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## Environment and health aspect of pesticide use in Indian agricultural

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### Abstract

Chemical ingredients known as pesticides are used to stop or manage weeds, insects, rodents, fungi, and other undesirable species. The application of pesticides presents serious risks to the environment and public health, notwithstanding their benefits in agricultural yield and disease control. Since pesticides have always been present in our atmosphere, they have tainted our food, water, and soil, posing acute and long-term health risks. If a large amount of a pesticide is swallowed, breathed, or comes into contact with the skin or eyes, it can induce acute toxicity. Chronic toxicity is caused by repeated or protracted exposure to pesticides. Pesticides can be neurotoxic, mutagenic, carcinogenic, teratogenic, or affect the endocrine system, among other forms of toxicity. The existence of inert or synergistic components that might alter or increase a pesticide formulation's toxicity, as well as the active ingredient itself, may affect how poisonous the product is. In order to reduce the health risks associated with modern pesticides, safety considerations are urgently needed. Concerns about the present legislature's ability to adequately preserve the environment and public health are paramount. The detrimental effects of pesticide use can be lessened and safer and more sustainable farming methods can be promoted by putting rules, appropriate training, and education into place.

**Keywords:** Pesticides, human health, environment, agriculture, and agribusiness

### Introduction

The pesticide industry is a big supplier of agricultural inputs. The uses of pesticides are controlling weeds, fungal diseases etc. which causes of yield losses in agricultural production. In agribusiness and agrichemical industry Globalization of markets, competition and innovation are the dominant trends. By the tradition of increasing productivity of agro-systems through generic, universally applicable technologies the innovation in the agrichemical industry is limited. The marketing of technology of agriculture needs to deal with some various trends such as locally-organized forces that envision a regionalized sustainable agriculture in the future Locally organised forces that anticipate a regionalized sustainable agriculture in the future are one of the many themes that the marketing of agricultural technology must address. The majority of crops were constrained by regional meteorological, geological, and ecological factors, even if mineral fertilisers had already been used in the second part of the 1800s. The excessive and careless use of toxic synthetic pesticides damaged agriculture and the ecology, and they affected all living things by entering the food chain. Typical examples illustrating the nature and extent of the problem include the inclusion of pesticide particles in packaged water. In order to promote the green revolution program in Indian agriculture, pesticides, herbicides, and fungicides were widely introduced in the mid-1960s along with other inputs. Preventing and managing diseases and insect pests in field crops was the main objective of the introduction of pesticides. Early pesticide use decreased pest attacks and made it possible for agricultural productivity to rise as anticipated. Chemical pesticides have become more widely used, contaminating the environment and having a number of long-term repercussions on civilisation. Farmers are now addicted to using agrochemicals excessively and irresponsibly, whether on purpose or by accident. This is making the problem worse not only in India but also in other parts of the world.

Synthetic inputs such as fertilisers (as nutrients) and pesticides (as insecticides) were recommended to increase output and productivity when new and high yielding (HYV) crop types, mostly grains, were introduced to Indian farmers in the mid-1960s. Their use has

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increased over time, but it took a lot of work on the part of agricultural scientists, decision-makers, and extension agents to convince farmers that they responded favorably, albeit slowly, to learning about these compounds' quick impact on crops in terms of yield response. When farmers learnt about these chemicals' quick effects on crop production response, they responded favorably, albeit slowly, and their use has grown over time. Corresponding to this, their use significantly rose once farmers were persuaded that substance pesticides were successful in preventing and scheming pests and diseases.

The main formulation forms for pesticides are liquids, dusts, liquid concentrates, and wettable powder. Pesticides have a number of effects on the environment when they are applied. Spraying pesticides into the air allows them to spread to other parts of the environment, such as soil and water. Additionally, pesticides can dissolve into soil, ground water, and surface water, depending on the kind of soil, temperature, vapour pressure, sunlight and rainfall, and the amount of pesticides used. In addition to having detrimental effects on non-target plants and animals like bees, the pesticides also have mutagenic, carcinogenic, teratogenic, and reproductive effects. The ecological and toxicological effects mentioned above are unavoidable unless great care is taken to use pesticides responsibly. The concentration of these pesticide particles in the soil and water would cause unfavourable, complicated issues if they were used consistently for years. Between 1960 and 1995, the global pesticide market expanded at an average rate of 11%, according to FAO calculations (FAO, 1997) <sup>[22]</sup>, and this growth is expected to accelerate in the years to come. Grain crops were the original target of chemical pesticides, but their use expanded as disease and insect attacks on other crops increased. According to the International Food Policy Research Institute (IFPRI), rice and maize were the next two most common crops to use pesticides, followed by fruits and vegetable crops (26%) and all other crops (23%) in that order (IFPRI, 1996). Pesticides have been used at various levels around the world based on the farming and cropping systems.

About a third of the worldwide agricultural output is thought to be lost to pests annually, even though over 2 million tonnes of insecticides are used annually. In India, weeds account for 33% of crop losses, diseases for 26%, insects for 20%, birds and rodents for 10%, and miscellaneous causes for the remaining 11%. Each year, pests cause crop losses of over 6000 crore rupees. As more and more (newer) pests and diseases are predicted to attack crops, the problem will become even more severe, requiring the use of different kinds of pesticides in the years to come.

In India, the price of pesticides is subsidised by the federal and state governments, particularly for farmers with limited resources. Both wet and dry land agricultural systems employ chemical pesticides, although chemical fertiliser is mostly only applied in irrigated regions. Farmers were persuaded to use terrible pesticides as a result of their ignorance and unwavering belief in rumors, for which they are currently paying a price. Without properly understanding the prescription and application guidelines, farmers began using chemical pesticides carelessly, and in certain instances, the government supported this by offering generous subsidies for the use of particular crops. Stated differently, farmers increase the inputs they utilise, which are then based on their prices, in an effort to increase their

output boundaries. This has contributed to an augment in the manufacture and use of agro-chemicals.

Despite this, proponents of agrochemicals are complacent and contend that chemical inputs cannot be reduced, much less stopped, in order to control illnesses and pests in the sake of boosting food supply. They contend that India achieved food grain self-sufficiency because it is highly unfeasible to boost food output in the short term without chemicals. The pesticides have harmful impacts on the environment, including non-target host plants and animals, as well as reproductive, teratogenic, mutagenic, and carcinogenic consequences. In a market-oriented framework, agrochemicals are theoretically utilised extensively for all crops; however, in a subsistence farming situation, farmers often use fewer pesticides because they believe that domestic production is adequate. liberal subsidies, wide and demanding pest attack, unthinking community policies, lack of legal construction, nepotism, strong campaigns favoring pesticides, poor alternative systems and farmers' approach have contributed to increasing pesticide application. It is obvious that continues and wholesale pesticide use contributes to many environment contamination and health problems.

The issue of chemical pesticides is not exclusive to India; developed countries are also impacted. According to Metha (1991), just one American out of every 100 is free of DDT. Chemical pesticides cause almost 500,000 ailments and 20,000 deaths annually worldwide. According to WHO estimates, there are 220,000 pesticide poisoning deaths and 3,000,000 cases of pesticide poisoning reported globally each year. Dasgupta and colleagues (2001) <sup>[21]</sup> claimed that Brazil's trade liberalisation encouraged farmers to apply pesticides to exportable goods in order to make money, which led to negative social and environmental effects. These findings offer enough information and evidence to draw the conclusion that the demand for agricultural products containing pesticide residues would decrease in a world centred on consumption and a market economy. So, in the framework of sustainable development, this issue requires staid assessment and without delay reply for social, environmental, and financially viable factors.

Despite this, pesticide proponents are complacent and assert that they cannot even reduce or stop using chemical inputs to prevent illnesses and pests in order to increase food output. Food grain self-sufficiency has been attained by India, they argue, because it is highly impractical to increase food production without chemicals in the near future. However, environmentalists contend that it is possible to effectively control agricultural diseases and pests by using alternative methods and techniques. They deplore that there are adequate natural protections to lessen, if not totally eradicate, diseases and pests.

The bulk of study publications on the detrimental effects of agro-chemicals (CSE, 2003; Rajendran, 2002; Kabra, 2000; and VHAI, 1991) <sup>[4, 7, 16]</sup> claim that continuous chemical inputs have caused irreversible harm to the environment and living beings. While some empirical studies (Pagiola 1995) found that the use of pesticides actually decreased production, other studies found that there was a detrimental effect on health. However, the cost of pesticide-related diseases and the resulting loss in farmer productivity is always greater than the value of crop loss from pests in many Asian countries, including India. Crucially, some state-run institutions have backed environmental terrorism in spite of grassroots demonstrations. The Kerala State

Plantation Corporation's involvement in the aerial application of produce outcomes to the cashew gardens in the Setup area is a prime example. The most recent research on pesticide residues has also revealed some critical information. In bottled water, which is guaranteed to be devoid of even minor chemical particles? So, under the idea of food security, ecological violence continues to frighten millions of impecunious and helpless people throughout the nation.

Undoubtedly, preserving food security is essential to averting national famine. Is that a sign that no alternative mechanism exists? To put it another way, finding alternatives to the careless application of synthetic pesticides is very important for preserving environmental balance, economic viability, and food security (for the sustained growth of society). This study examines the environmental terrorism of pesticides on agriculture (soil, environment, ground water, health, flora, and animals) and a number of other issues. Within the broader framework of food security and sustainable agricultural development (SAD), it also highlights current legislative inadequacies and suggests potential solutions.

Here, a few case studies about the adverse impacts of pesticide spraying have been selected and given a closer look. Neural tube defect (NTD) is a deformity that arises from the incorrect closure of the neural tube during the early stages of pregnancy, according to a doctor at the Indian Institute of Health Management Research in Jaipur, Rajasthan. It is shocking to learn that NTD kills about 500,000 babies worldwide each year, with 8,000 of those deaths taking place in Rajasthan alone. The primary cause of NTD, according to the aforementioned studies, is excessive pesticide use in agricultural fields. The research also says that these are typically caused by pesticides since they are incompatible with folic acid. In this country, even though folic acid is frequently given four to eight weeks after pregnancy is detected, the brain develops from the neural tube during the first four weeks of pregnancy. Because leafy greens and grains are high in folic acid, a vitamin B that is essential for brain development, pregnant women must eat them. When the rabi crop is harvested, farmers immediately plant vegetables and greens and apply large amounts of chemical pesticides, which are stores of hazardous heavy metals. There are clearly problems when pregnant women eat such contaminated and dangerous greens and veggies. The doctor claims that pesticide residue in food can prevent folic acid from being available, resulting in the birth of children with NTD. Although the information that this revision needs greater examination and deeper inspection across a cross section of pregnant women in varied situations, the data do suggest that birth problems are due to pesticide use and misuse.

Without a doubt, chemical testing has revealed that all other brands of bottled water contain dangerous pesticide particles that are much over permissible limits. These pesticide residues over time are hazardous to human health. Depending on the water's source, treatment method, and kind, different brands may contain varying levels of pesticide residues. However, the shocking conclusion is that, even though the market for bottled water is growing rapidly due to consumer demand, globalisation, and the market economy, manufacturers many of whose brands are multinational corporations have failed to provide consumers with crystal-clear water. Another noteworthy feature of the

innovation is that the heavy level of chemical pesticides in bottled water is caused by water sourced from heavily pesticide-sprayed agricultural farm plots and mechanically injured fields.

Once again, the CSE sparked a pesticide-related controversy, leading to the inclusion of pesticide residues in soft drinks that were often permitted to surpass European standards. According to this, soft drinks with pesticide residues were sold by MNC brands like Coca-Cola and Pepsi, and some state governments forced the sale of these drinks to be banned. After Parliament, the highest governing body, outlawed the sale of soft drinks in its canteen, a Joint Parliamentary Committee was formed to investigate the entire problem of pesticide particles in soft drinks. This clearly explains why pesticides are used so widely since they are applied indiscriminately and carelessly throughout the fields. The most defenseless groups, including agricultural workers, marginal and small farmers, and female workers are above all at risk for developing pesticide-related diseases over time.

Apart from the detrimental effects of pesticides, the disposal of empty plastic is a major problem globally. To stop pesticides from spreading to homes and animal barns, farmers are usually recommended to remove the containers after applying liquid and dust pesticides. Nevertheless, such containers have been used frequently in the production of lamps. This needs to be handled carefully because the dangerous pesticide particles in the containers have a gradual but permanent impact on the food items, including flours, pulses, cereals, and oil seeds. Researchers need to take immediate action because there aren't many studies on the environmental implications of disposing of empty plastic in India.

Additionally, beneficial creatures like bees and spiders multiply and multiply on organic farms while protecting the field crops. After years of practice, the indigenous knowledge system (IKS) was used to establish many of these farming techniques. Local documentation of this IKS is required, and patenting may be undertaken if required. The Indian Institute of Management in Ahamadabad's publication Honey Bee has done a lot of work in this area that might be repeated all over the country. According to what has been discovered so far, a large number of agricultural specialists are hesitant to accept that chemical inputs are necessary to guarantee food security. However, some of the leading agricultural scientists have acknowledged and suggested that cautious use of chemicals is necessary to achieve SAD. A wider variety of agro-ecological scenarios, such as cropping systems, have been considered in the piecemeal rather than thorough testing of the ecological farming system. Grey blight and fruit disease were successfully eradicated during harvest season by spraying plant-based decoctions including cattle urine on garden crops such as guava; nevertheless, this method resulted in black patches on the fruits. In order to address this, local agricultural researchers must work with driven organic growers and committed organisations to conduct research on native, environmentally friendly pest management techniques in general and SAD in particular.

Many academic fields have advocated for Integrated Pest Management (IPM), especially those that focus on innovative farming practices and technologies. This theory states that using synthetic inputs, such as pesticides, should only be used as last resort after all manual, biological, and

cultural approaches to disease and pest management have been tried. This calls for a strong political will, a committed group of extension experts, sufficient finance, and above all the active cooperation and engagement of farmers. Adopting IPM will have a long-term effect on farm and environmental fronts, based on the cost-effectiveness of treating pesticide-related health hazards.

### Conclusion

In the broader context of SAD, this essay aimed to both objectively analyse the detrimental effects of synthetic pesticides and identify appropriate alternative mechanisms. The aforementioned discussion shows how India's economy, ecology, health, and society have all suffered as a result of increased pesticide use. Additionally, it has brought to light several issues that have an impact on society at large. The current state of affairs is attributed to a number of factors, including farmers' ignorance, deliberate withholding of facts, resource scarcity, illicit practices, governmental regulations, and insufficient substitute mechanisms. This calls for prompt policy analysis and implementation. In order to attain SAD, examples of ecologically friendly pest management techniques must be researched, developed, and extensively shared.

However, every policy decision targeted a number of variables, including as weather trends, farmer decisions, market activity, the supply of essential inputs and output demand, scientific and technological advancements, the resource base, public policies, and a host of other variables. In addition to this, the state's liberal pesticide subsidies must be economically sound in order to curb excessive pesticide use. This issue has received a lot of attention in India during the liberalisation era that started in the early 1990s. The ultimate removal of input subsidies can have a direct positive impact on the sustainable management of the agricultural resource base. Throughout policy discussions, concerns have been expressed about the trend of declining public investment in Indian agriculture. SAD promotion necessitates luring private investment via realistic channels. Enhancing the legal and administrative framework for pesticide licensing, monitoring, and review is necessary to safeguard not only farmers and the environment, but also the general population. An army of recent agricultural graduates may be well-trained for the distribution of the SAD packages (under training and visiting programs at the local level across India). Strong moral and intellectual commitment and tackling this issue at the policy level alone can help to address the issues brought about by the careless use of despised agrochemicals on Mother Earth in the name of disease prevention and pest control.

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