Targeted Information for The Adoption of Flood-Tolerant Rice in India

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Sector(s): Agriculture

Location: Odisha, India

Sample: 72 administrative areas with 136 villages each

Initiative(s): Agricultural Technology Adoption Initiative (ATAI)

Target group: Farmers Rural population Agro-dealers

Outcome of interest: Technology adoption

Intervention type: Extension services Fertilizer and agricultural inputs Information Improved seeds

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Partner organization(s): Government of Odisha, National Food Security Mission, International Rice Research Institute (IRRI), Odisha Department of Agriculture & Farmers' Empowerment, Odisha State Seed Corporation, Gates Foundation, UK International Development

While smallholder farmers face a number of barriers to adopt technologies, decades of research show that knowledge plays an important role for adoption. Researchers conducted a randomized evaluation to test the effect of providing information and experimental kits of an improved variety of flood-tolerant rice, Swarna-Sub1 or SS1, to agro-dealers on adoption rates among their customers. Overall, informing agro-dealers and providing them with seeds led to increased farmer-level adoption compared to conventional extension approaches, particularly among high-risk farmers most likely to benefit from the technology. Consistent with these results on farmer adoption, agro-dealers were more likely to inform potential customers about the technology and keep SS1 in stock.

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Despite the prevalence of productive agricultural technologies, a large share of the population in low-income countries relies on traditional methods of production. While farmers face a number of barriers to technology adoption in these contexts, decades of research show that knowledge plays an important role in adoption. Public extension services traditionally try to inform farmers and spread new technologies by conducting farmer field days and providing new technologies first to select farmers, who then share their experience with other farmers in their community. Alternatively, smallholder farmers also seek information from commercial input suppliers or agro-dealers, who typically sell seeds, fertilizers, and agrochemicals. Because agro-dealers directly benefit from increasing demand for new technologies through additional sales, agro-dealers may be more effective (and cost-effective) in disseminating information than government-trained farmers, who have less to gain from diffusing technologies. Can

engaging directly with the private sector to disseminate information and sell improved inputs to farmers lead to higher adoption rates?

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Swarna Sub-1 (SS1), a flood-tolerant rice variety, reduces yield losses under flooding conditions while leaving yields unaffected during non-flood years. Previous ATAI-funded research tested the impact of SS1 in 2011 in Odisha, a flood-prone state in the coastal belt of India and found that adoption of SS1 led to substantial increases in farmer profits. Despite these benefits, only around 20 percent of farmers in Odisha used SS1 in 2015, four years after the evaluation. When surveyed about their decision to adopt or not, farmers noted that they did not have information about the new variety or that they lacked access to seeds because few agro-dealers stock them, suggesting that the existing agricultural extension system and supply networks were not effective in enabling farmers to adopt this new technology.

In Odisha, where this evaluation takes place, as well as elsewhere throughout India, state seed corporations play a major role in seed production, set standardized wholesale seed prices for all varieties, and regulate wholesale prices. The state-run Odisha State Seed Corporation (OSSC) produced around 84 percent of the seeds sold by agro-dealers in the study. As a result of state-regulated pricing, dealers earn uniform profit margins across all types of seed, meaning dealers profit from recommending a new variety to promote seed replacement and convince farmers to abandon older seeds held from previous seasons. Promotion of seed replacement can be particularly profitable in future agricultural seasons if farmers return to purchase the same seed variety or share knowledge with other farmers in the community. About 30 percent of the agricultural land is planted with newly purchased seeds each year, with farmers using seeds from the previous harvest for the remaining area.

Agrodealer holds package of seeds in a storefront.

Photo: J-PAL

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Researchers conducted a randomized evaluation to test the impact of targeted extension services to agro-dealers on farmers' adoption of SS1 seeds in Odisha. In partnership with Odisha's Ministry of Agriculture, researchers modified the existing extension system by delivering information and seeds directly to agro-dealers between 2016 and 2018.

Of the 72 blocks (administrative groups of about 136 villages) from ten flood-prone districts included in the study, researchers randomly assigned half to undertake either agro-dealer-focused or farmer-focused extension services.

1. *Agro-dealer focused extension services (36 blocks)*: In May 2016, five agro-dealers in each block received kits of 5 kilograms of SS1 seeds each as well as a small information pamphlet on the rice variety. In cases where fewer than five dealers were available, additional seed was provided to existing dealers to ensure that 200 kilograms of seed was introduced in each block. Dealers could test the seeds as they wished, allowing them to learn about the variety's quality and then pass information on to their customers.
2. *Standard public extension services comparison group (36 blocks)*: Researchers worked with government extension agents to provide extension services to introduce SS1 seeds to farmers using three standard practices in 2016:
    1. Government agents received and distributed kits containing basic information about SS1 and 5 kilograms of seeds to five farmers in two villages from each block in May.
    2. Government agents received 150 kilograms of SS1 seeds to conduct cluster demonstrations in August with groups of farmers with neighboring plots. Extension officers could choose the location and farmers to target for these demonstrations, though guidelines suggested that demonstration sites should represent average conditions in the area and be accessible to many farmers in the community.
    3. Government extension officers organized farmer field days in November where staff trained farmers about SS1 use and shared information from demonstrations.

To understand how these extension services compared with traditional ICT-based informational approaches, in 2017, researchers randomly assigned half of the farmers from 261 gram panchayats in the study area (administrative units of about eight villages) to receive SMS messages on SS1 use and benefits. The message also stated that SS1 was being produced by OSSC and was available for purchase at local dealers.

Finally, in 2019, researchers partnered with a local NGO to test whether profit incentives play a role in information dissemination among agro-dealers. Specifically, the NGO organized seed demonstrations in villages (located in dealers' blocks) where farmers could cultivate new varieties and villagers would be invited to learn about it. They asked dealers for recommendations on seed varieties, location, and farmers suitable for the demonstration. Each dealer was then randomly assigned to one of two groups. In the "profit-motive" group, the name of the dealer was advertised during the actual demonstration providing them an opportunity to profit from potential increases in sales. In contrast, dealers in the comparison group did not have their names displayed as part of the demonstration. Additionally, harvest collected after the demonstration in the comparison group was redistributed as seeds to farmers in the village, thereby reducing farmers' need to buy seeds after the demonstration and further limiting profit opportunities for the dealer.

Follow-up surveys to measure farmer adoption of SS1 were conducted from August-September 2017, around 15 months after the agro-dealer focused extension intervention. At the same time, researchers surveyed dealers to measure the quantity and variety of seeds sold. Surveyors disguised as "secret shoppers" were also used to assess whether dealers actively recommended SS1 to farmers. Lastly, remote sensing data was used to approximate flooding risk and predict which farmers were expected to benefit the most from adopting SS1.

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Overall, informing agro-dealers and providing them with seeds led to increased farmer-level adoption of SS1 compared to conventional extension approaches, particularly among farmers exposed to flooding who are most likely to benefit from the technology. Agro-dealers were also more likely to inform potential customers about the technology and keep SS1 in stock, increasing local seed production.

Farmer technology adoption: Farmers in the agro-dealer group were 3.5 percentage points more likely to adopt SS1 a year after the intervention from a base of 6.3 percent in the comparison group (a 56 percent increase). The average farmer in the agro-dealer blocks also cultivated 0.06 more acres using SS1 (a 69 percent increase) relative to farmers in the comparison group with no displacement in the adoption of other seed varieties. Agro-dealers were particularly successful at disseminating SS1 to farmers who lived in flood-prone areas and could benefit the most from the new technology. Specifically, high-risk farmers increased their adoption of SS1 by 6.4 percentage points , with no effect of the intervention among low-risk farmers.

The SMS intervention had no impact on farmer adoption of technologies, indicating that the adoption gains from agro-dealer focused extension services could not be obtained through a lighter-touch SMS information intervention in this context.

Agro-dealer behavior: Newly informed suppliers in the agro-dealer focused group became more proactive in carrying SS1, informing potential customers about the technology, and inducing adoption by farmers most likely to benefit from the technology. For instance, active agro-dealers were 11.4 percentage points (a 59 percent increase) more likely to have SS1 in stock two years after the intervention from a base of 19.3 percent in the comparison group. Agro-dealers that received extension services were also 13 percentage points (a 25 percent increase) more likely to list SS1 as a variety when visited by a secret shopper to consider for farmers from a base of 51 percent in the comparison group.

In 2019, when the NGO asked agrodealers for recommendations as part of the profit-motive experiment, dealers in the profit-motive group were more likely to suggest their own village as the demonstration location, spent more time thinking of which farmers to recommend, and were more likely to suggest neighbors or other farmers in their own village as potential attendees. This suggests that advice given by dealers is motivated, at least partly, by their concerns related to future profits. Finally, although the profit-motive intervention increased dealers' perception that the demonstration would affect business by 8.6 percentage points (a 13 percent increase), around 67 percent of the dealers in the comparison group also reported that it would, suggesting that many dealers thought the demonstration would increase seed demand, even if their names would not be identified.

Local seed production: Village blocks in the agro-dealer focused group produced an average of 57 percent more SS1 seeds during the three years after the intervention relative to the comparison group. This suggests that the agro-dealers may have shared information about SS1 to others in the community, including seed producers, who are typically large landholders that often rely on some of the same sources of information as smaller farmers.

Taken together, these results suggest targeting extension services to agro-dealers can increase adoption, especially among farmers with higher expected benefits from the technology. This is at least partly driven by dealers actively passing along information to farmers, motivated by profits from expanded sales. Thus, when incentives for farmers and agro-dealers are well-aligned, informing private input suppliers has the potential to improve the practice of agricultural extension in low- and middle-income countries.