Towards large-scale decision support for farmers: site and season specific advice for maize agronomy in Malawi
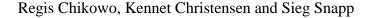
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Summary

In much of sub-Saharan Africa, national agricultural extension systems are severely constrained as extension worker: farmer ratio can be as high as 5000. A network of lead farmers complements the efforts of extension personnel. Regrettably, this combined effort falls far too short for effective dissemination of technologies to farmers. Interactive voice response (IVR) is a potential technology to reach farmers with agronomic messages, especially those that own cellphones in remote areas. These farmers could become hotspots for sustained change.

Between October 2018 and May 2019, we worked with two identical groups of farmers (treated/control), each composed of 140 households. The 'treated' group received IVR messages on targeted maize agronomy from three weeks before the cropping season until about maize physiological maturity while the 'control' group did not receive any messages save for the Airtel 321 platform general messages. IVR messages were on best maize agronomic practices that included land preparation, plant populations, fertilizer types and their application, and weeding. After this cycle, we conducted and electronic Year 1 endline survey as well as focus group

discussions with farmers involved. In October 2019, we increased the number of participating farmers to 650, including those we had initially engaged in October 2018. Thus, we created an exposure time factor due to two groups of farmers; 1) the 2019/20 cropping season newly engaged farmers – the 1-year cycle IVR farmers (new group), and 2) farmers initially engaged during 2018/2019 cropping season, the 2-year cycle (old group). This research design would enable us to understand the impact of exposure time to IVR messaging. We then conducted IVR evaluation surveys for both farmer groups, with follow up questions on maize agronomy soon after completing pushing through all the IVR messages.

During both IVR cycles messaging, farmer reach was between 80-90% across the sites. For participants that were unreachable on first attempt, call attempts were repeated at least three times per day. Apparently, those that could not be reached almost always had handsets with no power. For farmers that were reached, only 30-35% completed the survey during Year 1 and slightly higher at 43% during Year 2 for farmers in Cycle 2 compared to 33% for newly engaged farmers. Most of the older farmers did not respond, suggesting that literacy was vital for success of ICT initiatives for dissemination of agricultural technologies. However, this survey response rate compares favourably with experiences from even high literacy domains.

IVR was effective at influencing farmers to plant early, use available fertilizer more appropriately and better weed management through weeding at least twice. The amount of fertilizer used was not responsive to IVR in the short term. There was also evidence that questions with more than three response options confused farmers, resulting in incoherent responses. This initial work has provided us with insights on the opportunities and pitfalls for employing IVR in agricultural technology dissemination that often involve illiterate farmers.

Background

Maize is the staple crop that is grown by every smallholder farmer in central and southern Malawi. However, maize yields have remained poor due to multiple reasons, chief among which are poor soil fertility, poor seeds and inappropriate fertilizer management for farmers who access fertilizers. Some of the bottlenecks can be traced to a government extension system that is generally overstretched. For example, during implementation of the Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) project, we found out that more than 50% of the grassroots extension staff (the Agricultural Extension Development Officers – AEDOs) were each responsible for at least 3000 farming households. While the Malawi government extension system has provided motorbikes to the extension workers to increase mobility and reach more farmers, in practice the motors bikes are rarely functioning, leaving the extension system grossly incapacitated. This is an untenable situation as the majority of farmers are hardly reached with transformative agricultural extension messages that, when adopted, result in increased productivity and food security. Therefore, exploring alternative pathways for technology dissemination is key for achieving the desired food security outcome.

Interactive voice response for improved maize agronomy

There is increasing use of mobile phones among rural farmers, providing room for the interactive voice response (IVR) technology to support extension for transformation. However, the IVR technology has worked well in resource-rich domains. It is therefore necessary to contextualize and adapt this technology for smallholder farming context, more so with a large proportion of illiterate farmers.

Hypothesis: access to targeted agronomy messages through interactive voice response (IVR) leads to better decision making on farms, leading to increased resource use efficiencies, increased productivity

A possible game changer in each farmer's hand….

Early focus group discussions and development of IVR content

During October 2018, we held four focus group discussions (FGDs) composed of 35 farmers each in four study areas in Machinga and Mangochi districts in southern Malawi (Ntubwi, Nsanama, Nyambi and Ntiya 'extension planning areas'- EPAs). Each of these 140 'Intervention' farmers owned a cell phone. The objective of the workshop was to introduce farmers to how the current 321 service being provided by Airtel works. We then introduced the more targeted VIAMO platform where we would make available to farmers good practices on maize agronomy (Appendix A). FGDs were also held with a similar number of 'Control' farmers for which discussions were limited to the broader Airtel 321 service. The Machinga/Mangochi sites were ideal for this study as they provided the greatest contrasts agro-potential with Ntubwi as the lowest potential, Nyambi and Nsamana have medium potential, while Ntiya has high agro-potential.

During the FGDs, we also encouraged farmers to provide narratives on how they were managing their farming. Generally, farmers were aware about the limitations in terms of the natural environment and soil fertility. For example, in Ntubwi EPA, farmers raised issues on poor rainfall distribution and high temperatures that result in high evaporative water losses. However, there were inconsistencies on approaches to improve productivity, with weak understanding on the water-nutrients interactions that are key in marginal agroecologies. This was important as we then used the knowledge gaps in formulating appropriate content for IVR on maize agronomy.

Key steps followed implementing IVR with smallholder farmers

- After content was developed, Viamo recorded the IVR content in different formats and pre-tested with a group of farmers to see which versions (voices, tone, style) were considered more appropriate and engaging. Indications from the pre-testing were that content that was presented in a conversation mode was more persuasive.

- During early November 2018, intervention farmers started receiving IVR content, with early messages centered around land preparation, manure management, early planting and basal fertilizer management (Appendix A).

- We planned to push one message per week based on the farm activity priorities in line with the cropping season timeline. However, we quickly learnt that it needed pushing each message at least three times to get to 95% reach. In some cases, the phones were off, while in other cases phones were not picked as farmers were occupied with other activities.

- We tailored the messages to appropriately respond to farmers implementing activities at different times. For example, the message on planting was packaged as follows: "Have you planted your maize seed yet, press 1 for yes and 2 for no" Once the farmer indicated that they had planted, we proceeded to enquire if they had applied NPK fertilizer at the

time of planting maize. This would remind farmers to apply NPK fertilizer at the next earliest opportunity.

- At the end of the cropping season, we deployed an IVR evaluation survey to both intervention and control farmers (Appendix B). There were slight differences in the introduction for these two groups. For the intervention group we explicitly referred to their interaction with calls with improved maize agronomy content, while for the control farmers, we reminded them that they had agreed to take part in the study based on our early interactions and FGDs (see Intro 1 and Intro 2 in Appendix B).

- During the 2019/20 cropping season, we engaged new treated farmers and new control farmers. This was done to create an exposure time factor and answer the question – does repeated IVR messaging with farmers result in more positive changes in maize agronomy among smallholder farmers.

Key lessons from piloting IVR for scaling agronomy in Malawi over two cropping seasons

1. During 2018/19 cropping season, 72% of Viamo IVR treated farmers planted maize early (by 30 November) compared with 57% of farmers who planted maize by this time for the control group. The data from 2019/2020 cropping season was comparable to this. This is exciting as the link between early planting and high maize yields is well established. Following a long dry season early planting with first rainfall harnesses the early mineral N flush from soil organic matter that is otherwise missed when farmers plant late. Soil organic matter mineralization is often a significant source of plant available N for low external input cropping systems.

2. The proportion of farmers who planted three weeks after the onset of rainfall during the 2018/19 cropping season (after 10 December) was only 5.1% among Viamo IVR treated farmers compared to 20% for the control group. There was therefore clarity on the message on the benefits of early planting. This positive response was repeated during the 2019/2020 cropping season.

3. Women farmers in particular were markedly influenced by this targeted message. About 90% of youthful farmers (<18 years) planted their maize within one week after the onset of rains for the treated group compared to 72% for the control group. The message on early planting was part of both Viamo IVR and Airtel 321 content. This result is likely pointing to youth as interacting well with IVR platforms.

4. Access to and timing of NP fertilizer use was not influenced by Viamo IVR treatment. Access to fertilizer is often a long-term goal and is not responsive in the short-term. Access is expected to be in the main influenced by resource endowment. Farmers who had fertilizer generally applied NPK within 2 weeks after germination, regardless of

messages received. Thus, farmers using 321 are in the main following recommended practices for timing of basal fertilizer application to maize.

5. The timing of applying side-dress urea (high analysis nitrogen) fertilizer on the other hand was influenced by targeted information provided by Viamo IVR: 49% of farmers in the treated group applied urea fertilizer once the plant was established, as recommended, about a month after planting, compared to 25% for the control group. It appears that the Viamo IVR treated farmers used urea fertilizer efficiently, as a side-dress.

   In the future side-dress fertilizer recommendations could be tailored to local weather, urea should not be applied during a dry spell and the dose applied should be high in good rainfall years, and low in poor rainfall seasons (response farming).

6. Substantially larger proportion of farmers (66.7%) in the Viamo IVR treated group weeded twice, compared to 51.5% belonging to the control group during Year 1. During Year 2, 65% treated farmers weeded twice compared with 55% in the control group. This 10% gap could translate to significant maize production differences when scaled up in the community. Two weedings or more is recommended for maize production, and reminders of this in the treated group seemed to be effective. However, we note that the number of farmer survey responses on this topic was not high, so information on farmer behavior change needs to be triangulated through in person interviews in any future study of IVR effectiveness.

7. Exposure time had a significant impact on choice of maize seed type that farmers. About 71% of Cycle 2 farmers used hybrid maize seed compared with 40% for the Cycle 1 farmers. This would be a significant shift if the practice is linked with increased fertilizer use. Hybrids generally respond better to fertilizer application. More of Cycle 2 farmers also planted maize significantly earlier, and 80% applied NPK at germination or earlier compared with 69% for the Cycle 1 farmers. While bad practices were still prevalent on urea application, significantly less Cycle 2 farmers applied urea fertilizer wrongly.

8. To more intimately engage with farmers during the post –IVR messaging phase, we held focus group discussions with both treated and control farmer groups. Audio messages were pushed out to both the control and treatment groups, followed by discussing aspects of comprehension and perception. The activity engaged an analytical process for determining the reaction, to understanding of the content and behavior change information. Feedback was collected through focus group discussions with 10-15 participants per session.

   a. Participants showed that the messages were relevant and informative. According to Steven Williams from Mtubwi. "I am now harvesting a lot of maize from a

small plot. I have followed the advice for two seasons. I now use fertilizer appropriately. This is why I will have adequate maize this year from my farm'

b. They received their messages in good time, in October just in time for the planting season.

c. The messages were well packaged, because they took the farmers through the whole farming process, from planting to how to properly use fertilizer and control weeds.

d. Planting maize in good time has really simplified the weeding process. Their fields were less weedy compared to when they plant late.

e. During 2019/20 cropping season, it was clear that treated farmers all got the messages at the right time, and were able to follow the instructions, whenever it was feasible to do so.

f. The pilot should be up-scaled and more topics introduced for example, information on combating the Fall armyworm.

Conclusions

- We demonstrated that IVR messaging can support tailored messages and adoption of better maize agronomy with smallholder farmers.

- Substantially more farmers planted maize early among those who received tailored IVR messages vs generic messages, as indicated by farmers who participated in an IVR survey on planting time practices.

- Timing of urea side dress fertilizer application and weeding 2 times were other recommended practices that IVR treated farmers reported taking up, to a substantial extent relative to control farmers.

- Overall, IVR survey responses were modest (40% of treatment farmers and 35% of control farmers completed the IVR survey), and there is need for triangulation through in person interviews and measurements of maize yield through plot cuts to conduct a proof of concept.

- Focus group discussions revealed that participants were all satisfied with the content of the messages and they suggested that we stick to the dialogue format. This is best demonstrated in the words some of the participants:

  o "When we first listened to the instructions, we thought they would be difficult to follow through, but they were not and this year it was even easier for us." Daniel White – Two-Year cycle farmer in Mtubwi EPA:

  o "We are grateful to whoever started this project, we are now good farmers because of it. And we hope that the project will continue" Labiya Yusufu _Ntiya EPA