

# Agricultural Extension, Technology Adoption, and Information Spillovers\*

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## Abstract

Social learning is an important component of the process of technology diffusion. If actions are not perfectly observable, this could require information sharing by word-of-mouth. This project presents spillover impacts of a randomized controlled trial of a mobile phone-based agricultural extension program in rural India. The intervention was implemented in a setting in which farmers were already participating in bi-weekly agricultural meetings, which presumably would have reduced physical costs of sharing the information they received from the extension service. We find that the demand by farmers who were randomly invited to participate was high, and that their agricultural knowledge and practices changed one year later. However, un-treated members of their agricultural group were no more likely to have higher knowledge scores nor change their agricultural practices and they were less likely to report that they relied on others for agricultural information. These results suggest that informational spillovers might be small, and that, at least in some contexts, relying on farmers to discuss agricultural information with others might not be an effective strategy for technology diffusion.

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# 1 Introduction

Diffusion of information is critical for technology adoption. In many settings this presupposes farmers share information. For policy, the parameter of diffusion matters. This projects tests for information diffusion among farmers. This paper reports on a 16-month randomized trial of a mobile phone-based agricultural information service, in the state of Madhya Pradesh, India. Our efforts were motivated, in large part, by [Cole and Fernando \(2021\)](#), who find that the same service was effective in changing farmer behavior in the state of Gujarat. We observe significant usage of the service, even in a setting where farmers attend bi-weekly agricultural information meetings. Our impact evaluation finds that the service affects farmers’ self-reported sources of information, improves agricultural knowledge, changes information sharing patterns and, perhaps most importantly, encourages farmers to adopt safer and more effective pesticides. We find weak evidence of changes in fertilizer practices and no effect on average cotton yields for the growing season we study.

Examining spillovers directly, we find evidence of influences that impact information sharing trends in conflicting ways. First, we find no evidence that treated farmers share information directly with non-treated farmers in the same learning groups. In fact, we find that control farmers in mixed peer groups come to rely less on their peers for agricultural advice and more on their own experiences, perhaps because their treated peers, by switching their main source of information to the information service, reduce communication within the peer group.

In contrast, we also find evidence of “indirect” information spillovers that bear resemblance to free-riding: a modest proportion of control farmers do request their treatment peers to access the system and service questions on their behalf. We also find modestly lower rates of usage of the service among farmers in more intensely treated learning groups, compared to rates of treated farmers in less intensely treated groups. This may have occurred because for farmers receiving the same information, it can be easier for each to free-ride off of each other’s information processing efforts rather than engage with the service themselves. This sort of behavior highlights why it may be difficult to sustain a demand-driven information service system purely on the basis of private investment.

The present paper complements the previous study by providing a replication in an alternative setting but also extends previous analyses in several important directions. First, because agricultural information can, but need not, be shared, we design the intervention with the explicit goal of capturing the pattern of information spillovers. This design also allows us to measure how important widespread diffusion of technology is in driving use among a sample with relatively limited exposure to services beyond standard voice calls / text messages. Second, we augment direct survey data with administrative data, which is unlikely to be affected by anything except the actual intervention (i.e., demand effects are extremely unlikely in this context.) Third, we evaluate the efficacy of in-person training as a driver of adoption—an important factor in understanding whether the service could be scaled in a cost-effective manner.

This paper proceeds as follows. In Section 2, we provide a literature review and discuss the context. In Section 3, we describe our conceptual framework, experimental design, and interventions. In Section 4, we describe our sample and the data. Section 5 describes our empirical strategy and results. Section 6 concludes.

## **2 Context**

### **2.1 Cotton Farming in India**

The study was conducted among cotton farmers in the Khargone district in the state of Madhya Pradesh in collaboration with the Better Cotton Initiative-Solidaridad Cotton Solutions Network (BCI-SCSN), an international partnership aimed at increasing sustainability in cotton supply chains. The intervention was carried out by BCI-SCSN’s field partner, Action for Social Advancement (ASA), which provides agricultural advice to thousands of farmers across Madhya Pradesh.

ASA divides the farmers into “Learning Groups” (LG’s), which contain approximately twenty farmers each. Each LG meets bi-weekly with ASA field staff to learn about cotton farming practices that constitute BCI’s guidelines for cotton-related best practices.

### **2.2 Agricultural Information and Avaaj Otalo**

Avaaj Otalo (AO), is a mobile phone-based technology that allows farmers to call into a hot-line, ask questions, and receive responses from agricultural scientists and local extension workers. Farmers also receive weekly push-content, which includes time-sensitive information such as weather forecasts and pest planning.

By utilizing mobile-phone networks to deliver agricultural extension, AO seeks to address many challenges in traditional extension models. Importantly, AO has the capability to reach millions of previously excluded farmers at a minimal cost. Additionally, through providing a forum in which content provision is demand-driven, AO provides customized information that is both accessible and relevant. Finally, whereas extension agents are difficult to monitor, content provision on AO is easily monitored through a central forum.

To our knowledge, however, AO differs from all other initiatives by providing a voice-based platform through which farmers can also share their experiential knowledge and browse through expert responses to questions posed by their peers. The service was developed by academic computer scientists with a focus on voice as a medium to facilitate the inclusion of diverse language groups and low-literacy populations.