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## ***Pesticide use in India - Current Trends and Future Perspectives***

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**India's agricultural yields have improved due to the adoption of intensive agriculture practices that gained popularity after the green revolution. Interestingly, the yield loss estimates due to pests also showed a substantial increase between the early 1960s and early 2000s. The adoption of monoculture of commercial crops and intensive agricultural practices are the prime reasons for higher pest attacks. The yield loss due to pests, which was about 25 per cent in fruits, 18 per cent in cotton, and 10 per cent each in rice and sugarcane in the early 1960s, took a rapid stride to reach the level of 50 per cent in cotton, 30 per cent in sorghum and millets, 25 per cent in rice and 20 per cent in sugarcane. The situation thus warrants the use of suitable pesticides to control crop loss.**

### **INTRODUCTION**

Pesticides are a crucial component of present-day Indian agriculture, mainly since they serve as the best ally to farmers to save crops from insect attack. The green revolution brought the idea of employing high-yielding varieties to enhance food production, and the use of pesticides safeguarded the harvest. It significantly impacts the country's food security by reducing pests and the associated crop loss. Additionally, pesticides also contribute by controlling several diseases transmitted by insects. The use of pesticides such as herbicides, insecticides, fungicides, biopesticides, rodenticides, and nematocides has increased steadily throughout the nation. The commonly used pesticides in India are carbamates, pyrethroids, organochlorines, and organophosphates. The cause of concern, however, is the unscientific and sporadic use of pesticides that lead to negative consequences in terms of poor food quality and damage to the environment and human health (Agnihotri, 1999). The ignorance in handling the pesticides has resulted in them entering the food chain

as residues and polluting the soil and water. It poses a dilemma if we weigh the benefits of using pesticides in agriculture against the hazards associated with its manufacturing and application.

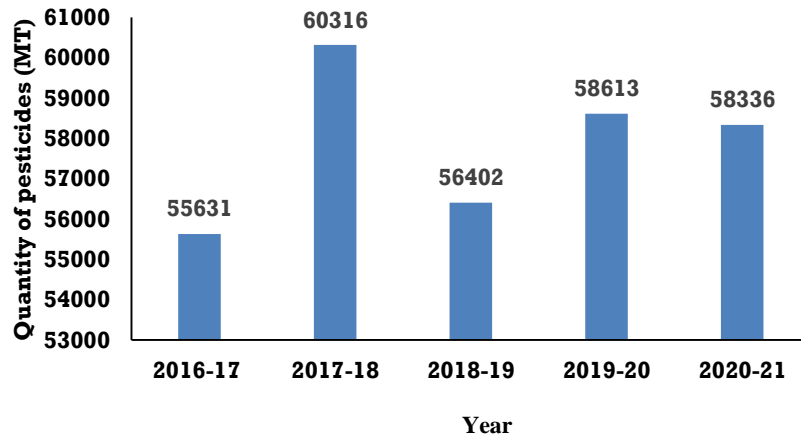
**PESTICIDE USE PATTERN**

About 15 to 25 per cent of India's total crop yield is estimated to be lost due to pests and other biotic stresses. This huge yield loss also inflicts a loss of 0.9 to 1.4 lakh crore rupees annually. Pesticides are the most popular means of controlling pest attacks on crops. In addition to the conventional insecticides, fungicides, and herbicides, newer and safer products such as pheromones, plant growth regulators, and micro-biological pest control organisms such as bacteria are also used in India.

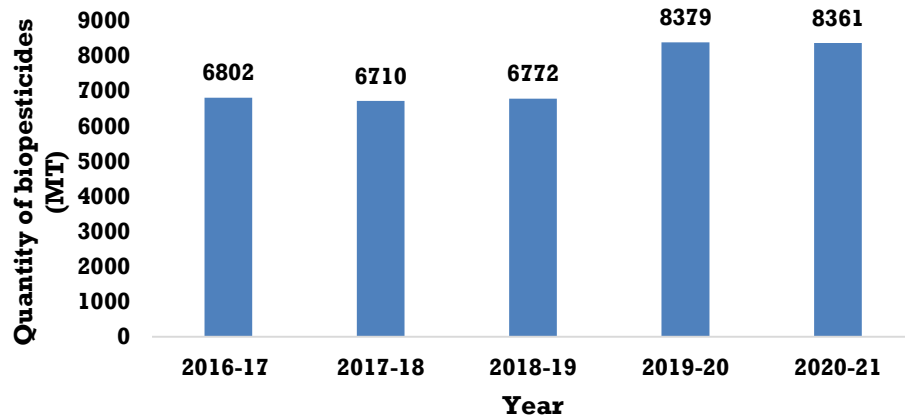
**STATE-WISE SHARE IN CONSUMPTION**

India consumed 58336 MT of pesticides (Figure 1) and 8361 MT of bio-pesticides (Figure 2) in 2020-21. During this period, the year 2016-17 witnessed the highest consumption. It also needs to be noted that pesticide consumption has been consistently higher than 55000 MT in the past five years. Among the states, Maharashtra topped in pesticide consumption, followed by Uttar Pradesh, Punjab, Telangana, and Haryana (Figure 3). In bio-pesticides, the top-consuming states are Rajasthan, West Bengal, Maharashtra, Tamil Nadu, and Kerala.

**Pesticide consumption in India**



**Figure 1. Pesticide consumption in India**



**Figure 2. Bio-pesticide consumption in India**

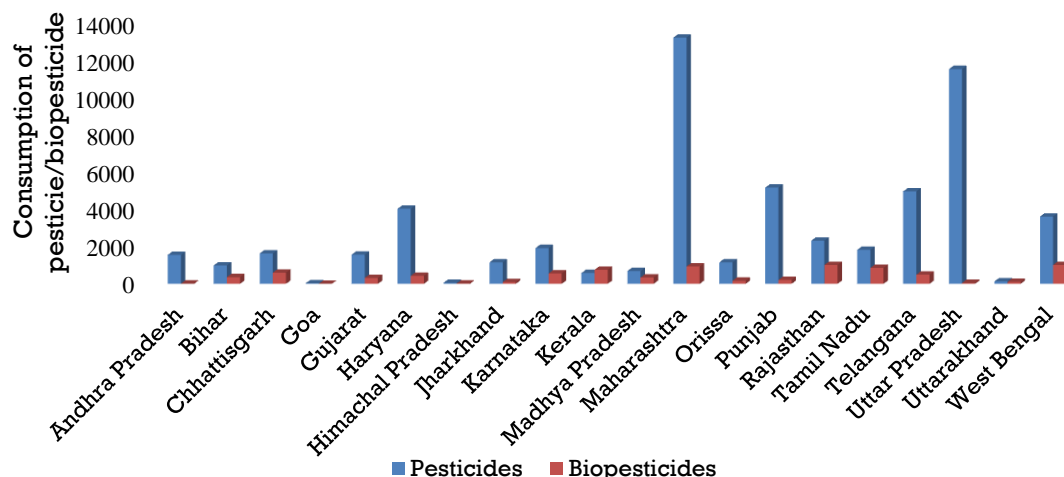


Figure 3. Consumption of pesticides/biopesticides in Indian states

**AREA TREATED WITH PESTICIDES**

In comparison to 2019-20, while the area under cultivation decreased by 5% in 2021-21, the area treated with chemicals increased by 3%. The area treated with bio-pesticides decreased by 4% (Table 1). Cereal consumes the highest amount of chemical pesticides and biopesticides (Figure 4). Among the crops, paddy accounts for the maximum share of agrochemicals consumption (26%-28%), followed by cotton (18% -20%). Insecticides dominate the Indian crop protection market with a share of 51%, followed by fungicides, bactericides, herbicides, and plant growth regulators (Figure 5) (FAO, 2019).

Year	Area (000 hectares) under cultivation	Area under				Not under the use of pesticides
		chemical	biopesticides	Chemical +biopesticides	Total	
2016-17	120798	71645	7267	25125	104037	28621
2017-18	132011	82189	7738	10268	100195	36052
2018-19	141555	81120	7119	10572	98812	45628
2019-20	198552	108035	14636	45213	167884	52874
2020-21	188595	111289	14014	22046	147349	41246

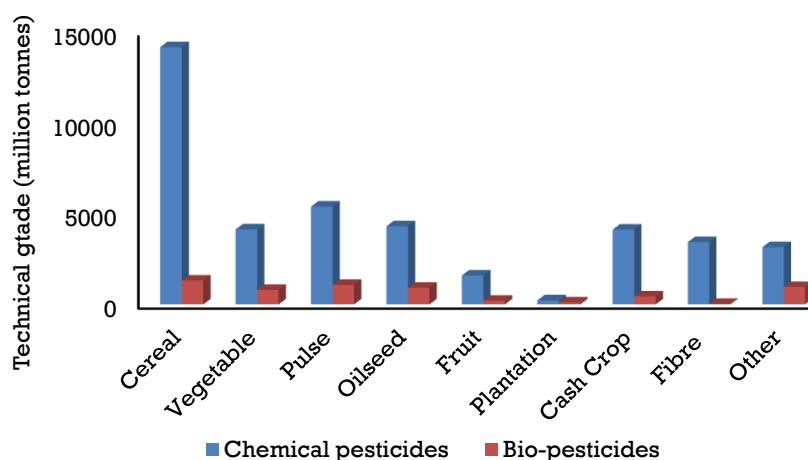
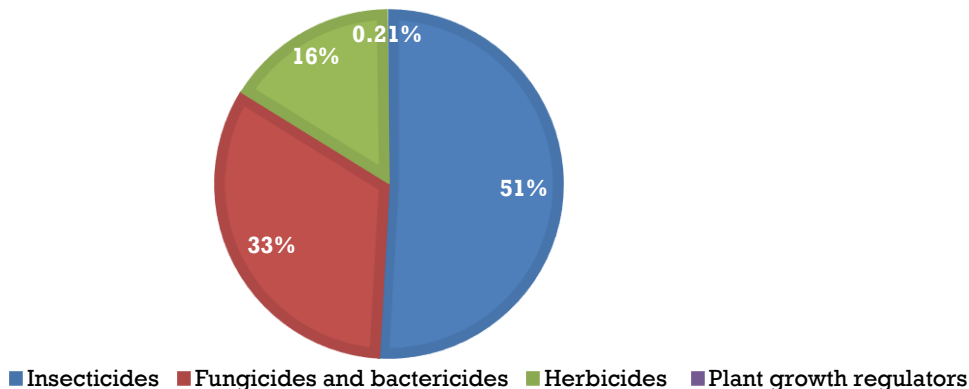
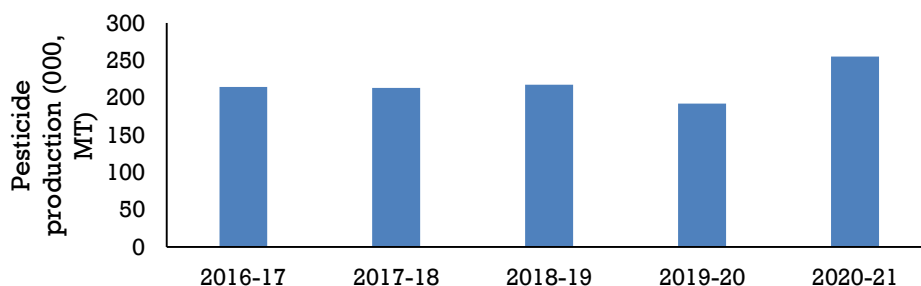


Figure 4. Commodity-wise consumption of chemical pesticides and bio-pesticides

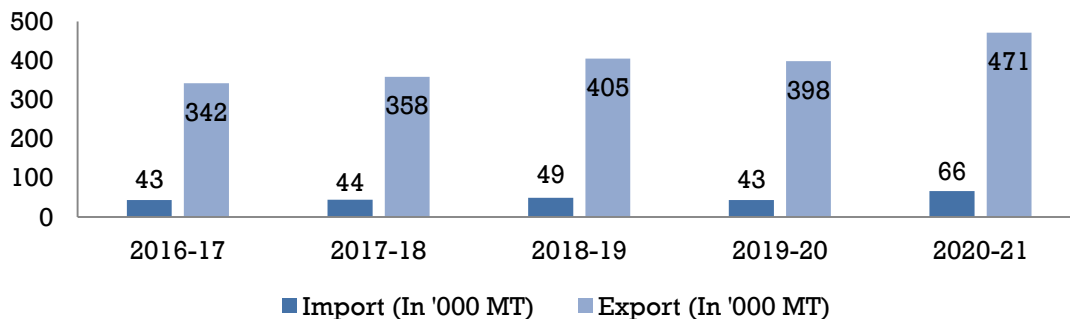


**Pesticide production in India**

India is the 4<sup>th</sup> largest producer of agrochemicals in the world. It is a Billion-dollar industry. The global agrochemical market, worth approximately 234.2 billion U.S. dollars in 2019, is expected to increase to more than 300 billion U.S. dollars by 2025. The production of pesticides was almost stagnant (or decreasing) during 2016-17 to 2019-20. The trend, however, reversed in 2020-21 when the pesticide production volume amounted to 255 thousand metric tons across India. The Export of Pesticides (Technical Grades & Formulations) was significantly higher than its import during 2016-17 to 2020-21. In terms of volume, Mancozeb tops the list of pesticides produced in the country (97428 MT), followed by acephate (29588 MT) and 2,4 D (27050 MT). Acephate is the top insecticide manufactured, followed by prophenofos, cypermethrin, chlorpyrifos, and monocrotophos.



**Figure 6. Pesticides Production (Technical Grades)**



**Figure 7. Pesticide trade (technical grade import and export in India)**

### **INSTITUTIONAL ARRANGEMENTS TO MANAGE PESTICIDES**

In the case of pesticides, the establishment of regulation and its practical implementation is equally important, as indicated by the poor implementation of pesticide regulations in many countries. Regulations mainly deal with registration, managing the production, trade and pesticide application, pesticide quality control, and residue limits. The regulations in India concerning pesticides deal separately with different categories of pesticides since including all these products in single category causes inefficiencies.

The Insecticides Act, 1968 and Insecticides rule, 1971 regulate the use of pesticides in India. It aims to regulate pesticides, including their manufacture, import, packaging, labelling, storage, advertisement, sale, transport, distribution, use, and disposal. Under section 9(3) of the Insecticides Act, 1968, 307 insecticides are registered for use in the country. Forty-six pesticides are banned for manufacture, import, and use as of 1.07.2022 (DPPQ&S). Currently, there are 970 biopesticide products registered. Recently banned insecticides for which no new certificate of registration shall be issued vide S.O.3951(E) dated 8th August 2018 are alachlor, carbaryl, diazinon, dichlorovos, fenthion, phorate, phosphamidon, trichlorfon, triazophos. As of 30.11.2020, 44 insecticides have been approved by the registration committee to control household pests. The registration committee has approved six insecticides to control stored grain pests. The registration committee also authorizes certain insecticides to prevent termites in buildings and crops. The Pesticide Management Bill was presented in 2008, though it could not make progress for a decade since then. An updated draft was made available in 2017 for public comments after thousands of unfortunate incidents of farmer poisonings were reported in several states of India. It took another three years for the government to develop an improved version, the Pesticide Management Bill 2020. The pesticide management bill 2020 (PMB) was approved by the Union Cabinet in 2020 to replace the Insecticides Act of 1968.

### **REGISTRATION OF PESTICIDES**

In India, the Central Insecticide Board and Registration Committee (CIB&RC) and the Food Safety and Standards Authority of India (FSSAI) are the organizations that govern the pesticide regulations. All insecticides (pesticides) must be registered with the CIB & R.C. before being made available for use or sale. The registration process is rigorous to ensure the quality and standards of the pesticides distributed in India. The rigorous registration process involves pesticide testing in four different agro-climatic conditions and the data requirement of toxicity levels. The certificate of registration that is finally issued makes it mandatory to put a label indicating the nature of the insecticide, its composition, the active ingredient, target pests, the dosage recommended, a sign of caution, and safety precautions.

### **THE PESTICIDE TESTING INFRASTRUCTURE**

The Central Insecticides Laboratory (CIL), Faridabad, is the prime organization responsible for pesticide testing. It was established under Section 16 of the Insecticides Act, 1968. The primary functions of the CIL includes analysing the insecticide samples and submitting the analysis certificates to the authority concerned, undertaking all the necessary investigations for the registration, and to determine the toxicity and efficacy of pesticides. The CIL is supported by 68 state-level and two regional testing laboratories.

### **CONCLUSION**

Pesticides will continue to play a crucial role in the nation's food security, considering our dependence on them. However, there may be a transition in the type of pesticides used. In the future, the share of safer and newer bio-pesticides may increase. The awareness of the

current generation regarding the potential damage that pesticides can cause to the environment and humans is a welcome development. In the future, the regulatory bodies will have to work more closely with nature and the people who can get affected. Stricter regulations and proper enforcement of the registration procedure can improve the quality or reduce the threat. Continuing the use of several pesticides in India that are banned in most developing countries is a concern. The standards followed by developed countries are higher, and it is high time to pursue such measures in our country. Care should also be taken in educating the farmers and general public in handling and disposing of pesticides. Promoting alternate pest control techniques like Integrated Pest Management is also necessary.

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