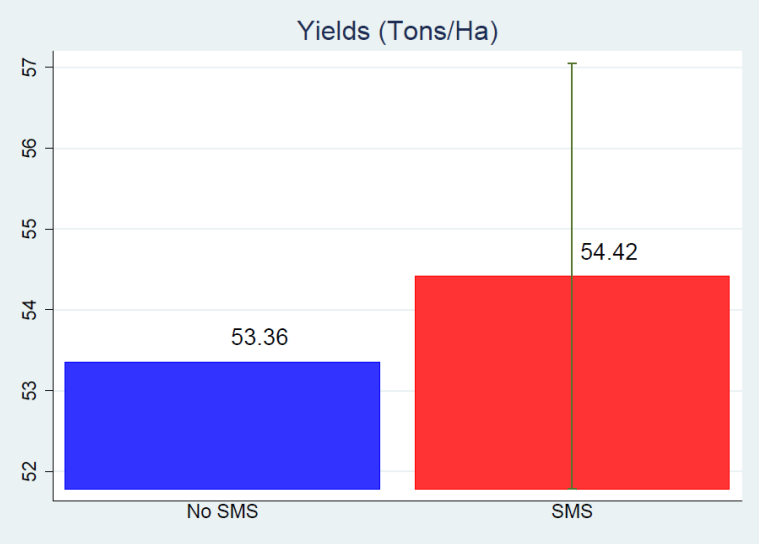


Figure 3B: Impact of text messages on cane yields



Moving Forward…

The study suggests that communication costs may be an important determinant of firm performance for large companies in developing countries. This is particularly relevant when these organizations interact with a large number of suppliers, as it is the case for 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.