



Case Study, 2025

Empowering 1 Million Farmers to Transition to Safe Agriculture Practices: The Case of India

A women farmer at her farm, in Markasa village, Meghalaya, India. Photo: HIL Limited

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Context

Biopesticides production capacity in India is growing, yet many farmers face challenges in adopting these safer alternatives to harmful agrochemicals. India has 970 registrations of 18 biopesticide products compared to 293 conventional pesticides,¹ and its biopesticides market is projected to hit a compound annual growth rate (CAGR) of 11.7% between 2022 and 2028.² Despite this, agricultural use is not widespread, with most biopesticides applied in the health sector, such as mosquito control to combat vector-borne diseases.

Biopesticides remain marginal in Indian agriculture, particularly among smallholder farmers, due to limited awareness of their efficacy, costs and benefits, compounded by regulatory hurdles and pressure from the chemical pesticides industry. This has increased farmers' and local communities' exposure to serious health risks and environmental degradation, including contaminated water.³ Currently, a wide range of pesticides are still being used in India despite being prohibited in several other countries around the world.⁴

Raising awareness of biobased products and sustainable agriculture practices – especially in the technical aspects of biopesticides handling, application and storage – is vital for a safer agriculture future. Driving behaviour change among farmers is key to transitioning to safer alternative solutions to pesticides, yet many struggle to envision the transition despite understanding the importance of biocontrol techniques.

Technical questions on where to source products, appropriate dosage and which options fit their crops must be addressed for farmers to develop and challenge their current practices. Without this practical guidance, knowledge gaps will reinforce reliance on conventional chemical use and entrenched practices developed over decades.

¹ Financing Agrochemical Reduction and Management (FARM). (2023). *CEO Endorsement (CEO) entry - Full sized Project Child – GEF – 7 (Regional, India, Philippines)*. Retrieved July 17, 2025, from <https://thegreenforum.org/knowledge/farm-india-and-philippines-ceo-endorsement>.

² BlueWeave Consulting. (2022). *India Biopesticides Market, By Product (Bioinsecticides, Bioherbicides, Biofungicides, and Others), By Source (Microbial, Plant, Biochemical), By Mode of Application (Foliar Application, Seed Treatment, and Soil Treatment), By Crop Type (Cereals, Oilseeds, Fruits & Vegetables, and Others), By Region (North India, South India, East India, and West India). Trend Analysis, Competitive Market Share & Forecast, 2018-2028*. Retrieved July 3, 2025, from <https://www.blueweaveconsulting.com/report/india-biopesticides-market>.

³ Saini, N. (2022). *Agricultural chemicals are killing Indian farmers*. Retrieved July 3, 2025, from <https://www.earthisland.org/journal/index.php/articles/entry/agricultural-chemicals-are-killing-indian-farmers>.

⁴ Financing Agrochemical Reduction and Management (FARM). (2023). *CEO Endorsement (CEO) entry - Full sized Project Child – GEF – 7 (Regional, India, Philippines)*. Retrieved July 17, 2025, from <https://thegreenforum.org/knowledge/farm-india-and-philippines-ceo-endorsement>.

Approach and intervention: FARM action

The Financing Agrochemical Reduction and Management (FARM) project in India – funded by the Global Environment Facility (GEF), managed by the United Nations Industrial Development Organization (UNIDO) and implemented by state-owned company HIL India Limited – strengthens the capacity of farmers to transition to biopesticides and access eligible financing schemes to support the process, as part of the project's interventions to promote and expand the use of biopesticides in the country.⁵ It aims to phase out persistent organic pollutants (POPs) and gradually reduce highly hazardous pesticides (HHPs) by enhancing the production of three biopesticides,⁶ increasing the capacity of farmers to be equipped in using the alternative products and agriculture practices, and supporting the government to solidify its regulatory infrastructure around biopesticides.

The project promotes the safe and judicious use of biopesticides across eight crops in 10 Indian states. Training covers both principles – such as preserving soil health, reducing risks from conventional pesticides, and adopting Integrated Pest Management practices – and practical guidance on application methods, recommended dosage at various stages of crop growth, safety measures during use, storage, and safe disposal of the containers after use. It also integrates HIL India Limited's crop solution products, such as Bti, Trichoderma and neem-based biopesticides, as viable options for farmers transitioning to safer alternatives.



Women farmers participated in the training programme in Dimapur, Nagaland. Photo: HIL India Limited

⁵ This effort builds on the assets of similar capacity-building programme conducted between 2016 to 2022, directly benefiting more than 70,000 paddy, tea and vegetable farmers. The project also leverages the commercial manufacturing facility for non-POP alternatives to DDT in a past project that was also managed by UNIDO and HIL India Limited, funded by GEF.

⁶ Btk-based biopesticides, neem-based products and Trichoderma.

This case study examines several characteristics of training initiatives by FARM India that could be adapted in other contexts to support behaviour change at the farmer level and reduce reliance on chemicals and plastics.

1. Specificity

The training material is locally adapted, based on the local crop, local climatic conditions, local topography and available resources for the respective geographic location or farming community in which the training is delivered.

“We build very specific training modules that define the right application. What are the dosages of these chemicals? What are the application methods? What is the right way to dispose of chemical pesticides? What is the right way to store pesticides? For what crop? If we go and promote products that are not suitable for their crop, it’s useless.”

– Rajendra Thapar, FARM India

In developing the modules, the project team analysed farming conditions across 12 climatic zones in India, assessing local crops, cropping patterns, pest biology, bioproduct feasibility and storage conditions. These insights shaped area-specific training materials, with recommendations tailored to each community and crop. For example, farmers are trained to choose the right biocontrol formulations for optimal efficacy and to determine correct dosage rates based on the crop’s leaf area index.

To establish the detailed modules and standards, the project worked closely with national agricultural experts from the Krishi Vigyan Kendra (KVK) under the Indian Council of Agricultural Research (ICAR) institutes.

Training also considered crop seasonality, weather and farmer availability. Sessions were avoided during sowing, harvesting, monsoon

season and peak summer, and instead held in less busy periods such as post-harvest or during the offseason, varying by crops and region. To improve accessibility, multilingual handouts were prepared and tailored to the target audience before distribution for better clarity and understanding.

2. Linkages to financial support that enable the transition

Access to finance plays a critical role in enabling farmers to shift to biopesticides and is therefore a key component of the training material. Nearly 80% of India’s farmers are smallholders, cultivating just one to two acres of land. Given their limited scale, they often expect quick, tangible results, particularly in terms of yield and financial returns, before adopting new practices. When considering alternatives to conventional pesticides, they carefully weigh the quick wins and potential benefits against the risks of unfamiliar approaches. To manage this uncertainty, farmers look for safeguards or financial safety nets that protect their income during the transition.

FARM India’s capacity-building activities highlight financing mechanisms and insurance schemes available to farming communities, which are designed to support the transition from chemical pesticides to safer alternatives. The aim is to align government and private sector offers – such as incentives, subsidy programmes and other support – so farmers can access coherent, reliable options during the transition.

One example is the Paramparagat Krishi Vikas Yojana (PKVY), a Government of India initiative to promote organic farming nationwide. The scheme supports practices like biocontrol, compost and manure use, which improve soil health and leave no pesticide residues in the food produced. Farmers are encouraged to form groups or clusters to scale adoption, with a

target of 10,000 clusters covering 500,000 acres of agricultural land under organic cultivation within three years. Each farmer enrolling in the scheme receives approximately \$360 (INR 31,200) per hectare over that period to ease the shift.⁷

The training also discusses the cost benefits of biopesticides. Produce treated with them can qualify as organic, opening access to higher-value markets and export opportunities. Farmers are further guided on how to access or participate in export schemes, further linking sustainable practices directly to economic gains.

3. Recognition of farmers' agency and expertise

Farmers' extensive experience, knowledge, cultural traditions and networks are leveraged and further boosted through the project. The training is grounded in an understanding

that farmers are not passive recipients of knowledge, but skilled practitioners with a deep, context-specific understanding of their land, crops and local practices. Hesitation to transition often stems from limited access to trusted information and visible, proven results.

The training supports farmers in making informed decisions to move away from harmful pesticides, boosting their confidence through validation and peer learning. Central to the programme is a peer-sharing model where local farmers with proven experience using biocontrol share insights alongside national experts, scientists and community leaders. This approach builds trust and credibility by highlighting real-life results, while also strengthening confidence in product efficacy. By showcasing tangible impacts in crop health, yield and profitability, the training not only encourages greater participation, but also demonstrates the practical value of biocontrol solutions.



Farmer training programme organised in West Khasi Hills, Meghalaya. Photo: HIL India Limited

⁷ Financing Agrochemical Reduction and Management (FARM). (2023). *CEO Endorsement (CEO) entry - Full sized Project Child – GEF – 7 (Regional, India, Philippines)*. Retrieved July 17, 2025, from <https://thegreenforum.org/knowledge/farm-india-and-philippines-ceo-endorsement>.

Results

More than **20,000+** farmers were directly trained from July 2024 to July 2025.

Around **1.7 million farmers** indirectly benefited from the process. HIL carried out training of trainers (TOT), and each participant will train around 80 to 100 farmers, other workers and fellow farmers in their own villages and other neighbouring villages through the training lessons and learning they had received in the initial training.

While still in its early stage, the **FARM** project in India builds on a proven training model implemented between 2016 and 2022 that reached over **70,000 farmers** and promoted safe pesticide use and IPM to reduce residues in food grains, oils, fruits and vegetables. The current phase expands activities to focus on women farmers and target crops and regions with extensive HHP use. This approach continues to contribute to national-level benefits, including an increase in biopesticide consumption from 7,190 metric tonnes in 2016 to 8,995 metric tonnes in 2022, as well as higher exports of organic produce that generate additional farmer income.

Some farmers reported positive change after the training. In Ukrem village, Meghalaya, a group of women farmers set up a small biocontrol production unit in 2023, combining practical guidance from the training with government financial support introduced during the sessions. The products are now available for other local farmers in the community and nearby villages, promoting natural farming practices while generating up to \$600 in additional monthly income for the women farmers.

Challenges and lessons learned

While this capacity-building programme serves as a key element of FARM India's multi-pronged approach, it is not a stand-alone solution and must be accompanied by other interventions to deliver transformational impact, following these challenges:

- **Chemical pesticides have been used by these farmers for decades and some farmers are more resistant to change.** They have their own understanding, informed by wisdom and knowledge based on past practices and experiences passed down from different generations. Consistent behaviour change advocacy and trainings are crucial in this scenario.
- **Biocontrol must be able to demonstrate its efficacy faster.** There are also misconceptions around the cost of transitioning, as it takes time for biopesticides to demonstrate quick and visible results. This creates a challenge for

farmers to accept the solutions compared to the quick-acting synthetic alternatives of chemical pesticides. Advancing the progress towards transition to alternative solutions will require further research and product development to enhance the efficacy, consistency and reliability of biocontrol solutions.

- **Biocontrol is not yet mainstreamed in the market.** Throughout its implementation, the project observes a lack of promotion from retailers, leading to minimal product awareness among farmers, as well as dealers or shops. This is important as retailers or shops are the first contact points of many farmers, given their position as distributors of the pesticide. Unless and until there is a certain level of influence from the dealer or distributor on the farmer to push the use of biopesticides, the transformation and transition towards safer agriculture could face significant hurdles.

Next steps

By training farmers and stakeholders on the safe and effective use of these products, the FARM project in India aims to drive acceptance and adoption at the grassroots level. Field demonstrations and knowledge-sharing sessions further build farmer confidence, promoting sustainable agriculture while expanding the reach and commercial viability of HIL's crop solution products, including Bti, Trichoderma and neem-based biopesticides.

Following the training programmes, FARM India seeks to further develop its three biosolutions under its portfolio ahead of its commercialization by the end of 2026.

Contact information

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The case study features work delivered by the FARM Programme. Funded by GEF and led by UNEP, it aims to reduce the use of harmful pesticides and plastics in agriculture by shifting policies, practices and investments towards sustainable solutions that safeguard ecosystems, human health and food security. Be part of the change: gef-farm.org

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