From Green Revolution to Agricultural Transformation: The Case of Short Duration Rice Varieties in Bangladesh

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BACKGROUND AND CONTEXT

Most of the world's extreme poor are located in Sub-Saharan Africa (SSA) and South Asia (SA), live in rural areas, and depend on agriculture as their main source of income. A vast majority are smallholder farmers, and improving their incomes can help them escape poverty. In areas where a Green Revolution-style intensification may not be an option, an alternative is to diversify income sources in agriculture by changing farming systems to introduce higher value crops and to extend labor calendars to reduce periods of forced idleness. When looking at the origins of rural poverty, it is indeed notable that lack of opportunities to use labor productively during an important fraction of the year is highly correlated with low per capita consumption. This is what the Agricultural Transformation tries to achieve.

TESTING FOR RURAL TRANSFORMATION

Through a randomized control trial (RCT), researchers from the University of California at Berkeley, the International Rice Research Institute (IRRI), and Tufts University analyzed whether a technological change in staple crops enables transition and transformation, by diversifying farming systems and extending labor calendars. This is in a setting where land could potentially be cultivated throughout the year because of access to underground water aquifers. Researchers introduced a shorter duration rice variety, BRRI Dhan 56, to free land for the introduction of a higher-value crop in the Rabi season in Bangladesh. Rabi falls between the Aman (benefitting from monsoon rains) and Boro (using pumping from tube wells) seasons. Land is often left fallow during this period, so enabling cultivation can extend the labor calendar.

DATA AND METHODOLOGY

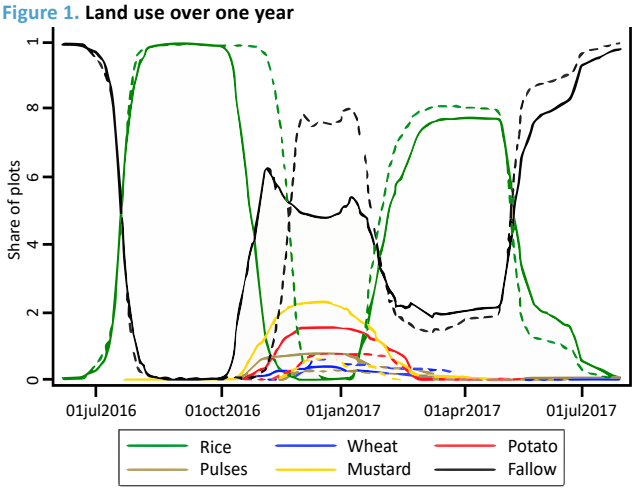
The study selected 256 villages in the Rajshahi region (Bangladesh) where the BD56 variety is suitable for cultivation. Of these, 192 were 'treated' with BD56 mini-kits, and 64 formed the control where seed mini-kits of an analogous long duration rice variety (BD51) were distributed. BD51 was expected to require 145 days of cultivation compared to 115 days for BD56. To see if the type of farmer who received seeds made a different to adoption and other outcomes, the study also randomized who received the mini-kits. In 64 villages, five mini-kit recipients were randomly drawn from the list of farmers in the village; in another 64, they were given to the five largest farmers in the village; and in the remaining villages (64), farmers were selected by the local extension officer (SAO) as suitable for demonstrating the new variety. BD51 was distributed in the same manner to up to 15 equivalent farmers in the control villages.

To obtain a good characterization of production in the three cropping seasons, data were collected in a baseline survey and in three subsequent surveys over a 14-month period covering a total of 1,795 farmers. For each farmer, land use was collected for three plots.

SHORT DURATION RICE HAS A YIELD PENALTY BUT NET PROFITABILITY CAN BE HIGHER WITH AN ADDITIONAL CROP

BD56 creates a short duration advantage and allows time for a Rabi crop. In the Aman season, BD56 was on average harvested 25 days earlier than BD51. With almost one month of additional time—sufficient to cultivate a Rabi crop—BD56 plots were 28 percentage points more likely than BD51 plots to be planted with a Rabi crop (Figure 1). BD56 plots were more likely to be cultivated with crops such as mustard (20 percent of plots), potatoes (15 percent), and pulses (8 percent). The likelihood of planting a Boro crop was not altered by the planting of a Rabi crop.

Figure 1. Land use over one year



Note: Dotted line BD51 (control), solid line BD56 (treatment)

BD56 has a large yield penalty. The cost of shorter duration is a 43 percent lower rice yield. Hence, the expected benefit from using a short duration rice variety comes from the sale of the Rabi crop.

Rabi crop can compensate for yield loss and increase annual profit. For the percent of farmers who used BD56 and kept the land fallow in the Rabi season, shifting to a short duration variety resulted in farm income loss. However, the 52 percent of farmers who chose to cultivate a Rabi crop had a 16 percent higher annual profit than control farmers, more than compensating for the lower Aman yield. The likelihood of planting a Rabi crop varied by how the treated farmers were selected. Thirty-five percent of the largest farmers planted a Rabi crop compared with 29 percent among SAO-selected farmers and 18 percent of randomly drawn farmers.

Need to better understand low uptake of Rabi crop. Forty-eight percent of BD56 mini-kit recipients did not cultivate a Rabi crop. Mini-kits provided only 5 kg of seeds (sufficient for 0.1-0.2 hectare of rice), and freed land (about half the mean plot size) could not always be put to productive use. One potential reason is that there may be economies of scale in cultivating a whole plot with a Rabi crop. If the BD56 area is, as was often the case, part of a larger area fully dedicated to rice and sharing water control, it may not be feasible to cultivate a different crop in the middle of rice fields. In addition, the farmer may not have been prepared to cultivate a Rabi crop in this first-year experiment. A better understanding of the decision to plant a Rabi crop, including who makes the decision and what factors constrain uptake, will be important for assessing the potential of BD56 to contribute to poverty reduction via agricultural transformation.

SOURCE

Manzoor, D., de Janvry, A., Emerick, K., Kelley, E., and Sadoulet, E. (2018). *The Modest Gains from Augmenting Social Learning in Agriculture*. Working Paper, Economics Department, Tufts University.

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