Manifesto of Instituto Fome Zero

Lowering the impact of climate change on food security and nutrition

Instituto Fome Zero (Zero Hunger Institute) aims to support policies to combat hunger and all forms of malnutrition and contribute to make them one of the highest priorities for Brazil and international community.

For this to be possible, the **Instituto Fome Zero** acts following five strategic objectives:

1. *Promoting the right to adequate food and its legal framework* with the establishment of a legal framework to introduce sound mechanisms and measures to guarantee individual social protection that eradicate hunger and malnutrition.

2. *Supporting the formulation of policies to combat hunger and malnutrition* with the adoption of policies and mechanisms to eradicate hunger and malnutrition, which are managed and conducted on a permanent basis and with the participation of the entire society.

3. *Involving the three federative spheres – central government, states and municipalities* – to formulate successful policies to eradicate hunger and malnutrition in Brazil, starting from local initiatives and subsequently replicating them at regional and national levels. Meanwhile, it is necessary to create mechanisms to make cities able to make their food systems more sustainable.

4. *Adopting local development with the nexus between family farming – new technologies – sustainable production* to shorten the path between production and consumption. This involves investing in family farmers and their agroecological production to meet the direct demand of consumers in urban centers, with the help of new distribution technologies.

5. *Harnessing South-South cooperation and sharing of experiences in the post-Covid-19 world*, by sharing with countries, organizations and institutions successful experiences to eradicate hunger and malnutrition.

Impact of climate change on food security

Climate change is already causing significant impact to agricultural production in many parties of the world due to extreme events such as tropical storms, cyclones, tsunamis, heat waves, droughts and water scarcity. However, if the global warming is not stopped the impact will be higher, resulting in drastic consequences to the availability of food and suitable nutrition.

The recently published analysis of IPCC Working Group I[1] states that even in best-case warming scenarios, food insecurity is set to rise further. The damage we are wreaking on the planet will leave even more people chronically hungry. Meanwhile, the ambition of ensuring everyone in the world can access a healthy, nourishing diet becomes even more remote.

This breakdown in our food systems continues to affect the most vulnerable most acutely, with people living in conflict areas, those suffering extreme poverty, and marginalized groups bearing the greatest burden, rising food prices and supply shortages exacerbated by climate change, conflict, and economic disruption. In the meantime, are limiting access and affordability of nutritious foods, even in wealthy nations and among relatively privileged populations.

The 2023 edition of the report on State of Food Security and Nutrition (SOFI) reveals that between 691 and 783 million people faced hunger in 2022, with a mid-range of 735 million[2]. This shows that over 122 million more people were hungry in the world since 2019 due to the pandemic and repeated weather shocks and conflicts. Likewise, more than 3.1 billion people in the world – or 42% – were unable to afford a healthy diet in 2021, that represents an overall increase of 134 million people compared to 2019. Furthermore, billions live with the consequences of micronutrient deficiencies, which weaken immune systems and cause preventable diseases. We cannot afford any further challenges and constraints on food systems which already do not fit-for-purpose.

It is projected that almost 600 million people will be chronically undernourished in 2030. This is about 119 million more than in a scenario in which neither the pandemic nor the war in Ukraine had occurred, and around 23 million more if the war in Ukraine had not happened. As it has been stated by many UN Agencies (FAO, IFAD, UNICEF, WHO and WFP): “if trends remain as they are, the SDG of ending hunger by 2030 will not be reached”.

Adding to the incapacity of many people not being able to afford food because of insufficient income, there are challenges including a greater availability of cheaper, convenience, pre-prepared and fast foods, often energy dense and high in fats, sugars and/or salt that can contribute to malnutrition; insufficient availability of vegetables and fruits to meet the daily requirements of healthy diets for everyone; exclusion of small farmers from formal value chains; and loss of lands and natural capital due to urban expansion. The prevalence of child overweight is at risk of increasing with the emerging problem of high consumption of highly processed foods and food away from home in urban centers, which is increasingly spreading into peri-urban and rural areas.

Impact of climate change on food production and nutrition

Climate change will make some contemporary food production areas unsuitable. Current global crop and livestock areas will increasingly become climatically inappropriate under a high emission scenario (e.g., 10% by 2050 and over 30% by 2100). Increased, potentially concurrent climate extremes will periodically increase simultaneous losses in major food-producing regions.

A modelling study estimates that complete removal of pollinators could reduce global fruit supply by 23%, vegetables by 16%, and nuts and seeds by 22%, leading to significant increases in nutrient-deficient population and malnutrition-related diseases (Smith et al., 2015)[3], highlighting the importance of this ecosystem service for human health.

Increased CO2 concentrations will reduce nutrient density in some crops. Elevated CO2 reduces some important nutritional elements such as protein, iron, zinc, and some vitamins in the grains, fruit or vegetables to varying degrees depending on crop species and cultivars (Mattos et al., 2014; Myers et al., 2014; Dong et al., 2018; Scheelbeek et al., 2018; Zhu et al., 2018a; Jin et al., 2019; Ujiie et al., 2019)[1]. Meanwhile, higher levels of CO2 are predicted to lead to 5-10% reduction in a wide range of minerals and nutrients (Loladze, 2014)[1].

Staple crops are projected to have decreased protein and mineral concentrations by 5-15% and B vitamins up to 30% when the concentrations of CO2 double above pre-industrial level (Ebi and Loladze, 2019; Beach et al., 2019; Smith and Myers, 2018)[1]. Without changes in diets and accounting for nutrient declines in staple crops, a projected additional 175 million people could be zinc deficient and an additional 122 million people could become protein-deficient (Smith and Myers, 2018[4]).

The IPCC report suggests that elevated temperatures and extreme weather events such as droughts, heat waves and floods will harm agriculture in Brazil if temperatures continue to rise. Corn production could fall by up to 71% by the end of the century in the Cerrado if emissions continue to increase, or 38% if emissions were reduced. Heat stress can also reduce animal growth, milk and egg production and increase animal mortality. If emissions continue to increase, the IPCC says, livestock and poultry will face thermal stress for most of or all the year in much of the country, while pigs will face thermal stress for most of or all the year in some parts of the country. Climate change will also harm fishing and aquaculture in Brazil. If emissions are high, fish production will fall by 36% in 2050-2070 compared to 2030-2050, while crustacean and shellfish production will be almost extinct, decreasing 97% in the same period. The Western Amazon faces a severe drought this year, which is causing significant increase in fires, and threats to navigation, access to drinking water, and aquatic life, with thousands of fish dying. The Government of Amazonas has declared a state of emergency in 55 municipalities for six months due to the drought. For alleviating its effects, measures such as purchase of products without public tenders, opening of artesian wells and support for small farmers have been implemented. This situation highlights the interconnectedness of global and regional climatic phenomena, showing the importance of addressing the issue of greenhouse gas emissions and environmental protection in an integrated manner.

Instituto Fome Zero fully acknowledges the consequences of greenhouse gases (GHG) emissions to food systems and its relevance to eradicate hunger and malnutrition. Climate variability and the increasingly frequent and intensive extreme climate events will affect the stability of food availability, access and use. This will likely happen through changes in seasonality, fluctuations in ecosystem productivity, increased risks and reduced predictability of food supply. Even if we stay at the limit of 1.5°C increase in the temperature, the agricultural production systems will have to go through profound transformations.

Governments' support to food and agriculture accounts for almost USD 630 billion per year globally. However, a considerable proportion of this support distorts market prices, is environmentally destructive, and hurts small-scale producers and Indigenous Peoples, while failing to deliver healthy diets to children and others who need them the most. Therefore, policies that support agriculture production transitions should undertake the following: shifting subsidies to remove perverse incentives, regulation and certification, green public procurement, investment in sustainable food systems, support for capacity-building, access to insurance premiums and payments for ecosystem services and social protection, among others.

Agriculture production and food loss and waste influence on climate change

GHG emissions from food loss and waste (FLW) have two major sources: the emissions from the production (including storage, processing, distribution and consumption) of food that is lost or wasted, and the emissions from FLW management (that is, waste management). Greenhouse gases resulting from rotted and otherwise wasted food account for around half of all global food system emissions, according to a recent study[5]. "We need collective action to scale up efforts to reduce food loss and waste while reducing GHG emissions," FAO Director General QU Dongyu said[6].

Meanwhile, according to FAO's State of Food and Agriculture (2019) report, around 14% of the world's food (valued at USD 400 billion per year) continues to be lost after it is harvested and before it reaches the shops; UNEP's Food Waste Index Report shows that a further 17% of our food ends up being wasted in retail and by consumers, particularly in households.

FLW also account for 8-10% of GHG emissions, contributing to an unstable climate and extreme weather events such as droughts and flooding. If FLW were halved, reduction of around one-quarter of total GHG emissions from the global food system could be achieved. Prioritizing the reduction of FLW is therefore critical for the transition to sustainable agrifood systems that improve the efficient use of natural resources, lessen their impact on climate and ensure food security and nutrition.

Impact of agroecological and organic production on nutrition

Comparative studies between foods grown in conventional and alternative ecologically-based production systems have shown beneficial effects of the latter on health since they have superior nutritional quality[7]. Organic cultures of lettuce, arugula, and common chicory vegetables showed greater antioxidant activity due to their content of total phenolic compounds. Increased intake of polyphenols and antioxidants has been associated with a reduced risk of chronic diseases, such as cardiovascular and neurodegenerative diseases, and certain types of cancer.

Likewise, with mango and melon, respectively, the organic fruit cultivation system favored an increase in postharvest quality, originating fruits with higher levels of sugars, total carotenoids, ascorbic acid, and folates. Apple fruits that grew in an organic manner showed higher K, Ca, Mg, Na, Mn content than the conventionally grown ones. Organic lettuce, peppers, and tomatoes are rich in Cr, Cu, Fe, K, Mg, or Na. The higher the level of Na content, the higher the sugar content and bioactive compounds in fresh produce[8].

When analyzing wheat, barley, potatoes, carrots, and onions grown in organic and conventional systems, it was found that the levels of polyphenol, flavanol, and lutein were higher in organic food. These compounds represent a class of metabolites that have been associated with antioxidant properties and neuroprotective, cardioprotective, and chemo preventive activities, and with reducing the incidence of cancer, gastrointestinal, liver diseases, atherosclerosis, obesity, and allergies.

When investigating soybean cultivars, Bohn et al. (2014)[7] found that organic soybeans, as compared to conventional ones, contained higher levels of zinc; sugars, such as glucose, fructose, sucrose, and maltose than conventional soybeans; and significantly more total proteins and amino acids, such as lysine, alanine, asparagine, serine, and glutamine. Also, organic soybeans showed lower levels of saturated fatty acids, such as palmitic acid, whose intake should be as low as possible within the context of nutritionally adequate diets.

Agroecological approaches for adaptation/resilience and mitigation of food systems to climate change

Agriculture, forestry, and other land use respond to 18,4% of global emissions, while only livestock, manure and agricultural soils represent over 10% of global emissions of GHG[9]. While agriculture is responsible for a significant part of the global greenhouse gas emissions, it also suffers from direct consequences of climate change. Thus, the challenge of agriculture within the climate change context is two-fold, both to reduce emissions and to adapt to a changing and more variable climate.

Though some mitigation measures may have negative impacts on the adaptive capacity of farming systems, most categories of adaptation options for climate change have positive impacts on mitigation. These include: 1) measures that reduce soil erosion; 2) measures that reduce the use of nitrogen (N) fertilizers and soil leaching of N and phosphorus; 3) measures for conserving soil health and moisture (such as raising carbon level); 4) increasing the diversity of crop rotations and applying integrated production systems (crop-livestock, forest); 5) modification of microclimate to reduce temperature extremes and provide shelter; and 6) adopting and implementing sustainable practices to avoid cultivation of new land (less deforestation). These adaptation measures will in general, if properly applied, reduce GHG emissions, by improving nitrogen use efficiencies and improving soil carbon storage[10].

Field surveys and results reported in the literature suggest that agroecosystems are more resilient when inserted in a complex landscape matrix, featuring adapted local germplasm deployed in diversified cropping systems managed with organic matter rich soils and water conservation-harvesting techniques.

According to FAO: "agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It seeks to optimize the interactions between plants, animals, humans and the environment, while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced"[11].

By minimizing or eliminating the use of agrochemical inputs, agroecology reduces agriculture's negative effects on both human and environmental health; by re-localizing diets, agroecology can help to inform sustainable and healthy diets; by maintaining a functional balance, agroecological systems are better able to resist pest and disease attack self-regulating pest outbreaks. Also, maintaining a functional balance, agroecological systems are more resilient to climate change while, at the same time, mitigating GHG emissions.

Agroecology empowers smallholder family farmers, including women, young farmers and Indigenous Peoples since it privileges ancient knowledge and local practices. Farmers are considered as more than just producers: their engagement in creating knowledge, innovations and adaptations, and their cultural and social values are intrinsically linked to the type of food they produce.

Agroecology helps to protect, restore and improve agriculture and food systems against climate shocks and stressors. FAO claims that there is robust evidence that agroecology increases climate resilience by building on ecological principles such as biodiversity and healthy soils, as well as social aspects such as knowledge sharing and empowering producers. The Organization recommends that agroecology should be recognized as a viable climate change adaptation strategy, and barriers to scaling up agroecological practices be overcome through better education about their benefits.

With the intent of facilitating the transition of food systems, FAO adopted the 10 Elements of Agroecology Framework and has implemented a platform in agroecology (Agroecology Knowledge Hub) with the objective of strengthening public policies, disseminating knowledge, scientific development evidence, statistical data, practices, methodologies and tools that support agroecological practices. Among these initiatives, we highlight the "Performance Evaluation of Agroecology" to measure the multidimensional functioning of agroecological systems in the economic, social and environmental dimensions, generating a global evidence base. Tool for Agroecology Performance Evaluation (TAPE) has already been tested in production systems of more than 30 countries, such as Argentina, Peru, Mexico, China, Italy, France, Mali and Kenya.

Amazon rainforest and food production

The Amazon rainforest has an area of more than 7 million km2, hosting about 28 million people and 10% of the world biodiversity. It is one of the last massive forests in the planet, having primary importance for the balance of biogeochemical cycles at global scale. Sixty percent of its territory is in Brazil and deforestation already affects about 20% of the biome, causing apprehension around the world as it is approaching the predictions of "no-return point" of the ecosystem[12]. Brazil has adopted strategies to contain deforestation by implementing the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon; this Plan applied command-and-control measures, reducing deforestation rates by 80% in the 2006-2012 period. However, it has been recognized by researchers, even by the government itself, that this type of measure has reached its limit, requiring further actions to support sustainable production activities to complement and deepen the battle against deforestation.

The production systems carried out by traditional Amazonian peoples are extensive and based on the biodiversity of the forest. The ample collection areas compensate for the low density of the species exploited. From a socio-environmental point of view, this characteristic is positive because by using large areas without causing negative impacts on vegetation cover these agricultural systems collaborate to maintain the provision of ecosystem services that help regulating water and temperature regimes in a regional, national and global scale. In addition, being wild, naturally occurring products, they are free of pesticides or any chemical input, being a source of income to improve livelihood of forest peoples[13]. On the other hand, the extensive nature of such production systems poses economic challenges. The long path taken by producers for collection is one of the reasons why the production costs of extractivism are, in most cases, appreciably higher than those of equivalent products in intensive agricultural systems. The fact that a considerable part of the extractive communities in the Amazon live in hard-to-reach places, far from any urban center and with poor transport infrastructure represents another obstacle. Such locations are visited only by a few middlemen, who manage the commercialization of the families' production. In such circumstances, those middlemen have major influence over the definition of local prices of products, sometimes remunerating only a small part of the market price paid in the urban center[14].

Although facing logistical and competitiveness difficulties but generating environmental services that go beyond the product itself, both for direct consumers and for the entire population, the so-called socio-biodiversity products are important for income generation and nature conservation. Examples of these products are Brazil nuts, babassu oil and flour and açaí, among many others that are naturally very abundant in the forest – the so-called hyper-dominant species.

Private companies should make efforts to incorporate these products into their production lines, sharing benefits with local populations. Governments should develop and adopt public policies that mitigate the price difference between conventional products, which are cheap but cause major environmental impacts, and forest products, which are more expensive but generate positive externalities by keeping the forest alive. Government support for these Amazonian chains should integrate the strategy between environmental and economic policies.

Call for actions to lowering the impact of climate change on food systems

It is of utmost importance to recognize the importance of improving the ecological and carbon footprint of food systems as an operational principle for transitioning to Sustainable Food Systems. In this way, encourage appropriate consumption together with agricultural and other food production practices that maintain or enhance natural resources and support integration of transdisciplinary science and local (including indigenous) knowledge in participatory innovation processes that transform food systems.

There are many measures to address transitions to diversified and resilient food systems that can be considered by National States and Intergovernmental Organizations, encompassing mixed livestock, fish, cropping and agroforestry that preserve and enhance biodiversity as well as the natural resource base, such as[15]:

i. redirecting subsidies and incentives that at present benefit unsustainable practices, to support transition towards Sustainable Food Systems (SFS);
ii. supporting use of participatory and inclusive territorial management planning to identify and foster locally sustainable practices and to protect common natural resources at distinct levels (landscape and community, national, regional and global);
iii. building adaptation of international agreements and national regulations on genetic resources and intellectual property to better take into account farmers' access to diverse, traditional and locally adapted genetic resources, as well as farmer-to-farmer seed exchange;
iv. strengthening the regulations on the use of chemicals harmful for human health and the environment in agriculture and food systems, promoting alternatives to their use and rewarding practices that produce without them;
v. building social capital and inclusive public bodies at territorial landscape scale so that policy processes can be implemented at a scale where the provision of, and the trade-offs among, key ecosystem services (provisioning, regulating, supporting and cultural) can be managed;
vi. promoting education and awareness, appropriate food labelling and certification; support for low-income consumers and the use of public procurement policies, including school feeding programmes and acquisition of food by governments for the poor; and
vii. encourage data collection at national level, documentation of lessons learned and information sharing at all levels, to facilitate the adoption of agroecological and other innovative approaches and foster transitions towards SFS.

Considering the current situation and prospects for global warming upsetting food security and nutrition, the ***Instituto Fome Zero*** *declares its full support to agroecology for family farmers as one of the most suitable choices aiming at sustainable, climate-resilient and low-carbon agriculture transformation and invites the international community to take the following actions*:

1. **Adopt agroecology as the main production approach** to diversify food production and allow adaptation and resilience to climate change, while at the same time providing safe, sustainable and nutritious food to eradicate hunger and malnutrition. Agroecology is a scientific discipline, an agricultural practice, or a political or social movement that can facilitate diversification of production offering a variety of local healthy foods to consumers while decreasing the post-harvest losses.

2. **Develop and implement public policies** that support the transition to sustainable and resilient agroecological production, respecting farmers' knowledge, culture and local values. Such policies should generate measures and mechanisms to benefit family farmers, particularly during the transition process, providing incentives, grants and social protection. Additionally, agroecology public policies should be integrated with other policies that address inequalities and social protection measures for food and nutrition access. Most importantly, farmers should participate in the entire process of policy formulation, implementation and assessment of the results.

3. **Create and expand street market and short marketing circuits** to facilitate access to healthy food by the local population at affordable prices while reducing the consumption of ultra-processed foods, which are rich in calories, additives, flavorings and preservatives but poor in nutritional value. This initiative must be structured and implemented by the local government with the engagement of producers and consumers. Governments should also promote agroecological markets giving priority to healthy foods in the public procurements (for instance on school meal programs and provision of food to the poor).

4. **Invest in scientific research and innovation** to develop and assess agroecological technologies and practices. Current known practices such as composting and soil health management, water management, biological control of pests and diseases, seed banks of native varieties adapted to each reality, intercropping and crop rotation, agroforestry and silvopastoral systems and integration of crops with local animal breeds, among others, should be tested, validated and expanded to different agroecosystems and social conditions. It should be considered that farmers' traditional knowledge combined with innovation in practices and the sustainable use of technologies is at the core of an agroecological farming system.

5. **Promote access of family farmers to digital information systems** to foster adoption and expansion of agroecology and to support traceability of products. Digital systems will support market linkages in a fairly way and facilitate family farmers access to agricultural advisory services (e.g., climate change information, technologies for climate adaptation, agroecological practices, and georeferenced information) and to financial services and insurance. Governments should prioritize investments and implement projects that enhance internet connectivity in rural areas;

assure affordability for mobile phones, sensors and drones; and increase skills of family farmers, particularly for women and youth, on the use of such devices. Special attention should be given to the participation of the farmers during the development and initial validation of such information systems and cell phone applications.

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