

Article

Pesticide Use, Regulation, and Policies in Indian Agriculture

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Abstract: This research paper presents a comprehensive analysis of pesticide use in global and Indian agriculture, focusing on the mounting food security challenges due to population growth and the increased demand for food and fiber crops. While pesticides are crucial in mitigating losses due to pests, diseases, and weeds, increasing apprehension regarding their adverse effects on human and environment health necessitates a critical examination of their usage patterns. Despite India's relatively low per-hectare pesticide usage of 0.4 kg compared to China's 1.83 kg, issues with pesticide residue contamination in the food chain require urgent attention. Additionally, significant regional disparities in pesticide application highlight the need for more uniform and sustainable agricultural practices. Therefore, this study examines the evolving trends in global and Indian pesticide application, providing a comprehensive analysis of the shifting dynamics across various Indian states and crop varieties. Furthermore, it analyzes various pesticide categories and their respective market shares, providing insights into production and export patterns. Our research also explores regulatory frameworks aimed at optimizing pesticide use while minimizing detrimental effects on human health and the environment.

Keywords: pesticides; India; pesticide residues; regulation; policies



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1. Introduction

Agriculture is the backbone of the Indian economy, contributing 18 per cent of the total gross domestic product (GDP) and providing employment for about 45% of the population. Assuring food security for more than 1.27 bn Indian residents with decreasing cultivable land resources is a difficult task [1]. Global agriculture incurs approximately 20–30% annual losses due to pests, diseases, and weeds [2–9]. Pesticides are used to control pests, weeds, and diseases in agriculture (see Appendix A, Tables A1–A3 for detailed crop losses due to insects, diseases, and weeds). A number of chemical and biological pesticides are used to minimize crop losses. Up to the 1950s, pesticide usage was minimal worldwide. However, the beginning of green revolution in the 1960s marked a dramatic increase in pesticide application globally, including in India, where their usage surged over a hundredfold, resulting in a significant impact on the environment and human health [10]. In 2020, approximately 3.39 million tons of pesticides were used in agriculture globally, with India accounting for 61,702 tons [11].

There is a growing body of literature on the excessive use of pesticides in agriculture, both in India and globally [8,12–15]. However, despite the widespread use of pesticides in India, there is a lack of comprehensive analysis regarding the extent of different pesticide use habits in India, their geographical patterns, and crop-specific intensity. Hence, there is an urgent need to address this gap. This paper aims to fill this important gap in the literature by conducting an in-depth examination of pesticide usage patterns and consumption across different crops and regions. By making use of the secondary data from input surveys and