

## Pesticides Production and Consumption in India

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Pesticides are chemical or biological agents designed to control pests that affect agricultural productivity, public health vectors, and structural materials. These include several classes such as insecticides, herbicides, fungicides, rodenticides, bactericides, and biopesticides. Their use enhances crop protection, reduces losses, and contributes to higher yields—however, it entails environmental, health, and regulatory challenges if misused. In India, with an agrarian economy and a rapidly growing population, pesticides play a vital role in crop protection strategies. Over the last several decades, pesticide consumption and production have undergone significant changes due to evolving agricultural practices, pest dynamics, and policy frameworks.

### Historical and Regulatory Background

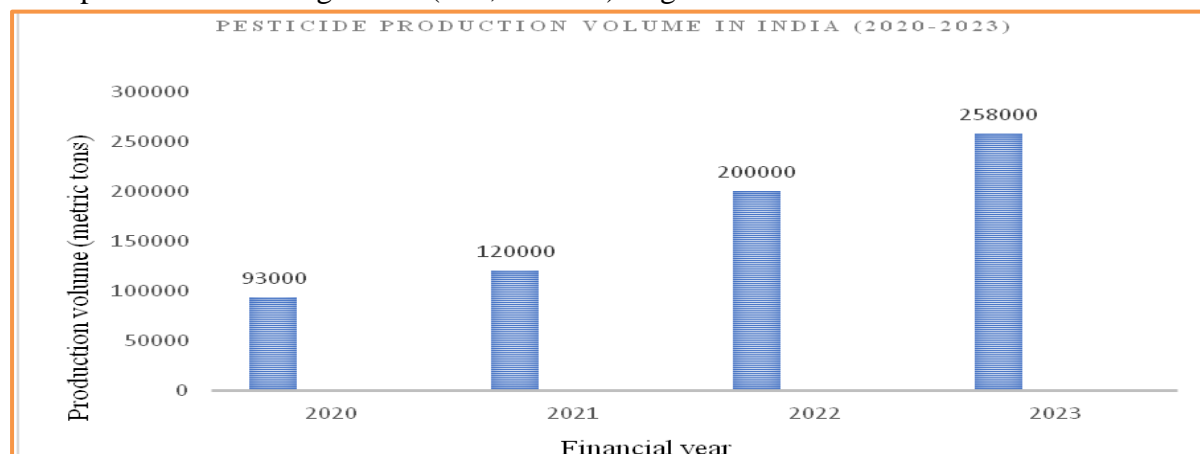
#### Early Introduction and Policy Framework

Pesticide use in India began post-Independence in the late 1940s and early 1950s, initially for public health purposes such as malaria and locust control with DDT and benzene hexachloride. By the 1950s, domestic pesticide production commenced, marking the start of India's agrochemical industry expansion. The Insecticides Act, 1968, and its associated rules (1971) form the backbone of pesticide regulation — covering import, manufacture, registration, sale, transport, and usage. The Act aims to safeguard human health and the environment by ensuring safe products and appropriate use practices. Recently, the Government of India has drafted the Pesticide Management Bill, 2025, to modernize regulatory oversight with a multi-sectoral body (Central Pesticide Board) to guide safety standards, registration, and disposal criteria.

### Pesticide Production in India

#### Production Volume and Composition

India's pesticide industry is a significant segment of the agrochemical sector. In FY 2023, total pesticide production in India was around 258,000 metric tons, with mancozeb being the most produced active ingredient (~83,620 tons). Figure 1



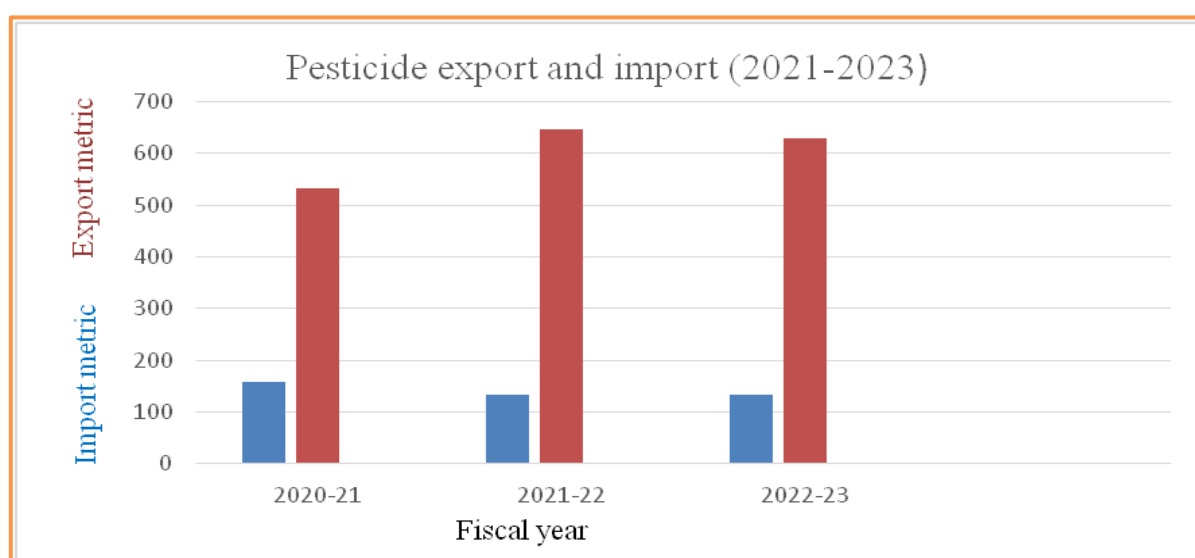
Domestically, the composition of production is dominated by:

- Insecticides
- Fungicides
- Herbicides
- Rodenticides

Insecticides and fungicides together consistently account for the largest share of production, with fluctuations observed across fiscal years due to market demand and pest pressures. Rodenticides, though smaller in absolute tonnage, have shown a steady upward trend. Several Indian companies also engage in processing and repackaging imported technical grade pesticides, enhancing export capacities—a factor that sometimes results in total exports exceeding direct domestic production.

### Export and Global Role

India is one of the world's leading pesticide producers and exporters, second only to China in global rankings. The industry's export value in FY 2022-23 was approximately ₹431.64 billion, reflecting its importance in international trade. Figure 2.



## Pesticide Consumption Patterns

### National Consumption Trends

The consumption of pesticides within India has increased substantially over recent decades. According to official data, consumption rose from around 40,000 tons in 2005–06 to about 63,000 tons by 2021–22. Independent agricultural surveys suggest that consumption volumes reached approximately 52,466–63,284 tons (2022–23), indicating some fluctuations due to crop area changes and input costs. Despite rising absolute consumption, per hectare usage remains low compared to many developed countries. Indian consumption per hectare is roughly 0.28–0.50 kg/ha, substantially lower than in countries like Japan and South Korea, where usage can exceed 10 kg/ha.

### State-wise and Crop Wise Trends

Pesticide usage is highly variable across India's states. Northern and central states such as Maharashtra, Uttar Pradesh, Punjab, Telangana, and Haryana consistently show higher consumption owing to intensive cultivation of cash and horticultural crops. States with perennial crops (e.g., orchards) or high pest pressure often show the highest intensity of use per hectare, as seen in Jammu & Kashmir.

### Biopesticide Adoption

While chemical pesticides still dominate the market, there is a growing interest in biopesticides—derived from natural organisms or substances—to reduce environmental impacts. However, biopesticide consumption remains a small fraction due to cost, efficacy perceptions, and regulatory complexity, even though biopesticide markets are projected to grow significantly by 2030.

## Drivers of Growth and Usage Patterns

Several factors influence pesticide consumption in India:

- **Labour Costs & Mechanization Pressures:** Rising agricultural wages have made mechanical weed control less economical, prompting increased herbicide use as a substitute for manual weeding.
- **Crop Intensification:** Expanded cultivation of high-value crops such as fruits, vegetables, and cotton increases dependency on protective chemical inputs.
- **Export Standards:** Compliance with international maximum residue limits (MRLs) compels producers to adopt specific pesticide regimes, sometimes increasing use of certain classes.

## Environmental and Health Implications

Although Indian pesticide use per hectare is relatively low, improper application, lack of protective equipment, and inadequate extension services can result in localized environmental contamination and human exposure risks. Historical pesticide incidents—for instance, parathion contamination events—highlight the potential for acute toxicity when safety protocols fail.

Concerns extend to:

- Residues in food products
- Contamination of water bodies
- Impact on non-target organisms and beneficial insects
- Risk of pest resistance

## Future Prospects and Sustainable Alternatives

To mitigate risks and promote sustainability, India's agrochemical sector, policymakers, and scientific community are focusing on:

- Integrated Pest Management (IPM) approaches
- Enhanced regulation through the Pesticide Management Bill
- Promotion of biopesticides and safer chemistries
- Farmer training on judicious pesticide use

Innovations in pest monitoring, biological controls, and precision agriculture technologies are vital to ensure the agricultural sector balances productivity with ecological stewardship.

## Conclusion

India's pesticide production and consumption landscape reflects a dynamic interplay between agricultural expansion, economic imperatives, and environmental considerations. While India has emerged as a significant global producer and exporter, the challenge remains to balance effective crop protection with human and ecological safety. Continued research, regulatory modernization, and farmer education are essential to shape a sustainable pesticide paradigm for the future.