Leveraging Local Governments to Support Rice Mechanization in India

Sector(s): Agriculture

Sample: 361 villages

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

Target group: Farmers Politicians and electoral candidates Rural population Extension agents Workers

Outcome of interest: Self-employment Technology adoption Productivity Profits/revenues Labor

Intervention type: Technology

Partner organization(s): Centre of Effective Governance of Indian States (CEGIS), Government of Telangana, Professor Jayashankar Telangana State Agriculture University (PJTSAU), Weiss Family Program Fund for Research in Development Economics

In low-and middle-income countries, agricultural mechanization technologies present an opportunity to increase labor productivity. However, for many reasons, small-scale farmers do not adopt mechanization technologies. When they do, these productivity gains may displace female agricultural laborers who traditional preform the mechanized task. Working with local government leaders and agricultural extension agents, the researcher is conducting a randomized evaluation to test the impact of promoting a mechanization technology. Uniquely, the researcher will closely track how employment shifts for women who formerly did the mechanized work.

Policy issue

Mechanized farm production is a feature of modern, intensive agriculture that can improve agricultural labor productivity by reducing unskilled labor hours completing arduous tasks in many low- and middle-income countries. However, small-scale farmers often face challenges in adopting mechanizing technologies due to factors, such as high up-front costs, limited availability, distance to providers, or reticence to experiment, despite potential gains from mechanization.

For many farmers who cultivate small plots of land, purchasing machines and equipment may not be financially feasible, so rental markets offer a potential solution, enabling farmers to benefit from the technology without committing up-front to a large asset investment before trialing the equipment on their own fields. In tandem, agricultural extension services may serve an important role in helping farmers learn about the benefits and use of these technologies, but they do not often have an incentive to train farmers well. Involving local officials in the market may affect the quality of service delivered as well as the sustainability of a rental market, but there is limited research to support this. Can local leaders' influence paired with the existence of an equipment rental market encourage small-scale farmers to adopt a new, labor-saving technology?

Another important question is how labor-saving technologies effect the overall village economy. While farming households' benefit, other households who have limited land of their own and rely primarily on supplying labor to other households may have to find other sources of income. Unlike many studies of agriculture productivity improvements, the study is designed to measure these displacement effects. Further, we plan on piloting an information intervention to help the displaced laborers find new jobs. Every village involved in this study was enrolled because the elected leader of the village was interested in promoting the technology believing it to be generally beneficial.

Context of the evaluation

In India, 70 percent of rural households depend on agriculture for their livelihoods, and rice production is particularly important to the economy and labor force.[1] Traditional rice cultivation involves several labor-intense activities throughout the production cycle, such as transplanting, water management, weed control, harvesting, and post-harvest activities. In Telangana, India, most small-scale rice farmers produce for and sell to the government-owned Food Corporation for a set price, and women are heavily involved in the labor-intensive activities, like transplanting rice.

Drum seeders are agricultural machines that evenly dispense pre-soaked seeds across rice fields, and have been shown to reduce the amount of labor required to plant an entire field relative to the traditional method of transplanting by hand. For example, one drum seeder can plant one hectare of land in one day. In contrast, manual transplanting one hectare would take ten laborers two days. Additionally, drum seeders decrease water requirements associated with rice cultivation which may help farmers adapt to unpredictable rainfall or irrigation. Due to these immense productivity benefits the Telangana Department of Agriculture selected it as one of five priority technologies to promote through its extension service starting in the 2022 summer season. The central government has also included drum seeding in its national agriculture action plan.

The downside of drum seeders is risk of weed infestation, and farmers utilizing drum seeders must manage weeds to receive the best yield. However, the Indian Government currently estimates approximately 8 percent of farmers engage in drum seeding across four central Indian states,[2] but the State of Telangana has distributed drum seeders with limited success due to lack of information on how to use them correctly or misaligned incentives for government extension agents to encourage farmers to use them. In Telangana, drum seeder rentals were available to small-scale farmers through local political leaders or extensionists. Most farmers in eligible villages owned or cultivated approximately 2 hectares of land or less.

A farmer uses a drum seeder in India.

Photo credit: Steven Brownstone | UC San Diego

Details of the intervention

In partnership with the Department of Agriculture's extension agents and local village leaders, the researcher conducted a randomized evaluation to test the impact of promoting a mechanization technology and subsequent productivity gains impact on agricultural laborers, specifically women. The village leaders promoted the devices and worked with the local extensionist to ensure farmers were given proper agronomic information and support.

The researcher randomly assigned 400 villages into the following three groups:

1. *Drum Seeder Rentals run by extensionists* (103 villages)*:* Farmers from villages in this group were offered access to rental drum seeders managed by government-employed extensionists in addition to their day-to-day roles and responsibilities.
2. *Drum Seeder Rentals run by locally-elected leaders* (102 villages)*:* Farmers from villages in this group were offered access to rental drum seeders managed by local village leaders, who leveraged village staff to monitor and reward extensionists who met drum seeder promotion targets.
3. *Status quo extension* (156 villages)*:* Farmers from villages assigned to this group served as the comparison. As such, extensionists continued their status quo practice of informing the farmers who attended extension meetings about drum seeders.

The study primarily measures the technology's impact during the 2023 summer and 2024 winter planting seasons. Participating villages were selected based on their leaders' willingness and interest in renting out drum seeders. The researcher collected data through in-person surveys, phone surveys, and administrative data at varying points throughout the study; specifically, the researcher surveyed at baseline and various times during the evaluation. He collected data on the change in the number of small-scale farmers using drum seeders, household labor and hired labor hours saved, and self-reported yields along with measures from remote sensing. Additionally, the researcher assessed the conditions that sustained a drum seeder rental market, as well as the extent to which elected leaders effectively promoted the technology by leveraging the effectiveness of local extensionists. The researcher also measured household time use and income from female laborer participants, as well as children's household production, to understand if a disruption to agricultural work led women to turn to more household production or wage work outside the farm, as well as any subsequent effect on children's education.

Results and policy lessons

Research ongoing; results forthcoming.

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1. https://www.fao.org/india/fao-in-india/india-at-a-glance/en/

2. Suresh Malhotra. 2021. "National Conference on Agriculture (Kharif Campaign - 2021) Rabi Review & Kharif Prospects." Ministry of Agriculture & Farmer Welfare.