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THE USE OF PESTICIDES AND THEIR IMPACT ON HUMAN HEALTH AND THE ENVIRONMENT

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ABSTRACT
This document provides a concise overview of recent trends in the use of pesticides in developing countries and its implications for human health and food security.. The degree to which pesticides have been outlawed and the difficulties in regulating them are discussed. To protect crops from pests and weeds, and to boost yields without sacrificing quality, farmers often turn to chemical pesticides. Most farmers don't know that employing pesticides might have harmful effects on their land since the chemicals interact with the environment by changing the characteristics of host substances. Soil particles take up pesticides, which are then distributed throughout the ecosystem by way of the food chain and cause acute and chronic health problems in humans of all ages.
Keywords: Environmental impacts, Human health, Pesticides, Remediation techniques, Sources of pesticides

INTRODUCTION
Exporting synthetic pesticides that are banned in developed countries is becoming questionable in light of growing evidence that these chemicals pose serious and persistent threats to human health and the environment. The overall pesticide usage in low- and middle-income countries (LMICs) is on the rise, despite rising concerns about the export of these products by corporations established in the bloc. The results threaten global food security and contradict the Sustainable Development Goals (SDGs) set by the United Nations.

Understanding and taking into consideration the consequences of climate change and the COVID-19 epidemic, which are reducing food supplies, is more crucial than ever. The authors of this paper analyze the correlation between the widespread use of pesticides and their negative impacts on developing countries' ability to provide safe and nutritious food for their citizens. The paper then investigates the viewpoints of companies participating in the trafficking of pesticides that have been banned in the bloc's member states but are nevertheless being supplied there. Following this, the paper examines the present international, national, and country systems for controlling pesticides, including some significant recent events in developing nations that show both legislative progress and the force of public lobbying.

In order to improve the SDGs and the quality of life for all people in developing countries, the report concludes with a number of recommendations for the nations to undertake. Several independent objections of the report were made by experts in the domains of agriculture, pesticide use in developing countries, and related public and commercial policies. The report's audience likely will not consist of specialists in the topic. Thus, despite their distinctions, the word pesticide is often used synonymously with other synthetic crop protection agents. Biological pesticides are discussed further on. The term developing country is used instead of the LMIC abbreviation.

Some of the ecosystem services that pesticide use might impair include pollination, soil function, pest control, food production, and the maintenance of future possibilities. It is now well established that pesticides upset the delicate ecological balance that prevents the proliferation of dangerous species (MA, 2005). However, whether or whether low-level pesticide exposure causes a drop in pollination services is more debatable. More research is required to learn the specifics of how pesticides could affect soil performance. Depending on the circumstances, pesticide usage may have either positive or negative consequences on agricultural output.

There is a major gap in our understanding of the long-term repercussions of pesticide use on the natural world, human health, and the economy. This means that the best and most sustainable methods of pest and vector management and the use of pesticides therein are being overlooked due to a lack of knowledge necessary to establish successful national and regional strategies.

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Since pest management is necessary, the best pesticide legislation will find a middle ground between protecting the environment and meeting the financial needs of farmers. The potential problems that may arise without pesticides are detailed in a number of papers. Requiring additional farmland to produce the same amount of food would have an impact on animal habitat if pesticide usage were to be phased out. Soil erosion would increase if the fields were handled more often. It has been postulated by Knutson et al. that a ban on pesticides in the United States would lead to a decrease in agricultural yields, an increase in food costs, a decline in farmer competitiveness, a decrease in U.S. exports, and the loss of thousands of American jobs.

While pesticides certainly have their uses, it is important to remember that they also come with threats to human health and the environment. Non-volatile, bio accumulative, and potentially harmful chemicals are abundant. The environmental half-life of certain insecticides may be many decades. It is possible for the general population to consume pesticide residues, such as the physical and biological breakdown products, owing to environmental contamination or occupational use.

LITERATURE AND REVIEW

Naveen Kumar et al (2012) Nowadays, pesticides are often employed in the agricultural sector. Insects, rodents, and molds may cause significant harm to crops, so farmers employ pesticides to keep them at bay. They are put to use after harvest to extend the consumable shelf life and forestall deterioration. Insecticides may also be used on farms with domesticated animals. Pesticide residues occur when even trace amounts of a pesticide employed in this manner linger in or on the food we eat. Many different illnesses and problems have been linked to pesticide residues, making them a major public health issue. Farmers should use IPM (integrated pest management), crop rotation, or organic agricultural practices to reduce the likelihood of pesticide residues in the food supply. Organic food items are the best way for consumers to avoid exposure to dangerous pesticides.

Kanwal Hanif et al. (2022). The overuse of pesticides is a major cause of environmental pollution and is thus not acceptable. Chemical pest control agents have the potential to be hazardous to people and other creatures, and they can have an adverse effect on the environment. Therefore, it is imperative that we find a replacement for these poisonous chemicals. Therefore, biopesticides that are safe for both people and non-target creatures are needed. Biopesticides are made up of various microorganisms and plant extracts that have insecticidal capabilities, as well as a broad variety of biochemical pesticides. Promoting their usage and encouraging the development of novel substances and combinations, as well as establishing regulatory frameworks for risk assessment, would have the most positive impact. This article examines the role of biopesticides in cleaning up the environment and provides case studies of their effective use in Pakistan.

Hina Gul et al (2022) The necessity for non-chemical insect pest management in today's society is highlighted by the rising demand for organic food production and the mounting evidence of the harm done to the environment by chemical pesticides. For decades, farmers have utilized mulches as a well-known environmental diversification tool. They are widely used in organic systems for weed and pest control, among other ecological benefits, and are now widely used in the cultivation of a broad variety of crops across the globe. By enhancing the soil's structure, porosity, and fertility, mulches may help reduce the prevalence of weeds and insect pests. Mulches come in an almost infinite variety; they may be organic, inorganic, alive, synthetic, dead, biodegradable, or non-biodegradable. The viability of employing living mulches as a form of biological pest management was explored in this chapter. Also, we spoke about how living mulches may invite unwanted guests like insects, weeds, diseases, and even birds.

Ashok Kumar Pathera et al (2013) Muscle foods are notorious for harboring harmful microorganisms that contribute to deterioration and sickness. Concerns about the safety of meat products have been raised in recent years due to outbreaks of animal illnesses including Avian Flu in Asia and Bovine Spongiform Encephalopathy in Europe. To meet the challenges of producing microbiologically safe products, plants can implement a food safety management program. This type of program takes a preventative approach to food safety by mandating the identification of all potential sources of contamination (hazards) and the development of plans to control, reduce, or eliminate them. Despite the availability of methods for the identification of infections in muscle meal, early management is essential.

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Dr. Mahmoud A. Alawi (2018) In order to check for traces of pesticides, researchers gathered 240 samples of locally grown produce in the governorates of Irbid, Jarash, Ajloun, and Mafraq in 2014 and 2015. 2.4% of the samples tested positive for residues over the Maximum Residue Level (MRL), 4.5% of the samples tested positive for residues below the MRL, and 94.8 % of the samples tested negative for residues.. In order to test for the presence of pesticides, the Jordanian government gathered 400 samples of imported vegetables and fruits at several border checkpoints in 2014 and 2015. The results showed that 2% of the samples tested positive for residues at levels above the MRL, 3% of the samples tested positive for residues at levels below the MRL, and 96.55% of the samples tested negative for residues. Pesticide residues in domestic and imported crops should be monitored regularly, and integrated pest management strategies should be used.

MATERIAL AND METHOD:

Despite the fact that there was no standardized procedure for article evaluation. This led to the systematic collection and analysis of a wide range of related texts. Pesticide and toxicology-related articles and papers from books and journals were read and analyzed. at addition to research at libraries, this study also made extensive use of online resources. The current investigation makes use of a notepad, pen, and pencil, as well as a pen drive/hard disk.

As early as the 1600s, a combination of honey and arsenic was employed to combat ant infestations. U.S. farmers in the late 1800s tried applying chemicals like nicotine sulfate, calcium arsenate, and sulphur to their fields in an attempt to improve crop yields, but their efforts were fruitless due to the ineffectiveness of the techniques they used. Arsenic, a byproduct of copper, was employed to combat a Colorado potato beetle epidemic in the United States in 1867 (History of pesticide usage, 1998).

A number of highly effective and reasonably priced pesticides were synthesized and mass-produced in the decades after World War II, marking a key milestone in the history of pesticide research. Aldrin, DDT (1939), Dieldrin, -Benzene Hexachloride (BHC), 2,4-Dichlorophenoxyacetic acid (2,4-D), Chlordane, and Endrin were all discovered during this time. Table 1 provides a brief overview of the evolution of pesticides throughout time.

Table 1 Historical account of pesticide use

Year	Events
1867	Paris Green (form of copper arsenite) was used to control Colorado potato beetle outbreak
1885	Introduction of a copper mixture by Professor Millardet to control mildew
1892	Potassium dinitro-2-cresylate was produced in Germany
1939	DDT discovered by Swiss chemist Paul Muller; organophosphate insecticides and phenoxyacetic herbicides were discovered
1950s	Fungicides captan and glyodin and insecticide malathion was discovered
1961–1971	Agent Orange was introduced
1972	DDT officially banned
2001	Stockholm Convention

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Table no 2- Different classes of pesticide and its health effect

Pesticides	Exposition	Sign and symptom	Treatment
Oraganophosphorus	Skin, conjunctiva, gastrointestinal tract, and lungs	Muscarinic syndrome and nicotine syndrome, resulting of excess acetylcholine in the synaptic cleft	Maintenance of vital function and cholinesterase levels. Avoid the use of partasympathomimetric agents.
Carbamets	Lungs, gastrointestinal tract and skin	Miosis, salivation, sweating, tearing, behavioral change	Maintance of vital function and cholinesterase levels. Avoid the use of partasympathomimetric agents.
Oraganochlorin	Lungs, gastrointestinal tract and skin	Dizziness, headache, nausea, vomiting, diarrhea, muscle weakness, mental confusion, anxiety	Maintance of vital function and administer diazepam and Phenobarbital to control seizures.
Pyrethrine and pyrethroids	Lungs, gastrointestinal tract and skin	In coordination prostration, drooling irregular movement of limbs and hypersensitivity to stimuli	Decontamination of the skin and eyes, besides basic maintenance of vital functions.
Triaznes	Skin, eye, nose and gastrointestinal tract		
Phenoxy Derivative	Lungs, gastrointestinal tract		
Dipyridyl Derivatives	Skin, eye, nose and gastrointestinal tract		
Glycine Derivatives	gastrointestinal tract and skin		
Dithiocarbamates	They show slow absorption by oral and dermal contact		

Classification and Use in Agriculture

Multiple classification systems exist for pesticides. You may categorize them based on the chemicals they use, the way they're applied, or, most typically, the kind of pests they target. Pesticides, weed killers, rodent killers, fungicides, and larvicides are all included in this category. According to Eurostat (2008), the term "pesticide" is generic enough to include both biocides and plant protection products.

Table 3 shows the most common types of pesticides covered by the FAOSTAT Pesticides Use domain (FAO, 2021). A major revolution in this area happened at the start of the 1990s with the introduction of neocotinoids. The key difference between these new molecules and the ones that have been employed in the past is the reduced dosage required for their use: just a few grams of chemical compound per acre, as opposed to many kilograms.

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Table 3. Pesticides groups

1) Insetticides	Organo—phosphates, Chlorinated hydrocarbons, Pyrethroids, Carbamates—insecticides, Biological products and Others
2) Mineral Oils	
3) Herbicides	Triazines, Phenoxy hormones, Carbamates–herbicides, Amides, Urea derivatives, Sulfonyl urea, Uracil, Dinitroanilines, Bipiridils and Others
4) Fungicides and Bactericides	Inorganic, Benzimidazoles, Dithiocarbamates, Diazines Morpholines, Triazoles Diazoles, and Others
5) Seed Treatment-Fungicides	Benzimidazoles, Dithiocarbamates, Diazines Morpholines, Botanical products and biological, Triazoles Diazoles, and Others
6) Seed Treatment-Insecticides	Carbamates–insecticides, Organo-phosphates, Pyrethroids, and Others
7) Plant Growth Regulators	
8) Rodenticides	C Cyanide Generators, Anti-coagulants, Narcotics, Hypercalcaemics, and Others yanide Generators, Anti–coagulantsNarcotics, Hypercalcaemics, and Others
9) Other Pesticides NES	
10) Disinfectants	

Herbicides and insecticides account for the bulk of pest control products (FAO, 2021). We've already covered the side effects of popular herbicides like glyphosate and isoproturon. Chloropicrin (trichloronitromethane) is one of the most popular insecticides used as a fumigant, despite its many drawbacks. From 1990 to 2018, global average annual pesticide uses per hectare of cropland increased steadily (FAO, 2021), with the highest quotas for Asian countries. Africa's consumption rates, at roughly 0.4 kg/ha/year from 1990 to 2018, are the lowest in the world. From 1990 to 2018, the average annual consumption across European nations was between 1.4 and 1.8 kg/ha.

Pesticide Registration and Safety

Pesticide registration is an involved legal and administrative procedure that involves the knowledge and experience of both the registration authority and the pesticide producers. To assure the safety of both the active and inert substances used in pesticide production, this procedure evaluates the possible consequences of pesticide usage on human health and the environment.

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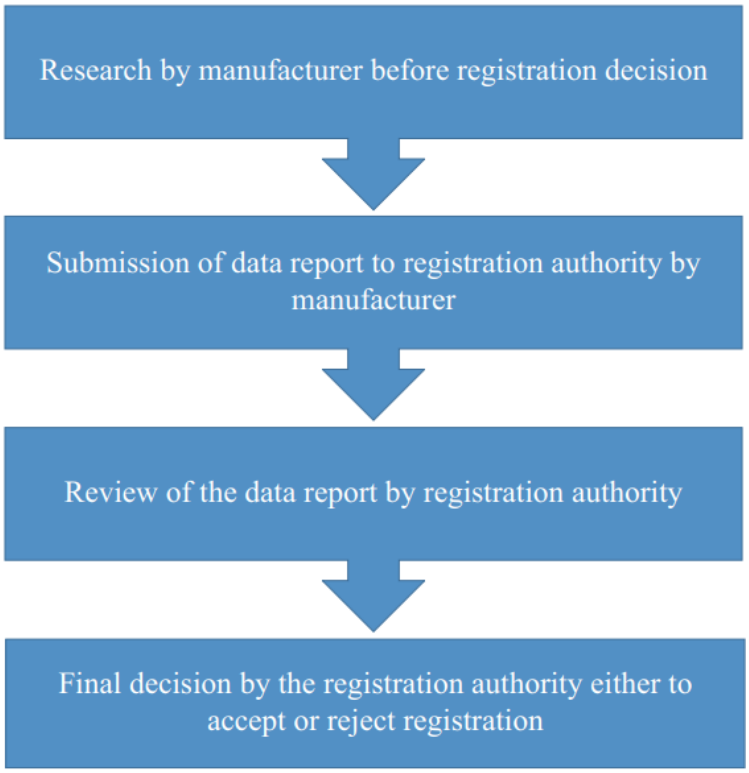

Fig. 1 Pesticide registration process

PESTICIDE IMPACT ON HUMAN HEALTH

While pesticides have helped improve health outcomes by reducing the spread of vector-borne illnesses, their widespread and chronic usage has had negative consequences for human health. The widespread and often inadequate use of pesticides makes everyone, but especially infants and young children, vulnerable to their harmful effects. Due to the huge increase in pesticide use over the past few decades, the likelihood of getting exposed to pesticides has increased considerably.. About three million instances of pesticide poisoning and two hundred and twenty thousand fatalities are recorded annually in poor nations, according to the World Health Organization.

Pesticides pose a greater threat to the health of around 2.2 million individuals, most of whom live in poor nations. In addition, pesticide applicators, infants, and children are more susceptible to the harmful effects of pesticides.. Human exposure to pesticides occurs when the chemical is ingested, inhaled, or absorbed via the skin. But most individuals are harmed by eating food that has been tainted with pesticides. They are able to penetrate many barriers before reaching human tissues or storage areas. Even though humans have detox pathways, there are times when poisons are retained after being absorbed into the bloodstream. When pesticide levels within the body rise above those in the surrounding environment, harmful consequences might occur.

EFFECT OF PESTICIDE ON ENVIRONMENT:

Various harmful effects on the environment may be traced back to the widespread lack of screening and sufficient specialized knowledge among farmers and field workers. The non-target organism is also affected by the everyday, widespread application of pesticides without screening. In cases when the crop was damaged due to erratic screening, excessive amounts of pesticide were applied. In the end, they have a lengthy half-life in the environment and pollute it, especially the soil. The soil's natural ability to support plant growth is diminished by the widespread use of pesticides, which also eliminates beneficial microorganisms.

Because solubility affects surface runoff transport and soil absorption capacity (Bernardes MFF et al., 2015), it is crucial to have a working knowledge of pesticides' physical and chemical characteristics. Long-range atmospheric transport of pesticides results in their deposition in water sources, resulting in water contamination. As a result of natural selection, certain pests have developed resistance to some pesticides, posing a threat to non-target organisms and sometimes even resulting in the instantaneous death of such organisms. On the other hand, there are pesticides that are degraded by

physical or chemical processes, microbes, or photodecomposition. However, the persistent presence of pesticides that have not been banned has serious consequences for the ecosystem. Long-lasting pesticides pose risks to aquatic and terrestrial ecosystems. The introduction of pesticides into aquatic ecosystems poses a threat to aquatic flora and fauna.

ADVERSE EFFECTS ON REPRODUCTION

In terms of pesticide mechanisms of action, it is ideal to have molecules that are highly selective, i.e. highly efficient and therefore very toxic, for target organisms (pests), but are either harmless to or only mildly toxic to non-target organisms, including humans. Many commercially available pesticides do this by selectively damaging enzymes found in their intended targets but not in any of the millions of other species that share the planet with them. In the wild, however, the complex mechanisms and interactions that occur make it difficult to predict whether or not pesticide molecules or their metabolites will have an effect on the vital and reproductive functions of non-target organisms, which are also very useful for maintaining the delicate ecosystemic balances.

The following pesticides are only a few of many that may have harmful effects on human development and reproduction.. The ability to reproduce is crucial to the survival of all species. The productivity and survival of humans, animals, and plants are all negatively affected by its disruption or malfunction. There is a wide range of possible causes for this disturbance.

Some pesticides, when consumed in large enough quantities, pose a serious threat to human and animal health. The risk of infertility, spontaneous abortions, teratogenicity, and developmental impairments in the fetus is increased when these substances are used. It was shown in the late 20th century that exposure to certain toxins, such as pesticides, may have far-reaching effects on the maturation of the nervous and reproductive systems in many species of laboratory guinea pigs.

CONCLUSION

Increased agricultural yield and other indirect benefits have resulted from the widespread use of pesticides.. However, the safety of pesticides has been questioned because of the harm they may do to humans and ecosystems. Soil, water, and the surrounding environment may be cleansed of pesticides with the help of plants, animals, and other things. Careful use of pesticides on crops has the potential to lessen their negative impact on the environment. Pesticide molecules are everywhere today, polluting our air, water, and food. Even the umbilical cord and breast milk have been shown to contain them. These compounds, which are increasingly being identified in "cocktails" of active components, disturb essential but delicate systems including hormone control, reproduction, and metabolism, and their effects are seen at extremely low doses.

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