FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Feed the Future Bangladesh Horticulture, Fruits, and Non-food Crops Activity

EVIDENCE TO ACTION BRIEF #1

Biopesticide Adoption and Use in Bangladesh: Findings from a Study of Teasle Gourd Farmers

October 2024

A farmer from Jashore, Bangladesh, secures a yellow sticky card to a stick, ensuring it stays in place even during heavy winds.

Introduction:

Bangladeshi farmers face high crop pest and disease pressures which result in annual crop losses of about 30 percent (BBS 2011, mentioned in Islam 2012). To protect their crops, farmers primarily rely on synthetic pesticides, which are readily available, widely marketed, relatively inexpensive, easy to apply and quick-acting (Islam 2012). Alternatively, biopesticides are a potential tool for farmers to lower synthetic pesticides usage, increase productivity and lower production costs. In Bangladesh, the biopesticide market has expanded rapidly in recent years, increasing nearly five-fold in the six years from 2016 to 2022 (Gill 2023), yet account for only five percent of total pesticide sales in the country in 2024. The Feed the Future Horticulture Activity, which focuses on biopesticide training and uptake, provided a valuable opportunity to better understand the biopesticide adoption process, how productivity using biopesticides relates to synthetic pesticide use, and to identify implications and recommendations for other programs, public and private, that aim to support the adoption and use of biopesticides.

Characteristics of Biopesticide Adopters: Research from Bangladesh

There is limited research on the usage of biopesticides in Bangladesh outside of formal agronomic field trials. One study on farmer use of organic inputs, including biopesticides, for watermelon production in the Khulna District found a positive correlation between biopesticide use and farmers' education level, number of years of watermelon farming, and receival of training (Hoque, et.al. 2022). Another study on the experience of 438 farmers trained in the use of pheromone traps (a commonly used biopesticide) in the Jashore region found that 43 percent of the farmers had sustained adoption of pheromone traps, 27 percent adopted initially but later discontinued use, and 30 percent did not adopt (Kabir, et.al. 2023). Farmers who discontinued using pheromone traps, did so because either the traps were too time-consuming, a lack of pheromone trap materials in nearby markets, a lack of knowledge on how to use them, or greater effectiveness of synthetic pesticides.

USAID
FROM THE AMERICAN PEOPLE

The Feed the Future (FTF) Horticulture Activity in Brief

The Feed the Future Bangladesh Horticulture, Fruits and Non-food Crops Activity, with a project period of July 2020 to July 2025, seeks to enhance food security in Bangladesh by increasing private sector capacity and productivity of horticulture crops that meet domestic and international standards. With a budget of $17.6 million, the Horticulture Activity provided support to farmers in 21 districts in the Southern Delta region of Bangladesh and two districts in southeastern Bangladesh through training and contract farming, single session training by input suppliers, and point-of-sale education. Already at the end of fiscal year (FY) 2024, the Horticulture Activity had successfully supported an estimated 160,000 farmers in adopting biological pest management practices, primarily the use of biopesticides, with resulting sales exceeding $120 million.

Study Objectives and Methodology

The overall objective of the study was to better understand the differences in practices, behaviors, and productivity of farmers exclusively using synthetic pesticides compared to those of farmers who use biopesticides. The study focused on teasle, or spiny, gourd producers in the Jashore Sadar Upazila in the Jashore District of Bangladesh. Specifically, the study aimed to explore productivity of teasle gourd farmers applying biopesticides management approaches compared to that of farmers using exclusively synthetic pesticides. The treatment group farmers consisted of teasle gourd farmers who were participants of the Horticulture Activity and used the recommended biopesticides during the previous growing season as a result of the Horticulture Activity. The control group consisted of teasle gourd farmers who did not use biopesticides during the previous season and were not participants of the Horticulture Activity.

The study had a mixed-method approach including both quantitative and qualitative data. The quantitative survey was administered through face-to-face interviews (f2f) with the control and treatment groups, while the qualitative survey included in-depth interviews (IDIs), key informant interviews (KIIs) and focus group discussions (FGDs). A total of 85 farmers from the treatment group and 86 farmers from the control group were included in the f2f quantitative survey. In the first phase of the study, five IDIs/KIIs, one FGD with treatment farmers, and one FGD with control farmers were conducted. [1]

Highlights of the Findings

- The quantitative survey revealed that the treatment group farmers, (those using biopesticides), tended to be better educated than the control group farmers (figure 1).
- For all treatment group farmers, biopesticides were used as a complement to synthetic pesticides, not as a full replacement.
- Based on qualitative data, the treatment group farmers, who used biopesticides as an additional pest management approach, applied synthetic pesticides less frequently than the control group, generally once a week for the treatment group compared to twice or more a week for the control group.

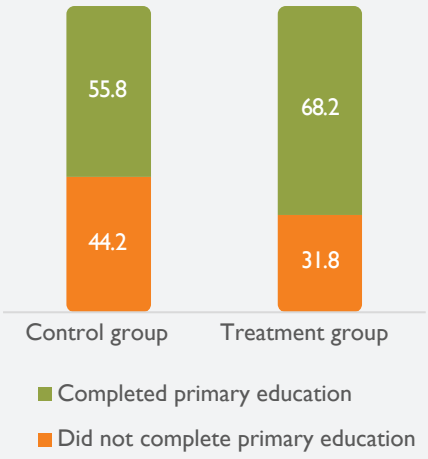

Figure 1
Education profile of the farmers (%)

1 The ongoing study would be completed with another round of qualitative data collection by November 2024.

> There is no farmer, who use only (sex) pheromone trap… they 'have to' apply both the (synthetic) pesticide and trap (to control certain type of insects)…
>
> - Treatment group teasle gourd farmer, Jashore

- The two mostly used bio-pesticides were pheromone traps (28%) and yellow (or "sticky") cards (24%) (figure 2)[2].
- Farmers from both the treatment group and the control group revealed:
  - Farmers apply pesticides as per their "own understanding" of need depending on the "type of insects."
  - Farmers are not convinced that biopesticides alone can improve the appearance of vegetables during harvesting, which is an important factor for selling the crops.
  - An extension officer stated that farmers thought biopesticides are best to use when a group of farmers are using them at the same time.

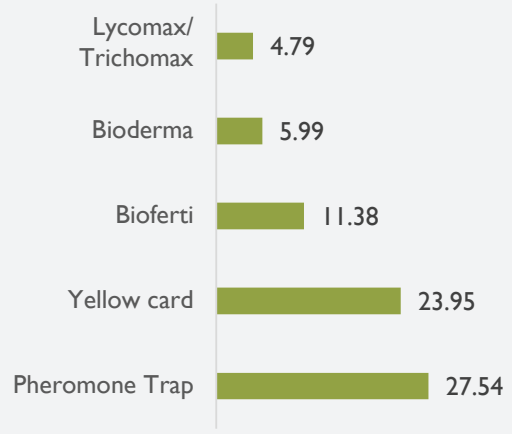

Figure 2
Top 5 categories of biopesticide used by the treatment group (%)

> Farmers do not have the confidence that only biopesticides like pheromone trap are effective on insects, they want to take extra protection for their vegetable, hence using synthetic pesticides also
>
> – Local Extension Officer, Jashore

- The Treatment group had statistically significant higher yields than the control group. Treatment yields averaged 134.44 kg/ decimal (.01 of an acre) compared to 118.84 kg/decimal for the control group (Figure 3). Treatment group sales were also higher (not statistically significant), averaging BDT 5,738 per decimal (.01 of an acre) compared to BDT 5,089 for the control group.
- Farmers reported reduced production losses when using biopesticides along with synthetic pesticides as compared to synthetic pesticides alone.

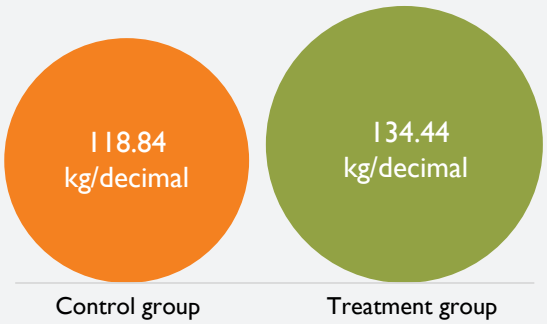

Figure 3
Average teasle gourd yield among the farmers in previous season (kg/decimal), significant at 95% level of significance

> If we use only pheromone trap, and no pesticide, then there will be loss of around 5-7 kg of teasle gourd per 40 kg …if we use both the pheromone trap and the pesticide, then the loss is much less, like 1-1.5 kg per 40 kg.
>
> – FGD, treatment group teasle gourd farmer

2 Bioferti: a microbial biofertilizer with humus, hormone and amino acid; Bioderma: Organic fungicide enriched with the beneficial fungus Trichoderma harzianum; Lycomax/ Trichomax: an antioxidant and biostimulant, with Trichoderma harzianum, Trichoderma viride, Metarhizium amisopila, Beauveria bassiana.

Implications and Recommendations

The ongoing study attempts to assess the impact of biopesticide use compared to the use of synthetic pesticides among teasle gourd farmers in Bangladesh. The study findings suggest the following implications and recommendations:

1. The present study represented an effort to introduce more rigorous evidence collection to complement the Activity's on-going Collaboration, Learning, and Adaptation (CLA) interventions. Rapid Assessment surveys could be conducted by the Monitoring, Evaluation and Learning (MEL) team with a focused objective to inform the Activity for future interventions.
2. Program activities that demonstrate positive impacts on yield and productivity from biopesticide use can be used to motivate farmers to adopt biopesticides and, in turn, reduce synthetic pesticide use.
3. Programs could leverage educated farmers who are more likely to adopt new technologies such as bio-pest management approaches as 'peer educators' to help train other farmers.
4. Enabling farmers who may apply synthetic pesticides without formal training with knowledge about the negative impact of synthetic pesticides on human health may reduce pesticide overuse and encourage the uptake of alternative technologies. Thus, awareness-raising activities for farmers and input suppliers about the negative health impact of synthetic pesticide use should be incorporated into the project design.
5. Farmers have experienced that sporadic use of the biopesticide would attract insects from other fields. Effective implementation of cluster farming is essential for farmer uptake and reduction of pesticide and other input costs from bio-pesticides and climate-smart technology use.

Shamsu Pramanik, a farmer from Jashore, Bangladesh, refills a trap with pheromone gel to lure pests.

References:

Gill, Gurbinder Singh, 2023, "Initial scoping for commercial marketing of Trichoderma and other biological solutions in Bangladesh: Study on current status of IPM products in Bangladesh". USAID Feed the Future Integrated Pest Management Innovation Lab. Virginia Tech and Agribusiness Associates.

Hoque, Md. Najmol, Sourav Mohan Saha, Shahin Imran, Afsana Hannan, Md. Mahdi Hasan Seen, Syed Sakib Thamid, and Fatema Tuz-zohra. 2022. Farmers' agrochemicals usage and willingness to adopt organic inputs: Watermelon farming in Bangladesh. Environmental Challenges 7 (2022) 100451.

Islam, Mohammad Azharul, 2012, "Pheromone use for insect control: present status and prospect in Bangladesh", International Journal of Agricultural Research, Innovation and Technology 2 (1): 47-55, June, 2012

Kabir, Muhammad Humayun, Sk. Md. Nur-e-Alam, Avishek Datta, Mou Leong Tan, and Md. Sadique Rahman, 2023, "Understanding Vegetable Farmers' Adoption, Dis-Adoption, and Non-Adoption Decisions of Pest Management by Pheromone Trapping". PLoS One, 18(9): e0292254.

Authors:

Authors, all from Feed the Future Bangladesh Horticulture Activity, include: Shafinaj Rahman, Former Director MEL; Yasmin Siddiqua, PhD, Director MEL; Philip J. DeCosse, Chief of Party; Md. Masud Rana, Manager, MEL; Abdul Motaleb, Data Management & Learning Coordinator, MEL

Photo: SM Tamzid Al Fatah/Chemonics International Inc