ESTE TEXTO TIENE DIVERSAS SECCIONES TEMÁTICAS MARCADAS CON LÍNEAS AL EMPEZAR C/U, NO NECESITAS TRADUCIRLO COMPLETO, SOLO DESCUBRIR A QUÉ SECCIÓN LE CORRESPONDE LA DESCRIPCIÓN QUE LO RESUME CORRECTAMENTE ENTRE LAS SIGUIENTES y NUMERARLOS.

(OJO, HAY VARIAS QUE SON DISTRACTORES!!)

( ) Peligros de su impacto en los microorganismos de los suelos / ( ) Beneficios de los pesticidas / ( ) Peligros de su impacto en humanos / ( ) Que son los pesticidas y un poco de su historia / ( ) Peligros de su impacto en alimentos / ( ) Necesidad de mayor educación y comunicación / ( ) Necesidad de mayores datos para su análisis científico / ( ) Peligros de su impacto en el agua / ( ) Discusión de la relación costo-beneficio / ( ) Peligros de su impacto por volatilización / ( ) Impacto en las ganancias económicas de los países / ( ) Peligros de su impacto directo en humanos y el medioambiente / ( ) Impacto en la productividad / ( ) Evidencias del impacto de los pesticidas como cancerígenos

Impact of pesticides use in agriculture: their benefits and hazards

1

(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2984095/)

The term pesticide covers a wide range of compounds including insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, plant growth regulators and others. Among these, organochlorine (OC) insecticides, used successfully in controlling a number of diseases, such as malaria and typhus, were banned or restricted after the 1960s in most of the technologically advanced countries. The introduction of other synthetic insecticides – organophosphate (OP) insecticides in the 1960s, carbamates in 1970s and pyrethroids in 1980s and the introduction of herbicides and fungicides in the 1970s–1980s contributed greatly to pest control and agricultural output. Ideally a pesticide must be lethal to the targeted pests, but not to non-target species, including humans. Unfortunately, this is not always the case, so the controversy of use and abuse of pesticides has surfaced. The rampant use of these chemicals, under the **adage**, "if little is good, a lot more will be better" has played havoc with human and other life forms.

2

The primary benefits are the direct gains expected from their use. For example the effect of killing caterpillars feeding on the crop brings the primary benefit of higher yields and better quality of cabbage. The three main effects result in 26 primary benefits ranging from protection of recreational turf to saved human lives. The secondary benefits are the less immediate or obvious benefits that result from the primary benefits. They may be subtle, less intuitive or of longer term. It follows that for secondary benefits it is therefore more difficult to establish cause and effect, but nevertheless they can be powerful justifications for pesticide use. For example the higher cabbage yield might bring additional revenue that could be put towards children's education or medical care, leading to a healthier, better educated population. There are various secondary benefits identified, ranging from fitter people to conserved biodiversity.

3

Many benefits have been derived from the use of pesticides in forestry, public health and, of course, in agriculture, a sector upon which many economies are largely dependent. Let us analyze the example of India. Food grain production, which stood at a mere 50 million tons in 1948–49, had increased almost fourfold to 198 million tons by the end of 1996–97 from an estimated 169 million hectares of permanently cropped land. This result has been achieved by the use of high-yield varieties of seeds, advanced irrigation technologies and agricultural chemicals.

Similarly outputs and productivity have increased dramatically in most countries, for example wheat yields in the United Kingdom and corn yields in the USA. Increases in productivity have been due to several factors including use of fertilizer, better varieties and use of machinery. Pesticides have been an integral part of the process by reducing losses from weeds, diseases and insect pests that can markedly reduce the amount of harvestable produce. Several studies stated that "considerable economic losses" would be suffered without pesticide use and quantified the significant increases in yield and economic margin that result from their use. Moreover, in the environment most pesticides (are at least supposed to) undergo photochemical transformation to produce metabolites which are relatively non-toxic to both human beings and the environment.

If the credits of pesticides include enhanced economic potential in terms of increased production of food and fibre, and amelioration of vector-borne diseases, then their debits have resulted in serious health implications to humans and the environment. There is now overwhelming evidence that some of these chemicals **do** pose a potential risk to life forms and unwanted side effects to the environment. No segment of the population is completely protected against exposure to pesticides and their potentially serious health effects, and a disproportionate burden is shouldered by the people of developing countries and by high risk groups in each country (WHO, 1990). The world-wide deaths and chronic diseases that are deemed to be due to pesticide poisoning number about 1 million per year (Environews Forum, 1999).

The high risk groups exposed to pesticides include production workers, sprayers, mixers, loaders and agricultural farm hands. During manufacture and formulation, hazards are higher because the processes involved are not risk-free.

OC compounds could pollute the tissues of virtually every life form on the earth, the air, the lakes and the oceans, the fishes that live in them and the birds that feed on the fishes. Pesticides can reach surface water through runoff from treated plants and soil, and water contamination is widespread. A comprehensive set of studies done by the U.S. Geological Survey (USGS) on major river basins in the 90s yielded startling results. More than 90% of water and fish samples from all streams contained pesticides. Pesticides were found in **all samples** from major rivers with mixed agricultural and urban land use influences and 99% of samples of urban streams.

Groundwater pollution due to pesticides is also a worldwide problem. According to the USGS, at least 143 different pesticides and 21 transformation products (TPs) have been found in ground water, including pesticides from every major chemical class. During a survey in India in 1995, 58% of drinking water samples drawn from various hand pumps and wells were contaminated with OC pesticides above the Environmental Protection Authority (EPA) standards. Once ground water is polluted with toxic chemicals, it may take many years for the contamination to dissipate or to be cleaned up, if not almost impossible.

Certain environmental chemicals, including pesticides termed as endocrine disruptors, are known to elicit adverse effects by mimicking or antagonising natural hormones and it has been postulated that their long-term, low-dose exposure is increasingly linked to human health effects such as immune suppression, hormone disruption, diminished intelligence, reproductive abnormalities and cancer. Observations confined to health surveillance in male workers engaged in production of dust and liquid formulations of pesticides (malathion, methyl parathion, DDT and lindane) in industrial settings of the unorganised sector revealed a high occurrence of generalised symptoms (headache, nausea, vomiting, fatigue, irritation of skin and eyes) besides psychological, neurological, cardiorespiratory and gastrointestinal symptoms, coupled with low plasma cholinesterase (ChE) activity.

5

Pesticide sprays can also directly hit non-target vegetation and can drift or volatilize from the treated area to contaminate air, soil, and non-target plants. Some pesticide drift occurs during every application, even from ground equipment. Drift can account for a loss of 2 to 25% of the chemical being applied, which can spread over a distance of a few yards to several hundred miles. Also as much as 80–90% of an applied pesticide can be volatilised within a few days of application. Despite the fact that only limited research has been done on the topic, studies consistently find pesticide residues in air. According to the USGS, pesticides have been detected in the atmosphere in all sampled areas of the USA (1997). Nearly every pesticide investigated has been detected in rain, air, fog, or snow across the nation at different times of the year (USGS, 1999). Herbicides are designed to kill plants, so it is not surprising that they would damage or kill desirable species if they are applied directly to such plants, or if they drift or volatilise onto them. In addition to killing non-target plants outright, pesticide exposure can cause sublethal effects on plants. Exposure to the herbicide glyphosate can severely reduce seed quality (1995) and can also increase the susceptibility of certain plants to disease. This poses a special threat to endangered plant species.

6

To determine the extent of pesticide contamination in food, programs entitled 'Monitoring of Pesticide Residues in Products of Plant Origin in the European Union' have been being established in the EU since 1996. Seven individual pesticides (acephate, chlopyriphos, chlopyriphos-methyl, methamidophos, iprodione, procymidone and chlorothalonil) and two groups of them (benomyl group and maneb group, i.e. dithiocarbamates) were analysed that year in apples, tomatoes, lettuce, strawberries and grapes. An average of about 9700 samples were analysed and 5.2% of the samples were found to contain residues. In 1997, other 13 pesticides (acephate, carbendazin, chlorothalonil, chlopyriphos, DDT, diazinon, endosulfan, methamidophos, iprodione, metalaxyl, methidathion, thiabendazole, triazophos) were assessed in five commodities (mandarins, pears, bananas, beans, and potatoes). Some 6000 samples were analysed and around 34% contained pesticide residues at or below the Maximum Residue Levels (MRL). Pesticide residues were most frequently found in mandarins (69%), followed by bananas (51%), pears (28%), beans (21%) and potatoes (9%). MRLs were exceeded most often in beans (1.9%), closely followed by mandarins (1.8%). Estimation of the dietary intake of pesticide residues (based on the 90th percentile) from the above-mentioned commodities shows that there is no exceeding of the Acceptable Daily Intake (ADI) with all the pesticides and commodities studied (European Commission, 1999). Still, the numbers raised some alarms.

7

Heavy treatment of soil with pesticides can cause populations of beneficial soil microorganisms to decline. According to the soil scientist Dr. Ingham, *"If we lose both bacteria and fungi, then the soil degrades. Overuse of chemical fertilizers and pesticides have effects on the soil organisms that are similar to human overuse of antibiotics. Indiscriminate use of chemicals might work for a few years, but after a while, there aren't enough beneficial soil organisms to hold onto the nutrients."* For example, plants depend on a variety of soil microorganisms to transform atmospheric nitrogen into nitrates, which plants can use. Common landscape herbicides disrupt this process: *triclopyr* inhibits soil bacteria that transform ammonia into nitrite; *glyphosate* reduces the growth and activity of free-living nitrogen-fixing bacteria in soil, and *2,4-D* reduces nitrogen fixation by the bacteria that live on the roots of bean plants, reduces the growth and activity of nitrogen-fixing blue-green algae, and inhibits the transformation of ammonia into nitrates by soil bacteria.

Mycorrhizal fungi grow with the roots of many plants and aid in nutrient uptake, but can be damaged by herbicides like oryzalin, trifluralin and Roundup, which has been shown to have damaging effects at concentrations lower than those found in soil following typical applications.

8

The data on environmental health risk assessment studies may be regarded as an aid towards a better understanding of the problem. Data on the occurrence of pesticide-related illnesses among defined populations in developing countries are scanty. Generation of descriptive epidemiological data based on area profiles, development of intervention strategies designed to lower the incidence of acute poisoning, and periodic surveillance studies on high risk groups are needed. Our efforts should include investigations of outbreaks and accidental exposure to pesticides, correlation studies, prospective studies and randomised trials of intervention procedures. Valuable information can be collected by monitoring human exposure in the form of residue levels in body fluids and tissues of the general population. The importance of education and training of workers as a major vehicle to ensure a safe use of pesticides is being increasingly recognised.

9

Because of the extensive benefits which man accrues from pesticides, these chemicals provide the best opportunity to those who juggle with the risk-benefit equations. The economic impact of pesticides in non-target species (including humans) has been estimated at approximately $8 billion annually in developing countries. What is required is to weigh all the risks against the benefits to ensure a maximum margin of safety. The total cost-benefit picture from pesticide use differs appreciably between developed and developing countries. For developing countries it is usually imperative to use pesticides, as no one would prefer famine or transmissible diseases like malaria. It may thus be expedient to accept a reasonable degree of risk.

Our approach to the use of pesticides should be pragmatic and based on scientific judgment and not on commercial considerations. There are some inherent difficulties in fully evaluating the risks to human health due to pesticides, as there are a large number of variables such as age, sex, race, socio-economic status, diet, state of health, *etc.* – and little is known about the effects of those variables. Additionally, the long-term effects of low level exposure to one pesticide may be greatly influenced by concomitant exposure to other pesticides and to pollutants present in air, water, food and drugs.

Pesticides are often considered a quick, easy, and inexpensive solution for controlling weeds and insect pests in urban landscapes. However, there are increasing evidences that their use comes at a significant cost. They have contaminated almost every part of our environment: their residues are found in soil and air, as well as in surface and ground water across the countries. Pesticide contamination poses significant risks to the environment and non-target organisms ranging from beneficial soil microorganisms, to insects, plants, fish, and birds. Contrary to common misconceptions, even herbicides can cause harm to the environment and, in fact, weed killers can be especially problematic because they are used in relatively large volumes. The best way to reduce pesticide contamination (and the harm it causes) in our environment is for all of us to do our part to use safer, non-chemical pest and weed control methods.

10

There is a need to convey the message that prevention of adverse health effects and promotion of health are profitable investments for employers and employees as a support to a sustainable development of economics. To sum up, based on our limited knowledge of direct and/or inferential information, the domain of pesticides illustrates a certain ambiguity in situations in which people are undergoing life-long exposure. There is thus every reason to develop health education packages based on knowledge and practices, and to disseminate them within the community in order to minimize human exposure to pesticides.