Training on and Adoption of Organic Farming Practices—A Long-Term Perspective

Training motivates farmers to use organic farming practices, but adoption is non-linear

After decades of focusing on the uptake of chemical fertilizer, promoting sustainable farming is ranking high on the policy agenda. In Indonesia, intensive cultivation combined with a high reliance on chemical fertilizer have increased soil acidity and reduced the soil organic content of rice fields. Overapplication of chemical inputs is costly to the environment and expensive for farmers. Organic farming practices offer an alternative, either to substitute part of the chemical inputs or as a complete system.

Yet, training and extension are costly for policy makers and also for farmers who invest their time. It is therefore highly relevant for policy makers to understand whether training has the intended impact and whether farmers are interested to apply the taught information.

This policy brief presents the results of a randomized experiment that was designed to evaluate the effectiveness of repeated training on organic farming. The training was targeted at smallholder farmers. The experiment was conducted in the Province of Yogyakarta and Tasikmalaya, West Java. Data was collected across four waves from 2018 to 2023. This rich data allows us to explore longer-term adoption patterns. Adoption patterns of new technologies are not necessarily linear and farmers might switch in and out of adoption in response to extension efforts.

Specifically, this policy brief addresses the following research questions:

- *What is the causal effect of repeated organic farming training on adoption, on the use of chemical inputs and on the probability of full conversion to organic farming?*
- *What adoption patterns are observed in response to repeated extension? Are farmers continuously using a practice after adoption or do they disadopt or readopt?*

Topics

- Training on organic farming
- Long-term adoption patterns
- Random experiment

The Experiment

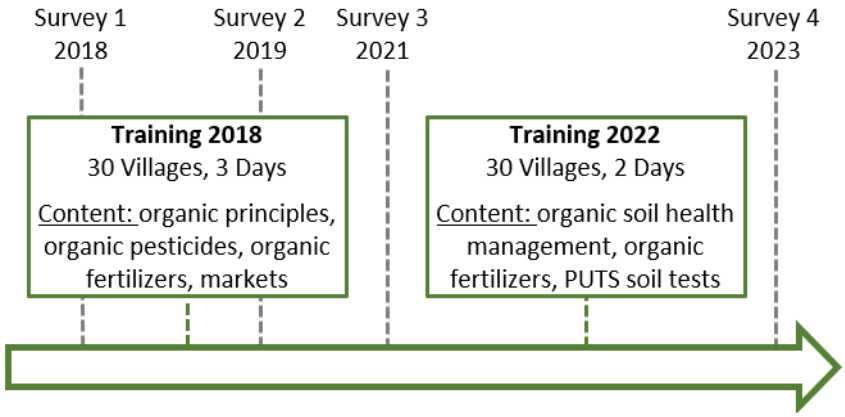
The experiment was conducted in Tasikmalaya district, West Java Province, and in three districts in the Province of Yogyakarta: Sleman, Bantul and Kulon Progo. Data was collected in 2018, 2019, 2020, and 2023. Farmers were randomly assigned to treatment or control groups at the village level. The treatment group was invited for training in 2018 and 2022. The control group did not receive any training. Figure 1 outlines the project timeline. At baseline, we interviewed 1,200 farmers, i.e. 20 from each sampled village. Most respondents in our sample are smallholders, with an average cultivated land size of 0.3 ha. In 2023, the average age in our sample was 57 years, most respondents are male.

The Training

The training was participatory and involved several practical exercises. Training was held in the respective villages to minimize travel time for farmers. In 2018, the treatment group was invited to a three-day training on organic farming, covering organic principles, input production, and marketing. In 2022, the same farmers were invited to a two-day training that focused on organic soil management and introduced the PUTS soil test kit by the Indonesian Soil Research Institute (ISRI).

Training attendance among those invited was high, with 90% in 2018 and 73% in 2022. Per invited farmer, the 2018 training incurred costs of around IDR 390k (USD 25) and the 2022 training costs of around IDR 480k (USD 31) per farmer.

Figure 1. Project timeline



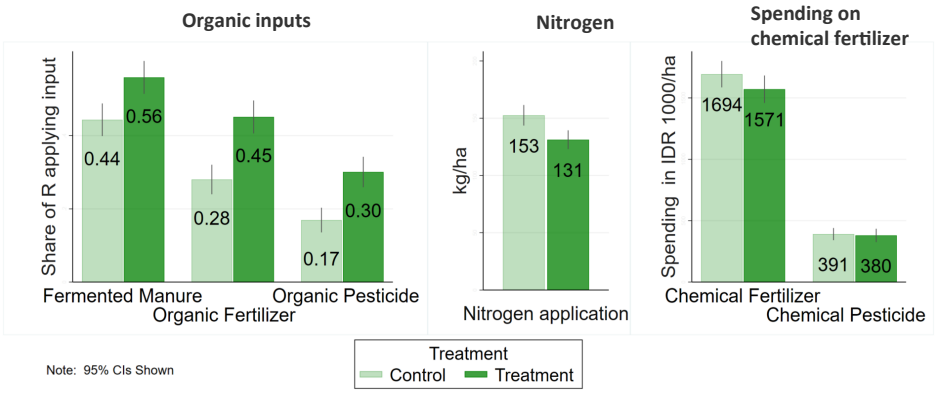
Findings: Adoption of Organic Farming Practices and Use of Chemical Inputs

The evaluation shows that **repeated training was successful in increasing farmers' uptake of organic farming practices.** Farmers who were invited for training in 2018 and 2022 were more likely to apply fermented manure in 2023. This effect is mostly driven by purchased manure. Training further increased the share of farmers who apply non-manure organic fertilizers and inputs (liquid organic fertilizer, MOL, PGPR). This is mostly driven by self-produced inputs, reflecting the focus of the training on teaching farmers how to produce own organic inputs. Similarly, training increased the share of farmers who applied organic pesticides.

However, five years after the first training, we do not find that farmers fully convert to organic farming in response to the training, they rather use the organic practices in addition to chemical inputs or to partly substitute chemical inputs.

In a context of high chemical fertilizer use, we find that training motivated farmers to apply less Nitrogen through chemical fertilizers. Compared to the control group, farmers invited to the training used, on average, 21 kg/ha (around 14 percent) less Nitrogen from chemical fertilizers on their rice plots. Yet, the effect seems to be limited to the application of Nitrogen. There is no significant effect of the training on the average chemical fertilizer spending per hectare nor on the average chemical pesticide spending per hectare.

Figure 2. Effect of training on adoption in 2023



Findings: Adoption Patterns

The adoption of new agricultural practices is a complex process. Looking at the adoption of organic pesticides, our data shows that adoption is non-linear for many farmers. Figure 3 shows that the use of organic pesticides among farmers in the treatment group increased following the first training. In 2019, 15 percent of farmers in the treatment group used organic pesticides compared to 7 percent in the control group, indicating a difference of 8 percentage points. However, by the end of 2021, the difference between farmers in the treatment group and the control group shrank to around 4 percentage points. Following the second round of training in 2022, the difference between farmers in the treatment and control group increased again to around 13 percentage points.

This adoption pattern can be explained by a high share of farmers that fall in the following categories:

- Dis-adopters: Farmers who started to experiment with organic farming by 2019, but dis-adopted at a later stage.
- Late adopters: Farmers classified as non-adopters in 2019, but later started to experiment with organic farming methods.
- Re-adopters: Farmers who adopted after the first training, dis-adopted by 2020 and re-adopted by 2023.

Interestingly, we do not find that farmer characteristics such as age or educational background are related to farmers' adoption category.

Randomized Experiment

This project used a randomized controlled trial (RCT). This enables us to establish a direct cause-and-effect relationship between the training and its impact.

Simply comparing organic to non-organic farmers can be misleading as organic farmers may differ in many other respects (e.g. education or land quality) from non-organic farmers. Likewise, comparing the same farmers before and after training can be misleading if other factors, such as subsidies, change simultaneously.

Like in a medical trial, random assignment and a large sample ensures treatment and control group are similar before the training. Therefore, any difference in outcomes can be causally linked to the training, as all other factors are expected to change similarly for both groups.

Joint Research Project

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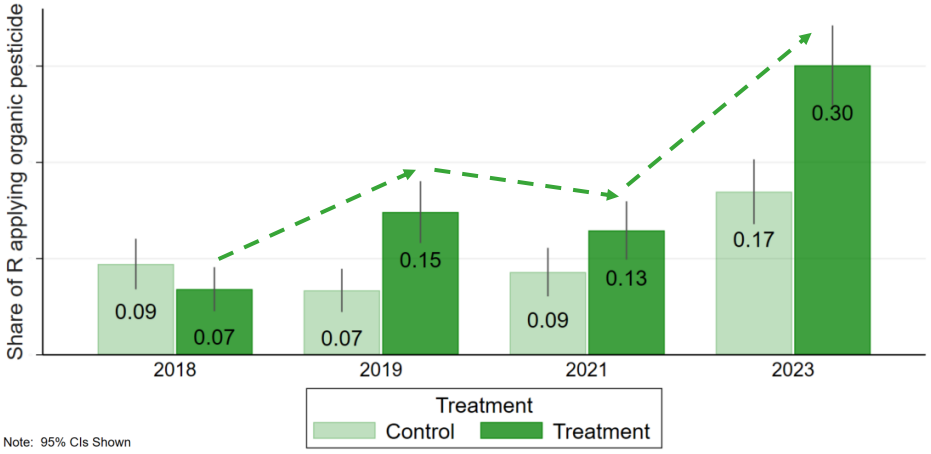
The observed patterns suggest that it requires repeated extension efforts to adopt organic farming methods.

Figure 3. Adoption pattern: Organic pesticides



Findings: Motivators and Obstacles

In addition to the quantitative data, we collected qualitative data in the form of focus group discussions (FGDs) and semi-structured interviews.

Motivators: During FGDs, participant expressed their appreciation for the training because it gives them more autonomy with respect to input choices. Participants stated that one of their main motivations to use organic farming practices is to substitute chemical fertilizer. Farmers further explain that they apply organic fertilizer to improve the quality of their soil.

Obstacles: Frequently mentioned obstacles to the uptake of organic farming practices include a lack of time, especially to ferment and apply manure. Some farmers explain that due to time constraints they prefer "instant" solutions. Furthermore, farmers are concerned that prices for organic products are not high enough to compensate lower harvest quantities. In addition, farmers perceive the access to markets of organic products difficult.

Key Messages

- Training is effective to boost the adoption of some organic farming practices, but it is difficult to reach full adoption. For non-manure organic fertilizer, use is 17 percentage points higher among farmers invited for training (45% in the treatment vs. 28% uptake in the control group).
- Training reduces farmers' application of chemical Nitrogen fertilizer.
- Farmers adoption process is non-linear; some dis-adopt, others re-adopt, and some only adopt after repeated extension efforts.
- Farmers value information on organic practices, particularly with declining fertilizer subsidies, and are motivated by soil quality improvements.
- Obstacles to wider organic farming adoption include time constraints, concerns about declining profits, and the access to organic markets.