to not more than a day. This recommendation applies to crowdsourcing schemes where the duration of 1 week is still considered near real-time.

3. Under this work we register the importance of training. For crowds that are mainly rural based, there is need for regular retraining and retooling programs. These could be a combination of online training via phone and onground live training sessions.
4. A communication strategy is key to such a framework. Particularly a strategy that emphasizes feedback to the crowd was found to be of critical importance for this type of work.
5. We found that social dynamics should be considered when implementing this type of system. We found not all participants were affected or responded the same towards certain incentives. While we did not do a rigorous study on this, we found that such dynamics as gender, age, social status, etc had a huge influence on the performance of the participants within this system.

Contributions

This work sought to find the most optimal setup possible to crowdsource all year round real-time surveillance data from volunteer agents in disparate rural agricultural localities around the country, and eventually to understand what types of incentives would be effective in motivating such a crowd. Whilst the pilot was not explicitly set up to measure the incentive mechanism, we still observe some contributions from implementing this and tweaking incentives over 76 weeks. We summarise the contributions of this work as follows.

1. We present a crowdsourcing based system to address a real world problem in Uganda. We provide the requisite evidence for using the said system to actually collect over 7000 reports from a crowd consisting of four categories of people. The contribution is in how to set up such a system as well as the experiences in getting this working.
2. We also present a live example of how manipulating different incentives can affect the outcomes of a crowdsourcing task such as this. Particularly we talk about differently motivated intrinsic and extrinsic incentives and the effect on the crowd of varying them. However working on a real problem with real people presents its unique challenges, for example having a device stolen or having the technology fail can not be solved by improving the incentive mechanism.
3. For people particularly interested in this particular problem of crowdsourcing crop health surveillance data perhaps for other crops apart from cassava, we provide an analysis of the different categories of the *crowd* and how they respond to different motivations. For example the more experienced members of the crowd respond differently to different types of incentives. Overall the social dynamics of the crowd in their localities also plays a big role, even though we were not able to demonstrate that concretely in this work.

Limitations of study

The focus of this work was to understand how agricultural actors participate in a mobile crowdsourcing setup for surveillance of cassava viral disease and pests, by drawing insights from observations on reporting patterns of individuals contributors, behaviours of their sub-groupings, their response to different incentives and the effectiveness of training exercises for rural crowds. It also looked at early benefits such a system presents in bridging the current gaps in monitoring of crop health. While we provide insights based on 76 weeks of piloting this system, we did not set it up systematically at the onset as a controlled experiment, and as such the conclusions from this work need to be looked at in that light. However it is also important to note that it is very hard to have a controlled experiment for an actual problem like this where the actors are playing in a rural field that we have no control over. Things like stolen phones, the actors falling sick, or getting involved in other activities do affect the outputs of such a system and it would be hard to tie them to the incentive mechanism for example.

Conclusion

This work harnessed the ubiquity of farmer communities and crowds using smartphones, to provide all year-round near real-time surveillance and monitoring data of cassava viral diseases and pests in Uganda as a supplement to the standard cassava crop surveys carried out annually. We obtained 7000 reports which is about one third of the expected number of reports if the system were operating in a very controlled environment with no phones stolen, no technical difficulties, and everyone motivated to send in data over 76 weeks. The goal is to eventually use this data to build an automated diagnostic tool for cassava diseases as well as use the data to provide a real time situation map of the state of disease in the whole country. Several issues come out of this work that require further investigation for example the social dynamics of this particular crowd, how to control the quality of images uploaded in such a system and how to incentivize the different categories of the crowd. This will form the substance of our future work.

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