

# An Overview on the Study of Pesticides

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**ABSTRACT:** *Agro-based pesticides are insecticides used by farmers to prevent pests from reducing the growth and production of agricultural crops. Farmers must be protected against pests, disease, and weeds, as well as enhanced production per hectare, in order to raise more food on less area. This paper discusses pesticides, including their advantages and disadvantages. Insecticides, fungicides, fumigants, and rodenticides are the most widely used pesticide groups. Pesticides are a type of pesticide that acts as a modifier. Some insecticides are organism-specific and kill pests in a specific way. As a result, pesticides serve a critical role in reducing illness and increasing agricultural yields across the world. As a result, it is important to discuss the agricultural development process, historical perspectives, pesticide kinds and particular uses, as well as their behavior, contamination, and negative environmental consequences. Excessive pesticide usage has the potential to destroy biodiversity. As a result, toxic chemicals put the lives of many birds, sea creatures, and other species in jeopardy. This study provides an overview of pesticides and its various aspects. It will be helpful in the future because farmers will be able to improve their output as well as their revenue by utilizing these pesticides, and they will be able to grow more food in less space.*

**KEYWORDS:** *Agriculture, Environment, Farmer, Food quality, Insecticide, pesticides.*

## 1. INTRODUCTION

Humans use pesticides to protect their crops and improve the quality of their food. Insecticides are toxic chemical compounds, combinations of chemicals, or biotic agents that are released into the atmosphere to prevent, control, or eliminate the population of insects, weeds, rodents, fungi, or other pests[1]. Pesticides are used to attract, entice, kill, or mitigate pesticides. They are not just employed in agricultural regions; they are also used in homes to control cockroaches, mosquitoes, rats, fleas, ticks, and other pests with sprays, poisons, and powders. As a result, pesticides are commonly discovered in our food, contributing to their presence in the air.

Chemical fertilizers are applied to soils to correct for mineral shortages and to provide extra chemicals required for the optimal growth of high-yielding cultivars[2]. The use of plant growth regulators in farming operations and research on plant tissue culture has drastically altered the pattern of plant development. Insects are the primary destroyers of agricultural crops. Fungus and bacteria are responsible for a wide range of plant illnesses. Insect pests and plant diseases are estimated to cause up to 30% annual losses in agriculture. Our country's food problem may be significantly alleviated if only half of the losses are avoided due to bugs. A pest is defined as any organism that causes financial loss or harms the physical well-being of humans. Pesticides are widely acknowledged to play a significant role in agricultural growth, since they may minimize agricultural losses while also improving affordable output and food quality. The pressing need to boost food production and combat insect-borne illnesses[3]. Plaguicides are pesticides that are intentionally put into the environment to kill, prevent, discourage, control, and eliminate insects, weeds, rodents, fungus, or other hazardous pesticides in farming, household, or industrial contexts, or to reduce insect populations. Pesticide serves as regulator or modifiers that work by destroying the pest.

In the agricultural industry, insecticides are used to boost quality produce by reducing pests and pest-related diseases. Pesticide overuse and abuse have resulted in significant health issues, financial losses, and environmental issues. Cancer, birth defects, reproductive issues, liver, kidney, and neurological problems are only a few of the pesticide-related health issues. Insecticides, fungicides, fumigants, and rodenticides are the four most frequent pesticide categories. Pesticides have provided tremendous benefits in forestry, public health, the home sector, and, of course, agriculture.

### 1.1 Pesticides Types:

Pesticides are chemical substances that are meant to kill pests. In general, a pesticide is a chemical or a biological agent such as a virus, bacterium, antimicrobial, or disinfectant that deters, incapacitates, kills, pests. This use of pesticides is so common that the term pesticide is often treated as synonymous with plant protection product. It is commonly used to eliminate or control a variety of agricultural pests that can damage crops and livestock and reduce farm productivity. The most commonly applied pesticides are insecticides to

kill insects, herbicides to kill weeds, rodenticides to kill rodents, and fungicides to control fungi, mold, and mildew. Different types of the pesticides are shown in the Figure 1.

Type of Pesticide	Target Pest
Fungicides	Fungi
Insecticides	Insects
Herbicides	Plants (weeds)
Nematicides	Nematodes
Rodenticides	Rodents
Acaricides/Miticides	Spiders, mites

**Figure 1: Schematic Illustration of the Various Kinds of Pesticides [4].**

### 1.1.1 Fungicides:

Fungicides, also known as antimycotics, are toxic substances used to kill or inhibit the growth of fungi. Fungicides are insecticides that kill or inhibit the growth of fungi and their spores. They can be used to manage fungi that cause plant harm, such as rust, mildews, and blights. They might also be used to keep mould and mildew at bay in other places[5]. Fungicides work in a variety of ways, but the bulk of them damage fungal cell membranes or stop them from generating energy. Examples of antibiotics include cyproconazole, tebuconazole, triadimefon, Bordeaux combination, copper-oxychloride, tricyclazole, and others.

### 1.1.2 Herbicides:

It is a chemical compound that is used to kill or inhibit the growth of unwanted plants such as weeds in residential or agricultural regions, as well as invasive species. Nonselective herbicides are used to remove waste ground, which means they kill any plant material that comes into contact with them. Chemical herbicides have several advantages over mechanical weed control, including ease of application, which can save money on labour.

### 1.1.3 Nematicides:

Nematicide is a chemical used to kill plant parasitic nematodes. The most prevalent have been broad-spectrum toxicants with high volatility or other properties that encourage soil mobility. To eradicate the nematodes that wreak havoc on tobacco yields in agriculture[6]. The Meloidegyne nematode infects the roots of tobacco plants, drastically reducing production. Purpureocillium lilacinum infests meloidegyne incognitia as a biological control agent. A strain of P.lilacinum has been discovered to produce proteases and chitinase, which may dissolve the shell of nematode eggs, allowing for the usage of nematophgi to limit infection connections.

### 1.1.4 Insecticides:

Pesticides are chemicals that are used to kill, harm, repel, or reduce the effects of one or more insect species. Insecticides work in a number of different ways. Some disrupt the neurological system of the insects, while others harm, repel, or regulate their exoskeletons in various ways. Sprays, polishes, gels, and apples are just a few examples of how they may be packaged. Because of these features, each pesticide may provide a different risk to non-target insects, people, animals, and the environment.

### 1.1.5 Dichlorodiphenyltrichloroethane (DDT):

DDT is a pesticide that is widely used to keep insects at bay. It was also used to keep insects out of crops, livestock, institutions, homes, and gardens. Due to the development of adaptive resistance, DDT is no longer effective in mosquito control.

### 1.1.6 Carbamates:

Carbonic acid derivatives with a – OCON = group in the molecule are known as carbamates. Three carbamates that are commonly used include carbofuran, propoxur, and aldicarb (Temik). Carbamate

derivatives are also used in herbicides (phenyl carbamates, thiocarbamates) and fungicides (Di thiocarbamates). Carbamates are a kind of carbamate that is good against nematodes and snails. Carbamates have a one-of-a-kind action mechanism.

### 1.2 Benefits of Pesticides:

The primary and secondary benefits listed in Table 1 are not the same. The primordial benefits are recognized as a byproduct of immediate, less visible, or longer-term consequences of primary benefits, such as the protection of human, animal, and agricultural health, as well as the protection of recreational turf[7].

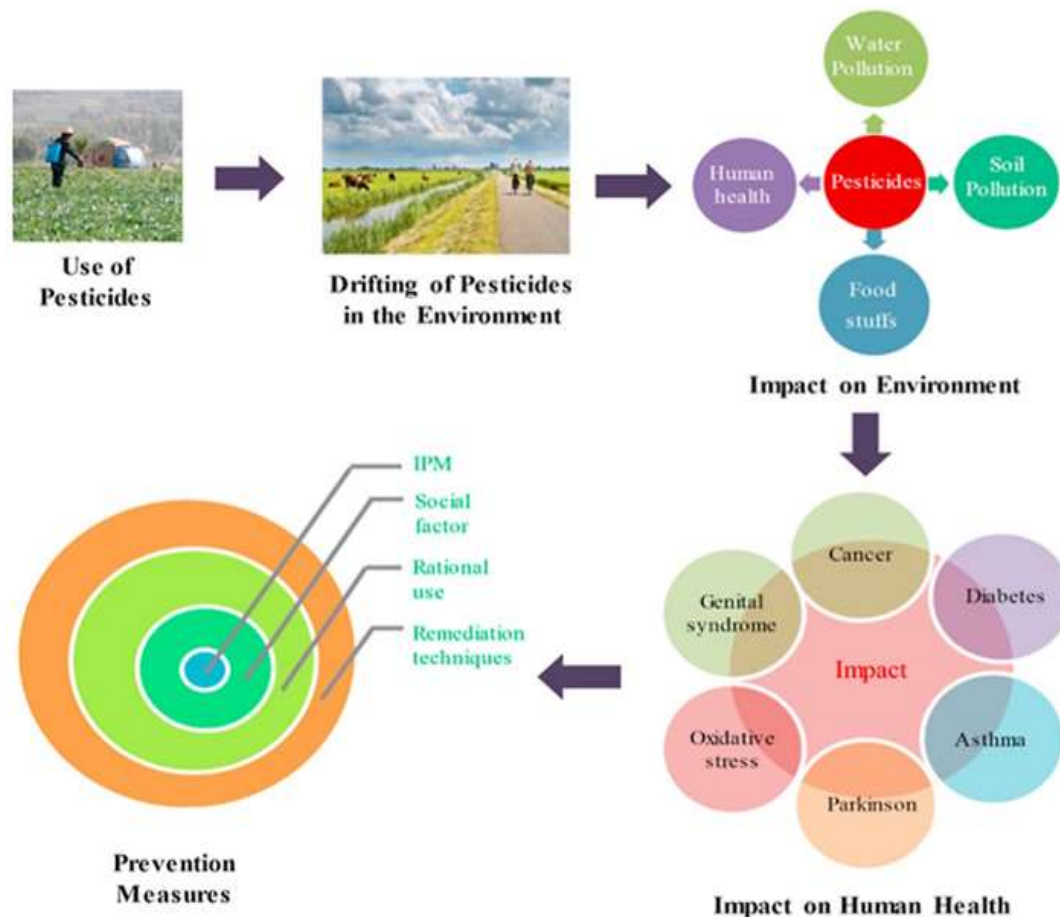
**Table 1: Illustrates The Main and Secondary Benefits of Pesticides.**

Primary benefits	Secondary benefits
1. Controlling pests and plant disease vectors:	Community benefits:
Improved crop/livestock quality	Nutrition and health improved
Reduced fuel use for weeding	Food safety/security
Reduced soil disturbance	Life expectancy increased
Invasive species controlled	Reduced maintenance costs
2. Controlling disease vectors and nuisance organisms:	National benefits:
Human lives saved	National agricultural economy
Human disturbance reduced	Increased export revenues
Animal suffering reduced	Reduced soil erosion/moisture loss
Increased livestock quality	
3. Prevent or control of organisms that harm other human activities and structures:	Global benefits:
Tree/bush/leaf hazards prevented	Tree/bush/leaf hazards prevented
Recreational turf protected	Recreational turf protected
Wooden structures protected	Wooden structures protected

### 1.3 Hazards Of Pesticides:

#### 1.3.1 Effect of pesticide on health:

Humans are extremely sensitive to pesticide impacts due to their fundamental nature, haphazard use, or abuse. Although most people are affected by pesticide-tainted food, pesticides enter the human body by ingestion, inhalation, and skin penetration[8]. Acute and chronic effects of the pesticide include skin irritation, headaches, pruritus, diarrhea, stomach pain, nausea, vomiting, blindness, and others, as illustrated in Figure 2.

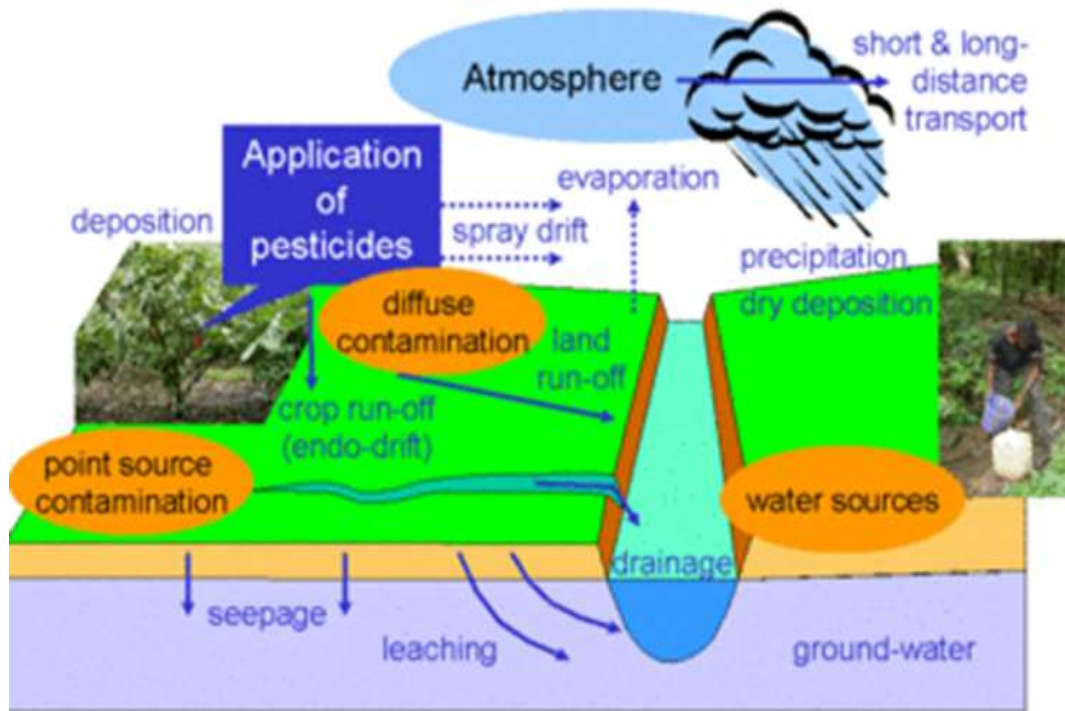


**Figure 2: Illustrates the Complete Process of the Pesticides Which Affects Human Health**

### 1.3.2 Effect of Pesticide over an Environment:

The majority of farmers and field workers are illiterate, and therefore used pesticides without adequate screening or knowledge, resulting in a variety of hazardous effects on the environment. They used a lot of insecticide after harming the crop because of the inconsistent screening. Finally, they remain in the ecosystem for a long time and pollute the environment, particularly the soil. The widespread use of pesticides also kills beneficial microorganisms, reducing soil's self-fertility. It is critical to have a practical grasp of pesticides' physical and chemical characteristics, as their solubility determines surface runoff movement and soil absorption capacity.

Pesticide resistance develops as a result of natural selection in numerous situations, posing a threat to non-target organisms and resulting in the mortality of such organisms. Pesticides that remain for a long period pose a threat to aquatic and terrestrial biodiversity. Pesticides are introduced into the aquatic ecosystem, where they operate as a toxic agent, posing a threat to aquatic plants and animals. Pesticides can contaminate soil, water, grass, and other vegetation. Birds, fish, beneficial insects, and non-target plants, among other things, can not only destroy insects and weeds, but also induce chemical toxicity. Insecticides are the most toxic class of pesticides in general; however non-target species may also be at risk. Figure 3 shows the impact of pesticides on environment.



**Figure 3: The Above Figure Shows the Impact of Pesticides on Environment Which Are Harmful for Crop and Human Beings**

## 2. LITERATURE REVIEW

*Sachin et al.* discussed about pesticide usage and environmental impacts in agricultural and livestock animals[9]. Pesticides are commonly thought of as quick, easy, and cost-effective treatments for weeds and insect pests in urban areas. Pesticides have contaminated nearly every aspect of our ecosystem. Pesticide residues in the soil and air, as well as the use of urban pesticides, are discovered in the surface and grounds across the country. Pesticide contamination causes serious risks to the ecosystem and non-target animals, including beneficial soil microorganisms, insects, plants, fish, and birds. Herbicides, contrary to popular belief, can be harmful to the environment. In this document, the author explains all of the information about pesticides' effects.

*Aktar* explained about the effects of pesticide which are utilize in farming along their benefits and hazards[10]. Pesticides are used in agriculture to control insects, improve food quality, and enhance food output, among other things. It has an influence on the environment and human health in addition to the advantages. The author of this article covered all aspects of pesticides in this paper.

*Niva et al.* discussed a review on the health and environment impact of pesticides[11]. Because pesticides have such a negative impact on human health and the environment, it is critical to carefully control their use. This is accomplished by ensuring that pesticide users are properly trained. The widespread use of pesticides also kills beneficial microorganisms, resulting in a reduction in soil fertility. This article also discussed the altered pesticide class and its effects on human health.

## 3. DISCUSSION

In this article, many pesticide types from various sources are discussed. These insecticides are used for a variety of purposes, including increased agricultural yields, plant protection, and food preservation. Pesticides used wisely may assure product quantity and quality, provide economic benefits, and reduce labor costs, but pesticides used carelessly can harm public health and the environment.

Pesticides can be classified based on the pests they kill, their chemical makeup, their method of entrance, mode of action, and how or when they operate to help kill certain targeted pests, and their broad usage can be limited. Because chemical pesticides are more dangerous than bio-pesticides, pesticide classification based on source of origin aids in the replacement of chemical pesticides with bio-pesticides.

## 4. CONCLUSION

Pesticides have several benefits, as evidenced by the preceding study, including improving crop output on agricultural land (with less acreage), assisting plant growth, and reducing insect pests that impact crop production. This improves economics and meets requirements, but it also has a negative impact on abiotic

and biotic elements since pesticide exposure is higher. The value of soil is diminished, and this has an influence on the cleanliness of water, making it harmful for aquatic species and humans, as well as pesticides, which have an environmental impact. Environmentally friendly pesticides (organic and inorganic) must be altered via research that benefits the environment and is important to all humans.

Pesticides have proven to be beneficial in a variety of sectors, including public health and agricultural activities. Mosquitoes, ticks, rats, and mice are among the pests killed by pesticides in homes, offices, malls, and streets. Pesticide misuse causes environmental harm, including soil contamination, water pollution, air pollution, and food contamination. Pesticides are also a result of climate change. The quantity and diversity of pesticides may increase as a result of climate change. Crop development, climatic conditions, insect pest migration and dispersion, changes in pest abundance, pest quantity and vector dissemination, weed evolution, and disease stimulation are all impacted by climate change.

Pesticide contamination and its negative effects on non-target species and the ecosystem must thus be managed. These studies should include an emphasis on occupational and environmental exposures, as well as the related pesticide health risk assessment, in order to better understand the use and management of pesticides in the future. Bio pesticides (Organic) should be developed with chemical pesticides to avoid pesticide contamination. Because organic pesticides have less negative effects on the environment and human health.

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