

South Asia Biosafety Program

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BANGLADESH

Widespread Use of Pesticides in Potato Cultivation Causes Health and Environmental Concerns in Bangladesh

Dr. Mohammad Zabed Hossain, Professor, Department of Botany, University of Dhaka



Potato farmers in Dhaka, Bangladesh (9 March 2021). © Bayazid Akter | Dreamstime.com

Potato is a good source of carbohydrates, vitamins, trace elements, and high-quality protein for the human diet. Further, due to its diverse distribution and high production rate, the crop has become popular among farmers and is used as a staple food crop in many countries worldwide. Therefore, the crop has the potential to help achieve food security and also generate income and employment in developing countries.

Potatoes contribute a large share of Bangladesh's agricultural sector. In terms of production, it holds the seventh position in the world and third in Asia. After rice, wheat, and maize, it ranks fourth, representing about 48% of the total vegetable production in Bangladesh, and it is an important cash crop. However, the yield of this crop is much lower in Bangladesh than in many other countries due to several factors, including pests and diseases. Consequently, farmers are increasingly dependent on the use of pesticides to protect their crops. Although the use of pesticides has boosted production, its externalities on human health and the environment are of great concern.

"Farmers' knowledge and handling practices of pesticides in cultivation of potato in Bangladesh" by Hossain et al. (2024) was recently published in the journal *Frontiers in Public Health*. The study revealed an alarming scenario of widespread pesticide use in potato cultivation

in Bangladesh. The research was made possible thanks to the Biosafety Research in Bangladesh Grants Program, which was managed by the Agriculture & Food Systems Institute's South Asia Biosafety Program and supported by funding from the USAID Mission in Dhaka. The researchers surveyed 553 farmers selected from the 14 districts where most of the potato in Bangladesh is produced, and the study reported a total of 321 different pesticide brands used by farmers in the study area. Among

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these pesticides, 50.5% were registered, 47.7% unregistered, and 1.9% were banned. Pesticides used by the surveyed farmers were also comprised of various chemical families with high carbamates (33.5%), followed by organophosphates (22.2%), organochlorines (4.2%), and pyrethroids (3.0%). Mixtures of these four types contributed to the remaining pesticides (37.1%). According to the World Health Organization's hazard categories, of all the registered pesticides, 5.6% were highly hazardous, 24.8% were moderately hazardous, and 6.2% were slightly hazardous, indicating high hazard risks for the chemicals in use. These chemicals are persistent and neurotoxic and can cause both acute and chronic effects, including reproductive disorders.

Pesticides were found to be used by farmers commonly and frequently. Among the farmers surveyed, 96% reported the use of pesticides in their potato fields. Of these, 16.6% of farmers sprayed more

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Photos showing pesticide use without personal protective equipment (left) and improper disposal of pesticide containers (right) at a potato farm in Bangladesh.

than five times in a cropping season. This widespread use of pesticides is alarming because of the effects on biodiversity, the environment, and health. Degradation of soil quality and, hence, reduced productivity of agroecosystems owing to the use of inorganic fertilizers is also well reported.

The health of potato farmers has been ignored for decades. The use of personal protective equipment (PPE) was not satisfactory among the farmers in the study area, with them using simple and ordinary protective measures, such as the use of hand towels (77.9%) and shirts (70.0%), to cover their body parts in order to avoid pesticide exposure. There was no proper disposal mechanism for the empty pesticide containers, such as bottles and bags. The majority of the farmers (57%) threw away the containers indiscriminately, with many found to bury them under soil (25%), while some burned them in the open air (18.6%). About 84% of farmers mentioned various kinds of health impacts immediately after spraying pesticides, and the majority reported that they did not consult with physicians about these issues. Nevertheless, the health effects owing to long-term exposure to these pesticides are yet to be investigated in Bangladesh, and they might have profound socio-economic impacts.

The study also revealed that the majority of the farmers in the study area were aware of the externalities of pesticide use in the field. However, despite their knowledge of the harmful effects of pesticides, farmers continue to apply pesticides in their fields. This indicated no relationship

The adoption of integrated pest management and organic farming can help reduce dependency on inorganic pesticides. The use of pest-resistant potato varieties can also help farmers avoid the use of pesticides.

between pesticide use and farmers' awareness of the harmful effects of pesticides. Rather, farmers are cultivating potatoes to get economic returns on their investment. It also indicates that farmers do not have better alternatives to pesticide use to protect their crops.

Improving the current alarming situation of the widespread use of pesticides in potato cultivation in Bangladesh warrants immediate actions to protect human health and the environment. The adoption of integrated pest management and organic farming can help reduce dependency on inorganic pesticides. The use of pest-resistant potato varieties can also help farmers avoid the use of pesticides. It is also important to develop proper waste disposal systems. Farmers should be trained in safe handling practices and proper disposal mechanisms for pesticides. Stringent enforcement of laws and

regulations is of utmost importance to ensure sustainability in agriculture to control the externalities of pesticide use.

References:

Hossain MZ, Ferdous F and Rayhan MI (2024) Pesticide knowledge and attitude among the potato growing farmers of Bangladesh and determinant factors. *Front. Public Health* 12:1408096. doi: [10.3389/fpubh.2024.1408096](https://doi.org/10.3389/fpubh.2024.1408096)

N.B.:

The research project "Use and handling practices of pesticides used in the cultivation of high yielding potato varieties in Bangladesh" was funded by the Agriculture & Food Systems Institute (BRBGP-05-2019).



Potato farmers in Dhaka, Bangladesh (9 March 2021). © Bayazid Akter | Dreamstime.com

New Tool for Navigating the Regulatory Landscape for Microbial Biotechnology Products in the USA

Dr. Vibha Ahuja, Chief General Manager, Biotech Consortium India Limited (BCIL)

Dr. Bhavneet Bajaj, Senior Manager–Scientific Programs, Agriculture & Food Systems Institute (AFSI)

Microorganisms are a key source of industrial enzymes and drive the production of a wide range of products, from food to chemicals and pharmaceuticals. Microorganisms form the basis of next-generation products, including bio-based fuels and chemicals. Significant research efforts are underway to use modern biotechnology techniques, including genetic engineering and gene editing, to develop modified microorganisms to ensure efficient and safe use. Interest in the bioeconomy and biomanufacturing globally requires an understanding of regulatory requirements by biotechnology developers.

On 2 October 2024, the U.S. Department of Agriculture (USDA), U.S. Environmental Protection Agency (EPA), and U.S. Food and Drug Administration (FDA) released a new web-based tool on the Unified Website for Biotechnology Regulation (<https://usbiotechnologyregulation.mrp.usda.gov/biotechnologygov/home>) for companies that develop microbial biotechnology products. The full press release is available at: <https://www.epa.gov/pesticides/epa-fda-and-usda-release-tool-help-biotechnology-developers-navigate-regulatory>

Biotechnology products include plants, animals, and microorganisms developed through genetic engineering or the targeted manipulation of genetic information. The tool provides a starting point for researchers and developers, especially those new to biotechnology product development, to navigate the regulatory requirements for genetically modified microorganisms. This advancement helps meet U.S. President Joseph R. Biden's goals of ensuring public confidence in the biotechnology regulatory system and improving its transparency, predictability, coordination, and efficiency. The *Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy (14081)* can be accessed at: <https://www.whitehouse.gov/briefing-room/presidential-actions/2022/09/12/executive-order-on-advancing-biotechnology-and-biomanufacturing-innovation-for-a-sustainable-safe-and-secure-american-bioeconomy/>

The *Interactive Tool for Genetically Modified Microorganisms* provides users, through a series of prompts, more information on regulatory requirements for biotechnology products developed using genetically modified microorganisms and the approval process across U.S. regulatory agencies. The tool was tested by seeking input from biotechnology organizations of varying sizes and includes a built-in feedback function to submit feedback directly to the agencies for continuous improvement. The tool can be accessed at: https://zingtree.com/live/126497995/embed?tree_id=126497995000&z=embed#1

LINK



The Guide for Submitting Permit Applications for Microorganisms Developed Using Genetic Engineering under 7 CFR Part 340 was published on 10 September 2024.

It can be accessed at:

<https://www.aphis.usda.gov/sites/default/files/brs-microbe-permit-guide-revised-draft.pdf>



Products of classical microbial biotechnology, such as yogurt, bread, and cheese. © Andrii Ovsianiuk | Dreamstime.com

National Biodiversity Target (NBT) 17 on Strengthening Biosafety Regulatory Capacity in India's Updated National Biodiversity Strategy and Action Plan (NBSAP)

Dr. Vibha Ahuja, Chief General Manager, Biotech Consortium India Limited (BCIL)



Speakers and guests at the event marking the release of India's Updated National Biodiversity Strategy and Action Plan in Cali, Colombia (30 October 2024)

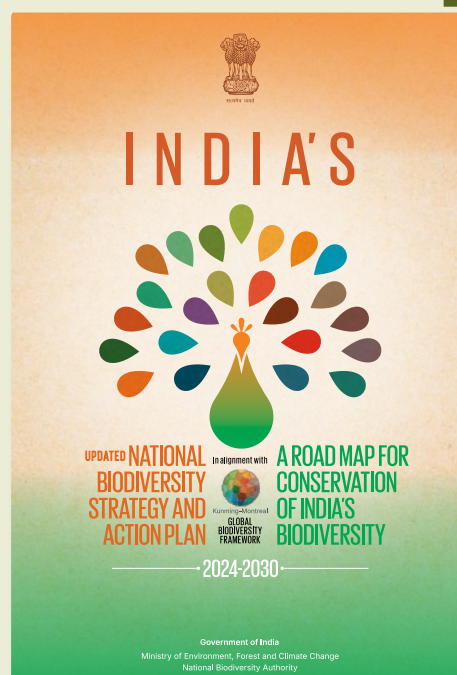
India's Updated National Biodiversity Strategy and Action Plan (NBSAP) was released by Shri Kirti Vardhan Singh, Union Minister of State for Environment, Forest and Climate Change (MoEFCC), at the 16th Meeting of the Conference of Parties (COP 16) to the Convention on Biological Diversity (CBD) on 30 October 2024 in Cali, Colombia. The following distinguished guests were present at the event: Mauricio Cabrera, Vice-Minister of Environment and Sustainable Development, Colombia; Ms. Kandya Obezo, Vice-Minister of Multilateral Affairs, Colombia; Ms. Astrid Schomaker, Executive Secretary, CBD; Shri Tanmay Kumar, Special Secretary, MoEFCC; and Shri C. Achalender Reddy, Chairman, National Biodiversity Authority.

The MoEFCC is the central agency responsible for coordinating biodiversity conservation efforts across India, adopting the "Whole-of-Government" and "Whole-of-Society" approach. The updated NBSAP aligns with the Kunming-Montreal Global Biodiversity Framework (KMGBF), setting 23 National Biodiversity Targets (NBTs) through an extensive consultative process involving diverse stakeholders. The NBSAP update was driven by an extensive consultative process led by MoEFCC, involving 23 central ministries and multiple departments, state-level organizations, communities, and other stakeholders. In line with the KMGBF Target 17, India's National Biodiversity Target (NBT) 17 focuses on strengthening biosafety regulatory capacity.

LINK

Access India's National Biodiversity Target (NBT) 17: Strengthen Biosafety Regulatory Capacity:
<https://ort.cbd.int/national-targets/my-country/part-1/28B2499D-3D79-10AF-7CDA-13A27F22E20D/view>

RESOURCE



Access India's Updated National Biodiversity Strategy and Action Plan (NBSAP):
<https://ort.cbd.int/nbsaps/my-country/8D6F8524-3F89-5B94-FC00-2927C0F47AF9/view>

Biosafety Technical Series 06: Legislative Study on Biosafety Mainstreaming

Dr. Vibha Ahuja, Chief General Manager, Biotech Consortium India Limited (BCIL)


The term “biosafety mainstreaming” refers to the integration of biosafety in domestic cross-sectoral and sectoral legislation, policies, and institutional frameworks, taking into account national circumstances and priorities.

Published in September 2024, the *Biosafety Technical Series 06: Legislative Study on Biosafety Mainstreaming* was launched during a side event at the 16th Meeting of the Conference of the Parties (COP 16) to the Convention on Biological Diversity (CBD) and the Eleventh Meeting of the Conference of the Parties serving as the Meeting of the Parties to the Cartagena Protocol on Biosafety (CP-MOP 11), which was held on 16 October-1 November 2024 in Cali, Colombia.

The study was prepared by the Secretariat of the CBD in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the Montevideo Programme on Environmental Law under the United Nations Environment Programme (UNEP). It provides a comprehensive overview of biosafety obligations and the practical ways in which biosafety measures can be mainstreamed into the national laws, policies, and institutional frameworks of the Parties to the Cartagena Protocol on Biosafety to the Convention on Biological Diversity.

The publication focuses on the food and agriculture sectors, where biotechnologies are widely applied. Many examples of biosafety mainstreaming at the national level were presented, including example provisions, to illustrate how biosafety may be mainstreamed in a domestic context. Biosafety mainstreaming is expected to contribute to implementing the Convention and the Cartagena Protocol in a more resource-efficient manner, e.g., through sharing expertise and resources.

[LINK](#)



Access Biosafety Technical Series 06:
<https://bch.cbd.int/en/database/VLR/BCH-VLR-SCBD-273276-1>

Access all publications in this technical series:
https://bch.cbd.int/protocol/cpb_technicalseries.shtml



16th Meeting of the Conference of the Parties (COP 16) to the Convention on Biological Diversity (CBD) Plenary Meeting in Cali, Colombia (30 October 2024). © UN Biodiversity | Flickr.com CC BY 2.0 - <https://flic.kr/p/2qrd17y>

CALENDAR OF EVENTS

EVENT	ORGANIZED BY	DATE	WEBSITE
INDIA			
Training on Tissue Culture Propagation of Banana Plant	ICAR-Indian Institute of Horticultural Research	26-28 November 2024 Bengaluru	https://www.iihr.res.in/events
National Symposium on Hybrid Technology for Enhanced Crop Productivity	Trust for Advancement of Agricultural Sciences (TAAS)	2-4 December 2024 New Delhi	https://www.taas.in/ForthcomingEvents.aspx
Third Indian Rice Congress 2024	Association of Rice Research Workers	5-7 December 2024 Cuttack	https://icar-nrri.in/
International Conference on Trailblazing Trends in Sustainable Climate Resilient Precision Agriculture Through Artificial Intelligence and Remote Sensing	Centre of Excellence on Soil & Water Management Research Testing and Training Centre at Junagadh Agricultural University	23-24 January 2025 Junagadh	https://www.ictpairs.in/
National Conference-cum-Workshop on Sustainable Biotech Solutions for Global Challenges	Jamia Hamdard University	19-21 February 2025 New Delhi	http://jamiahamdard.edu
XVII Agricultural Science Congress	National Academy of Agricultural Sciences and G B Pant University of Agriculture & Technology	20-25 February 2025 Pantnagar	http://www.17asc2025.in/ https://www.gbpuat.ac.in
Indian Seed Congress 2025: Emerging Technologies - Propelling Seed Revolution	National Seed Association of India	23-25 February 2025 New Delhi	https://isc.nsai.co.in/
Second International Conference on Biological Control: Biocontrol Contributions to One Health (2icbc2025)	Society for Biocontrol Advancement (SBA) and the ICAR-National Bureau of Agricultural Insect Resources	25-28 February 2025 Bengaluru	https://www.nbair.res.in/
INTERNATIONAL			
Asian Seed Congress 2024	Asia & Pacific Seed Alliance (APSA) and the China National Seed Trade Association (CNSTA)	2-6 December 2024 Sanya, China	https://web.apsaseed.org/asc2024
17 th ISBR Symposium (ISBR 2025)	International Society for Biosafety Research	2-6 November 2025 Ghent, Belgium	https://isbr.info/



SOUTH ASIA
BIOSAFETY PROGRAM

The South Asia Biosafety Program (SABP) is an international development program implemented in India and Bangladesh by the Agriculture & Food Systems Institute (AFSI). SABP aims to work with national governmental agencies and other public sector partners to facilitate the implementation of transparent, efficient, and responsive regulatory frameworks for products of modern biotechnology that meet national goals as regards the safety of novel foods and feeds, and environmental protection.



Agriculture &
Food Systems
Institute

CONTACT SABP

BANGLADESH

Dil Afroj Moni
Program Officer
South Asia Biosafety Program
Agriculture & Food Systems Institute
1900 L Street NW, Suite 302
Washington, DC 20036, USA
Email: dilafroj@southasiabiosafety.org

UNITED STATES

Layla Tarar
Manager, Communications & Digital Learning
Agriculture & Food Systems Institute
1900 L Street NW, Suite 302
Washington, DC 20036, USA
Twitter: @AgFoodSystems
Email: ltarar@foodsystems.org

INDIA

Vibha Ahuja, Ph.D.
Chief General Manager
Biotech Consortium India Limited
Anuvrat Bhawan, 5th Floor
210, Deendayal Upadhyaya Marg
New Delhi 110 002, India
Email: vibhaahuja@biotech.co.in

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