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Eco-Friendly Agriculture: Reducing Pesticide Usage For Environmental Conservation And Human Well-Being

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Abstract:

The advancement of agricultural products relies upon pesticides. They've been utilized by ranchers to control weeds and bugs, and there have been reports of them essentially expanding agricultural yield. The twentieth century's phenomenal overall populace blast could never have been conceivable without a proportionate expansion in food creation. Around 33% of agricultural merchandise should be treated with pesticides during produce. Without the utilization of pesticides, natural product creation would have dropped by 78%, vegetable creation by 54%, and cereal creation by 32%. Hence, pesticides play a basic part in lessening sickness rates and expanding crop yields around the world. The motivation behind this study is to investigate the way in which normal pesticide use is presently in Nepal and the damage that pesticides do to the climate and to individuals' wellbeing. Pertinent information and data were gained via cautiously going through diary articles, research papers, reports, and different distributions. This exposition begs and illuminates the perusers to change to more thorough, secure, natural, and feasible assembling and the board methods.

Keywords: Eco-friendly agriculture, Pesticide reduction, Environmental conservation, Human well-being, Sustainable farming

Introduction:

The class of chemicals alluded to as pesticides incorporates those used as nematicides, rodenticides, herbicides, insect sprays, and fungicides. Pesticides are by and large recognized to essentially affect agricultural development because of their capacity to bring down agricultural item misfortunes and upgrade the reasonable yield and nature of food. [1] During The Second Great War (1939-1945), there was a flood in the making of pesticides because of the squeezing need to improve food creation and oversee food-borne sicknesses. Besides, the developing utilization of engineered crop security specialists beginning during the 1940s considered a significantly more prominent ascent in food yield. Besides, the result of pesticides rose at a speed of roughly 11% year worldwide, ascending from 0.2 million tons during the 1950s to more than 5 million tons by 2000. Just 1% of all pesticides are utilized effectively to control bug bothers on track plants, regardless of the way that three billion kg

of pesticides are utilized yearly around the world. The significant amounts of leftover pesticides saturate or show up in non-target vegetation and ecological media. [2] Thusly, ecological contamination and unfavorable wellbeing impacts have been incited by pesticide tainting.

The Way of behaving of Pesticides in the Climate:

Pesticides can possibly spill into the climate when they are showered on track plants or discarded. Pesticides can go through processes like exchange (or movement) and corruption when they get into the climate. New mixtures are established by the climate's breakdown of pesticides. Through move cycles such adsorption, draining, volatilization, shower float, and overflow, pesticides move from the objective site to other ecological media or non-target plants. The numerous chemical sorts highlight the varieties by they way they act in the climate. For example, organochlorine chemicals, similar to DDT, show negligible intense poisonousness however an outstanding ability to gather in tissues and keep on hurting long haul. [3] Despite the fact that their deal is denied in most of nations, their tendency implies that their remainders wait in the climate for quite a while. Organophosphate bug sprays have a huge intense harmfulness in warm blooded creatures in spite of having a low determination.

Degradation of Pesticides:

Pesticides are separated by light, chemical cycles, or microorganisms whenever they are regulated to the objective living being. Corruption times for pesticides could go from hours to days or even years, contingent upon the encompassing conditions and the chemical properties of the weapon. Pesticide breakdown processes produce particular metabolites and control the determination of pesticides in soils. Furthermore, it presents the possibility of a pesticide's half-life in the climate. For example, trichloro-2-pyridinol (TCP), the primary metabolite of chlorpyrifos, is altogether more versatile and risky than chlorpyrifos itself. In many spots, it has been normal to track down chlorpyrifos and the side-effects of its breakdown in soils, silt, and groundwater. These substances are viewed as endocrine disruptors, possibly hurting human wellbeing.

Three various types of pesticide breakdown exist. The breakdown of pesticides by microscopic organisms and growths is known as microbial debasement. For example, the essential component of niclosamide breakdown in regular settings is biodegradation, which is worked with by the high limit of native aerobatic and anaerobic microorganisms to separate niclosamide. Pesticide microbial breakdown is impacted by various elements, for example, temperature, oxygen, dampness content, pH, and soil porosity. For example, the pH of the dirt for the most part influences the

enantioselective breakdown of benalaxyl, with a higher pH causing a more grounded corruption.

Chemical cycles in the dirt can separate pesticides. We allude to this interaction as chemical crumbling. Moreover, in light of the fact that UV radiation is a chemical cycle that is generally moving, it fundamentally affects the crumbling of particles on soil surfaces. [4] Temperature, pH, dampness content, and bug spray restricting to the dirt all influence the sort and pace of chemical breakdown.

Pesticides go through photograph debasement when presented to daylight. Somewhat, all pesticides can go through photograph debasement; the pace of corruption differs relying upon the insect poison's attributes, season of openness, and light power. For example, when presented to light, niclosamide may hydrolyze to deliver 2 chloro-4-nitroaniline and 5 chlorosalicylic corrosive.

Literature Review:

Karunarathne et al. (2020): This study highlights the catastrophic effects of pesticide misuse beyond unintentional poisoning by estimating the number of premature deaths from pesticide suicide since the Green Revolution. [5] It highlights the necessity of all-encompassing preventive measures that address the hazards of poisoning, both unintentional and purposeful. The larger societal costs of pesticide use are clarified by this study.

Gyenwali et al. (2017): This study looks at pesticide poisoning cases in the Chitwan district with an emphasis on descriptive epidemiology. It was carried out in Nepal. It examines factors such as demographics, pesticide types used, exposure routes, and clinical symptoms. [6] This study offers insightful information about the particular cost of pesticide toxicity in the setting of developing nations.

Lorenz, (2009): This book provides a thorough summary of the possible health consequences linked to different kinds of pesticides. It addresses the roles of marketing and communication in the use of pesticides, as well as the mechanisms of toxicity, target organs, and acute and long-term effects. [7] This source offers a more comprehensive framework for comprehending the health hazards linked to pesticide exposure.

Kole et al. (2001): This study looks for endosulfan and hexachlorocyclohexane (HCH), two particular pesticide residues, in fish samples from markets close to Calcutta. It draws attention to the possibility of pesticide residue exposure to humans through the food chain, posing questions about the potential effects on public health. [8] This study illustrates how pesticides spread throughout the ecosystem and how that might affect the safety of food.

Abdullah et al. (2011) The possible connection between long-term exposure to organophosphate pesticides and coronary

artery disease is examined in this conference presentation. This study adds to the body of information on the many health effects of pesticide exposure, even if it acknowledges the need for more research. [9] It also raises the possibility of long-term health consequences from pesticide exposure. This study suggests that using pesticides may raise even more general health issues.

Research Methodology:

Design of Research:

This study employed a descriptive research design to analyze the pesticide use scenario in India. The research focused on understanding the patterns of pesticide usage across ecological belts and crop types, aiming to provide insights into the distribution and trends of pesticide application in Indian agriculture. [10] The research design involved a comprehensive analysis of existing data to draw conclusions about the factors influencing pesticide use in different regions and for various crops.

Data Collection:

The data and information were gathered from the optional sources during the arrangement of this original copy. Research articles, books, reports, news, and other required materials were gotten from different e-sources like Google, Google Scholar, Research Gate, Directory of Open Access Journal,, and so on and were totally assessed and significant appraisal was finished for the advancement of the work.

Reputable government reports, academic journals, and statistical databases on Indian agriculture and pesticide use provided the data for this study. Reports from government organizations like the National Sample Survey Office (NSSO), the Indian Council of Agricultural Research (ICAR), and the Ministry of Agriculture and Farmers' Welfare were among the primary sources. Secondary sources comprised scholarly articles, research papers, and publications from academic journals that provided insights into the pesticide use picture in India. [11] The information gathered covered pesticide imports, pesticide use distributed across various crop categories, and pesticide use along the ecological belt.

Ethical Consideration:

Ethical considerations in this work principally addressed the responsible use of data from credible sources and adherence to academic integrity. The research relied on publicly available data and did not involve any human or animal subjects, thus eliminating ethical concerns related to participant consent and privacy. The study recognized the contributions of earlier research in the area of pesticide use in India and made sure that sources were properly cited to uphold academic integrity.

Statistical Analysis:

A thorough summary of pesticide use in India was produced by applying descriptive statistical methods to the collected data. To show the patterns and variances in pesticide application across

various ecological belts and crop kinds, descriptive statistics including averages, percentages, and trends were computed. The investigation intended to provide a good knowledge of the previous pesticide use scenario in India, considering regional variances and crop preferences. Additionally, the study may have employed inferential statistical techniques if deemed necessary to draw more nuanced conclusions from the data.

Data Analysis:

Pesticides use scenario of India:

Pesticides have a significant impact on India's agricultural landscape and are essential for raising crop yields, enhancing crop quality, and conserving produce for the country's population of over 1.3 billion people. The difficulties presented by increasing pesticide imports, which totaled 66,000 tons and □ 5,432 crore in the fiscal year 2021–2022, highlight this dependence. The need to increase agricultural output in the face of insect threats and environmental limitations is reflected in this development. There are clear regional differences in the amount of pesticide used; valleys use the most (0.470 kg/ha), while high hill areas use the least (0.085 kg/ha). Pesticide distribution is also greatly influenced by crop preferences; of these, vegetables account for 89% of overall consumption, followed by cereals (7.5%), cash crops (2.5%), pulses and fruits (0.5% each), and cash crops (2.5%). Although pesticides play a crucial role in maintaining food security, there are worries over the environmental and public health effects of their widespread use. As a result, India is placing more emphasis on advancing integrated pest management (IPM) tactics that give priority to environmentally friendly pest control techniques. [12] To secure food security while protecting the environment and public health, a balanced approach that prioritizes IPM, biopesticide research, and farmer awareness-building are essential.

Table 1: Pesticide Use According To Ecological Belt

Active Ingredient (a.i) kg/ha	Ecological Belt
High Hill	0.091
Hill	0.308
Terai	0.989
Valley	0.51

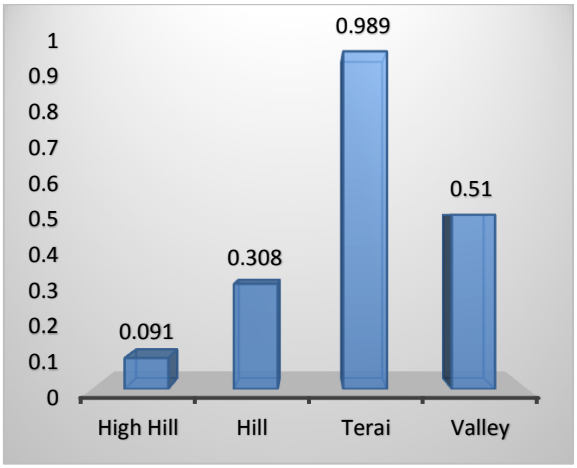

Figure 1: Pesticide use according to Ecological belt

Table 1 displays information on the amount of pesticides used in India's various ecological belts, expressed in kilograms of active ingredient (a.i.) per acre. The average amount of pesticide used in the high hill regions is 0.091 kg/ha, which suggests that these areas may have

less intensive agricultural methods or have less pest burden. On the other hand, hilly areas have a higher average pesticide use of 0.308 kg/ha, indicating a larger need for pest management because of the unique crop kinds or environmental circumstances in these locations. With an average pesticide use of 0.989 kg/ha, the Terai region has the highest level of use, which may be attributed to more intensive agricultural techniques and increased insect pressure in this fertile lowland area. [13] The valley regions also show a noteworthy average use of 0.51 kg/ha of pesticides, probably as a result of the importance of agriculture in these areas and the necessity of keeping important crops safe from pests.

Table 2: Pesticides Shares by Crop

Crops	Pesticide shares by Percent
Cereals	6%
Vegetables	90%
Cash Crops	1%
Pulses	2%
Fruits	1%

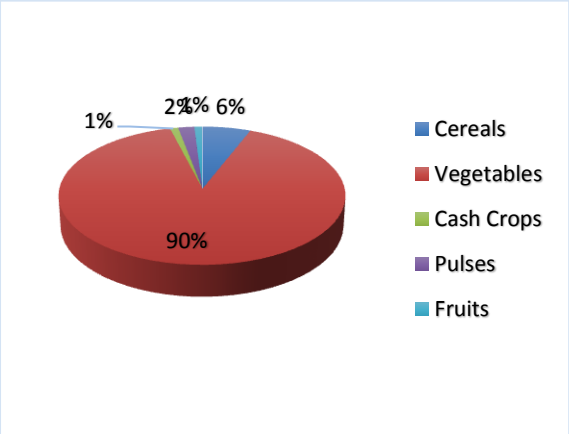

Figure 2: Pesticides shares by crop

As percentages of total pesticide shares, Table 2 shows how pesticide usage is distributed among India's various crop categories. Based on the data, it may be inferred that vegetables account for 90% of all pesticide usage. This implies that the production of vegetables depends significantly on the use of pesticides, maybe as a result of the economic importance of vegetable crops or the vulnerability of vegetables to pests and illnesses. At 6%, cereals—which include staple foods like wheat and rice—use comparatively fewer pesticides than other crops. With their respective 1% shares, cash crops and fruits show less dependence on pesticides than vegetables. Compared to other crop categories, pulses—leguminous crops like lentils and chickpeas—have a 2% share, which indicates a modest amount of pesticide usage.

Conclusion:

There is a long history of agricultural improvement in different regions of the planet. There are three particular periods throughout the entire existence of pesticide use in agricultural development. Different arrangement terms, including chemical classes, utilitarian gatherings, methods of activity, and poisonousness, are utilized to order pesticides. [14] Pesticide use has created gigantic advantages for different fields, including horticulture and general wellbeing. As far as general wellbeing, pesticides are routinely utilized to

annihilate bothers from homes, work environments, malls, and roads, like rodents, mice, ticks, and mosquitoes. To sum up, in order to preserve this planet for the current and upcoming generations, we must examine our own behavior. We must act with foresight as we carry out our acts and consider the implications of those actions, and we must act quickly to mitigate and adapt. When it comes to chemicals and pesticides, we should try to avoid using them as much as possible because even the so-called safe level may eventually start to have negative effects. There are many of secure, dependable, and sustainable substitutes for chemical pesticides, so reliance on chemicals and pesticides is not necessary. [15] We must also consider ethical and ecological issues, since making money and commercializing should not be our primary goals. Farmers should be educated about the fact that pesticides are poisons rather than medications, and they should know the proper dosage and safe application techniques.

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