

# Environmental Education for climate-conscious eating

## Abstract

Industrial agriculture, which is the dominant food production model of the 21st century, is one of the causes of various health problems, as well as the emission of greenhouse gases, therefore, climate change. However, for the world, overcoming hunger and nutrition continue to be a challenge; critical and transformative environmental education in the face of climate change is more necessary than ever, among other things aimed at new ways of feeding the population. Achieving conscious citizenship requires an education where teacher training is fundamental. A documentary review was carried out based on reflections on the impacts of food and agriculture on the climate with participants of an EA and climate emergency course at UNICENTRO, Guarapuava, Brazil. As a result, ten principles are proposed that allow building food sovereignty with climate awareness to contribute to mitigation and adaptation through individual and collective action. The principles consider the origin of food, the distances between origin and consumption, processing and the production model.

**Keywords:** agriculture, sustainability, eating habits, education, climate change

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## Introduction

The climate emergency (CE) that we face puts the lifestyles of the general population at risk, but mainly affects the most vulnerable classes in a poverty that continues to increase in the face of constant environmental injustice.<sup>1</sup> One of the aspects that is in danger, along with access to drinking water, is food production. According to Jaramillo,<sup>2</sup> to meet the food demands of the population expected for 2050 in Latin America, there had to be an annual increase rate of 1.3%. In addition to that, CE is accompanied by extreme weather conditions, droughts and floods that directly affect agricultural production. FAO<sup>3</sup> expresses that in the In 2017, there was a 25% increase in acute and chronic hunger in the world compared to the previous 2 years, which is mainly attributed to climatic factors, such as the increase in droughts in that period. Previously, it was explained that the change in the periodicity of the El Niño – La Niña phenomena has had an important effect on the amount and distribution of rainfall, causing negative effects on agricultural and livestock production in large continental areas.<sup>4</sup>

Other risks, according to specialists, are the increase in temperature that will generate genetic erosion problems and lead to the extinction of many plant species. In another sense, they say that the rapid increase in temperature will not allow a process of adaptation of the species (HABIBULLAH et al, 2022). In general, hunger and malnutrition are problems that, despite historically being on international and government agendas, have not yet been reduced in a growing world population of already more than 8 billion inhabitants, despite of a reality of food production to feed 10 billion. The causes are associated with multiple dimensions, where social and economic inequality is clear, which need to be addressed to reduce the problem. Here the focus is education in order to change eating habits with environmental awareness and improve nutrition.

The agricultural production market does not have food as a priority, much less the nutrition of the population. Therefore, many crops are used for the production of biofuels, bioplastics, fiber, and animal feed, in addition to the high percentages of losses. To meet food demands, they rely on technologies that are charged on the value of food and reduction of labor in the field, including the production

of synthetic foods with an ethical background.<sup>5</sup> But, the problem in a world of inequality will continue to be the impossibility of accessing food in sufficient quantity and quality for the most vulnerable classes. For example, Rodríguez<sup>6</sup> explained that new trends in agriculture, such as the production of fuel from crops, is one of the main causes of deforestation and loss of biodiversity, in addition to the inequalities that in developing countries are raising food prices and causing food insecurity.

Others point to solutions in the return to rurality and changes in eating habits that have been homogenized, placing global food in a few agricultural areas, leaving aside local food cultures supported by local biodiversity.<sup>7,8</sup> That is why we talk about food insecurity, not only due to sufficient and timely access, but also due to the possibility of meeting nutritional demands.

Food security and sovereignty are very recurrent terms for some decades within political frameworks, and with a direct relationship with the goal of zero hunger, with the achievement of sustainable societies.<sup>9</sup> These concepts are related to poverty, well-being and consumption, in the complexity to advance in overcoming the nutritional deficiencies that are seen in the problems of poor nutrition (malnutrition and obesity).

Despite there being initiatives to transform eating habits, by acquisition, types and origin of food, we are still far from this being a significant part of the population and the market. In this sense, this article brings reflections with an environmental educational approach, on the meaning of our climate-conscious diet and how each aspect can be supported by actions for both mitigation and adaptation to the climate emergency. Therefore, ten (10) principles are developed to be adopted individually and collectively to achieve climate-conscious eating.

For clarification purposes, this article presents general ideas about the relationship between agricultural production and greenhouse gas (GHG) emissions, with ecophysiological explanations and production processes. Then, the importance of agroecology as a science for adaptation and mitigation to the climate emergency is announced. Afterwards, the environmental educational approach to transform

eating habits is presented. As a contribution to the discussion, ten (10) principles are presented to adopt climate-conscious eating habits that contribute to food sovereignty in the territories.

### Relationship between agricultural production and greenhouse gas emissions

At this time, it is inevitably necessary to understand that each food consumed for nutritional purposes brings with it a high amount of energy costs and GHG emissions from its production to the consumer's table. These gases determine the carbon footprint of each product, for each of the consumers; and also a water footprint.<sup>8</sup>

From the determination of what will be planted, there is an energy expenditure of technological, administrative, human processes, and investments that precede other equally energy-consuming systems. Next comes the preparation of soils, on lands with previous deforestation of natural areas that stopped capturing carbon, which was also an action that required a high human and fossil energy content.<sup>10</sup> These events are followed by a series of agricultural actions of planting, irrigation, fertilization, weeding, pest control until harvest, which, depending on the production model, which can be extensive high technology or with agroecological technologies, will cause more or less energy expenditure.

After the products are harvested, they are transported to the collection centers for fresh sales or for agribusiness for processing purposes that increase energy expenditure and GHG emissions, therefore, the carbon footprint increases. These processes are also directly related to the increase in the water footprint, which represents one of the major problems faced, due to droughts and floods. All affecting the behavior of the species.

Plant physiology and ecophysiology are fields that have many answers to what will happen to food production in the face of climate changes, both in extreme dry or flood conditions, as well as due to increases in global temperature and carbon concentrations in the atmosphere. Barroso et al.,<sup>11</sup> conclude that:

Plant production will be directly influenced by the lack of water and climate change, such as the increase in CO<sub>2</sub> concentration and the increase in temperature, expected for the end of the century. Although there is evidence that increased CO<sub>2</sub> can benefit and even mitigate the detrimental effects of drought, the rise in temperature caused by this increase in greenhouse gases tends to negate this improvement. Alternatives are needed to alleviate this tension between environmental phenomena and plant growth to ensure global food security.

To understand the risks of obtaining food, it is necessary to know what happens in vegetation as the first link in the food chain, particularly in agricultural crops. Plants, as producers of oxygen and their own food through the process of photosynthesis, have interesting differences in the face of the increase in atmospheric CO<sub>2</sub>. Nature has plants with three types of photosynthesis, C<sub>3</sub>, C<sub>4</sub> and CAM. According to scientists, a higher level of CO<sub>2</sub> in the atmosphere allows an increase in the rate of photosynthesis in C<sub>3</sub> plants.<sup>2,4</sup> These are precisely the ones that first appeared when the atmospheric CO<sub>2</sub> contents were higher than those of the current atmosphere. This allows us to understand that in plant biodiversity there are physiological differences that determine the behavior of each species, due to their productive capacity in different CO<sub>2</sub> concentrations, water availability and temperature ranges.

But the increase in carbon emissions is not exclusive to the agricultural sector, nor does it "necessarily mean a reactivation of this sector, nor an increase in food security".<sup>12</sup> As these authors point

out, food continues to be imported, but the causes of this increase are in livestock activity, the intensive unsustainable management of agricultural soils and manure. Therefore, it is necessary for the agricultural sector to carry out actions to reduce emissions to contribute to mitigation of the global climate change phenomenon.

### Agroecology as a science for adaptation and mitigation in the face of the climate emergency

Without a doubt, the solutions to achieve food sovereignty need to be addressed from various dimensions, interdisciplinary, with guidelines for mitigation and adaptation. However, it seems that adaptation is advancing in a sense of "resignation" in the face of the impossibility of solid agreements for mitigation; in such a way to reverse the effects of the climate crisis and change the dominant condition of fossil fuels as the main energy source until today.

For adaptation, science and technology are mainly thought of, which, as is known, have short reach in a world of so much socioeconomic imbalance. Accessing them represents a cost that in certain societies is unattainable and also generates high scientific and technological dependencies, as well as economic ones, making production systems less sustainable.

In the case of agriculture, several authors bet on science and technology with emphasis on genetic manipulation, to modify the behavior of plants and give them resistance to biotic and abiotic factors.<sup>11</sup> But, in a critical sense, GMOs have become a key piece of the seed market, with economic-technological domination and many criticisms that are in clear contrast with the principles and values of agroecology.<sup>13</sup> These are reductionist solutions designed to maintain the homogenization of the world's diet and the crops that support agribusiness. While the breadth of species in nature, with food and nutritional potential, are managed by small producers and indigenous peoples.

Furthermore, the concept of productivity continues to be used in reference to monoculture and not what a diversified (agroecological) system can provide.<sup>14</sup>

The current agricultural models for agribusiness and commodities continue to be responsible for deforestation, for the accumulation of land in a few owners<sup>15</sup> who on the one hand accumulate capital, but at the same time do not allow the soil to be efficiently captured. carbon.<sup>16</sup> In this way, monocultures increase the amount of GHGs in the atmosphere. Therefore, industrial agriculture is responsible for the production of processed foods and their homogenization, which provide cheap calories, imposing the consumption of foods that impair nutrition, due to the loss of nutritional elements in processed and frozen foods.<sup>17</sup> These are also products with a high ecological, water and carbon footprint, which was amplified in the transformation and storage process of the market chain.

Looking at solutions in nature itself and in models with better degrees of sustainability is a way of aiming for solutions with a character of independence that requires new ways of thinking, being and doing in life. Within this framework it is possible to relate food sovereignty to agroecology through a sustainable and resilient agricultural system that provides solutions for mitigation and adaptation to climate change (CONDE et al, 2022).<sup>18</sup>

Agroecology is an environmentally friendly agricultural science that seeks new society-nature relationships, which is based on principles of autonomy, appreciation of life, and recognition of territorial and cultural diversity.<sup>8</sup> In this science, different technologies are used with low environmental impact, reduction of carbon emissions, through

minimal soil removal and waste management; as well as, with the establishment of diversified carbon capture models.<sup>10,19</sup>

### Environmental education to transform eating habits

Referring to the deep environmental crisis and specifically the climate crisis, Rodríguez<sup>6</sup> explained that it is not for technological or scientific reasons, but for cultural and philosophical reasons due to the way we see ourselves occupying space on Earth as humanity. This calls us to rethink ourselves as humanity and the ways of living and living together, including taking care of our eating habits that obey a homogenized, extractive global market that generally omits environmental impacts.

Various movements are taking place that aim to promote dietary changes in the population, which, together with the climate emergency, requires several approaches, due to its high complexity of causes and effects. Among so many initiatives, generating environmental awareness about the climate and promoting dietary changes is urgent. The WHO<sup>20</sup> recognizes the importance of educating consumers' health and "promoting desirable food consumption habits and improving nutritional well-being." Furthermore, the WHO includes the need for the consumer to understand about the "nutrient content of foods, also through easily understood information at the point of choice" and "adds that nutrition education is necessary for all citizens".<sup>20</sup> It is encouraging to know how researchers and educators are already working on issues of sustainable foods or decarbonized diets,<sup>21</sup> which are approaching new society-nature relationships around the socio-cultural phenomenon of food.

Given these premises, which constitute us as environmental educators and agroecologists, they propose necessary transformations in eating habits; that, if massified, they would modify the individual and collective food culture, which would not only be with climate awareness, but with appreciation of life and with a transgenerational legacy to achieve health and well-being. This is because environmental education achieves its objectives, not in mere scientific, technological and cultural knowledge, but in the possibility of imbuing it with a political, critical and action sense. Knowledge without action is a useless role, but knowledge applied in everyday life can empower people and change the world.

Without any desire to fall into utopias, it is recognized that the changes in destructive habits indicated by Tamayo et al.,<sup>22</sup> are not an easy task, but neither is it impossible. Ontologically, the authors say, it is about recovering the human being who is lost in everyday life, in the depths of being before the power of technology and economy that dominates life. These researchers added that:

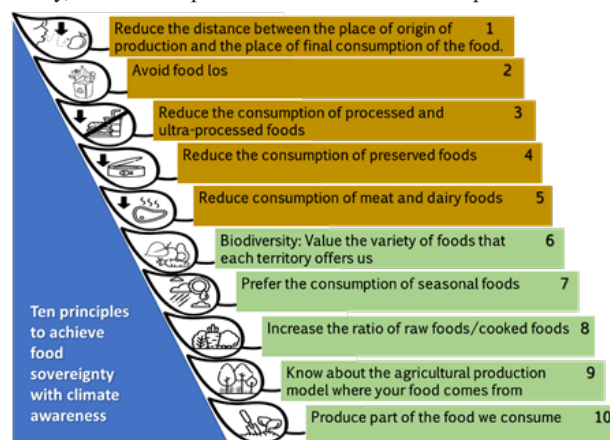
And the corporate world has also taken care of taking away our hope, of making us believe that we are incapable of stopping the current predation, that we are too small in the face of such powerful organizations and that it is impossible to modify the predatory civilizational model. This is why recovering the path of hope and acting accordingly is absolutely key if we intend to take back our world.<sup>22</sup>

Despite knowing how harmful predatory habits that are imposed on the world, such as those around food, can be, they still need liberation. There is evidence of the residual effects of poisons used in agriculture, carcinogenic preservatives, and the harmfulness of processed and ultra-processed foods, which are still consumed by the majority of the population. Given this reality, environmental educational actions are required that promote critical, political and reality-transforming thinking, from our own habits that sustain the unsustainable system,

as an ethical act consistent with thought. For example, the LabVida school garden program in Chiapas, Mexico appears to offer an effective initiative in preparing educators in agroecology, with practices that they can apply in their school gardens. Morales et al.,<sup>23</sup> indicated that the greatest effect of this program was on the eating habits of educators and their perception of the value of local knowledge and its relevance to school work.

### Discussion and conclusion

Ten (10) principles are proposed here, which are presented in Figure 1, referring to eating habits to reflect on educational actions on social well-being and the climate crisis for food sovereignty. They are ideas designed to motivate actions that promote changes in conceptions of the sociocultural phenomenon of food, with a focus on autonomy, the appreciation of life and biological and cultural diversity, and with impacts to reduce the GHG footprint.



**Figure 1** Ten principles to achieve food sovereignty with climate awareness.

**Fountain:** Own creation.

The principles are proposed in two senses, based on health and climate, five (5) above in brown from Figure 1 (1, 2, 3, 4 and 5) in understanding harmful culturally ingrained habits that need to be reduced until they are eliminated; It is understood how difficult it is in today's society, due to the implications for everyday life. On the other hand, the other five (5) principles in green. Figure 1 (6, 7, 8, 9 and 10) are located in the acceptance of new healthy habits, with new practices and evaluations of food and territories; They seek, above all, to achieve the right to healthy food (timely, sufficient and nutritious) as steps to achieve food sovereignty.

### Reduce the distance between the place of origin of production and the place of final consumption of the food

The further away the origin of the food consumed is, the more energy is spent on transportation (truck, plane, ship or train), storage and conservation, which causes a high GHG footprint. Even though there are not many academic studies that relate food shipments to GHG emissions, Simón-Fernández et al.,<sup>24</sup> in a study carried out in Spain, conclude that.

It is possible to affirm that the increase in GHG emissions is more closely related to the increase in the volume of weight transported than to the increase in distances traveled, and to a lesser extent to the change in modal distribution.

The same authors point out, according to data from 2007, Latin America in second place in food imports after Europe, which when



adding North America would occupy first place. Added to imported eating habits, which affect local economies, are consumer whims, for example, when people want products that travel thousands of kilometers and leave a large ecological footprint, mainly GHG, to which is added the expense. energy for processing, storage and transportation until the food is consumed. Dussi; Flores<sup>25</sup> from a multidimensional vision of agroecology to confront climate change, “the differences between desire and need are also raised. A desire should not go beyond the biophysical limits of the ecosystem (ecological functions), that is, it would not be feasible to fulfill that desire if the ecological functions are broken.”

Therefore, it is necessary to practice solidarity consumption at local producer fairs as a way that could bring us closer to the origin of food, even reducing the marketing chain that affects the prices and profits of the producers themselves. This is a revaluation of what is locally available for better nutrition.

### **Avoid food loss**

Food loss reaches a third of production and the destination of food is not exclusive for human consumption.<sup>26</sup> Losses occur at different times during food production, first in the field, due to: pests and diseases; problems with harvests at the wrong time or inadequate equipment; insufficient labor; unexpected weather events (drought, floods, heat or cold waves), among other possible events. Other losses occur in storage, due to humidity, pests or contamination; in the transport; in processing and packaging; in wholesale and retail marketing; and waste by consumers. According to the same report, the FAO indicates that 25% of the losses are of roots, tubers and oilseed crops; 21% fruits and vegetables.

Here our focus is on the food losses that occur in our homes due to improper purchases, inappropriate uses of food, often due to underuse of its parts, such as, for example: the leaves of beets or cabbages in general, the peel of some products. such as mango, cucumber, potato, among many. Many universities around the world are developing programs and strategies to reduce food waste, while educating their students and raising awareness within their communities.<sup>27</sup>

The principle is about reducing food loss with efficient use of it, which can be achieved in its proper storage; in fair purchase to consumer needs; and when comprehensive use of fruits and vegetables is made.

### **Reduce the consumption of processed, ultra-processed and preserved foods**

The way we fed ourselves in these last two centuries imposed on us a diet of little variety and ultra-processed foods, which distanced us from contact with nature. Nature that provides us with a diversity of fresh and healthy foods, many of them with high nutritional potential; foods that lost recognition in current cultures.

From a nutritional point of view, there are more health problems than imaginable associated with the consumption of ultra-processed foods (additives, refined, preserved) and low variability, which has been causing nutritional problems, including overweight and obesity. The WHO,<sup>20</sup> in its annual report, showed that 20% or more of children between the ages of 5 and 19 were more obese in countries in the Pacific, the Eastern Mediterranean, the Caribbean and the Americas. In this document, they associate the greater risk of severe COVID to people with obesity than to people with normal weight.

Also, the document points out the need to educate about the “consumption of whole grains, legumes, nuts, vegetables and fruits,

also to reduce the demand for products with excessive fat, sugar and salt/sodium content” that aim at “ increased consumption of unprocessed or minimally processed foods”.<sup>20</sup> Díez,<sup>28</sup> among the conclusions of his work, on the effect of technological processing on the nutritional value of foods, explains that proteins are the most sensitive group for causing the loss of essential amino acids.

PAHO<sup>29</sup> made it clear that during the period 2000-2013, the consumption of ultra-processed foods increased by 2.8% annually, while the world population maintained an annual population increase of 1.2% according to data from the World Bank.<sup>30</sup> In this increase in ultra-processed foods, by 2013 North America had 22.3% share in the world market and Latin America 16.8%.

In this sense, this principle tries to raise awareness about healthy eating by acquiring and consuming unprocessed foods that in turn represent less energy expenditure and therefore less ecological footprint.

### **Reduce the consumption of meat and dairy foods**

Foley<sup>31</sup> suggested shifting diets toward meatless foods because for every 100 calories of grain crops fed to animals, for example, you get only 40 calories from milk, 22 from eggs, 12 from chicken meat, 10 from pork and 3 calories of beef. These returns do not demonstrate efficiency! An ecological reality of energy transfer, along the food chain, with losses when passing each trophic level.

On the other hand, Willett et al.,<sup>32</sup> proposed the planetary diet that justifies a minimum consumption of meat and dairy products because a large part of the world's population is poorly nourished. This as a contribution to finding solutions to the deterioration of many ecosystems that are suffering losses of their ecological services, which are pushed beyond the safe limits for food production.

An urgent transformation of the food system is needed, at a global level. As a way to replace conventional animal protein, which is associated with environmental and climatic impacts, Gertrudis<sup>33</sup> “recommends carrying out studies to develop new foods based on insect flour and its derivatives (protein isolate)” to include them in the human diet.

If you think about cultural and biological diversity, and the different ways of eating, you can begin to replace meat with other protein alternatives for consumption, which obey traditions, agroecological characteristics and customs. But these new protein sources need to be accompanied by climate awareness, such as food and protein alternatives that reduce the ecological footprint, due to the reduction of GHGs.

### **Biodiversity: Value the variety of foods that each territory offers us**

Each ecosystem, each territory, has a certain associated flora and fauna that develops under those conditions that are favorable to it. Local species with unique adaptations to climate and soil conditions consume less auxiliary energy, therefore, they represent a way to face climate changes.<sup>18</sup>

It is necessary to reduce market dependencies and value native and cosmopolitan species that are in our environment that can be part of the diet, and even with the possibility of being grown in urban spaces. These species are recognized as Non-Conventional Food Resources (RANC), which are considered as all “Species” in general, plants, fungi and animals with nutritional value that are available locally. RANC represent a lifeline against possible future food crises; many of them are undervalued wild species that are adapted to the

local conditions where they are found. This adaptation implies the independence of the species to develop with low energy expenditure (humans and fossils).

The Brazilian Agricultural Production Company (EMBRAPA) has been contributing with the promotion and scientific knowledge to position the consumption of non-conventional foods in society, which contributes to the placement of new food products in local fairs, which promote their recognition and assessment. In this regard, Gortaire<sup>34</sup> presents “agrobiodiversity and its link with food as a collective heritage to recognize and defend.”

This principle is the recognition of agrobiodiversity for its nutritional value and thus a variety of nutritious and healthy foods of local origin are incorporated into the diet.

Prefer the consumption of seasonal foods

It is known that a seasonal food is available at a shorter distance and cost to the consumer. In addition to this, foods that are locally grown contribute to improving people’s lives, their health and the well-being of their communities; and most importantly, they have the potential to involve city residents in producing their own food.<sup>35</sup>

The effect of consuming foods from different seasons and forms of production has been studied by the Nutrigenomics Research Group (Department of Biochemistry and Biotechnology, Rovira i

Virgili University, Tarragona, Spain) by Muguerza et al.,<sup>36</sup> has shown differences in their phenolic compounds. They conclude that “The results obtained demonstrate that the consumption of the same variety of fruit has differential effects depending on seasonality, growing conditions or the origin of the fruits.”<sup>36</sup>

Therefore, environmental education with an emphasis on agroecology is necessary to reconnect citizens with nature in order to understand and value, among other things, the biodiversity that each territory offers and when it provides us with certain foods. Thus, this principle aims to promote seasonal foods to achieve consumption preference with territorial criteria and availability according to each climatic period.

Increase the ratio of raw foods/cooked foods

It is proven that many foods have greater nutritional value when they are consumed fresh, in addition to not incurring energy costs in cooking them. There are certainly foods that must necessarily be cooked to achieve better accessibility of certain nutrients or eliminate anti-nutritional toxins.

Learning new eating habits requires scientific knowledge to make the best decisions when it comes to eating and taking care of your health. In Carchipulla’s thesis; Torres,<sup>37</sup> researchers analyzed the nutritional values of several commonly used foods presented, some in Table 1.

Table 1 Analysis values of nutrients in cooked and raw foods, macronutrients expressed in g/100 g edible portion and minerals in mg/100 g edible portion

Alimento	Tip° de coccion	Humedad	Cenizas	Proteinas	Lipidos	Carbohidratos	Ca	Fe	K	Mg	Na	P	Zn
lanahoria	Cocinado	92.86	0.37	0.77	0.10	5.90	20.25	0.18	96.35	6.14	52.7	15.0	0.09
	Ninguna	89.63	0.71	1.35	0.10	8.21	33.00	0.30	320.0	12.0	69.0	35.0	0.24
Brocoli	Cocinado	89.25	0.78	2.38	0.14	7.18	0.40	0.67	293.0	21.0	41.0	67.0	0.45
	Ninguna	89.30	0.87	2.82	0.37	6.64	47.00	0.73	316.0	21.0	33.0	66.0	0.41
Rernolacha	Cocinado	87.06	1.12	1.68	0.18	9.96	16.00	0.79	305.0	23.0	77.0	38.0	0.35
	Ninguna	87.58	1.08	1.61	0.17	9.96	16.00	0.80	325.0	23.0	78.0	40.0	0.35
Papa con piel	Cocinado	77.80	2.04	2.86	0.10	17.20	45.00	6.07	407.0	30.0	250.0	54.0	0.44
	Asada	68.08	1.74	2.22	1.81	26.15	15.00	0.50	450.0		298.0		
	Ninguna	83.29	1.60	2.57	0.10	12.44	30.00	3.24	413.0	23.0	10.0	38.0	0.35
Papa sin	piel Cocinado	79.94	1.08	1.37	0.14	17.47	27.00	0.72	230.0	18.0	263.0	32.0	0.20
	Ninguna	79.08	1.04	2.02	0.14	17.72	12.00	0.78	421.0	23.0	6.0	57.0	0.29

Most nutritional values such as protein and iron (Fe) are in greater quantities in raw foods than cooked (marked in blue); and generally, sodium (Na) and carbohydrates are found in greater quantities in cooked foods (marked in red), with the exception of carrots. Other foods such as beets had no differences between cooked and/or raw. These are interesting data that allow us to make better decisions when it comes to eating healthier by preferring raw foods and relating to the expense of energy sources for their preparations.

Know about the agricultural production model where food comes from

For many people in the world it seems that food is something obvious without much to think about, because they believe that food is abundant. However, the fragile structure on which the highly harmful and controlling food and agricultural system is supported is unknown.<sup>38</sup> The reductionism of immediacy thinking calls us to think about ready-to-eat foods, without questioning their origin. Knowing about the agricultural production model that is implemented to obtain the food that is consumed allows us to make appropriate decisions to maintain and even improve our health, while reducing part of our carbon footprint.<sup>32</sup>

This principle is then about becoming aware of the environmental and nutritional impacts that certain handling and forms of food production may cause. For example, knowing if they are genetically modified or organic, if they are of national or imported origin. This and other similar topics should be common knowledge in today’s society; However, this level of education can only be achieved when all school curricula propose the inclusion of the sustainability approach<sup>39</sup> and also the critical and political sense of food sovereignty.<sup>40-42</sup>

Produce part of the food we consume

One way to connect with nature is through the production of the food that is consumed, at least part of it represents the maximum expression to reduce the distance between the origin of the food and consumption. It is precisely in this principle where it is possible to rely on agroecology to produce healthy foods free of toxic substances and in an organic way. The production of healthy foods invites us to properly manage our organic waste through composting, biodigestion or vermiculture techniques.

The promotion of school gardens and organic agriculture is historic, a way to even positively impact the family economy.<sup>23</sup> There

are multiple ideas regarding cultivation in homes, and particularly in urban areas, but here he shares the idea of production based on agroecological principles that ensure a product free of agrotoxins. This principle is the one that represents the greatest step towards food sovereignty, by promoting independence in the cultivation of species for self-consumption.<sup>14</sup>

## Final thoughts and recommendations

The climate emergency we face puts the lifestyles of the general population at risk, but mainly affects the most vulnerable classes in poverty, which continues to increase, amidst manifestations of environmental injustice. One of the dangers, along with access to drinking water, is the production and access to healthy food in sufficient quantity. Food, as a sociocultural phenomenon, requires the transformation of consumption habits in society, which makes us aware of environmental impacts in general. It is necessary to become aware of the various problems, of environmental co-responsibility, of ways to contribute to their occurrence and solutions to be built. We need information that raises awareness and motivates us to be part of the transformation that the world needs.

In that sense, food is a common phenomenon for the entire world population, as a primary need that manifests itself according to local characteristics. However, today it is a social practice that has become greatly homogenized, globalized, occurring mainly with no more than 10 species, out of the thousands that exist. Species that are produced in unsustainable agricultural models, which are responsible for deforestation, rural exodus, malnutrition, health problems, contamination of aquatic and terrestrial ecosystems, and the climate emergency itself. All of them are factors responsible for the increase in GHGs or the inability to capture carbon. Added to this is the pollution generated by agrochemicals and the impacts of agroindustry.

So, there really is a need to change a food culture of high dependence on the market, processed foods, and little variability, among other defects. In response, ten principles for “Climate-Conscious Eating” are presented to serve as a starting point and also as recommendations for the necessary transformation of the food system. These principles derive from our personal experience in the field of agroecology and environmental education, in addition to a review of the literature that considered the scientific knowledge achieved to validate what was stated. With the contextualization of these ideas, food sovereignty can be directed and contribute to mitigation and adaptation to the climate emergency.

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## Conflicts of interest

Authors declare that there is no conflict of interest.

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