# Diversity in Agriculture and Consumption: The Basis for Healthy and Sustainable Eating

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## Abstract

**THE CHALLENGES FACING CONTEMPORARY PRODUCTION** and consumption patterns are reflected most clearly in the agri-food system, which accounts for one-third of greenhouse gas emissions. Technological advances have led to homogenous agricultural landscapes and the standardisation of animal breeds, which puts farming expansion at risk. This homogeneity is the basis for the supply of ultra-processed foods, which rely on a few agricultural products that are transformed by chemical ingredients, making them attractive to the consumer. Contemporary scientific literature also corroborates the link between ultra-processed foods and the global obesity pandemic. Multilateral cooperation boosted by G20 initiatives can help reduce the adverse outcomes of the current agri-food system and improve local, healthy, and diversified production. This requires both a drastic reorientation in subsidies for agriculture and

livestock farming globally, as well as policies that encourage the diversification of production and diets to promote human health.

## Introduction

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) recognises contemporary agricultural growth (1) as the primary global driver of biodiversity destruction. According to the Food and Agriculture Organization (FAO), emissions from the global agri-food system released 16.5 billion tonnes of greenhouse gases in 2019—a 9 percent increase since the beginning of the millennium (2). The production patterns underlying the technological innovations that have dominated agri-food supply since the late 1970s no longer fit the Earth's boundaries (3).

The central feature of these production patterns, enshrined in the technologies of the Green Revolution, is the monotony of agricultural landscapes and their consequent reliance on chemicals. Together, these features lead to soil depletion and often, the contamination of rivers and ecosystems has ramifications on human health and contributes to progressive loss of habitats and biodiversity (4). The standardisation of contemporary animal husbandry and the routine use of antibiotics also contribute to the worsening global trends in antibacterial resistance (5) and the loss of production and consumption potential in agrobiodiversity.

This productive standardisation is the basis of food consumption, whose increasing monotony is one of the most critical threats to health (6). The dependence of human feeding on the global trade of a few products distributed by a few companies represents a threat that multilateral cooperation must confront (7). Such confrontation involves the strengthening of productive capacities, the promotion of diversity, and local food and culinary cultures within the framework of a nature-based knowledge economy (8) (9). Modern farming aims to provide food diversity and to regenerate ecosystem services that have been systematically destroyed by the expansion of crops and animal husbandry. This regeneration also involves a drastic reduction in food loss and waste, estimated globally at almost one-third of all food produced (10).

Globally, 7,039 species of plants have been catalogued as edible, of which 417 are cultivable. There are increasing discoveries of new plants and fungi that can compose food biodiversity, characterised by the diversity of foods that make up a local, regional, or national ecosystem (11). Despite this, Brazil, one of the most socio-biodiverse countries in the world, has been suffering from the degradation of its biodiversity (12). As a result, from the total availability of food at present in Brazil (an average of 1,092 grams per day), only 7.09 grams are represented by foods from Brazilian biodiversity, of which 5.89 grams are from native fruits and 1.20 grams from native vegetables (13).

The contrast between the potential for a biodiverse diet and current agri-food patterns is stark: 90 percent of what human beings eat come from no more than 15 crops, with 66 percent concentrated in just nine products; wheat, corn, and soy constitute 50 percent of the supply (14). The loss of genetic diversity is also a characteristic of products originating from animal husbandry and has disastrous consequences on biodiversity. The FAO estimates that the world has lost 75 percent of the diversity of global crops in the last 100 years, which reinforces the significant role of gene banks (15).

The geopolitical consequences of the current agri-food system are also of concern. More than 60 percent of the global agricultural supply is concentrated in five countries (16), representing a systemic risk that the war in Ukraine made further evident. Droughts like the ones that hit India, France, and the Colorado River in the US in 2022 and caused immense agricultural losses in the Cerrado region and southern Brazil are increasingly becoming a global phenomenon, in addition to the unprecedented heatwaves worldwide. The costs of such destruction are not expressed in the regular price system; in 2021, the costs of environmental externalities of the current global agri-food system reached US$7 trillion (17).

Currently, closely related to the lack of diversity, the agri-food systems are marked by imbalances and inconsistencies that materialise in the opposite of what would be the basis for healthy and sustainable diets, since they promote excessive global consumption of ultra-processed foods, sugars, and animal proteins, and a deficit in the consumption of fresh foods (18).

Although calls for an assumed need to increase global protein production in the coming years are frequently made, such an idea ignores the fact that most of the world population, including many of those in developing countries, already consume far more protein than is necessary for a healthy life (19). In contrast, global fruit and vegetable consumption only reaches a level compatible with the needs of human metabolism in the industrialised countries of Asia. At the same time, the supply of animal proteins is linked to the monoculture of global grain exports, of which more than 41 percent is used to feed animals.

Finding production methods that enhance animal feed from products that don't compete with human food is necessary and possible, given the global oversupply of proteins. This can be achieved through moderate intensification of production, which respects planetary boundaries, and by shortening supply chains. Such actions are also necessary to provide fresh fruit and vegetables with reduced food loss and waste and to make food systems resilient to shocks and global trade failures (20).

Equally important is dealing with the problem from the perspective of food demand. According to the Intergovernmental Panel on Climate Change (IPCC), among the response options to mitigate, adapt to, and combat desertification and strengthen food security, food demand and consumption-based responses—especially those related to dietary change—have the greatest probability of impact, lowest cost, and highest confidence of delivering the expected results.

It is estimated that, by 2050, 80 percent of food consumption will occur in cities (21), where the need to diversify diets becomes most urgent. As recently acknowledged by the United Nations, the high rates of urbanisation and the consolidation of rural–urban continuums along the world increase the threat of a gradual standardisation in dietary patterns based on consumption of highly processed foods. Such demographic trend reinforces the need for policies that promote healthy food environments, both formal and informal, and empower consumers to make nutritious food choices.

Short circuits, compared with long supply chains, tend to preserve agrobiodiversity (22) while reducing food losses and waste and contributing to educating consumers about healthy and sustainable eating habits. Moreover, it has ecosystemic effects, such as the reclamation of degraded areas, enhancement of insect and pollinator biodiversity in the urban environment, reduction of food loss, and carbon sequestration within cities. Shortening food supply chains and applying this rural–urban continuum lens involves rethinking food environments, incentives for transitioning to a circular economy approach (23), and, as urged by the UN, supporting smallholder farmers in urban and peri-urban agriculture (24).

Today, 70 percent of calories from the top 10 global agricultural products are for uses other than feeding people. What may disrupt achieving the Sustainable Development Goal (SDG) 2 (Zero Hunger) by 2030 is not production shortages, but the growing gap between agricultural production and the plates of those who need food most. The situation is even more worrisome because crop yields for products intended directly for human consumption have grown much less than those for export, industrialisation, or animal feed over the last 50 years (25).

Fundamental to this is the reorientation of the agricultural sector and the industries responsible for an increasing part of the food supply. A 2022 study found that 71 percent of the food products displayed on North American supermarket shelves are ultra-processed (26). This is a global pattern, and the monotony in agricultural supply and its disastrous consequences on biodiversity cannot be separated from the monotony in industrialised food supply and its destructive consequences on human health.

It is not a question of opposing industrial processing but of advocating for the transition from an industry that transforms agricultural monotony into food monotony (27)

through the introduction of chemical components that are today largely responsible for the diseases that kill most in the contemporary world.

The G20 is responsible for stimulating an integrated approach to agricultural and food policies that responds to the global orientation contained in 'One Health,' in which healthy diets, regeneration of ecosystem services, and animal welfare are seen in an organically articulated way and not as distinct compartments separated by guidelines and administrative bodies that have little connection with each other (28).

These policies affect not only the countries that make up the G20 but many others over which the G20 exerts influence. One should not ignore the inequalities that plague the entire world, as well as the growing number of vulnerable populations, i.e., many people who depend heavily on agri-food systems. Therefore, the G20 can approach these problems from the perspective of security and world peace, which the war in Ukraine has left very latent.

The growing awareness about the threats of this monotony is expressed through two fundamental components, which are the focus of this chapter: the need to face the growing ubiquity of ultra-processed products in today's food patterns and the urgency of strengthening protected areas and promoting forms of agriculture that regenerate biodiversity and reduce greenhouse gas emissions and the erosion of biodiversity.

## The G20's Role

### Reversing the ubiquity of ultra-processed foods

After the Second World War, global priority was focused on increasing food production, the shelf life of food products, and their safety. These requirements, however, could not prevent food from being a vector for a wide range of non-communicable diseases that are of most concern to 21st-century medicine (29).

Obesity tripled globally between 1975 and 2016, and the demographic aged 5–19 years affected by obesity multiplied fourfold in the same period. Most of the world's population is concentrated in countries where obesity is a more frequent cause of death than hunger (30).

This weight gain is at the root of the most disabling and deadly chronic non-communicable diseases. There are 17 million premature deaths per year—one every two seconds (31). According to WHO, 86 percent of these deaths occur in low- or middle-income countries (32). These diseases account for most health system expenditures.

Costs arising from health problems linked to the agri-food system are estimated at US$11 trillion (33).

One of the hypotheses explaining the explosion of obesity goes far beyond what the nutrition sciences of the twentieth century taught: it is not enough to say that obesity results from consuming more calories than are expended through daily activities. The 'obesogen hypothesis' proposes that chemicals "influence individual susceptibility to obesity by interfering with metabolic systems that regulate appetite, weight gain and fat development and distribution, and thereby have contributed to the rise in obesity" (34).

In the last two decades, a new paradigm has been developing in nutritional science. More important than examining the caloric, macro-, and micro-nutrient food content is knowing the composition and number of industrial substances, originally absent from nature and everyday cooking, which are increasingly becoming a part of people's diets.

The NOVA classification is being increasingly used in current scientific research. First proposed in 2009, the NOVA classification brought industrial processing as a key to understanding, more comprehensively and systemically, the linkages between food and health, especially regarding obesity and chronic non-communicable diseases (35).

NOVA classifies all foods and food products into four groups according to the extent and purpose of the industrial processing they undergo. It considers all physical, biological, and chemical methods used during food manufacturing, including additives (36). In this classification, foods are grouped into four major groups: unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed food products. This last group includes formulations of food substances often modified by chemical processes and then assembled into hyper-palatable foods and beverages with industrial-only substances and cosmetic food additives. Ultra-processing makes them highly profitable, extremely attractive, and intrinsically unhealthy. The processes that make ultra-processed foods possible involve multiple steps and different industries, with little or no whole foods (37).

The NOVA classification is an indispensable reference in the scientific literature on the challenges of contemporary eating and for the food guides adopted by a growing number of countries, which stands at more than 100 today. Consequently, the damage of ultra-processed foods to health, society, the environment, and public finances is already entering the radar of the world's most important business organisations, such as the World Economic Forum (38).

Because of the importance of G20-originating companies in the agri-food system (particularly in the food industry), their contribution to combating the advancement

of ultra-processed foods and the global obesity pandemic is crucial. This contribution should have at least four components, which are proposed at the end of this chapter.

**Strengthen biodiversity in protected areas, in agriculture and animal breeding**

The fight against the global growth in the supply of ultra-processed foods will succeed only if this industrial transformation correlates with the emergence of regenerative agricultural practices. These practices presuppose the protection of forests, above all, the protection of tropical biodiverse forests (39).

The Forest Protection Pact signed by Brazil, Indonesia, and the Congo is critical in this regard. The contribution of the G20 in financial support and the dialogue on the governance of such an agreement is fundamental to stopping the advancement of destruction and promoting the regeneration of the socio-biodiversity of tropical forests. The sustainable use of forest socio-biodiversity must meet the requirements of the Nagoya Protocol regarding the rights of peoples and communities whose knowledge makes a decisive contribution to contemporary research.

It is evident that forests and other protected areas (including rivers and seas) will always have a much greater biodiversity than areas with massive conventional agri-food production. However, it is fundamental that these areas are managed in such a way as to drastically reduce their dependence on nitrogen fertilisers and, above all, on agrochemicals. Currently, agriculture exceeds the safe operating space regarding the use of agrochemicals. In 2020, the global limit for nitrogen and phosphorus losses has been exceeded by a factor of 1.7 and 2, respectively (40).

Soil depletion, crop losses, and increasing temperatures in main production areas are some of the factors leading contemporary research to seek alternatives to conventional methods of increasing agricultural supply. The recovery of soil biodiversity is one of the most essential premises to avoid the collapse of agricultural supply. Research around agroforestry and agroecology systems indicates that these are a solution to biodiversity loss and can capture more carbon than ordinary reforestation (41).

Similarly, animal husbandry should be the focus, considering the methods and techniques applied on a large scale so far. Genetic transformation (especially in poultry and pigs), breed homogeneity, and densification are strong hallmarks of this breeding operation, favouring the spread of viruses and bacteria, and justifying the application of antibiotics for ‘disease prevention’ and ‘growth promotion’ (42). In Germany, during the 200 days of a pig’s life, antibiotics are administered for 48.5 days. In Brazil, these drugs are absorbed during 78 percent of the lifetime of the dominant pig farms (43).

This brings us to the alarming figure that 73 percent of the antibiotics produced today (93,000 tonnes in 2020 and, according to current estimates, 150,000 tonnes in 2030) are destined for the animals of these intense breeding operations. The consequence is the advance of resistance to antimicrobials, which exposes society to the emergence of viruses and bacteria that known drugs cannot combat.

Public discussion of this matter is recent. In 2000, only five countries publicly reported the consumption of antimicrobial products. This number has risen, but today only 47 countries report this data. Brazil, with almost 8 percent of global consumption of animal antibiotics (second in the world, well behind China with 45 percent of the total, but ahead of the United States with 7 percent) has no open record of this use, and the state supervision of the problem could hardly be more precarious (44). A recent document issued by several science academies of the G20 nations (45) urges their governments to take various actions to tackle the global advance of antimicrobial resistance. This can be managed using methods and techniques that improve animal welfare and reduce densification.

## Recommendations to the G20

Acknowledging that the current monotony of agriculture and the influence of ultra-processed products have jeopardised food patterns by reducing the diversity of food available, the G20 should commit to finance and provide adequate incentives to biodiversity-friendly practices and approaches, like those recognised by FAO (46): organic agriculture, sustainable soil management, agroecology, sustainable forest management, agroforestry, and diversification practices in aquaculture and fisheries.

Given that the large agri-food industry (naming a few, but not exhausting: Archi-Daniels Food, Bunge, Cargill and Dreyfus—known as the 'ABCD,' Danone, General Mills, Kellogg, Kraft, Mondelēz, Mars, Nestlé, PepsiCo, Unilever) originates in G20 countries (47) (48), a commitment must be made by the G20 and these industries towards a significant reduction in the supply of ultra-processed foods, thus contributing to human health. This would be possible only by establishing a global multi-stakeholder task force especially focused on that.

The G20 should strengthen the guidance currently prevailing in dietary guidelines (led by the Brazilian example and strengthened by FAO recommendations) to favour the consumption of fresh or minimally processed products, preferably those of local origin, and to reduce the rising trend of ultra-processed products. In addition, adopting the Pan American Health Organisation's nutrient profile model for front-of-package nutrition labelling regulations and the marketing restrictions for ultra-processed foods are the most effective evidence-based solutions to discourage the consumption of these harmful products (49).

The G20 must commit to the taxation of ultra-processed products (whose low prices often hide substantial social and environmental costs) as recommended by the World Bank to advantageously use health finance tools to mitigate the growing burden of non-communicable diseases. This can occur through higher taxation (for example, the WHO's recommendation to increase the prices of ultra-processed beverages by 20 percent) or reduced use of subsidies on fresh or minimally processed food categories.

The G20 should strengthen the European decision to ban the marketing of agricultural products from recently deforested areas. This positive sign encourages total dissociation between food supply and forest destruction.

The G20 must promote active, multilateral, and multistakeholder coordination for a global reduction in chemical inputs that compromise soil life, human health, animal welfare, and water quality. It is not a matter of suddenly eliminating the use of these inputs, but rather, of recognising that their reduction is a global challenge that requires international technical cooperation.

The G20 must support and establishes mechanisms to achieve the most important objectives of the Convention on Biological Diversity (COP15) on the protection of 30 percent of land areas, oceans, coastal areas, and rivers and the restoration of at least 30 percent of what has already degraded.

Subsidies should be directed to meeting social and environmental targets that allow for the regeneration of the losses that agricultural growth and the monotony of crops have imposed on current societies. The G20 should support the reduction of agricultural subsidies that support the destruction of ecosystem services, following the lead of the COP15 documents (which propose decreasing subsidies by US$500 billion annually) (50).

The G20 countries must commit to developing urban food system policy strategies based on the circular economy concept to deal with local food (diversity) production as well as fight food loss and waste and secure healthy urban food environments, as guided by the Ellen MacArthur Foundation and the Urban Food Systems Coalition (51) that emerged from the 2021 UN Food Systems Summit.

## Conclusion

UN Secretary-General Antonio Guterres, in his Statement of Action on the UN Food Systems Summit 2021 (52), emphasised the urgency of a systems approach to food aligned with the 2030 Agenda, embracing the complexity of our world to deliver the transitions we need. By July 2023 (53), the secretary-general acknowledged once more

that the world was losing the fight against climate change and biodiversity loss, and that the international community, international financial architecture and businesses need to rethink food systems to shift their focus towards people, not profit, and ensures outcomes for people and planet.

As evidenced in this chapter, sustainable food production is linked to healthy diets and decent livelihoods. In other words, both the state of the world's food and nutrition security and the fight against climate security will not advance with solutions lacking a food systems lens.

The G20, as an intergovernmental forum to deal with the global economy, financial stability, climate change mitigation, and sustainable development, comprising the world's major economies and two-thirds of the world's population, can and must play an important role in the fast emergence of an agri-food system that is entirely decoupled from forest destruction, is less dependent on chemical inputs that are harmful to the ecosystem services on which we all depend, and free of malnutrition. Correcting and adjusting incentives and disincentives along the global agri-food system is absolutely necessary to strengthen global security and ensure healthy diets are provided to all within planetary boundaries.

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