

Glyphosate and its alternatives. Executive Summary.

For many years, the herbicide glyphosate has been used in several agricultural and non-agricultural activities, and its contribution to industrial food production is undeniable. But these achievements have been obtained at a very high environmental and health cost, which in the long term can be very harmful to the future of humanity.

Its negative consequences for many organisms that fulfill essential ecosystem functions are still not fully understood. Glyphosate is a substance directly harmful to plants, algae, fungi, and bacteria, the latter present in the digestive systems of humans and other organisms important for the pollination of food, such as bees.

Thus, the knowledge is just beginning about the effects that glyphosate can have on the elements of the environment with which it comes into contact, such as metals present in the soil and in organisms like ours, that due to their physico-chemical characteristics can alter elements' translocation, leading to imbalances that manifest as chronic diseases.

Questioning by civil society, scientists, and academics about the dangers that humanity faces when these highly hazardous pesticides are released into the environment has already begun in many countries. Despite significant pressure from the giant agrochemical companies, some governments have announced their intention to seek alternatives to glyphosate to gradually phase out its applications from urban and agricultural areas.

This document aims to offer information on the characteristics of the glyphosate molecule and the collateral impacts it has on the health of people, the environment, and other non-target organisms. It also presents a series of alternatives within an agroecological transition strategy to the integrated management of weeds, both for agricultural production systems and for areas where their use is common.

There are proven, successful, and sustainable alternatives for most situations where glyphosate is used. These make use of an ecosystem approach and are not only based on controlling the weeds that could interfere with crops or human activities, but also provide other types of benefits that enrich the environment in general, without contaminating resources as important as the water, or producing physiological alterations in beneficial organisms or chronic diseases in humans.

Farmers can use several preventive strategies to prevent weed propagules from entering their fields, such as ensuring that seed, compost, seedlings, machinery, equipment, livestock, and irrigation water are free of weed seeds. Then cultural management is key, where it

seeks to give the crop an advantage over weeds, such as planting by seedlings, localized irrigation and fertilization, increasing the density of sowing, applying crop rotation and crop combination, and using cultivars of fast growth. Likewise, the physical suppression of weeds in agriculture using various types of covers, such as mulch, crop residues, living covers, plastic covers, solarization, and the application of hot water or steam that can be used in urban areas without risk of producing intoxications can also be efficient measures.



Figure 1: Drip irrigation for vegetables; live mulches between oil palms; and organic mulch in a sugar cane field. Costa Rica.

Managing weeds with tools and equipment is an option for the use of glyphosate that can be adapted to many situations, as they range from hand tools to motorized machines or equipment adapted to tractors. Biological control using everything from insects and pathogens to small and large livestock, which enriches the agroecosystem, is also a viable alternative.



Figure 2: Hand tools and seed destroyer when harvesting.

Many alternatives, such as crop rotation or mixed crops, and the use of live cover, or planting nectariferous plants, among others, have been revived from ancestral knowledge, respecting nature and life. Other alternatives have emerged with modern technologies' help, but always seeking the same goal: a production of food and other goods that respects human health and natural balance and that is sustainable for a long time, for the benefit of future generations.



Figure 3. Mixed crops, coffee is planted together with fruit trees for shadow, and a pecking bee on a plant of *Sida sp.*

Based on numerous scientific arguments about the negative impacts of this herbicide on the ecosystem in general, the authorities that manage public policy are recommended that glyphosate, a substance that is likely to cause cancer in humans, that is widely used in all countries exposing food users, inhabitants and consumers, and that is also considered a Highly Hazardous Pesticide due to its long-term harmful effects, should face a gradual withdrawal, starting with the prohibition of its use in urban areas, roadsides and other non-agricultural places, and that a total ban is considered, something which has already been implemented in several European countries, Mexico and Vietnam.