



Pesticides and the Health of the Brazilian People

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Editorial

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Abbreviations:

GDP: Gross Domestic Product; AI: Active Ingredients; PNDA: National Agricultural Defensives Program; DDT: Dichlorodiphenyl-Trichloroethane; ADI: Acceptable Daily Intake.

Editorial

Agribusiness in Brazil, which accounts for almost 25% of the country's Gross Domestic Product (GDP), is associated with the intensive use of pesticides, producing a number of negative externalities, which emerge as socio-environmental and public health impacts [1]. The naturalization of pesticide use in Brazilian crops has affected the health of rural workers, who deal directly with these products, whether during the handling, dilution, mixing, application and disposal of pesticides, as well as during the cleaning of containers and handling of crops. Farm workers may also be at risk when re-entering treated fields, during harvesting and when cleaning equipment. Individuals who consume products from these crops or use water that passes through contaminated properties are also subject to risks, as well as communities affected by aerial spraying residues. The agrochemical industry is one of the sources of risks of late modernity, and these risks escape the perception of the majority of the population, constituting social situations of threat, especially in developing countries [2]. Currently, 3,125 cases of pesticide poisoning are reported each year in Brazil, with 50 cases going unreported for every one reported.

Brazilian agriculture, as in many other countries, has established its production bases on the use of chemical

inputs in order to increase productivity. However, reports of environmental contamination and public health problems, such as poisoning of rural workers and residues in food, have triggered recognition of the risks arising from the abusive use of pesticides. Despite this, the Brazilian government has encouraged the use of these pesticides by continually releasing new products. In 2022, 652 new pesticides were released, a record in the historical series, which began 24 years ago. In 2021, consumption in Brazil reached 720,000 tons, an increase of almost four times compared to 2003, when it was 183,000 tons. In addition, the amount consumed per hectare of cultivated area has increased significantly, reaching 10.9 kg ha⁻¹ in 2021, almost 3.5 times more than in 2003, as Brazilian consumption exceeds that of the United States, the world's second largest consumer of pesticides, by 1.57 times. This amount represents 20% of all the pesticides consumed in the world in this period, while in European Union countries, the average application is between 0 and 2 kg per hectare. In addition, the Brazilian market and legislation can be considered to have little restriction on the use of pesticides, given that 30% of active ingredients (AI) with authorized registrations are banned in the European Union. Counterfeit pesticides from Paraguay still circulate on the Brazilian market, as more than 30 tons of such products are seized every year [3].

These agrochemical products are regulated in Brazil by Law No. 7.802/1989, the result of pressure from organized civil society groups, which meant an important advance in the control of these substances. Before this law, the matter was regulated only by ministerial ordinances, which are fragile mechanisms that can be abolished at any time. The new legislation now considers pesticides to be: 1) products and agents of physical, chemical or biological processes, intended for use in the production sectors, in the storage and processing of agricultural products, in pastures, in the protection of forests, native or implanted, and of other ecosystems and also of urban, water and industrial



environments, whose purpose is to alter the composition of flora or fauna, in order to preserve them from the harmful action of living beings considered harmful; 2) substances and products, used as defoliants, desiccants, stimulators and growth inhibitors [4]. The law defines the use of the term “agrototoxic” to highlight the toxicity of these products, although the terms “agricultural defender” or “medicine” are usually found on leaflets or in advertisements.

These products emerged when Justus Von Liebig, a German chemist, published a work in 1840 that would become the basic reference for agrochemistry: *Organic Chemistry in its application to agriculture and physiology*. In the book, the chemist argues that the increase in agricultural production was directly proportional to the amount of chemical elements incorporated into the soil, since plant nutrition essentially occurred through the presence of chemical substances in the soil. This discovery led many farmers to abandon traditional organic fertilization practices, opting instead for the chemical route. Underpinning the ideological discourse of increasing food production in order to end world hunger, the so-called Green Revolution began in the 1940s in the United States, which meant a profound change in the agricultural production process. Its essence was the use of pesticides and inputs of industrial origin, such as high-yield seeds, fertilizers, pesticides, herbicides and fungicides, as well as mechanized irrigation systems [5].

Some chemical inputs were leftovers from products used in war, such as dichlorodiphenyl-trichloroethane (DDT), used on the battlefield to combat insects that transmit typhus, malaria and yellow fever. Others, such as 2,4-D and 2,4,5-T, were used as chemical weapons in the Korean and Vietnam wars, known as “Agent Orange”, which decimated thousands of soldiers and civilians, as well as contaminating the environment. The practical success of chemicals in agriculture, alongside advances in the pharmaceutical industry in the 1950s, led to a growing feeling that “a better life is possible through chemistry”. The author adds: Confidence in chemistry was such that children were sprayed with DDT to combat fleas and mosquitoes. Advertising urged housewives to get rid of cockroaches by applying the pesticide. A safe method that could even be applied in the baby’s room. At government level, entomologists and health workers involved in malaria control campaigns even ate spoonfuls of DDT to convince the population that the substance posed no danger. Confidence in these chemicals led to their indiscriminate aerial distribution, by way of rain, over insects, plants, humans and non-humans, fields, forests, villages and cities. Exaggerated and alarming government campaigns against insects spread fear and legitimized control actions [6].

In Brazil, as in other Latin American countries, the Green Revolution had the participation of private international

agencies and institutions focused on the development of agriculture. It was presented as a technological answer to the world food shortage or to the difficulties in producing food for an ever-growing population, with large-scale production, using technology, being the solution found to combat world hunger. At the beginning of the 1960s, the Brazilian government, now under a military dictatorship, through an alliance between national elites and foreign capital, motivated even by political alignment, began to favor medium-sized and large farmers in the South and Southeast, who emphasized production for foreign trade [7], disregarding self-consumption agriculture and small properties. In this way, the dynamics of the Brazilian countryside were transformed to meet the modern aspirations of a more developed Brazil, focused on the large-scale production of commodities and the effective implementation of the agribusiness model, thus promoting a whole new industrial chain. This modernization demanded industrial labour in urban centers, while the expansion of the agricultural frontier and the actions of land grabbers expropriated the land of many farmers, promoting a rural exodus. The Green Revolution was then consolidated on the national scene with the creation of the National Agricultural Defensives Program (PNDA) in the 1970s. The aim of this program was to stimulate domestic production and consumption of agrochemical products, while making the granting of rural credit conditional on the compulsory use of part of this resource for the purchase of these products. The increase in imports of chemical products, the installation of industries that produce and formulate agrochemicals and government stimulus were essential to this process [5].

As a result, a third of the food consumed daily by Brazilians is contaminated by pesticides, i.e. has pesticide levels above what is acceptable. The safety parameter used to calculate the Acceptable Daily Intake (ADI) of each active ingredient (AI) is the result of toxicological evaluations and classifications carried out by the Ministry of Agriculture, Livestock and Supply (MAPA), and an acceptable daily dose is equivalent to the maximum amount that, if ingested daily over a lifetime, does not appear to pose a health risk. However, estimates of an acceptable level of pesticide are flawed, since the methodologies used by the government to stipulate the ADI limits for pesticides are based on an average individual weighing 60 kg, ignoring the impact of these products on more vulnerable groups such as the elderly and children [8]. The crops with the most contamination in selected samples were: peppers (91.8%), strawberries (63.4%), cucumbers (57.4%), lettuce (54.2%), carrots (49.6%), pineapples (32.8%), beet (32.6%) and papaya (30.4%) [9]. In addition, the residual presence of pesticides is not only found in fresh foods, but also in products processed by the food industry, whose ingredients include wheat, corn and soy. These residues can also appear in the meat and milk of animals that eat pesticide-contaminated feed, because over time,

the pesticides end up penetrating the pulp of the fruit and are not restricted to the skin, so that, according to results, the product penetrates an average of one millimeter per day [10]. Another serious fact: when the grace periods - the interval between the last application of the poison and the harvest - are not complied with, pesticide residues remain in the food in concentrations that are not permitted by law.

The use of agrochemicals has caused damage to soils, especially light and sandy soils, especially through the application of combinations of substances, which increase the harmful effects, such as the temporary interruption of nitrification, which makes nitrogen from the atmosphere available to plants. Prolonged applications lead to a large accumulation of products in the soil and, as many have a persistent and long-lasting action, each new application adds to the amount left over from the previous application [6]. Pesticides for domestic use, usually used in homes, offices, markets, etc., such as rodenticides, insecticides, formicides, terminicides, have also caused many cases of poisoning, including deaths and other illnesses, especially in children, the elderly and people who are more susceptible to allergic processes.

Despite the increase in the capacity to generate food supplies in Brazil and around the world, it is important to note that the increase in agricultural productivity, associated with monocultures and agribusiness for export, has not met the demands of food security and sovereignty in the countries, although it has been responsible for numerous impacts, including the concentration of land, income and political power in large producers; unemployment; rural-urban migration. As well as the impact on the population's health. Chronic pesticide poisoning can cause delayed neurotoxic effects, chromosomal alterations, contact dermatitis, liver damage, cardiac arrhythmias, kidney damage, peripheral neuropathies, respiratory allergies, dermatitis, Parkinson's disease, cancers, among others [9].

Considering that interventions aimed at reducing the risks and harms to the population's health are complex to implement due to their inter-institutional nature, and the weight of capital on the subject of pesticides, it can be seen that the Brazilian population's relationship with this poison

is far from being mitigated. In this sense, Brazil has been quick to liberalize the use of agrochemicals, while at the same time being weak in monitoring and controlling their damage to health and the environment.

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