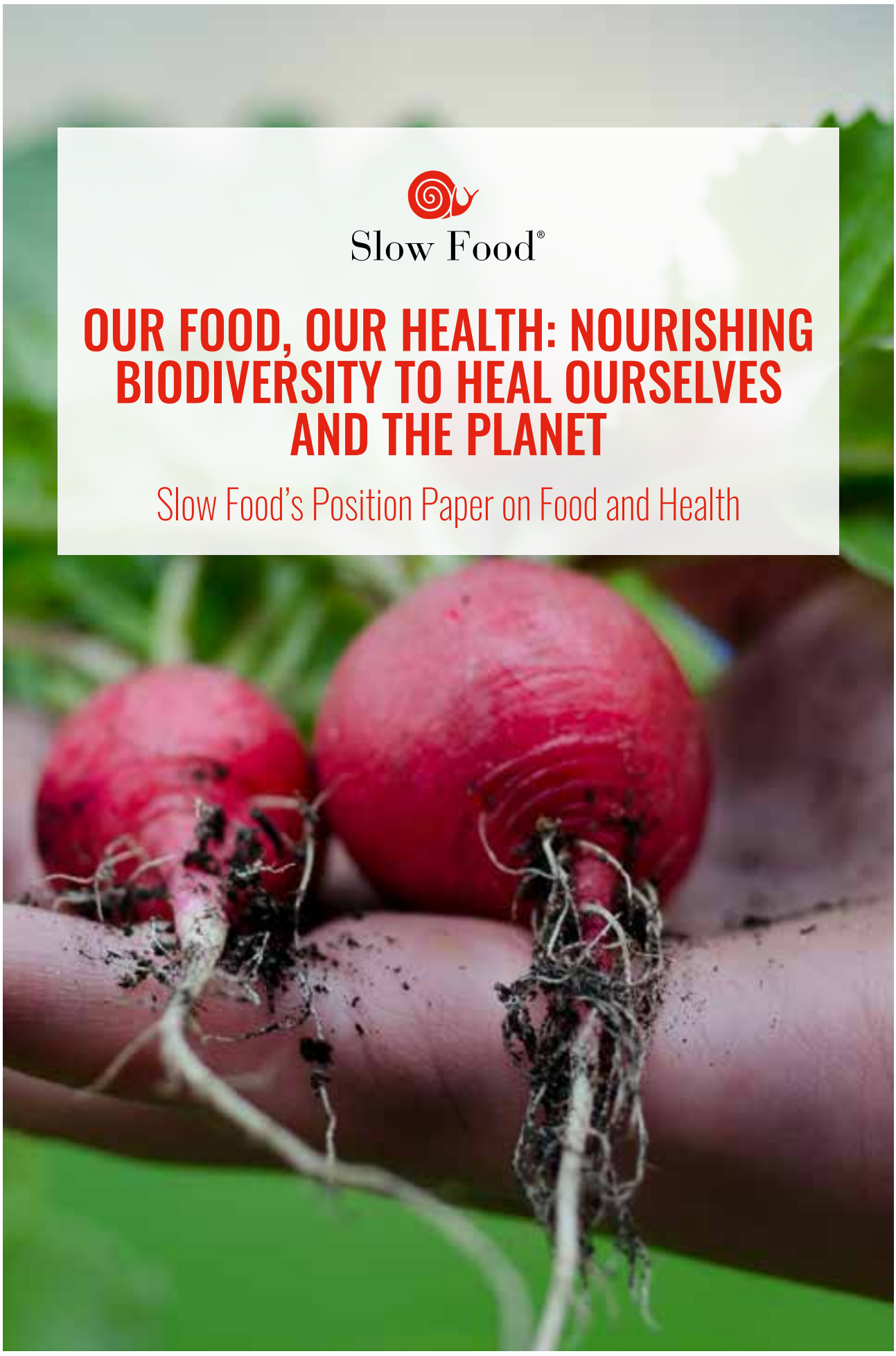
Slow Food®

OUR FOOD, OUR HEALTH: NOURISHING BIODIVERSITY TO HEAL OURSELVES AND THE PLANET

Slow Food's Position Paper on Food and Health



2021

Curated by
Eleonora Lano

Inputs, texts and editing from
Madeleine Coste, Jacopo Goracci, Francesco Sottile

With the contributions of
Renata Alleva, Claudette Bethune, Marco Bobbio, Greta Borrelli, Andrea Devecchi, Graciela Beatriz Di Benedetto Puerto, Maria Caramelli, Cesare Castellini, Andrea Da Porto, Rosanna Desiato, Danila Fava, Francisca Feiteria, Federica Ferrario, Roberto Frediani, Giampaolo Gaiarin, Karalyn Hingston, Vivien How, Erin Kelly, John Kiwagalo, Stefania Maggi, Irene Marocco, Richard McCarthy, Laura Manuritta, Irene Marocco, Valentina Meraviglia, Marta Messa, Serena Milano, Carolina Modena, Luca Monge, Enrico Morello, Edie Mukiibi, Paola Nano, Michelle O Fried, Marika Orlando, Yael Panzer, Andrea Pezzana, Raffaella Ponzio, Becky Ramsing, Silvia Rolandi, Roberto Rubino, Elena Sandrone, Piero Sardo, Achille Schiavone, Rosalind Sharpe, Kathy Sykes, Massimo Todaro, Roberto Volpe, John Wanyu, Nina Wolff

Layout
Claudia Saglietti

Translator
Carla Ranicki

Photos

Summary

Abbreviations and Acronyms

AFN: Alternative Food Networks
AMR: Antimicrobial resistance
CAP: Common Agricultural Policy
CLA: Conjugated Linoleic Acid
CSA: Community Supported Agriculture
ECI: European Citizens Initiative
ECJ: European Court of Justice
EFSA: European Food Safety Authority
EPHA: European Public Health Alliance
EU: European Union
FAO: Food and Agriculture Organization of the United Nations
FOP label: Front-of-pack label
FWBD: Food- and water-borne diseases
GHGs: Greenhouse gases
GI: Geographical Indications
GMO: Genetically Modified Organisms
GPP: Green Public Procurement
HDL: High-density lipoprotein cholesterol
HIC: High-income country
IARC: International Agency for Research on Cancer
IPM: Integrated Pest Management
LCA: Life Cycle Assessment
LDL: Low-density lipoprotein cholesterol
LIC: Low-income country
LMIC: Lower middle-income country
MUFAs: Monounsaturated fatty acids
NCDs: Noncommunicable diseases
PUFAs: Polyunsaturated fatty acids
SDGs: Sustainable Development Goals
SFAs: Saturated fatty acids
SUD: European Sustainable Use of Pesticides Directive
TFEU: Treaty on the Functioning of the European Union
TBM: Triple burden of malnutrition
UN: United Nations
UPFs: Ultra-processed foods
WCRF: World Cancer Research Fund International
WHO: World Health Organization

Introduction

Health lies at the heart of Slow Food's vision of making good, clean and fair food accessible to all. A healthy diet is a diet that is not only nutritionally adequate, but also promotes human health and respects that of the planet. It should favor a rich diversity of foods of plant origin, whole foods and minimally processed foods, locally grown using sustainable methods. It should also be enjoyable.

As the human and economic costs of diet-related illnesses are exploding, health professionals, policymakers, civil society and citizens across the world are realizing the importance of paying closer attention to what we eat. Between 2010 and 2030, public health costs related to noncommunicable diseases are expected to exceed $30 trillion.[1] The gradual shift that has taken place over the last few decades from diets based on a wide variety of plants and animals to diets increasingly composed of ultra-processed foods and a limited number of species have resulted in a food supply capable of supporting a growing human population, but evidently at the cost of the population's health. It is becoming ever more urgent to educate people about healthy diets and call for public policymaking that places health at the core of food and agricultural policies.

A second trend that is becoming increasingly evident is that the global food production system is seriously compromising human health, the health of the planet and the health and welfare of animals. However, the urgently needed transformation of the second-biggest carbon-emitting sector, the industrial food system, is yet to become a priority on the global agenda. The global food production system is based on intensive agriculture, which relies on synthetic pesticides and fertilizers to produce highly processed, calorie-dense foods packed with additives, preservatives, sugars and saturated fats. This is creating imbalances in environmental, economic and social dynamics, particularly in more vulnerable countries, and generating public health issues such as obesity and malnutrition. We must take a One Health approach to our food systems, recognizing the fundamental relationship between the health of animals, people, plants and the environment and ensuring joined-up strategies for tackling the health threats facing all of them.

Global food production has transformed food into a commodity whose value is expressed only by its price. Within this system, the costs to our environment and public health are not taken into account. When food is treated as a mere commodity, people lose its social, cultural and health connections, since it is treated as no more than a money-making product, with ethical considerations generally absent from production systems. But food is not a commodity. Food is a source of vital energy and nutrients, of livelihoods, of cultural expression, and the result of thousands of years of human cooperation with nature. This is why Slow Food is working to promote healthy and sustainable food habits in which food is considered vital both for the health of the environment and for the health of the people that produce and consume it.

Slow Food's approach to food and health

Slow Food exists to nourish biodiversity, climate and health through food. Too often, healthy diets are associated with privation, calorie restrictions and monotony. In reality, eating can easily be healthy and enjoyable at the same time. Given the interconnectedness between the health, climate, biodiversity and social crises facing us today, Slow Food strives to take a holistic approach to food, and to promote food that is good for the people who eat it, good for the people who grow and make it and good for the planet.

In recent years, Slow Food has launched a thematic strand of research and activities linked to

the relationship between food and health. With this project, Slow Food wants to clarify its vision of the relationship between health and food, highlighting the extent to which human health, the health of the planet and the health of animals are intimately linked and how the defense of biodiversity, a battle that has always characterized our association, represents a possible solution to the climate crisis and malnutrition in all its forms (overnutrition, undernutrition and micronutrient deficiencies).

Slow Food's food and health objectives:

• Advocate for a healthy and sustainable diet that promotes human health and respects that of the planet, favoring a wide variety of foods of plant origin, whole foods and minimally processed foods, produced locally using sustainable methods.

• Discourage unsuitable lifestyles that contribute to the spread of overweight, obesity and chronic degenerative diseases and, at the same time, are harmful to the environment, based on an excessive consumption of foods of animal origin and ultra-processed food high in calories, sugar, fat, salt and preservatives as well as foods out of season and foods that have travelled long distances from where they were produced.

• Promote food education that uses the senses and taste as a starting point and focuses on the principle of pleasure as a way of introducing concrete and positive changes to what people eat, moving beyond the exclusively nutritional approach that has proven ineffective in modifying unhealthy eating habits.

• Promote sustainable food production systems and discourage those that destroy biodiversity (based on intensive farming, monocultures and the heavy use of pesticides and fertilizers).

• Promote the protection of biodiversity in all its forms, from the invisible microorganisms naturally present in food to the variety of livestock breeds and edible plant species.

• Communicate the nutritional value of biodiversity and good, clean and fair supply chains, demonstrating that food that is good for the environment is also good for us.

• Develop training and educational activities that aim to improve food production and raise greater awareness about the foods we consume and their impact on our health and the planet's natural balances.

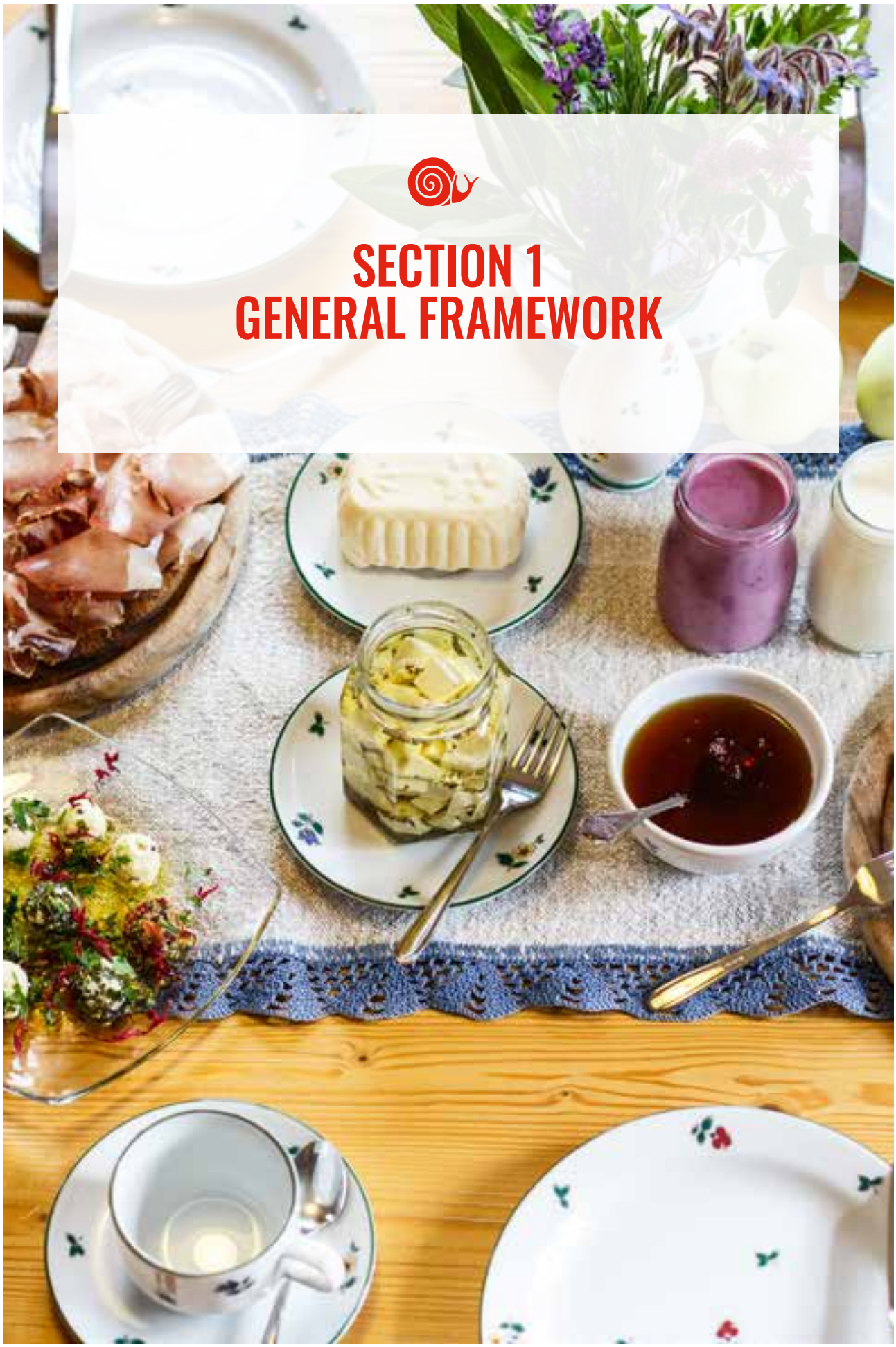
• Advocate for public policies that promote sustainable and healthy food systems.

Slow Food's Position Paper on Food and Health is divided into three sections.

Section 1 examines the current state of our global food systems, and the ways in which Slow Food works to promote healthy diets. After looking at the underlying trends that are shaping diets across the world and driving diet-related illnesses and malnutrition, it shows how a One Health approach can offer an understanding of how the way food is produced can directly impact human, animal, plant and planetary health.

Section 2 presents original research conducted by Slow Food to analyze the nutritional content of Slow Food products as well as describing the main Slow Food initiatives, such as food gardens and local markets, that support local communities and ensure healthy and sustainable diets by protecting biodiversity.

Section 3 discusses the way our food systems are being governed today and the need for better policymaking in the food and health field, concluding with Slow Food's recommendations for European policymakers.



SECTION 1
GENERAL FRAMEWORK

Introduction

Slow Food's vision of enabling access to good, clean and fair food for all is greatly complicated by the context in which we operate. Many societal and technological trends are deeply affecting people's diets, and the evidence is becoming clearer and clearer: Western diets, which are gradually spreading to other regions of the world, have led to a sharp rise in diet-related illnesses, which appear alongside persistent undernutrition. As well as causing rising malnutrition in all of its forms, our current global food system is critically damaging our planet. And of course our health is intrinsically tied to the planet's health. It is worth taking the time to explore these two trends, to understand how food can become a vector of good health and what needs to be done to transform our food system, making it healthier and more sustainable.

Problems related to inadequate nutrition often arise when two basic conditions are not guaranteed, defined as "food security" and "food safety." Food security "is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life."[2] The level of food security varies drastically between countries and regions, but also between neighborhoods and even households. Food security is affected by current trends such as the so-called "triple burden" of malnutrition, whereby obesity rates are rising alongside undernutrition and micronutrient deficiencies, as well as the rise of ultra-processed foods that provide little in the way of nutrition.

Food safety, on the other hand, refers more to hygiene and whether a food is safe for human consumption—free of harmful substances, not contaminated and so on.[3] It is based on a complex framework of rules set by competent authorities to protect consumers. An estimated 600 million people fall ill every year due to unsafe food (food and waterborne diseases, known as FWBD). Among the main culprits are bacteria such as salmonella, *Escherichia coli* and *Clostridium botulinum*, as well as viruses and parasites.[4] When looking at food safety, the way we grow food must also be taken into account. The increasing use of synthetic pesticides and antimicrobials, for example, is directly affecting people's health. Resistance to antimicrobials is rendering certain medical treatments ineffective, while pesticides poisonings continue to rise.

The One Health approach recognizes the complex interconnectedness between the health of people, plants, animals and the planet. The health of a population can never be guaranteed if the health of plants, animals and the planet is not also taken into account. This is why Slow Food advocates for and works to build sustainable food systems based on cultivating and protecting biodiversity and local food varieties, healthy soils and climate-friendly food production. This is how we can ensure healthy and sustainable diets capable of providing adequate nutrients while not threatening the health of ecosystems.

Slow Food believes that food and health is a critically important issue, not only because of the human, economic and environmental costs of diet-related illnesses associated with industrial food systems, but also because of social justice. Great inequalities exist in terms of access to healthy diets. According to the UN's Food and Agriculture Organization (FAO), on average, the cost of a healthy diet is about 60% more than a diet that meets only the requirements for essential nutrients, and almost five times higher than a diet that only meets the minimum dietary energy needs.[5] Furthermore, recent studies have shown that low socioeconomic status and dietary patterns are correlated[6] and have looked at whether racial differences may be determinants of eating patterns and food-purchasing behaviors.[7] The correlation between food security and exposure to racism and the impact of structural racism on food insecurityhave also been

examined.[8] These connections demand further study and should be taken into account in order to promote nutrition education programs targeted at specific groups, such as ethnic groups[9] and those with low socioeconomic levels.[10] Slow Food believes that in addition to the essential need to educate both children and adults about food, a greater focus must be put on increasing access to healthy food, a key determinant in achieving healthy and sustainable diets for all. We must therefore address both the food habits and lifestyles of populations and take a One Health approach to food systems.



HEALTH STATUS, FOOD HABITS AND LIFESTYLE

Introduction

Driven by the so-called "Green Revolution," the global food system has increased dietary energy availability in all regions of the world, but not without a host of negative side effects. Firstly, the current system is dominated by large corporations that produce, manufacture, distribute and sell food, framing the food choices that people have by defining the top-down availability of food and its price. Secondly, the quality of food that has been delivered is, to a certain extent, nutrient-poor: high in fat, salt and sugar and lacking important nutrients such as minerals and vitamins. Moreover, the excessive abundance of these foods also brings up food security problems, since many individuals and communities now lack access to adequate and culturally appropriate diets.

As a result, we have seen a shift in people's food-shopping habits over the past 70 years, particularly in Western countries. Fresh and minimally processed foods purchased mostly from local stores and markets have been replaced by ready-to-eat and processed packaged products found in supermarkets and megastores.[11]

The development of food technology has also led to the rise of ultra-processed foods (UPFs) which are attractive to both consumers and manufacturers since they are convenient, ready-to-eat and calorie-dense, as well as being made from cheap ingredients. But they have damaging effects on consumers' health.[12]

All of these changes in the global food system have had serious health impacts. Unhealthy diets are closely connected to the development of several pathologies, especially obesity and non-communicable diseases such as cardiovascular diseases, several types of cancers and diabetes.



These pathologies are among the leading causes of death worldwide[13] and are compromising the percentage of life spent in health even though the population is living longer in most countries.

Due to unhealthy diets, three different forms of malnutrition coexist in the world today, found in both developed and developing countries: overnutrition, undernutrition and micronutrient deficiencies, also known as the triple burden of malnutrition (TBM).[14]

Current health and longevity trends

The current world population is approximately 7.8 billion people,[15] with an estimated positive growth rate for almost all countries. The population is living longer as life expectancy is rising in most countries, with a global average life expectancy of 72 years.[16] But the same cannot be said for the percentage of life spent in health, as longevity is often compromised by various pathologies.[17] Specifically, we are seeing an alarming increase in noncommunicable diseases (NCDs), also known as chronic diseases, which are not directly transmissible between people. The main types of NCDs are cardiovascular diseases (such as heart attacks and strokes), cancers, chronic respiratory diseases and diabetes, which are collectively responsible for 71% of all deaths worldwide.[18] According to the World Health Organization (WHO), hypertension and diabetes, both risk factors for the development of cardiovascular diseases, respectively affect over one billion and 415 million people and are among the leading causes of death in the world.[19] The rise of NCDs has been driven by four major risk factors: tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets.[20] But it is unhealthy diets that pose a greater risk to morbidity and mortality than unsafe sex, alcohol, drug use and tobacco use combined.[21] Proper nutrition, for example, can prevent a third of cardiovascular diseases and cancers.[22]

Considering what a relevant role food plays in health issues, Slow Food believes it is vital to ensure that everyone has access to adequate amounts of healthy food. Since it was founded, our association has defended the right of consumers to access healthy and nutritious diets. We have run countless food and taste education programs for children, families and adults, using school gardens as a tool for food and environmental education. We have launched many initiatives in which participants, both adults and children, can become co-producers, in other words citizens aware that individual purchasing choices have consequences on the world around us. Furthermore, Slow Food's mission has always been to protect biodiversity by supporting producers with specific projects, such as the Slow Food Presidia[23] and the Earth Markets.[24]

[17] Concerning the burden of disease vs. longevity two main concepts can be addressed: Disability-adjusted life years (DALYs) and Human Capital. For further information: WHO. Disability-adjusted life years (DALYs). Accessed February 10, 2022 and Human Capital Project. The World Bank. Accessed February 10, 2022.

The triple burden of malnutrition

Thanks to the paradoxical triple burden of malnutriton (TBM)—overnutrition, undernutrition and micronutrient deficiencies—malnutrition, in different forms, affects all countries, both developed and developing.[25] Diverse types of malnutrition can co-exist in the same country, community or household, and even at the individual level.[26]

Currently there are 1.9 billion overweight adults in the world, including more than 650 million who are obese, while at the same time there are nearly 800 million undernourished people suffering from hunger,[27] and billions of people with micronutrient deficiencies.[28, 29] Obesity, once a trend mostly seen in higher-income countries (HICs), has now expanded to low- and middle-income countries (LMICs)—often existing alongside undernutrition.[30] Even in those countries where a higher calorie availability has mitigated food security problems, malnutrition persists in the form of micronutrient deficiencies.[31]

Women are especially affected by malnutrition problems. A third of women are anemic[32] and it has been shown that different forms of malnutrition or diseases in pregnant women, such as obesity or hyperinsulinemia,[33] are connected to the onset of future chronic diseases in their children.[34]

Being overweight as a child can lead to early-onset type 2 diabetes, stigmatization and depression, as well as being a strong predictor of adult obesity,[35] which brings serious health and economic consequences. The greatest burden of all forms of malnutrition is shouldered by children and young people from the poorest and most marginalized communities, perpetuating poverty across generations.[36]

According to the UN's State of Food Security and Nutrition in the World report, in 2020 an estimated 2 billion people did not have regular access to safe, nutritious and sufficient food. The problem of food insecurity has been exacerbated by the Covid-19 pandemic. After remaining virtually unchanged for five years, world hunger levels increased significantly in 2020. Projections confirm that it will be a major challenge to reach the Sustainable Development Goal (SDG) of eliminating hunger by 2030, in part due to the lasting effects of the pandemic. We now have 30 million more people suffering from hunger than we would have if the pandemic had not occurred.[37]

[29] Globally, at least 1 in 3 children under the age of 5 are not growing well due to malnutrition in its more visible forms. In 2018, almost 200 million children under 5 suffered from stunting or wasting. At least 1 in every 2 children under 5 suffer from hidden hunger due to deficiencies in vitamins and other essential nutrients. At the same time, overweight and obesity continue to rise: Between 2000 and 2016, the proportion of overweight children (aged 5 to 19) rose globally from 1 in 10 to almost 1 in 5. Source: UNICEF. The State of the World's Children 2019. Children, Food and Nutrition: Growing well in a changing world. 2019. Accessed February 11, 2022.

[33] Hyperinsulinemia is a condition in which there are abnormally high levels of insulin, a hormone that helps maintain proper blood sugar levels, circulating in the blood.

[34] On this topic, see Barua S, Junaid MA. Lifestyle, pregnancy and epigenetic effects. Epigenomics. Accessed February 13, 2022. and Danielewicz H, Myszczyszyn G, Dębińska A, Myszkal A, Boznański A, Hirnle L. Diet in pregnancy—more than food. European Journal of Pediatrics. 2017;176(12):1573-1579. doi:10.1007/s00431-017-3026-5

Figure 1: The triple burden of malnutrition

Sources: FAO, IFAD, UNICEF, WFP, WHO, 2021; UNICEF, 2019; WHO, 2022

Food system changes

The global food system is dominated by large corporations who are responsible for producing, manufacturing, distributing and selling food. The way they operate determines people's food choices by defining both the availability of foods and their price. This is crucial given that food prices continue to be one of the most important decision factors in whether certain foods are eaten or not.[38]

Beginning in the mid-20th century, driven by the Green Revolution,[39] dietary energy availability has increased in all global regions and has greatly helped reduce undernutrition.[40] However, this dramatic growth in food production has not been without negative consequences. The food delivered by the current system is often of poor nutritional quality, being high in fat, salt and sugar and lacking important nutrients such as minerals and vitamins. Furthermore, the regions with the highest daily energy availability per capita over the longest period since the 1960s have also developed the highest obesity rates.[41]

The nutrition transition

In terms of health, there has been a global shift in disease patterns from infectious diseases associated with undernutrition to chronic diseases associated with overnutrition.[42] This shift in dietary patterns has been called the nutrition transition. Its main drivers are food prices, rapid industrialization, new and improved marketing and distribution infrastructure, better roads and ports, increased access to foreign suppliers and imports and the globalization of food consumption patterns.[43] All of these changes combined have resulted in a shift towards the so-called "Western diet," characterized by an increased consumption of refined cereal grains; foods of animal origin, particularly red meat; caloric sweeteners (especially added to drinks); oil for frying; ultra-processed foods rich in saturated fats, salt and sugar; sweet and savory snacks and packaged, precooked and ready-to-eat foods.

[39] "Great increase in production of food grains (especially wheat and rice) that resulted in large part from the introduction into developing countries of new, high-yielding varieties, beginning in the mid-20th century. [...] The new varieties require large amounts of chemical fertilizers and pesticides to produce high yields." Encyclopedia Britannica. 2020. Accessed December 21, 2021.

The nutrition transition originated in the 1970s in the US before reaching Europe, then began to affect low- and middle-income countries in the early 1990s.[44] Its changes are mainly related to diet and lifestyle, with consequent effects on healthcare systems, and have occurred within one generation.[45] The nutrition transition is also problematic for food security, as it means that individuals and communities can no longer access adequate and culturally appropriate diets.

The emergence of supermarkets and megastores has also contributed to the disappearance of local markets and small retailers. One of the consequences of this is the emergence of "food deserts"—areas where people have limited access to a variety of healthy and affordable foods. Communities living in food deserts often struggle with low incomes, a lack of adequate access to transportation and a limited number of food retailers who can provide healthy groceries at an affordable price,[46] strengthening the link between unhealthy diets and food insecurity, poverty and inequality.

Slow Food was founded to prevent the disappearance of local food cultures and traditions, counteract the rise of fast life and combat people's dwindling interest in the food they eat, where it comes from and how our food choices affect the world around us. Our organization believes food is tied to many other aspects of life, including culture, politics, agriculture and the environment. Through our food choices we can collectively influence how food is cultivated, produced and distributed, and change the world as a result.

The 21st century brought incredibly radical changes to our eating habits, thanks to the emergence of supermarkets, refrigeration, industrial food processing and long-life packaged food. While these innovations certainly led to important improvements in both food safety and food security, they also had many other significant effects, especially when combined with globalization. We have seen a rapid increase of delivery and food supply services, the spread of large-scale food marketing driven by television and other communication media and the improvement of logistics and transport meaning we can now eat any food, anywhere in the world, at any time of the year. Meanwhile, the increasingly frenetic pace of life of Western societies means the amount of time spent in the kitchen has halved over the three decades between the 1960s and the 1990s.[47] The emancipation of women has—in many countries—theoretically freed women from the role of housewife, exclusively responsible for the preparation of food and the care of children and the family. However, this has not always led to a shared responsibility for work in the house, leading to an abandonment of culinary traditions and a loss of knowledge in favor of choices based on speed and convenience, at the expense of proper nutrition. For many people, the act of cooking and eating has been increasingly transformed into a solitary experience. As a result, meals have become disconnected from traditions and conviviality. These fast-paced changes have massively disrupted the oldest social activity in human history.

Globalization's effects on food habits: The case of Africa

The shift from fresh, local and minimally processed food to ready-to-eat and processed packaged products does not affect only Western countries. Over the past 50 years, African consumers have increased their consumption of these products, with a surge particularly in the last few years.[48] Markets and supermarkets across the continent have been invaded by products such as stock cubes, powdered milk, industrial beers and oils and sugar-sweetened beverages. Due to their convenience and particularly effective marketing campaigns, these products are becoming increasingly popular and there has been a significant rise in their consumption.

Home cooks would traditionally concoct their own flavor enhancers using fresh herbs and vegetables. But the use of industrial stock cubes is eroding this culinary knowledge, even though traditional seasonings enrich dishes with diverse colors and flavors and are healthier than industrial versions, being low in salt and rich in proteins and minerals. Meanwhile, overabundant stocks of European powdered milk at unbeatable prices have flooded the West African market, threatening the local dairy sector and replacing breastmilk for newborns.

The increased consumption of unhealthy ultra-processed foods has had consequences on the health of the population, especially in urban centers. High levels of undernutrition have gradually been accompanied by the spread of overweight, obesity and NCDs.[49, 50, 51]

Since 2018, through the Slow Food Cooks' Alliance project, Slow Food has launched awareness-raising activities among East and West African populations about the benefits of choosing local foods instead of industrial products, which besides being harmful to people's health and the local economy are also undermining traditional gastronomic knowledge. Tips for making more conscious daily choices include using local grains instead of imported rice, choosing local honey over white sugar, preferring millet beer to industrial brews and drinking local herbal infusions instead of imported tea. For more information, have a look at Slow Food's cookbooks on traditional products here.

Ultra-processed foods and health

Food processing refers to any method used to turn fresh foods into food products.[52] Food processing allows us to make food edible, reduces the cost of foods and can improve food safety, shelf life, preservation, nutritional quality and convenience. Food processing includes traditional methods (heat treatment, fermentation, pickling, smoking, drying, curing) and modern methods (pasteurization, ultra-heat treatment, high pressure processing, modified atmosphere packaging). Processing can also involve adding ingredients to a food, for example to extend its shelf life.[53, 54]

Food has actually been processed since prehistoric times, when humans started preserving the food they were hunting and gathering. Food processing methods such as cooking,[55] fermenting and drying allowed communities to survive, and marked the start of modern food processing.[56, 57] Historic products like wine, olive oil and bread are also the result of food processing.[58]

Nowadays food transformation is largely disconnected from the need to survive. Instead, processing is used to save time, extend shelf life, reduce costs, increase convenience and improve taste. Food science and modern systems have contributed to achieving important results such as producing greater amounts of foods while enhancing food safety. Modern food manufacturing also often improves the quality of life for individuals with specific health conditions, offering modified foods to meet their needs.[59]

However, the consequences of food processing on the quality of food and therefore on the health of consumers are not always purely positive, depending on the level of transformation of the raw materials. Researchers at the University of São Paulo in Brazil have come up with the NOVA classification of foods, dividing foods into four categories based on the extent and purpose of their processing: unprocessed or minimally processed foods, processed culinary ingredients, processed foods and ultra-processed foods (UPFs).[60]

NOVA classification of foods

Source: Monteiro CA, et al. (2010). A new classification of foods based on the extent and purpose of their processing.

GROUP 1 - Unprocessed and minimally processed foods

"They are the edible parts of plants or of animals after separation from nature. Minimally processed foods are natural foods altered by methods that include removal of inedible or unwanted parts, and also processes such as drying, powdering, roasting, boiling, non-alcoholic fermentation, pasteurization, freezing." Group 1 includes fresh, dry or frozen fruits and vegetables; meat, poultry, fish and seafood; grains and pasta; legumes; eggs; fresh, powdered or pasteurized milk; fungi; herbs; tea and coffee and drinking water.

GROUP 2 - Processed culinary ingredients

"Substances derived from group 1 foods or else from nature by processes such as pressing, refining, grinding, milling, and drying." Group 2 includes oils, butter, lard, sugar and salt.

GROUP 3 - Processed foods

"They are made by adding salt, oil, sugar or other substances from group 2 to group 1 foods. Processes include various preservation or cooking methods, and with breads and cheeses, non-alcoholic fermentation." Group 3 includes canned or bottled vegetables or legumes preserved in brine; fruit in syrup; salted, dried, cured, or smoked meats and fish; canned fish and freshly made breads and cheeses.

GROUP 4 - Ultra-processed foods

"Ultra-processed foods are formulations of ingredients, mostly of exclusive industrial use, typically created by a series of industrial techniques and processes." Group 4 includes energy-dense food products; soft drinks; various refined starchy foods; processed meats; sweet, fatty and salty packaged snacks; mass-produced packaged breads; breakfast cereals; salt-preserved foods and infant formulas.

It is likely that UPFs are associated with obesity and various NCDs.[61, 62, 63] Over the past 70 years, starting in Western countries, diets have seen a dramatic increase in the consumption of UPFs, which have gradually replaced traditional foods. This further explains the coexistence of multiple forms of malnutrition within the same community and even household.[64] UPFs have been identified as determinants of overweight, obesity, premature mortality, cancers, cardiovascular and metabolic diseases, diabetes or high fasting blood sugar and high levels of cholesterol in the blood.[65] In addition, consumption of UPFs has been associated with frailty, irritable bowel syndrome and functional dyspepsia in adults as well as metabolic syndrome in adolescents and dyslipidemia in children.[66]



Recommendations for salt and sugar consumption

The WHO recommends not exceeding an intake of 2 grams of sodium per day, which corresponds to about 5 grams of table salt, roughly the amount in one teaspoon.[67] Most dietary salt (about 75 to 80%), especially in Western countries, comes from processed and packaged foods, rather than salt added at the table or during cooking.[68] Higher quantities of sodium, together with insufficient potassium intake, contribute to high blood pressure and increase the risk of heart disease and stroke.[69]

As for sugar, the WHO "recommends adults and children reduce their daily intake of free sugars[70] to less than 10% of their total energy intake. A further reduction to below 5% or roughly 25 grams (6 teaspoons) per day would provide additional health benefits."[71] However, sugar is found in very high quantities in most ultra-processed products like packaged snacks and carbonated soft drinks and is also added to salty foods. Reducing our intake of highly processed foods and consuming more whole, fresh foods will concurrently decrease our sodium and sugar intake.

Besides salt and sucrose (table sugar), a variety of other food additives, sugars (e.g. fructose, high-fructose corn syrup, fruit juice concentrates, invert sugar, maltodextrin)[72] and modified oils (hydrogenated or interesterified oils)[73] can be used for specific purposes when producing UPFs.

In the European Union, additives are defined as "any substance not normally consumed as a food in itself and not normally used as a characteristic ingredient of food, whether or not it has nutritive value, the intentional addition of which to food for a technological purpose in the manufacture, processing, preparation, treatment, packaging, transport or storage of such food results, or may be reasonably expected to result, in it or its by-products becoming directly or indirectly a component of such foods."[74]

Additives include food colorings, sweeteners, acidity regulators, emulsifiers, preservatives and antioxidants, among others.[75, 76]

Although the use of additives is regulated, evidence is growing in support of how the use and intake of these substances can be correlated to the onset of new allergic conditions, metabolic disorders and, in some cases, to the increased incidence of some cancers.[77, 78] Nitrites, additives often added to foods as preservatives, can bind to the amines contained in products of animal origin, thus generating a group of compounds known as nitrosamines, some of which are carcinogenic.[79] Children and adolescents are often the most vulnerable to the harmful health effects of additives.[80]

[70] According to the WHO, "free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates." Source: WHO. Guideline: Sugars Intake for Adults and Children. 2015. Accessed March 1, 2022.

The public health problems associated with UPFs come firstly from the intentional addition of the various substances described above, and secondly from the substances that can appear in the food as a result of transformation processes, such as cooking and irradiation.[81] High cooking temperatures can create chemical reactions among amino acids, creatines and sugars that may produce dangerous compounds that can damage our DNA. For example, acrylamide is a chemical that naturally forms from the sugars and amino acids found in many foods during high-temperature cooking (e.g. frying, baking, roasting) and also during industrial processing at +120°C and in low-moisture conditions. It is found in products such as potato chips, French fries, bread, biscuits and coffee. In 2015 the European Food Safety Authority (EFSA) declared that acrylamide potentially increases the risk of developing cancer for consumers in all age groups.[82]

To counter the trends of supermarketization, the increase of UPFs in diets all over the world and the subsequent rise of NCDs and obesity, Slow Food believes that a return to traditional diets and low-processed foods is urgently needed. Not only do UPFs represent huge health costs for our societies, but they are also the product of industrial food systems that have little regard for tradition, culture, pleasure and most of all biodiversity. Slow Food believes that food habits and lifestyles can be changed by bringing people together and educating them, encouraging them to appreciate and understand seasonality and tradition and to recognize the profound links that should exist between a food, the environment where it was made and the people who made it.

[76] "The Joint FAO/WHO Expert Committee on Food Additives (JECFA) is the international body responsible for evaluating the safety of food additives. Once a food additive has been found to be safe for use and maximum use levels have been established in the Codex General Standard for Food Additives, national food regulations need to be implemented permitting the actual use of a food additive and standards and guidelines on food labelling established. These standards are implemented in most countries, and food manufacturers are obliged to indicate which additives are in their products. In the European Union, for example, there is legislation governing labelling of food additives according to a set of pre-defined 'E-numbers'." Source: WHO. Food Additives. Accessed February 14, 2022.

[81] "Irradiation is the physical treatment of food with high-energy ionizing radiation and is carried out to destroy microorganisms, viruses, bacteria or insects; prevent the germination and sprouting of potatoes, onions and garlic; slow down the ripening and aging of fruit and vegetables; or prolong the shelf life and prevent food-borne diseases in meat, poultry and seafood". Source: Food irradiation. Food Safety. Accessed February 14, 2022.



ONE HEALTH: THE INTERCONNECTEDNESS BETWEEN HUMAN, ANIMAL AND ENVIRONMENTAL HEALTH

Introduction

Food systems have the potential to nurture human health and support environmental sustainability, but the industrial food systems we have today present significant threats to both.[83] Malnutrition in all its forms (undernutrition, overnutrition, micronutrient deficiencies) and the degradation of environmental and natural resources are both happening at an accelerated pace and are symptomatic of these industrial food systems.[84]

Population growth is putting increased pressure on natural resources and the environment. At the same time, the phenomenon of antimicrobial resistance (AMR)[85] is becoming increasingly relevant and seriously threatening the health of humans and animals. A shift toward the One Health approach[86] is needed to protect future generations and their right to access natural resources and to safeguard animal and environmental health.

One Health approach

According to FAO, the health of animals, people, plants and the environment is interconnected. One Health is an integrated approach that recognizes this fundamental relationship and ensures that specialists in multiple sectors work together to tackle health threats to animals, humans, plants and the environment. Maria Helena Semedo, FAO Deputy Director General, believes that ensuring a One Health approach is essential for progress to anticipate, prevent, detect and control diseases that spread between animals and humans, tackle antimicrobial resistance, ensure food safety and prevent environment-related human and animal health threats.[87]

The urgent challenge of the next few years is to provide a healthy and sustainable diet for the entire population, capable of satisfying the nutritional needs of each individual and guaranteeing an adequate state of health, while simultaneously ensuring that it has a low environmental impact, so the health of the planet is not further compromised.

[85] "Antimicrobial resistance (AMR), or drug resistance, arises when microorganisms, such as bacteria, change over time and stop responding to medicines," meaning antimicrobial medicines lose their effectiveness and infections become more difficult to treat. Source: EPHA. Meat Production & Consumption (in Europe) and Public Health. 2021. Accessed February 14, 2022.

A diverse diet rich in plants, adapted to their environment and grown locally using agroecological methods, is sustainable and nutritious, ensures food security and helps to mitigate climate change. Slow Food strives for sustainable and healthy diets to be accessible to all.

A sustainable and healthy diet

In 2014, the FAO/WHO Second International Conference on Nutrition (ICN2) recognized that "current food systems are being increasingly challenged to provide adequate, safe, diversified and nutrient rich food for all that contribute to healthy diets due to, inter alia, constraints posed by resource scarcity and environmental degradation, as well as by unsustainable production and consumption patterns, food losses and waste, and unbalanced distribution."[88]

Production systems with the greatest negative impact on the environment and biodiversity (based on intensive agriculture, monocultures, the use of pesticides and other synthetic chemicals, the conversion of land from original habitat to food production and a high dependence on a small number of plant types) coincide with those that can compromise human health, because they produce an excessive amount of animal-origin foods and highly processed foods and drinks, packed with sugar, fat, salt and preservatives.

Current food trends and the estimated growth of the world population (expected to reach 10 billion by 2050) exacerbate the risks of unsustainable food system practices to human and planetary health. The incidence of non-communicable diseases (NCDs) is expected to worsen and the effects of food production on greenhouse gas (GHG) emissions, nitrogen and phosphorus pollution, loss of biodiversity and the exploitation of common goods such as water and soil are expected to increase.[89] The predicted increase in demand for animal-based protein in particular is expected to have a negative environmental impact.[90]

The 2019 Intergovernmental Panel on Climate Change (IPCC) report states that the "consumption of healthy and sustainable diets presents major opportunities for reducing GHG emissions from food systems and improving health outcomes."[91]

> *"Sustainable Healthy Diets are dietary patterns that promote all dimensions of individuals' health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable. The aims of Sustainable Healthy Diets are to achieve optimal growth and development of all individuals and support functioning and physical, mental, and social wellbeing at all life stages for present and future generations; contribute to preventing all forms of malnutrition; [...] reduce the risk of diet-related NCDs; and support the preservation of biodiversity and planetary health."*[92]

Ensuring healthy diets from sustainable food systems for all will require substantial changes in dietary patterns, major reductions in food waste and significant improvements in food production practices.[93] A healthy and sustainable diet is based on the abundant consumption of plant foods, an overall reduction of foods of animal origin and energy from free sugars and fats, a shift to unsaturated fats over saturated and trans fats[94] and a limited salt intake. It features plenty of unprocessed or minimally processed foods, with few industrially processed products, and involves the purchase and preparation of raw ingredients. Thanks to its minerals, vitamins, fiber, antioxidants and low energy density, a healthy and sustainable diet helps prevent cardiovascular diseases, diabetes, cancer and all forms of malnutrition.[95]

To have the lowest possible impact on the environment, food production must make the most of

[94] For further information on the different types of fat, see of fats. Types of Fats. Michigan Medicine. Accessed February 14, 2022.

the land already being used and not exploit new land. Water must be managed responsibly, nitrogen and phosphorous pollution must be reduced, carbon dioxide emissions must be avoided and methane and nitrous oxide emissions must not increase. It must preserve the plant and animal biodiversity of crop varieties, livestock breeds, forest food sources and aquatic species and avoid excessive fishing and hunting. During production phases, it must involve a limited or conscious use of antibiotics, and during the packaging process a minimal use of plastic materials.[96]

The immense climate change and public health challenges we face today should not be looked at separately from those of growing inequality and social injustice. For this reason, Slow Food believes that sustainability must be viewed with a holistic approach that goes beyond the usual three dimensions of social, economic and ecological to also consider resilience, health and ethics.[97]

Antimicrobial resistance (AMR)

Antibiotics represent one of the most important discoveries for humanity. Their development and use has made it possible to treat serious and previously fatal diseases, revolutionized the treatment and prevention of infectious diseases and allowed the evolution of modern medicine. But the other side of this overwhelming success is antimicrobial resistance (AMR) or drug resistance, which arises when microorganisms such as bacteria, viruses, fungi and parasites change over time and stop responding to medicines. As a consequence, antimicrobial medicines lose their effectiveness and infections become more difficult to treat.[98]

Antimicrobial resistance can occur naturally, as all microbes can adapt to their surrounding environment. However, it is exacerbated by the inappropriate and excessive use of antimicrobials in both human healthcare and the agriculture sector[99] and boosted by a greater spread of resistant strains due to an increase in international travel and migratory flows.[100] The overuse of antimicrobials occurs primarily in human medicine and animal farming, including aquaculture.

The prolonged, incorrect and excessive use of antibiotics may alter the microbial composition of the gastrointestinal tract, leading to antibiotic resistance, intestinal domination by pathogenic bacteria and the transient or profound loss of microbial diversity and number of microbial species.[101] Furthermore, according to a 2020 EFSA report,[102] an ever-increasing number of pathogens, known as multidrug-resistant bacteria, are resistant to multiple antibiotics. Infections associated with multidrug-resistant organisms result in a substantial cost burden to the healthcare system[103] and appear to be strongly associated with prolonged hospital stays and increased mortality in patients.[104] As microbes develop resistance to antimicrobials, medication becomes less effective when used in the standard treatment of infections in both humans and animals, ultimately becoming useless. AMR has become a global concern, rendering certain chemotherapy treatments, organ transplants and other major surgeries very risky.[105] Globally, AMR is so widespread that it has been included in the top list of public health threats



facing humanity.[106] Currently at least 700,000 people die each year globally due to drug-resistant diseases.[107] In Europe, that number is 33,000 people every year, equal to the death toll from influenza, tuberculosis and HIV/AIDS together.[108] Some experts believe that within a few decades AMR could become the leading cause of death in the world, causing 10 million deaths a year by 2050 and taking more lives than cancer.[109, 110]

While comparable amounts of antibiotics are used for individual animals and humans, the total biomass of farm animals exceeds that of humans, resulting in a considerably greater use of antibiotics in agriculture. Plus, agriculture is a main contributor to the exposure of ecosystems to antibiotics and the development and dissemination of resistance genes.[111] The main reasons antimicrobials are used in animal farming are to prevent disease and promote growth, ensuring health and productivity. Though AMR is a natural process, it has been greatly accelerated by the misuse of antimicrobial medication, both in human and veterinary medicine. For example, it is common practice for animals to be given antibiotics preventively rather than reserving them for the treatment of infections (often to compensate for poor farming practices), and in many countries antibiotics are still regularly used as growth promoters to meet an increasing demand for meat.[112]

The same phenomenon also occurs in aquaculture, but it is very difficult to link AMR in bacteria found in aquaculture systems with the use of antibiotics in this sector, since the aquatic environment receives effluents from hospitals and terrestrial animal farms, consequently leading to the spread of resistant bacteria from all sectors through aquatic systems. So, while residues found in animal tissues may be directly related to the use of antimicrobials in the sector, resistant bacteria found in farmed fish may not necessarily be derived from aquaculture.[113] In fact, recent studies have suggested that antibiotic usage per ton of product in many farmed fish species is much lower than other food animals, even in developed countries.[114]

The consumption of antimicrobials varies greatly depending on geographic area.[115] As part of the European Commission's strategy to tackle AMR, since 2006 the EU has banned the use of antibiotics as growth promoters in animal feed in order to eliminate the use of antibiotics for non-medical purposes.[116] While sales of veterinary antibiotics in the EU and the United Kingdom decreased by more than 34% between 2011 and 2018,[117] it is expected that by 2030 the global consumption of antimicrobials will rise by 67% and up to a third of this rise is expected to happen in low- and middle-income countries. In the same period, consumption is expected to double in Brazil, Russia, India, China and South Africa. This rise is likely to be driven by the

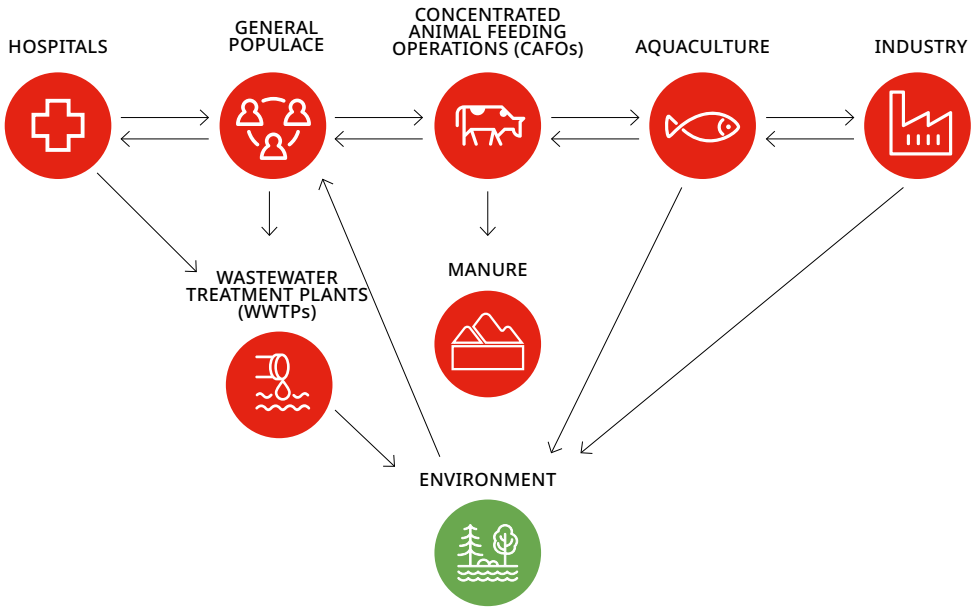


Figure 2: Schematic flow of antibiotic resistance-carrying bacteria (ARBs) and antibiotic resistance genes (ARGs) from hotspots of evolution and transmission (red circles) to the environment (green circle).

Infographic adapted from Kraemer SA, et al. (2019). Antibiotic Pollution in the Environment: From Microbial Ecology to Public Policy

growth in consumer demand for animal-source products in middle-income countries and a shift to large-scale intensive farms where antimicrobials are used routinely to keep animals healthy and maintain productivity.[118]

There are different ways to reduce the risk of AMR in humans, however the most long-term secure way seems to be to reduce the use of antibiotics.[119]

Biodiversity and diets

Food biodiversity, understood as the diversity of plants, animals and other organisms used for food, contributes in various ways to a healthy and diversified diet. Dietary species richness, which is the count of the number of different species consumed per day, is a measure of both food biodiversity and the nutritional quality of a diet.[120]

Worryingly, food biodiversity has been declining dramatically over the last 100 years, leading to less and less diverse diets around the world. This decline can be attributed to the gradual shift from diets based on a wide variety of plants and animals to diets increasingly composed of processed foods and a limited number of species.[121]

Between 20,000 and 10,000 years ago, humans shifted from a diet of exclusively wild animals and gathered foods to one of domesticated animals and agricultural produce. Then in the last half of the 20th century we saw a switch to a diet based on industrially produced foods, including chemically managed farmed animals and produce and sterilized, ultra-processed foods containing preservatives and additives. These shifts have resulted in a food supply capable of supporting a growing human population, but perhaps at the cost of the population's health.

Of the more than 300,000 known edible plant species, the world's food supply depends on about 150. Furthermore, four crops—rice, corn, potatoes and wheat—contribute more than half of the calories consumed in the world.[122] With only a small percentage of plants routinely consumed, there is a plethora of untapped potential available, whilst declining food biodiversity has interlinked consequences on human and planetary health, as well as on the resilience of food systems.

Global food security is also being threatened by the decline in the nutritional value of crops, a widespread global phenomenon. As centralized and industrialized farming methods and monocultures that depend on the intensive use of chemical fertilizers and pesticides spread in the second half of the 20th century, the nutritional content of agricultural products has been falling. This decline has been directly associated with these changes in farming methods, for example due to their effects on soil quality.[123] The nutritional value of food biodiversity, with local varieties and breeds, could compensate for this loss.

The most appropriate and sustainable long-term solution to improve the nutritional status of populations and tackle malnutrition is through healthy diets, avoiding a reliance on food supplements which represent an added cost and only work as long as they are taken.[124, 125] Sustainable and lasting change is possible by empowering people through education and reaching an understanding of local food plants and the nutrients they provide. In this regard, food biodiversity has been recognized as a fundamental principle to achieving high-quality diets in recent versions of some national and regional dietary guidelines, including the Brazilian guidelines,[126, 127] the New Nordic Diet[128] and the Mediterranean diet pyramid.[129, 130]

[115] In 2010, the five countries with the largest shares of global antimicrobial consumption in food animals were China (23%), the United States (13%), Brazil (8%), India (3%) and Germany (3%). The projections for 2030 are expected to be China (30%), the United States (10%), Brazil (8%), India (4%), and Mexico (2%). Source: Van Boeckel TP, Brower C, Gilbert M, et al. Global trends in antimicrobial use in Food Animals. Proceedings of the National Academy of Sciences. 2015;112(18):5649-5654.

Despite a recognition of the importance of food biodiversity to improving the nutritional status of communities, at present, only a fraction of local food varieties have had their nutrient content analyzed. Further research would allow the selection and promotion of the most nutrient-rich species, varieties and breeds to be promoted on farms, at markets and through public health campaigns, maximizing the nutritional adequacy of diets.[131]

Local food plants support food security

Often forgotten, local edible food plants can make a significant contribution to adequate nutrition and diet diversity. From a nutritional point of view, many local edible food plant species are richer in vitamins, minerals and macronutrients like fats and proteins than conventional domestic species.[132] Examples of nutritional differences between different species and within the same species can be found in chapter "Food biodiversity and health" of Section 2. Moreover, local edible food plants require less inputs (chemicals, water, fertilizers), are naturally better adapted to their environment and are able to better withstand disease and pest pressures. Promoting local edible food plants is a strategy that increases diet diversity among urban and rural populations throughout the year and reduces hunger and the risk of malnutrition in times of food shortages and famine. What's more, it is sustainable, cost-effective, proven to work and addresses many of the issues raised earlier.

Despite the great value of local food plants, increasing modernization and globalization are contributing to the loss of knowledge about them and a decline in their use. The cultivation and breeding of local varieties and native breeds and the rediscovery of traditional processing methods can be a successful strategy to diversify diets and enrich them nutritionally, improving in particular the nutritional status of very poor and marginalized communities.[133]



[124] As defined by the European Union, "food supplements are foodstuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form". Source: Directive 2002/46/EC of the European Parliament and of the Council of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements.

The climate crisis and health

The climate crisis is one of the greatest challenges that we face today, and its consequences on the underlying social and environmental determinants of health are already visible, with clean air, safe drinking water, sufficient food and secure shelter already at risk.[134] Unfairly, climate change most affects the populations who have contributed the least to the problem, meaning climate change is also a matter of social justice,[135] since the climate crisis exacerbates already existing social and economic inequalities within and between countries.[136]

The changing climate will impact all environmental systems, which will harm human health. Moreover, global food security is also under threat as rising temperatures and changes to precipitation, plus extreme events like heatwaves, floods and droughts, have a profound effect on agricultural productivity.[137]

Our diet is also one of the drivers of climate change. Meat production alone accounts for nearly a fifth of global greenhouse emissions.[138] At the same time, the overconsumption of red meat also has negative effects on human health. For more information on this topic, see the chapter on sustainable and healthy diets. At the same time, crop yield potential has fallen for all major crops, foreshadowing severe consequences for food-insecure populations. The climate crisis will also negatively impact soil health by reducing the amount of organic matter in it, damaging its structure and increasing its vulnerability to erosion.[139]

Climate change can also make food less nutritious. Carbon dioxide is increasing significantly in the atmosphere. A nutrient for plants, it allows them to grow. But when it is present in high concentrations, plants increase the synthesis of carbohydrates, sugars and starches, and decrease the concentration of proteins, vitamins and minerals such as calcium, potassium, iron and zinc.[140] In particular, rice and wheat crops, primary sources of dietary protein for many countries, have already seen an almost 8% reduction in their protein content due to elevated atmospheric CO_2 concentrations.[141]

Nutritional impoverishment due to increased CO_2 concentrations would affect the concentrations of almost all micronutrients. Inadequate quantities of iron and zinc, which decreased by approximately 8%,[142] would increase the risk of diseases such as malaria, dysentery, pneumonia and iron deficiency anemia.[143] In particular, iron deficiency can lead to serious problems for pregnant women and children.[144] Seemingly small variations can still have significant consequences on the food security of disadvantaged populations, whose diet is mainly based on starchy foods. For example, African and Asian regions that are heavily reliant on rice for nutrition would be among the most affected.

The content of B vitamins is also compromised by high concentrations of CO_2, with folic acid reduced by 30%.[145] Pregnant women with a folic acid deficiency have an increased risk of delivering a child with birth defects such as spina bifida.[146]

This alteration in the nutritional value of food due to climate change joins the consequences caused by soil depletion. When exploited and contaminated by pesticides as well as antibiotics and hormones from livestock farming, soil loses its biodiversity and ends up with an impoverished microbiome, as do the people eating the food harvested from poor soil. Increasingly sterile soils are leading to a drastic fall in micronutrients in plant species. The quality of forage fed to cattle is also losing its nutritional value and, as a consequence, the nutritional quality of meat is also being compromised.

Even though the climate crisis is threatening agricultural systems, and agricultural systems are contributing to causing the climate crisis, Slow Food believes that agroecological production models based on localized, ecological food systems and biodiversity can be part of the solution for many of the problems caused by a changing climate. These agroecological production models do not disrupt existing ecosystems. Instead they enhance agricultural biodiversity and improve resilience and adaptability, especially in the face of the threats caused by the climate crisis. For more information, see Slow Food's Climate Change and the Food System Position Paper.

Soil health, human health

The human microbial community, or gut microbiota, represents an ecosystem of a trillion microbial cells, most of which are found in the colon,[147] and it contains at least 100 times more genes than the human genome.[148] The term microbiome refers to the genetic material possessed by the microbiota, in other words the genes that the microbiota is able to express.[149]

The gut microbiota is crucial to human health. When unbalanced, it can cause numerous gastrointestinal diseases, but it also affects pathologies such as obesity, metabolic syndrome, atherosclerosis and cardiovascular, neurological and psychiatric diseases.[150]

The main factors that determine the human intestinal microbiome are genetic, but non-genetic factors related to diet and lifestyle are also important,[151] since the intestine's microbial community is very dynamic and microorganisms can be absorbed from food, water and the surrounding environment.

In this regard, the relationship between humans and soil is fundamental. As an important inoculant and supplier of beneficial gut microorganisms, soil has been essential in the evolution of the human gut microbiome. Extensive research suggests that contact with the soil and its

microbiome is beneficial for the health of the intestinal microbiota, and in fact soil is the most important factor that determines the formation of the intestinal microbiota, dominating even genetic factors.[152]

Indeed, humans have been consuming soil as a supplement to their otherwise nutrient-poor local diet since prehistoric times, a habit known as "geophagy."[153]

There are also functional similarities between the human intestine and the rhizosphere, the portion of soil that surrounds plant roots and from which they absorb water and nutrients essential for growth. Root hairs and the microvilli of the intestine contribute to modulating the absorption system, and implement similar strategies for the control of pathogens.[154] The intestine and the soil's rhizosphere are environments rich in nutrients of extraordinary importance for the health of the host, significantly improving its functioning and, above all, its natural resistance to stresses of all kinds.[155]

In the last century, the dramatic increase of urbanization has led to a significant reduction in the natural biodiversity of the environment in which city dwellers live and a lower exposure of the population to environmental microbes.[156] Today, more than half the world's population lives in urban areas, and by 2050 this is projected to grow to two-thirds.[157] Global urbanization has led to a loss of contact with the natural environment, with negative consequences on intestinal microbiome health and overall human health.

Modern hygiene standards and the use of antibiotics have reduced the risk of transmission of pathogens and consequently the burden of disease and mortality. However, excessive application of disinfection decreases the biodiversity of bacteria present in the environment, bacteria that also combat pathogens. A rich microbial diversity also helps protect against the onset of allergies and some autoimmune disorders.[158]

Recent studies on urban renewal point out the importance of a greater presence of areas with high biodiversity (green spaces and parks) which also favor greater contact with a diverse set of environmental microbes, contributing to the prevention of immune diseases and generally to the improvement of human health.[159]

The relationship between the gut microbiota and microbial vitality in the soil is also demonstrated by the greater richness of intestinal bacterial species in rural societies compared to urban communities. Types of agriculture that respect the soil have been shown to have significant beneficial effects on immune functions, in contrast to rural populations that practice intensive agriculture. Intensive agricultural practices, characterized by monocultures, chemicals, genetic modification and mechanization, reduce soil biodiversity, resulting in a lack of some micronutrients in the diet and an alteration of the human microbiota.[160]



An increased use of antibiotics in human and animal medicine (especially on factory farms) and increased meat consumption have contributed to a growing number of antibiotic-resistant bacteria, with negative consequences for human health and the environment.[161] In addition, the calorie-dense packaged processed foods typical of the Western diet, packed with sugar, salt and fat, alter the intestinal microbiome. This is in part due to the products used in industrial farming and the treatments applied to the raw materials after the harvest.[162] Conversely, a diet high in fiber and complex carbohydrates can preserve the gut's microbial wealth.[163]

There are virtuous examples of the development of symbiotic relationships. For example, the use of mycorrhizae in crop growing introduces specific fungi that establish close relationships with plant roots. This symbiotic relationship creates an environment favorable to useful microorganisms and unfavorable to pathogens and parasites. Mycorrhizae, which are known for their ability to improve the nutritional absorption of plants, are also capable of increasing the nutritional quality of foods, including the content of vitamins, minerals, antioxidants and other secondary metabolites. They can also help limit parasite attacks during storage, meaning fewer treatments are necessary to preserve the product.[164]

It is essential to support the biodiversity of soils to protect human health,[165] since there is a strong connection between healthy soil and a healthy gut microbiome and therefore a healthy body. And good regenerative practices in agriculture, such as increasing crop diversity, not only preserve and revitalize soil but can also be a solution to hunger.[166]

Human and animal health are closely connected, and in order to best preserve them, we need an approach that takes them, and environmental health, into account.

[166] In 2018, FAO Director-General José Graziano da Silva declared that "soil degradation affects food production, causing hunger and malnutrition, amplifying food-price volatility, forcing land abandonment and involuntary migration, leading millions into poverty" and he stressed the importance of sustainable soil management as an "essential part of the Zero Hunger equation." Source: Healthy soils are essential to achieve zero hunger, peace and prosperity. FAO. Accessed February 16, 2022.

Pesticides

The food production industry has long used chemicals, known as pesticides, to eliminate pests, including rodents, fungi, unwanted plants and insects.[167] The agricultural use of pesticides is a subset of the larger spectrum of modern industrial chemicals, which are numerous: In 1993, the American Chemical Society database identified 13 million chemicals, with 500,000 new compounds being added annually.[168] Unfortunately, these chemicals affect much more than their pest targets and have significant ecological and human health consequences.

Pesticide types

Pesticides are categorized by their purpose of use, and include herbicides to destroy unwanted vegetation, insecticides to eliminate unwanted insects, rodenticides to kill rodents, fungicides to prevent the growth and spread of molds and mildews and disinfectants to prevent the spread of bacteria. There are more than 1,000 different pesticides in use worldwide.[169] Herbicides account for almost 90% of all pesticides used in agriculture.[170] The amount of pesticides applied each year has been increasing for decades, growing by around 80% between 1990 and 2017, and is estimated to currently be at around 4 million tons worldwide.[171]

***Organophosphate** (OP) compounds are the most widely used pesticides. There are more than 100 existing compounds, including malathion, parathion, diazinon and chlorpyrifos. Extremely toxic when consumed, these compounds affect the central nervous system, including neonatal developmental, and can cause endocrine disruption, neurodegeneration, neuroinflammation and cancer.[172]*

***Glyphosate** is the active ingredient in Bayer-Monsanto's Roundup, and the most widely used herbicide throughout the world. Glyphosate kills broadleaf plants that compete with crops like cotton, corn and soy. Absorbed through foliage, and minimally through roots, it is transported to the growing parts and inhibits an enzyme involved in the synthesis of the amino acids tyrosine, tryptophan and phenylalanine. These amino acids, involved in protein synthesis, are critical to the life cycle of plants. Glyphosate can now be found in the majority of rivers, streams, ditches and wastewater treatment plants as well as in 70% of rainfall samples.[173] In 2015, the World Health Organization's International Agency for Research on Cancer (IARC), the gold standard in identifying carcinogens, concluded that glyphosate "probably causes cancer in humans."[174]*

***Neonicotinoids**, or neonics, are the fastest growing class of insecticides. They attack the nervous systems of insects and are highly toxic to bees. Although recently banned in the EU, emergency authorizations for the use of neonics are regularly granted to EU member states. Neonics are still used in other regions of the world, with the EU continuing to export them to low- and middle-income countries despite deeming them too dangerous for use in the EU.[175] Neonics became popular in the 1990s due to their comparatively low toxicity to mammals and humans, but there is a growing body of research linking neonics to the decline of wild and domesticated pollinators, including bumblebees and honeybees. Pollinators are essential to fruit, vegetable and nut crops.*



The human and ecological health effects of pesticides

By their very nature, pesticides are potentially toxic to other living plants, insects, animals and humans. Due to their widespread use in agriculture, they bring unintended consequences for the ecosystem and human health.[176]

Humans can be exposed to pesticides from food residues and in drinking water. Hazards from exposure can be short term (skin and eye irritation, headaches, dizziness, nausea) or chronic (cancer, asthma, diabetes). The level or dose of exposure, the combination of pesticides and the level of toxicity and the persistence of the pesticide are all factors that impact their effects. Research is still lacking regarding the potential additional harm of pesticide combinations, known as the "cocktail effect." To this day, most regulatory systems continue to conduct risk assessments on pesticides individually, ignoring the fact that pesticide cocktails can cause significantly more damage than individual pesticides.[177]

It is important to note that there are no groups in the human population that are completely unexposed to pesticides.[178] However, some groups experience greater exposure to pesticides, including farm workers. An estimated 385 million cases of unintentional acute pesticide poisonings occur annually worldwide, including around 11,000 fatalities. This means 44% of farmers are being poisoned by pesticides every year.[179]

Chemicals in synthetic pesticides can contaminate the air, water, soil and ecosystems. They can be transported by air, water runoff and soil runoff, because some of the chemical residue will be present in all forms.[180] The transport pathway or medium of exposure is determined by environmental fate properties, toxicological endpoints, environment characteristics and the amount of a chemical used.[181]

Though generally sprayed on land, pesticides can turn into a vapor or gas and be transported through the air. After a heavy rain, pesticides can end up in lakes, rivers, streams and the ocean and even leech into the groundwater, the source of our drinking water. Even at levels deemed safe, pesticides have been shown to cause a loss of biodiversity, including reducing populations of beneficial insects, as well as birds and amphibians.[182] Many of the less expensive (off-patent) pesticides such as DDT can remain in the soil and water for years and accumulate in the food chain.[183]



Climate change can impact the distribution and toxicity of pesticides. For example, temperature, precipitation and extreme weather changes can impact the distribution and concentration of pesticide residues. Studies suggest that "increases in temperature will enhance the toxicity of contaminants and increase concentrations of tropospheric ozone regionally, but will also likely increase rates of chemical degradation."[184] Furthermore, areas with more precipitation will have greater run-off of pesticides. Increases in the frequency and intensity of storm events caused by climate change could result in the severe chemical contamination of bodies of water and watersheds. Moreover, "climate change coupled with air pollutant exposures may have potentially serious adverse consequences for human health in urban and polluted regions."[185]

It is essential we eliminate or reduce the use of pesticides, in particular highly toxic pesticides, and shift towards diversified agroecological food systems, based on agrobiodiversity, with lower dependency on external inputs, allowing farmers to replace chemistry with biology.

Biodiversity and pandemics

Many of the so-called emerging diseases that have affected large areas of the planet in recent years, such as Ebola, AIDS, SARS, swine flu and avian flu, are not random catastrophic events, but the consequence of human activities on nature. The recent arrival of SARS-CoV-2, or Covid-19, may also be a consequence of the close relationship between people and wild animals, though there is not yet sufficient evidence to say for sure. What has been proven is that increased epidemics are associated with decreasing biodiversity, as deforestation, extractive industries (including logging and mining), the introduction of invasive species, urban development and agricultural intensification increase contacts between wildlife, domestic animals and humans, encouraging the spread of zoonotic diseases.[186]

The infectious diseases mentioned above share a zoonotic origin as they are all transmitted by animals, especially wild animals. More than 60% of human infectious diseases originate in animals,[187] while land use change, food production and the agricultural sector are responsible for nearly half of all emerging infectious diseases (EIDs),[188] infectious diseases whose incidence has increased in the past 20 years and may increase in the near future.[189]

Certain viruses are endemic in wild animal populations but generally do not have particularly widespread consequences, as species with a high genetic diversity can sustain a high diversity of pathogens.[190] However, these viruses can threaten human health when spillover occurs, in other words "the process by which a pathogen moves from one host population (or environmental reservoir) to another host population."[191] The pathogen can move directly between the wild species and humans or via intermediate hosts, such as domestic and farm animals.

For centuries, the existence of natural barriers prevented the spread of viruses. Large forests, populated by very rich biodiversity, prevented the transmission of viruses through the so-called "dilution effect": The viruses were blocked by finding many obstacles to propagation in non-receptive species.[192]

The growing global demand for food and natural resources and consequent human activities have led to important environmental changes, such as the loss of large expanses of habitat to make space for intensive animal farming and other agricultural activities. Massive deforestation causes the destruction of forests and natural habitats that are home to a wide biodiversity of animal and plant species who host numerous unknown viruses. The destruction of these ecosystems involves the release of viruses from their natural hosts, which can then find their new host in humans. We also now have increased possibilities of contact between humans and wild animals, due to the construction of roads and settlements, greater mobility of people to remote regions and inadequate socioeconomic conditions and food shortages leading to the capture of wild animals.[193]

Since 1990, it is estimated that 420 million hectares of forests have been lost through conversion to other land uses.[194] The most affected are tropical regions where the primary forest is devastated by deforestation, the development of plantations and the extraction of minerals, gas or oil. Due to deforestation, countless wild species of animals are killed, or settle in urban areas, while others, through legal or illegal trafficking, are taken to "wet markets," markets that sell fresh meat and fish and other perishable products. These markets, characterized by precarious sanitary conditions, have all the favorable conditions for the outbreak of new epidemics.[195]

While the destruction of habitats and biodiversity creates favorable conditions for the emergence of zoonotic diseases, the creation of artificial habitats or environments poor in nature and with a high human density can further facilitate their spread.[196]

The risk and impact of infectious diseases is not limited to urban environments. But environments with a high population density have a greater potential for the spread of and maintenance of pathogens. Worldwide, more than 800 million people live in slums, where the overcrowding and inadequate hygienic conditions favor the spread of viruses.[197]

Numerous studies show that the expansion of intensive animal farming increases the risk of spreading zoonoses exponentially. This happens when farms are located on the edge of forests, wetlands and other natural areas with high biodiversity, where the opportunities for contact with wild animals are greater. The intensification of animal farming generally involves a high density of animals, an overuse of antibiotics and low genetic diversity among individual animals. These are the ideal conditions for the spread and evolution of pathogens, especially between genetically similar breeds or in immunosuppressed animals. Farmed animals often play a role as an intermediate host for the transmission of zoonoses from wild animals to humans and in some cases as an amplification host, i.e. an organism in which a virus or other pathogen multiplies (and from which it spreads) in extraordinary ways. One example is the Nipah virus, which appeared in humans in Malaysia in 1998, and had the fruit bat as a natural reservoir. The conversion of a portion of forest for intensive pig farming allowed bat-pig contact and the subsequent transmission from pigs to humans.[198]

If no brakes are placed on human activities, the disruption of natural habitats, deforestation, the uncontrolled development of intensive farming and the destruction of biodiversity will create the conditions for many new viral emergencies on a planetary level. Safeguarding biodiversity means protecting humanity from new pandemics.[199]

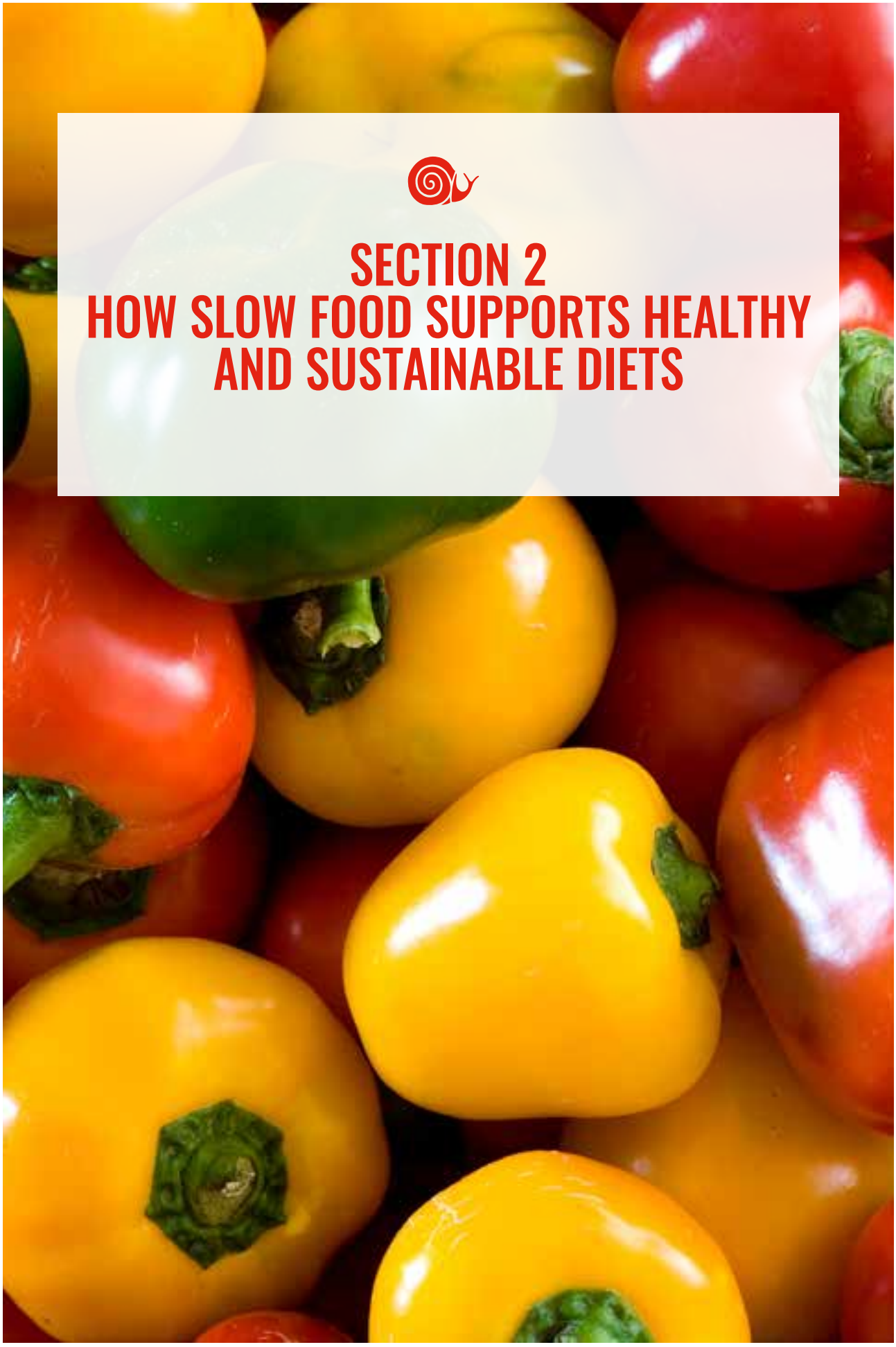
The Covid-19 pandemic and food insecurity

The spread of pandemics can severely undermine food security, as witnessed by the Covid-19 pandemic, which exposed the vulnerabilities of the current food system. From food production, distribution, trade and retail to restaurants and food purchasing, the whole food system has been and continues to be impacted by the Covid-19 virus.

According to FAO (2021) the number of people facing hunger in 2020 was severely affected by the pandemic, with approximately 118 million more people going hungry in 2020 than in 2019. Close to 148 million more people were severely food insecure in 2020 compared to the previous year.[200]

The Covid-19 pandemic exposed the inequalities of our current political and economic system, which ultimately affects our food system. The economic slowdowns and downturns caused by the pandemic, coupled with persistent high levels of income inequality, caused millions of people around the world to suffer from food insecurity and different forms of malnutrition. The FAO estimates that healthy diets, which tend to be more costly, have been out of reach for more than 3 billion people.[201]

During the pandemic, the Slow Food network proved to be a strong and united community, coming together to support those most in need. The Slow Food Heroes project collected and celebrated virtuous initiatives developed in response to the Covid-19 emergency, inspiring others. These food-related good practices across Europe help strengthen a feeling of solidarity in a time of emergency and give hope for the future, inspiring new paths to fight the crisis and take action to build a more cohesive and community-oriented society. More information on the Slow Food Heroes project can be found here.



SECTION 2
HOW SLOW FOOD SUPPORTS HEALTHY AND SUSTAINABLE DIETS

Introduction

Feeding the planet while guaranteeing good, clean and fair food for all can only be done by starting from biodiversity and drastically changing a dominant food production model that has generated countless environmental and social disasters and undermined the foundations of food security for present and future generations.[202] By now, all the most authoritative international institutions have recognized the crucial value of biodiversity and its close links with food. FAO's "The State of Global Biodiversity for Food and Agriculture" report declares that "biodiversity for food and agriculture is indispensable to food security" as well as "a key resource in efforts to increase food production while limiting negative impacts on the environment" and in reaching the 2030 Agenda Sustainable Development Goals (SDGs).[203]

Since Slow Food was founded, the defense of biodiversity has always been at the center of its mission. Taking a One Health approach[204] to our food systems and working to defend biodiversity, Slow Food is contributing to improving the health of people, animals and ecosystems.

The health of a society is closely related to the ways in which food is produced, distributed and consumed. Sustainable and healthy diets become more common in the population if, at the same time, access to quality food increases.

This section of our position paper describes how the safeguarding and consumption of traditional and local varieties and breeds and the promotion of small-scale production, short supply chains, local markets and food gardens can help ensure the food security and health of people, especially the poorest and most vulnerable. It presents original research conducted by Slow Food and findings in the literature that analyze the nutritional content of Slow Food products (Slow Food Presidia). It also looks at the main Slow Food initiatives, such as food gardens and local markets (Earth Markets), that support local communities and ensure healthy and sustainable diets by protecting biodiversity, putting consumers in direct contact with producers of fresh, local, seasonal foods and creating spaces and events to educate consumers of all ages, as well as producers and professionals in the food sector.

With its programs, Slow Food aims to raise awareness about the food system and empower consumers to become active participants in their healthy and sustainable food choices. By reconnecting with food, producers and the local area and becoming informed eaters, consumers will help make a positive impact on the larger world of food and farming and will contribute to their own health, the health of animals and the health of the planet.

FOOD BIODIVERSITY AND HEALTH

Food biodiversity, understood as the diversity of plants, animals and other organisms used for food, contributes in various ways to a healthy and diversified diet.

The use of local edible food plants benefits food security and therefore social stability and the sustainability of food production environments through increased biodiversity and land stewardship. They also make it possible to do more with less, relying on improving the productivity of the agricultural system through better management, biodiversity and improved soil health rather than the use of external inputs such as imported nutrients, pesticides, chemicals and non-native varieties.

Food composition studies show that there can be important differences in nutrient content (macro- and micronutrients) not just between different species but even between cultivars of the same species, and that wild species generally have a higher nutrient content than domesticated varieties.[205] The differences in nutrient composition can sometimes be quite surprising and can have important implications, allowing vulnerable populations to meet their nutritional needs. For example, a banana variety from the Pacific region, Asupina, has such high levels of carotenoids (precursors of vitamin A) that a preschooler consuming a single banana (about 77 grams) will meet half of their daily requirement of vitamin A. They would need to consume a kilogram of Williams bananas (which belong to the Cavendish group, the most consumed banana variety in the world) to get an equivalent amount of vitamin A.[206]

Some analyses have shown that consuming 200 grams of rice per day can provide anywhere from 25% to more than 65% of an individual's recommended daily protein intake, depending on the variety.[207]

Native species have typically adapted to the environmental conditions in their area and often have less need for external inputs—such as water, fertilizers and pesticides—because this makes them more resistant. Environmental stresses such as high temperatures, water deficits, cold damage and soil salinity cause the production of free radicals (reactive oxygen species, ROS), capable of damaging the plant's DNA. To defend themselves, plants implement resistance mechanisms that involve the production of molecules with antioxidant capacity (ascorbate, glutathione, tocopherols, carotenoids, flavonoids). These are secondary metabolites, and some of them can be toxic to herbivorous animals and pathogenic microbes. These molecules are not essential for the growth, development or reproduction of the organism, but are of fundamental importance for the ecological interactions between the plant and its surrounding environment.[208,209]

By consuming native plant species that have developed defenses against environmental conditions or external agents, we can increase the content of protective substances in our diet, like terpenes; extremely important molecules such as carotenoids and vitamin E; phenolic compounds (including flavonoids); alkaloids and compounds that contain nitrogen and sulfur, all with remarkable antioxidant activity. Over the long term, diets rich in plant polyphenols help to reduce the risk of cancer, cardiovascular diseases, diabetes, osteoporosis and neurodegenerative diseases[210] and prevent DNA damage caused by the action of free radicals.



The same goes for animal foods: The literature shows that there are significant nutritional differences between different species of animal. For example, some native fish species are an important source of protein and have a higher content of vitamins and minerals, such as iron and zinc, than farmed exotic species.[211] Particularly in developing countries, favoring the consumption of wild and gathered food from aquatic habitats allows the local population to have a more diverse and balanced diet, improving food security.[212]

Slow Food promotes agroecology, "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."[213] Agroecology promotes and strengthens the interactions between plants, animals, humans and the environment and supports socially equitable food systems. More than just a set of agricultural practices, it can play an important role in changing social relationships, empowering farmers and privileging short productive chains.[214] When they follow agroecological principles, farmers are able to adapt to climate change and contribute to the sustainable use and preservation of natural resources and biodiversity.[215]

According to FAO, agroecology has ten elements: diversity, synergies, efficiency, resilience, recycling, co-creation and sharing of knowledge, human and social values, culture and food traditions, responsible governance and the circular and solidarity economy.

These elements can help countries to put agroecology into practice and guide policymakers, practitioners and stakeholders in planning, managing and evaluating agroecological transitions.[216]

Although FAO underlines the crucial role of agroecology in developing countries, there are many models of agroecology also available in developed agriculture.[217]

Agroecology conserves agrobiodiversity or agricultural biodiversity, "the variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries."[218]

Agroecological systems improve soil fertility, enhance crop diversity and are better able to resist pest and disease attacks, so they reduce the need for external fertilizer or pesticide inputs and minimize pollution. As a consequence, agriculture can be more resilient and therefore better able to feed the growing population and address malnutrition in all its forms. In addition to ensuring food security and mitigating climate change, agroecology brings solutions to multiple SDGs in areas such as health, education, gender, water, energy and economic growth.[219, 220, 221]

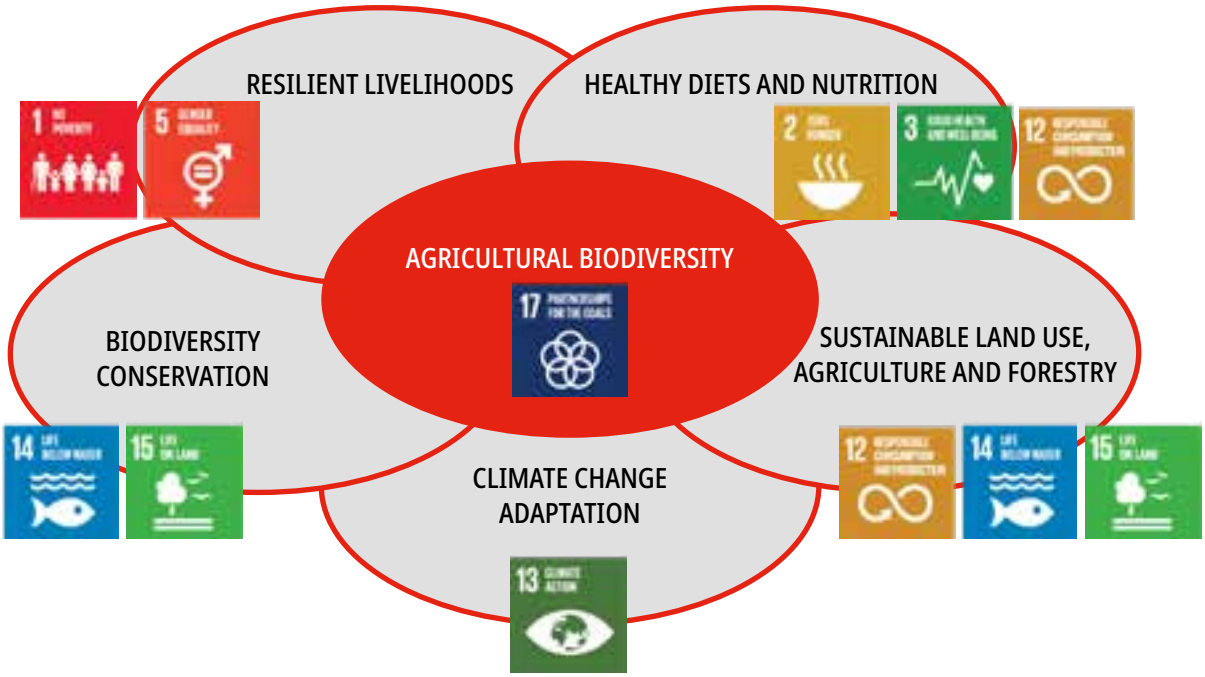


Figure 3. Agricultural biodiversity contributes to multiple sustainability dimensions and development goals. Infographic adapted from Bioversity International (2017).

"Zero residue" food

A "zero residue" or "residue-free" food does not always mean a healthy food for the consumer from a systemic point of view because this definition does not certify that synthetic chemicals have not been used during production, but only that at the moment of consumption there are no residues in the food or, as is often the case, that the residue is below the defined limit. Adverse effects on human and animal health have been scientifically proven even below these thresholds.[222] Looking at the food-health relationship in a systemic way means looking not only at the intrinsic quality of a food but also at the way it is produced in relation to the preservation of the environment. A food defined as "zero residue," therefore, may be only partially healthy: It might be healthy to consume it directly but not in terms of the environmental pollution caused by its production.

In the many countries around the world where it works, Slow Food focuses its activities on the preservation of agrobiodiversity, as it contributes to food security and represents a source of healthy, nutritious food linked to cultural traditions.

Slow Food's activity in this field has always been aimed at the conservation of biodiversity in a dynamic way that respects the natural genetic variability that occurs from year to year, especially for species propagated by seed. In order to preserve agrobiodiversity, it is therefore necessary to protect the strong relationship between variety, place and community; this also allows an enhancement of the specific nutritional and nutraceutical characteristics of foods,[223] which are combined with cultivation models respectful of the environment and, therefore, of consumers' health.

Slow Food's conservation of agrobiodiversity is carried out through all the projects developed in the countries where the association operates. Of these, the Ark of Taste and the Presidium programs are focused on specific foods.

The Slow Food Presidium project

The Slow Food Presidium project was first launched in 2000 in response to the urgent need to save food biodiversity. Initially, products at risk of extinction were being mapped in order to create a virtual catalog, the Ark of Taste, which gathers together edible plant varieties, animal breeds, breads, cheeses, cured meats, sweets and other food products from across the globe. This list still exists and continues to grow every day,[224] but with the Presidium project, Slow Food shifted from creating a catalog to implementing concrete action in the field with the direct involvement of food producers. Each Presidium represents a community of producers inspired by the Slow Food philosophy, a traditional food product, a place, a cultural heritage and a legacy of knowledge, and is a virtuous expression of the most diverse cultures, ecosystems and landscapes. Slow Food Presidia follow the principles of agroecology, respecting the soil, water, animal welfare and biodiversity, including the invisible biodiversity of microflora and the cultural biodiversity of wisdom and skills. They try to reduce the environmental impact of food production to a minimum, avoiding the use of pesticides, antibiotics, preservatives and artificial additives and colorings. They also use detailed labels that describe every step of the production process.

To support the producers from its 600-plus Presidia,[225] Slow Food organizes training activities, promotes products at events and fairs, networks them with other actors (cooks, experts, universities, journalists), encourages direct sales (through buying groups or Earth Markets) and tells the stories of products, producers and places through all of Slow Food's communication channels and on narrative labels. Various studies of the results obtained by the Presidia, carried out in collaboration with the universities of Turin and Palermo and based on over 50 quantitative and qualitative indicators, have shown how Slow Food's activities have had extremely positive economic, environmental, social and cultural impacts.

[223] A "nutraceutical is a substance that may be considered a food or part of a food which provides medical or health benefits, encompassing prevention and treatment of disease." Source: Dudeja P, Gupta RK. Nutraceuticals in Food Safety in the 21st Century. Academic Press. 2017:491-496.

[224] At the beginning of 2022, the Ark of Taste catalog included 5,688 products, distributed in 150 countries. For further information: The Ark of Taste project.

[225] At the beginning of 2022, there were 622 Slow Food Presidia in 79 countries. For further information: The Presidia project.



In addition to assessing the economic, environmental, social and cultural impacts of the Presidia, over the last 10 years Slow Food has also been investigating the impact of Presidium consumption on consumer health. In collaboration with universities and analysis laboratories, it has carried out a series of nutritional analyses on animal and plant products.[226] This section contains many examples of research carried out on Presidium and Ark of Taste products.

For each food group covered in the following chapters, case studies from among the Presidia highlight the relationship between food biodiversity and human health.

Food products of plant origin

The production of plant species is fundamental for human nutrition. Recently, policies to promote the importance of these foods to human health have been very active in different parts of the world, with the United Nations declaring 2021 the International Year of Fruits and Vegetables.[227]

Globally, the production of fruits, vegetables and cereal grains is extremely widespread and closely intertwined with the globalization of agrifood production. Fruits and vegetables are constantly shuttled between the two hemispheres, showing the agrifood industry's ever-decreasing attention to seasonality and environmental sustainability. The forced availability of some fruits and vegetables throughout the year represents an obstacle to the strengthening of sustainability policies.[228]

The seasonality of agrifood products is very important to the relationship between food and health. Seasonality derives from the biology of the variety of fruit, vegetable or grain. Every species has its own seasonality, and, within a species, every variety has different production times in the field, mainly determined by genetic characteristics and the natural relationship between the variety and the environment. From this comes the importance of respecting environmental suitability: Each variety thrives where it is best acclimatized, and when a variety thrives it produces healthier, more nutritious produce with a lower environmental cost, without requiring high external energy inputs. Ultimately, these are the best varieties to use when applying the principles of agroecology.[229]

On a global level, small-scale farmers have been able to preserve varieties through seed reproduction and respect for the natural genetic variability that plant varieties have from year to year. This commitment has allowed the preservation of many varieties and ecotypes that represent an important cultural and economic tool for rural areas.[230]

[226] Some of the organizations involved in analyzing Slow Food Presidia include the University of Gastronomic Sciences, Pollenzo (Italy); Chamber of Commerce Chemical Laboratory, Turin (Italy); Mérieux NutriSciences (Italy); Ospedale San Giovanni Bosco ASL TO 2, Turin (Italy); Ospedale Mauriziano, Turin (Italy).



Fruits and vegetables

Fruits and vegetables are highly nutritious. Essential components of our diet, they are key to the preservation of human health. Despite their low to medium caloric contribution, they have high concentrations of vitamins (especially A, C and K), as well as minerals, fiber and other functional substances. These nutrients contribute to a series of beneficial effects within the human body, including inhibiting obesity and strengthening the immune system as well as many anti-inflammatory, antioxidant and hypotensive actions.[231]

There is abundant scientific research on the effects of fruit and vegetable intake. Fruits and vegetables are the main sources of fiber in the daily diet, helping to reduce cholesterol levels and regulate blood pressure. What's more, fiber brings a faster sense of satiety, making it indirectly helpful for weight loss or maintenance. The most recent studies have shown a positive relationship between the consumption of fruits and vegetables and the functional capacity of the intestinal microbiota, helping to prevent cancers of the gastrointestinal tract as well as chronic inflammatory diseases. The immune system is strongly boosted by a functional microbiota, ensuring, thanks to the presence of fiber, a microbiome effective in the production of vitamins and functional compounds.[232]

Fruits and vegetables are also an extraordinary source of vitamins, minerals and functional substances such as phenolic compounds with high antioxidant power. These compounds are very important for the regulation of cell cycles, which can counteract the progression of cancer as well as infectious diseases. While they do not have a direct effect against diseases of viral origin, they can contribute significantly to the recovery phase, with a balanced diet strengthening the immune system.[233]

Nuts, like walnuts, hazelnuts, almonds and others, have the advantage of being free from seasonal constraints. The edible parts are the seeds; with a moisture level below 10% they are capable of being preserved for more than 12 months, especially when kept in the shell. Nuts are rich in protein, fiber, vitamins (folic acid, niacin, vitamin B6), minerals (calcium, magnesium and potassium) and phenolic compounds such as phenolic acids, flavonoids, lignin, hydrolysable tannins and proanthocyanins. Moreover, nuts contain unsaturated fatty acids (oleic and linoleic acids, in particular) with anti-inflammatory and cardiovascular-protecting properties and have a low content of saturated fatty acids. They also feature functional substances such as phytosterols and tocopherols, which have a role as antioxidants.[234]

Scientific studies have shown that processing fruits and vegetables before consumption can significantly alter their nutritional and nutraceutical characteristics and, therefore, their effects on health. Plant products that are less processed and with little physical treatment better preserve their characteristics, while substandard processing or storage can cause them to lose their nutritional properties and even become harmful.

A short supply chain—e.g. direct sales, alternative food networks, farmers' markets—is best able to preserve the characteristics of fruits and vegetables until consumption. Refrigeration and freezing are useful tools to ensure longer preservation, but they also risk being used to evade seasonality. The cold chain can, however, limit the degradation of nutrients.[235]

The nutritional power of plant foods changes as a consequence of cooking or processing, including with the addition of sugars, sodium, trans fats or saturated fats.[236] Lengthy cooking can lead to the loss of some nutritional substances, particularly minerals and vitamins, which are degraded at high temperatures. When possible, raw is the best way to consume many fruits and vegetables. When cooking, steaming should be the preferred method in order to best maintain the original characteristics as much as possible.[237]

Legumes

Among edible plants, legumes (beans, lentils, chickpeas, etc.) are an excellent systemic source of nutrients, offering proteins with essential amino acids, complex carbohydrates and dietary fiber. They also have no cholesterol, are generally low in fat and provide essential minerals and vitamins.[238] Protein, fiber and carbohydrates make these foods capable of giving a sense of satiety by lowering the level of glucose in the blood and providing fiber and protein.[239]

When it comes to micronutrients, legumes are generally rich in vitamins, such as those belonging to the B complex (including folate, thiamine and niacin), as well as some key minerals such as potassium, phosphorous, calcium, magnesium, iron and zinc. Phenolic compounds are the most bioactive substances present in legumes: mainly flavonoids, tannins, and phenolic acids, with multiple beneficial and antioxidant properties. Among these the most important are anthocyanins and anthoxanthins.[240]

A legume's composition of macronutrients (protein, carbohydrates, fat) and micronutrients (minerals and vitamins) can vary according to the variety, growing location, climate, soil and other environmental factors. Starch is the main complex carbohydrate found in peas and beans, which are low in fat-soluble vitamins (vitamins A, D, E and K) and rich in water-soluble vitamins (B complex and vitamin C). Interest has been growing in legumes recently as they make a good replacement for animal protein, particularly when eaten with grains, as they traditionally are in many cultures. The proteins in grains and legumes complement each other, improving protein quality and meaning they are as easily assimilated by our body as protein from meat.[241] This drives our promotion of a lower consumption of meat, especially from unsustainable farming methods, and a greater consumption of legumes.

Legumes are also highly efficient to produce. Members of the Leguminosae family are able to fix nitrogen autonomously, leaving the soil richer in nutrients at the end of their cultivation cycle. This makes legumes useful when applying agroecology principles, both for production and as cover crops.[242]

Cereal grains

Human nutrition has always been closely linked to the cultivation and consumption of cereal grains.[243] Rice, wheat and corn are three crops fundamental to the global diet that together are responsible for about 35% of the human caloric intake. These crops have been subject to continuous improvement to increase yields, by reducing their size, making them better suited to higher-density sowing and processing technology, selecting higher-yielding varieties and intensifying agriculture. Since World War II, global wheat production has been based on monocultures, supported by chemical fertilizers, pesticides and herbicides.[244]

Research on wheat has led to profound changes to the landscape of varieties. Those cultivated in the first half of the 1900s had particular morphological characteristics, such as a very tall stem which allowed plants to grow up to a meter or more. When agribusiness realized chemical fertilizers could be used to increase production, an increased yield meant the plants were more susceptible to lodging, a bending of the stem which does not damage the grains but makes the mechanization of harvesting practically impossible. This led to a sustained bout of genetic improvement, aimed at lowering the size of the plants in order to allow more use of fertilizers and double the yields. Meanwhile, the processing industry, especially for bread and pasta, demanded more technologically advanced wheat capable of withstanding machine processing. This meant increasing the percentage of proteins, particularly gluten, which is a protein complex formed from gliadin and glutenin in the seed.[245] As a result, a series of recent varieties were developed with a high protein content, primarily thanks to the development of gluten, which over time has been shown to be not ideal for extensive daily consumption. Recently, several studies have analyzed differences in gluten protein composition between ancient and modern wheat varieties.[246, 247] Different health effects could result not only from different amounts of gluten, but also its quality.[248] While further studies are still needed to verify the proposed hypotheses, what is certain is that the popularity of gluten-free diets, adopted by people suffering from celiac disease or gluten intolerance but often fueled by food fads and bloggers, has led in recent years to a rediscovery of traditional grain varieties. Often these are little cultivated because of a lower yield per hectare, but they are increasingly recognized as being healthier.

The application of agroecology principles to the production of wheat, both *Triticum durum* and *Triticum aestivum,* is on the rise, and is linked to traditional processing through milling systems that respect the raw material and its components, without excessive refining. Choosing whole grains instead of refined grains ensures a better micronutrient intake, since bran and germ, eliminated during refining, are excellent sources of fiber, minerals, vitamins and antioxidant substances.[249] Consumption of whole grains has been linked to a reduced risk of chronic diseases, including cardiovascular diseases and obesity.[250]

The genetic improvement of corn has also been particularly invasive, with the selection of varieties aimed at maximizing yields without enhancing local specificity or environmental suitability. Globally, corn has suffered more than any other cereal due to the spread of hybrid seeds. These are able to provide high yields, but often the seeds produce non-productive plants in the second generation. In many parts of the world this has led to a monopoly of seed companies and farmers losing sovereignty over their own seeds. Instead, they are forced to purchase hybrid seeds to meet the demands of customers, and cannot reuse part of their harvest. Then there is the issue of GMOs, which greatly threaten biodiversity linked to the modified species but also environmental and social sustainability due to an indiscriminate use of herbicides.[251] See Slow Food's Position Paper on Genetically Modified Organisms.

Corn remains one of the world's main food sources, with high amounts of bioactive compounds that provide desirable health benefits. These health benefits come not only from its basic nutrients such as carbohydrates, vitamins and minerals, but also from unique phytochemicals such as phenols.[252, 253]

The agrobiodiversity of grains is strongly linked to the places where they are grown and the communities who preserve and use them. Some cereal grains can naturally be black, purple, blue, pink, red or brown. These grains are particularly important because the coloration can indicate specific anthocyanins that mean they can be transformed into functional ingredients with potential positive effects on consumer health.[254]

Slow Food and plant foods

Nutritional value of Presidium and Ark of Taste products

An ancient variety of corn survives in the French Basque Country: Known locally as Arto Gorria, Basque Grand Roux corn is a Slow Food Presidium. In traditional farming systems, it was always cultivated together with beans, and is used to make cornbread, polenta and tortilla-like talo as well as to feed livestock.

Nearly abandoned at the beginning of the 20th century, when local farmers began to switch to more productive American varieties, Grand Roux corn reappeared in the 1990s thanks to the careful reproduction of seeds. Now it is greatly appreciated for its excellent sensory qualities.

Compared to the most common varieties, hybrids or American, it is lower in starch (56.2g/100g), sugars (0.91g/100g) and carbohydrates (57.1g/100g). When ground into flour, the starch content increases slightly (62.9g/100g), as do the sugars (1.50g/100g) and carbohydrates (64.4g/100g). The protein content is 5.8g and 6.9g/100g respectively in the kernels and the flour. The flour has a fat content of less than 2.5g/100g, 30% less than the most common commercial varieties.[255]

Millo Corvo (crow corn), included in the Ark of Taste catalog, is an unusual variety of corn, named for its black kernels. One of the first corn varieties to be cultivated in the north of Spain, back at the beginning of the 17th century, it has always been very important locally for the food security of rural communities.[256] Besides having excellent nutritional characteristics (though within the average of other local Spanish varieties) the variety also has a very high content of phenolic substances in its flour, which is how it is most commonly used in the traditional cuisine. Analyses have revealed a much higher content of anthocyanin, as well as flavonols and phenolic acids, compared to other commercial varieties, consequently giving it important antioxidant properties.[257]

One of the annual species most widespread in the world is sesame (*Sesamum indicum* L.) which has found different areas of cultivation worldwide. The plant produces very small oily seeds, which are eaten whole, pressed into oil or made into other products which are used in many traditional food preparations.[258] Thanks to its international nature, it has become a highly globalized product, often processed industrially and subjected to rapid drying that does not ensure that its quality is maintained. Slow Food is working on reviving the agricultural traditions related to this species in Ispica, on the Italian island of Sicily.

The Ispica sesame variety was selected two centuries ago by farmers and produces small, amber-colored seeds with an intense flavor. The cultivation area was once rich in marshy land that

[253] Corn is a staple of our diet, often highly processed and transformed into an invisible and ubiquitous ingredient. Along with soy, it is the basis of nutrition for intensively farmed animals, including fish. It is also used in a huge range of industrial packaged goods for a variety of purposes, though often not listed in the ingredients as "corn" or "maize." Read more.

[255] Basque Grand Roux corn Presidium analyses were performed by the Turin Chamber of Commerce's Chemical Laboratory in Italy on a sample of flour and grains of Basque Grand Roux corn (Arto Gorria) from the Association Ble Haize Berri Ostabat-Asme (France) and compared with data in the literature: Gwirtz JA, Garcia-Casal MN. Processing maize flour and corn meal food products. Ann N Y Acad Sci. 2014;1312(1):66-75. doi:10.1111/nyas.12299

would dry up during the spring but keep the perfect moisture level for sowing, without the need for irrigation. When it comes to nutrition, it has a very low content of carbohydrates from simple sugars (< 1g/100g)[259], while calcium, iron, magnesium and potassium are contained in quantities quite similar to those reported in the international literature. With the same caloric content, Presidium Ispica sesame has over 20% higher (22.7 compared to 18.08g/100g), a lower ash content (3.6 compared to 5.4g/100g) and a slightly higher fat content (53.1 compared to 50.01g/100g). Moreover, the lipid component was overall higher for both saturated and unsaturated (mono and polyunsaturated) fatty acids, but the ratios between polyunsaturated and saturated remained almost unchanged and assimilated.[260]

Slow Food Presidium legumes have also had their high quality and nutritional characteristics confirmed. The Swabian Alb is a semi-mountainous region in Germany between Baden-Württemberg, Bavaria and the Alpine foothills, an area characterized by volcanic soils which give the local agricultural products unique characteristics. Lentils have been cultivated here since ancient times, and became the region's main crop and an identity-shaping food. But in the second half of the 1900s, the cultivation of legumes was slowly abandoned, due to a lack of profitability and changing food consumption patterns. As a result, seeds of traditional lentil varieties were lost until 2006, when two researchers found Späth's Albllinse 1 and Späth's Alblinse 2 seeds in the gene bank of the Wawilow Institute in St. Petersburg. The Slow Food Presidium Swabian Alb lentils require a long process of drying and cleaning, but the favorable combination of soil, climate and local knowledge give them an excellent sensory and nutritional quality. Protein content is high (26.2g/100g)[261] while the average can be between 15 and 20% lower.[262, 263] Similarly, fiber reaches high levels (29g compared to an average of 12g/100g) as well as fats (1.5 compared to 1.0g/100g) while there are no particular differences for minerals and carbohydrates.[264] These results show extraordinary health benefits that are the result of specific genetic characteristics as well as a link to a cultivation area that makes it possible to grow an excellent product. However, it should be noted that the literature is extremely diverse due to a wide genetic variability among lentils around the world. Moreover, many values need to be further investigated after cooking, because the transformation process significantly affects the nutritional quality of the product. This complicates objective evaluations even more since it is hard to compare cooking methods, especially when they are derived from traditional models.[265]

Another legume of interest is the Öland Island brown bean. A Slow Food Presidium was created to protect these beans, which have been grown in the sandy soils of a Swedish island for centuries.[266] Their cultivation became more specialized in the early 20th century, but then improved international varieties became more common, which are more productive but also less characteristic in terms of nutrition and sensory qualities. Öland Island beans have a high phenolic content with specific antioxidant power. Flavonols, in particular, reach levels not present in other commercially known varieties, testifying to a significant nutraceutical value.[267] Some international studies have also shown that these beans retain the highest polyphenolic content after cooking (513 µg/g d.w.)[268] while for other varieties these bioactive compounds decrease by more than 70%. In addition, the beans have been shown to have high levels of vitamin B6 and water conservation.[269]

[259] Ispica Sesame Presidium analyses were performed by Mérieux NutriSciences in Italy on a sample of Ispica Sesame from Azienda Agricola Gambuzza Antonino, Ispica (Italy) and compared with data in the literature.

[261] Slow Food Presidium Swabian Alb lentils Presidium analyses were performed by Mérieux NutriSciences in Italy on a sample of Swabian Alb lentils from Lauteracher Alb-Feld-Früchte, Lauterach (Germany) and compared with data in the literature.

Slow Food Presidium legumes in space

Cortereggio Canavese Piattella beans, Ustica lentils, Carpino broad beans and Murgia Carsica black chickpeas are four Italian Slow Food Presidium legumes with excellent nutritional characteristics, like levels of fiber four times greater than analogous, more common products.[270] These four products were used to make a ready-to-eat soup that was sent to the International Space Station (ISS) in 2014 as part of the "Futura" mission. This dish, combining the latest technology and gastronomic tradition, was able to meet the astronauts' nutritional needs and the demands of space, maintaining the food's original form and sensory aspects. As a result, the act of eating regained its link with pleasure and tradition.[271] Inspired by the soup, on Terra Madre Day 2014 astronaut Samantha Cristoforetti sent a message to the whole planet about the importance of choosing food that is healthy, sustainable and enjoyable, in space as well as on Earth.[272]

Slow Food has supported the creation of a network of Italian producers, cooks and activists united around the issue of legumes, called Slow Beans. The network has grown over the last decade, spreading around Italy, and is about to become international. The Slow Beans network works to safeguard legumes and increase their consumption, first by growing them and then by organizing various initiatives, such as promotional events (like the annual Slow Beans gathering) and campaigns (like the recent Let It Bean!, addressed to local mayors) in partnership with other organizations, such as Meatless Monday.

The benefits of nuts have already been mentioned above. Slow Food has always been particularly active in identifying nuts with a strong link to their local area that are particularly at risk of disappearing or losing their original genetic make-up. Among these is the Bleggiana walnut, a Slow Food Presidium. The small but particularly spicy and aromatic fruit is protected by a fairly soft shell. Walnut trees are a vital element of the landscape around Bleggio, in northern Italy, and the walnuts have long been used to make typical sweets, breads and liqueurs. They even used to be exported far from their cultivation area, until they were replaced by more productive, globalized, non-local varieties. Bleggiana walnuts are characterized by valuable nutritional characteristics:[273] While they have the same calorie and protein content per 100 grams compared to the common varieties on the market, they have a very high level of iron (15.9mg/kg), manganese (1490mg/kg) and potassium (3,350mg/kg). Moreover, with the same fat component (62.4g/100g), the contribution of saturated fatty acids is lower (5.84g/kg, respectively), showing the reason why this variety has always represented an important component in local diets. However, it is necessary to consider that the great variability of genotypes selected in the world that make up the biodiversity of the different countries where walnuts are cultivated makes such a precise comparison complex.[274, 275, 276]

Toritto almonds are grown in the southern Italian region of Puglia, one of the Mediterranean's most important almond production areas. The plantings are often promiscuous and yields are low, but the link with local gastronomic history is very strong, especially for the production of sweets and other products. The caloric contribution of Toritto almonds is the same as the standard (about 600 kcal per 100g) but the protein content is higher (16.4g/100g) and fats are lower (50.6%) with a high content of omega-9 (42.2g/100g).[277] The presence of carbohydrates decreases (2.2g/100g) while the content of calcium (1060mg/kg) and potassium (3310mg/kg) is high.

[270] Pezzana A, Bersani L, Zanardi M, Baldereschi F, Ponzio P, Frighi Z et al. The role of traditional foods, legumes in particular, in the Mediterranean diet and the Slow Food Presidia products: from agri-environmental and socio-cultural aspects to economic sustainability and nutrition evaluations. and Pezzana A, Bersani L, Baldereschi F, Ponzio R, Frighi Zaira, Durelli P, et al. 2014. An "LCA" approach to Slow Food Presidia products: from agro- environmental and socio-cultural aspects to economic sustainability and nutritional evaluations. 10.13140/2.1.3701.3760.

[273] Bleggiana walnut Presidium analyses were performed by Mérieux NutriSciences in Italy on a sample of Bleggiana walnut from Azienda Agricola Iori Arrigo, Fraz. Bivedo P1, Bleggio Superiore (Italy).

This set of values gives Bleggiana walnuts and Toritto almonds an important nutritional role to play, especially as non-seasonal (dry) products that feature in many healthy eating guidelines. In terms of nutraceuticals, both nuts are significant for their content of polyphenols (1750mg/100g in the walnuts and 92mg/100g in the almonds) with important implications for their antioxidant content.

Food biodiversity also grows underground, in the form of roots and tubers like carrots and potatoes. Polignano carrots, for example, are a type of multicolored carrot traditional to areas with sandy soils in the province of Bari, also in Italy's Puglia region. The carrots can be orange, pale yellow, bright yellow or even dark purple, and the variety is being preserved thanks to an ancient tradition of saving the seeds. These traditional carrots have a lower sugar content than commercial varieties, with a similar level of mineral elements. What's more, the antioxidant activity of purple carrots was found to be about four times higher than that of commercial carrots. Eating 100 grams of purple Polignano carrots would allow you to benefit from the same antioxidant activity that one would get from eating about 400 grams of common commercial carrots. Purple Polignano carrots also have a total phenol content three times higher than commercial carrots. Like the antioxidant activity, the presence of phenols is primarily concentrated in the cortex, the purple outer part, and it is probable that the total phenol content is directly proportional to the content of anthocyanins, also typically present in purple carrots. Anthocyanins have antioxidant and anti-inflammatory effects in the body.[278]

Another clear example of the relationship between biodiversity and nutrition is represented by potatoes. A few years ago, Slow Food started a project in the potato's native land, working with Andean communities whose food security is based on potatoes. The Slow Food Quebrada de Humahuaca Andean potatoes Presidium is located in the north of Argentina, where the richness of different ecosystems has allowed the development of many species and plant varieties, selected and safeguarded by the patient work of the local people.[279] The Presidium potatoes are cultivated between 2,000 and 4,000 meters above sea level and are traditionally used in the daily diet of local people. They have a lower caloric value than common commercial potatoes (267kcal/100g), a higher protein content (2.28g/100g), a medium fat (0.42g/100g) and ash content (1.08g/100g) and medium-high fiber (2.46g/100g) as well as a low vitamin C content (7.54mg/100g) which actually shows a low level of selection and genetic improvement.[280]

However, it is worth remembering that the conservation of diverse ecotypes and varieties, typical of rural areas, must always be accompanied by sustainable agricultural models that manage crops in a way that respects ecosystems and natural resources. This is the case, for example, with a Moroccan Presidium, for Rif Einkorn wheat, traditionally grown in association with extensively planted olive trees, creating a multifunctional model that ensures the strengthening of ecosystem services and enhances the resilience of local areas.[281] This type of model shows the application of agroecological practices, able to ensure a balance between natural resources and respect for every living organism that makes up the ecosystem. This balance strengthens the microbiota that make the soil fertile.



[277] Toritto almonds Presidium analyses were performed by Mérieux NutriSciences in Italy on a sample of Toritto almonds from Masseria Storica Pilapalucci, Toritto (Italy).

Food products of animal origin

Meat

Meat has been a cornerstone of the human diet since prehistoric times. Large primates have an expanded colon, necessary for extracting the additional energy obtained by fermenting plant fibers, while humans have a smaller colon and an enlarged small intestine, the result of adaptation to more easily digested animal proteins. Brain size also increased during evolution, from 400 cubic centimeters in the earliest australopithecines to between 1,300 and 1,400 cubic centimeters in modern humans. Larger brains were needed for complex foraging behavior, the emergence of more elaborate cognitive skills and the use of tools. While *Homo habilis* used to obtain meat from scavenging and to a lesser extent by hunting, *Homo erectus* mostly obtained animal proteins from hunting.[282] The decrease in molar teeth size and the formation of stronger front teeth, useful for tearing and chewing meat, could be attributed to diet changes, while changes to the digestive tract also reflect the influence of a higher-quality diet. In addition, the fire-based thermal processing of food, whether of animal or plant origin, may have offered advantages such as easier digestibility.[283] Of course, meat seems to have been acting as the nutritional input required for brain building, not as the trigger: The driver behind this process is to be found elsewhere, probably in the emerging need for problem-solving in order to guarantee food security.

Meat is one of the main sources of quality protein for a large part of the world's population. Red meat in particular contains many micronutrients, such as iron, zinc, selenium, vitamin D and vitamin B12.[284] In addition, beef and other ruminant products constitute an important dietary source of conjugated linoleic acid (CLA), especially cis-9 and trans-11 isomers, identified as an important health promoter factor with anti-tumoral and anti-carcinogenic activities.[285] Although these nutrients can be provided in sufficient quantities through the consumption of plant foods, it should be noted that in countries where access to nutritious food and food security are uncertain, meat is a defense against malnutrition and improves cognitive development in infancy.[286]

Moreover, fish and partly meat and eggs can represent a valuable source of polyunsaturated fatty acids (PUFAs), which are essential for human nutrition. In particular, most of the human diets have low omega-3 content, thus foods rich in short or long chain omega-3 PUFAs should be promoted. Unfortunately fish, which is the richest source of long chain omega-3 PUFAs, is not sufficient to meet the world requirements and thus it is necessary to find other "sustainable" sources of omega-3. When land animals (mainly poultry, pigs and rabbits) are raised in free-range systems where they can feed on omega-3-rich grass, their meat and eggs are enriched with these bioactive compounds (omega-3s and vitamins).

Moreover, the use of more foraging animal breeds (local breeds, etc.) and specific dietary strategies also improve these levels.[287]



Meat consumption has also often been investigated to assess any adverse health effects.

Excessive consumption of meat and animal products is often associated with an excessive consumption of fat and calories in general, contributing to chronic diseases such as cardiovascular disease and type 2 diabetes. In addition, some components of cooked or cured red meat may increase these risks and predispose to cancer, specifically colorectal cancer.[288]

When assessing the health risks of meat consumption, and in particular the risk of cancer, it is critical to make a distinction between fresh and processed meat. According to the World Cancer Research Fund (WCRF), there is strong evidence that the consumption of processed meat,[289] such as ham, salami, bacon and some sausages, can cause colorectal cancer.[290]

In addition, these products are usually energy dense and can contain high levels of salt, which can increase the risk of cardiovascular mortality and high blood pressure. Some of the methods used to produce processed meats, such as smoking, curing and salting, are known to generate carcinogens.[291] Chemical preservatives are also often added. For example, nitrites are used to improve the color and flavor of cured meats and to prolong their shelf life by lowering water activity and through a direct antimicrobial effect.[292] However, nitrites can react with the degradation products of amino acids—the molecules that combine to form proteins—generating a group of compounds known as nitrosamines, some of which are carcinogenic. For this reason, the WCRF's Cancer Prevention Recommendations suggest that we "eat no more than moderate amounts of red meat, such as beef, pork and lamb, and eat little, if any, processed meat."[293] If we exclude processed meats, it seems that the specific nutrients in meat are not themselves having a negative impact, but that the overall composition of a meat-rich diet may affect or even cause adverse effects. For example, the people who eat the most meat often have a lower consumption of fish, vegetables and whole grains, pointing towards a lower intake of several kinds of dietary fiber and a less healthy eating pattern. So, any possible adverse health effects may be due to the shortfall of dietary fiber or other plant components in the diet, rather than the intake of meat per se.[294]

Not all meat is the same, and Slow Food has long been battling to defend quality meat. From a nutritional point of view there are differences between meat obtained from different farming systems. Several studies show that meat from animals raised outdoors and allowed to graze has less fat.[295] In addition, several researchers have suggested that if the animal's diet is based mainly on the consumption of grass this can significantly improve the composition of fatty acids and the antioxidant content of its meat. Grazing results in a higher content of omega-3 fatty acids and vitamin A and E precursors, as well as anti-cancer antioxidants such as glutathione and the superoxide dismutase enzymes.[296]

Grass-fed animals produce milk with a higher content of omega-3 fatty acids and CLA, which have anti-inflammatory, anti-thrombotic and immunomodulatory properties, and with smaller amounts of palmitic acid (a saturated fatty acid) and omega-6 fatty acids, which have an aggregating and pro-inflammatory activity.[297]

This is mostly true for monogastric species (poultry, rabbit and pigs) where the intake of grass has a direct and positive effect on the fatty acid profile, oxidative stability and antioxidant content of meat and eggs.

The effects of meat consumption are not related only to human health, but also to environmental health and animal welfare. In the face of population growth and global warming, there is

[289] Processed meat is "meat that has been transformed through salting, curing, fermentation, smoking or other processes to enhance flavour or improve preservation. Processed meat can include ham, salami, bacon and some sausages such as frankfurters and chorizo. Minced meats such as fresh sausages may sometimes, though not always, count as processed meat." Source: Limit red and processed meat.

[293] "If you eat red meat, limit consumption to no more than about three portions per week. Three portions is equivalent to about 350–500g (about 12–18oz) cooked weight. Consume very little, if any, processed meat." Source: World Cancer Research Fund. American Institute for Cancer Research. Continuous Update Project Expert Report 2018. Meat, fish and dairy products and the risk of cancer. 2018. Accessed March 2, 2022.

increasing concern about the sustainability of farm animal production.[298] While a modest intake of meat represents an important strategy to avoid essential nutrient deficiencies, limiting its consumption and at the same time choosing meat from non-intensive farms can reduce the risk of a range of chronic diseases and have significant beneficial effects on global food security. Official recommendations in most countries, in fact, support reductions in red and processed meat intake based on the findings of international organizations.

The environmental impact of meat

As many studies have shown, one of the foods with the greatest environmental impact is meat, in particular meat coming from intensively farmed animals and linked to industrial agriculture.[299] Intensive livestock farming has a huge environmental impact. According to FAO, it is responsible for 14.5% of greenhouse gas emissions, a higher percentage than the combined emissions of cars, trains and planes.[300] Even if it is now generally agreed that the quantity of meat produced should not be considered in and of itself an indicator of the sustainability of a farming method, we are well aware that overconsumption of meat products is strongly linked to the overproduction of meat and a race to the bottom for meat prices.

Global average annual meat consumption per person is approximately 43 kilograms. The average European consumes nearly 80 kilos, while in North America the figure is more than 110 kilos.[301] This amount is already unsustainable both in terms of resources needed and impacts on the environment (e.g. as a driver of deforestation and land use change). Animal farming[302] and the global demand for animal-source foods is projected to increase substantially, particularly in many low- and middle-income countries,[303] as a result of growing population and incomes and changes to lifestyles and dietary habits.[304] In the next few decades the situation is expected to become even worse.

Animal farming is important not just for the production of high-quality proteins, but also for sustaining rural livelihoods and its potential contribution to food security. However, more than half of the cereals grown globally are destined for animal feed, with a disadvantageous ratio between plant food consumed and animal-source food produced. Since energy and protein transformation efficiency in ruminants is very low, food security can only be effectively promoted if the feed given to the animals is not being produced in competition with human food.

The breeding of large numbers of animals in confined environments often involves the irresponsible use of drugs, such as antibiotics, which amplify the phenomenon of antimicrobial resistance (AMR). The loss of biodiversity and the destruction of natural habitats caused by deforestation to make room for monocultures of corn and soy for feeding animals, associated with the poor health conditions of the animals amassed in intensive farms, are some of the main causes of the explosion and spread of viral diseases, epidemics and pandemics.

However, it is important to highlight that not all farms have the same impact: A well-managed pasture-based farm can support many important ecosystem services that benefit the environment and society as a whole.[305] According to regenerative agriculture principles, innovative animal farming systems can have a significant role in the full regeneration of some landscapes.[306]

Generally speaking, examples of animal-plant integration are less environmentally expensive than analogous conventional farms. Poultry raised under olive trees or geese in vineyards produce less impact than standard production.[307, 308, 309] The environmental impact of animal production is mainly due to animal feeding, at least in monogastric animals where digestion produces few emissions of greenhouse gases. This means that how much feed is converted into food has a major effect on sustainability.



However, sustainability also depends on the feed ingredients (i.e. crops that need more or less inputs that are more or less renewable) and the cultivation techniques (i.e. organic production does not use chemical fertilizer or pesticides). Another relevant aspect is the risk of competition with humans for protein sources. Accordingly, the use of locally sourced feedstuffs and agricultural by-products, which do not compete with human food or need extensive transport, should be encouraged in animal feeding.[310]

Some farms have a complex farming ecosystem which is able to store more carbon dioxide than it emits thanks to a closed cycle, short supply chains, a long-term pasture system, sustainable forest management and efficient regenerative agriculture.[311] But global statistics make clear that we need a heavy reduction in meat production and consumption if we wish to slow down the polluting effects of industrial meat production.

In response to the problems of consumer health, environmental sustainability and animal welfare linked to the excessive consumption of meat coming from intensive farms, Slow Food has launched the Slow Meat campaign, which aims to raise awareness among co-producers about better, cleaner, fairer consumption habits, encourage a reduction of meat consumption and promote the work of small- and medium-scale producers who respect animal welfare. Slow Meat advocates the consumption of less meat, but of better quality. This shift would create enormous benefits for our health, the farming system and the quality of our air, soil and water.

As mentioned above, the farming system represents one of the most influential aspects for the final quality of a food. The breed of the animal is one of these components, together with diet, the human-animal relationship, the environment and other factors.

Analyses conducted on Maremmana cattle in Italy, one of the oldest Slow Food Presidia, revealed very different characteristics if the animals are fattened indoors or on pasture.[312] As a consequence of grazing, pasture-fed beef showed a greater shank weight, thanks to prolonged muscle action. The grass ingestion typical of a pastured animal gives their diet a higher α-linolenic content and, as a consequence, animal products derived from grazing cattle contain greater amounts of omega-3 PUFAs. The effects of the farming system are significant for the omega-6/omega-3 ratio, which is lower in grazing steers, as a consequence of the greater content of α-linolenic acid (a 3.9 ratio in grazing beef compared to 12.4 in animals kept in feedlots). It has been demonstrated that a diet rich in omega-6 PUFAs and with a very high omega-6/omega-3 ratio, like the typical Western diet, may be responsible for several pathologies, such as cardiovascular diseases, cancer and inflammatory and autoimmune diseases.[313] On the other hand, high levels of omega-3 PUFAs and a low omega-6/omega-3 ratio can result in cardioprotective effects, including anti-inflammatory, vasodilating and antioxidant activity.[314]

Feeding livestock can also improve meat quality by influencing oxidative parameters. The post-mortem aging process is indispensable to making meat more tender and flavorful,[315] through a natural chemical and physical process that gradually transforms the animal's muscle into edible meat. Oxidative processes occur during the deterioration process of the meat: Oxidation changes the muscle's proteins and lipids in a way that can eventually affect the meat's sensory and nutritional properties. Some antioxidant substances in the muscle, such as catalase and glutathione peroxidase, protect the different components of meat against oxidative stress and indicate good oxidative stability for the aged meat. The oxidative parameters of beef from Italy's Slow Food Piedmontese Cattle Presidium were analyzed and compared with similar Piedmontese beef, and the results showed better characteristics for the Presidium meat. It is worth noting that in the Presidium beef, the oxidative parameters were not strongly influenced by the age of the animal, the maturation process and different preservation methods,[316] unlike what has been shown in other recent studies.[317] The data underlined that the meat from older animals from this breed is in many ways similar to that of younger animals, an indication of good meat quality. It could be that the cattle's diet (based on corn, barley, wheatgerm and other foods) influenced the oxidative parameters, thus improving the quality of the meat.[318]

The effects of the animal's lifestyle and diet on meat quality can also be seen in the case of pigs and sheep. It is interesting to compare meat from wild boars, intensively farmed hybrid pigs and pigs crossbred with pigs from the Slow Food Mora Romagnola Presidium kept outdoors on an organic farm. Wild boar meat seems to have the most favorable fatty acid composition, with a high ratio of PUFAs to saturated fatty acids (SFAs),[319] a measure of the propensity of the diet to influence the incidence of coronary heart disease,[320] and a low omega-6/omega-3 ratio, while pork from the crossbreed Mora Romagnola pigs lies in between wild boar and the hybrid pigs.[321] These positive results can be attributed to semi-wild conditions and a diet for crossbreed Mora Romagnola pigs more similar to that of wild boar than of intensively farmed hybrid pigs.

In addition, it is well known that the fattening diet may influence the aromatic profile of fresh and cured products. Fresh and cured lard from the Slow Food Nebrodi Black Pig Presidium in Italy, for example, was analyzed in order to identify volatile composition. These compounds, which are responsible for the product's aroma, could represent a valid tool for establishing the product's characteristics and traceability, closely associated not only with the type of fattening diet, but also with the farming system.[322]

Sambucano lamb, a rustic Italian breed that has been a Slow Food Presidium since 2001, has tender meat with a low fat content, a low omega-6/omega-3 ratio and good water retention.[323] These favorable characteristics can be attributed to the farming method: Animals are reared on small farms, left to graze freely in the summer and kept in stalls and fed dry hay for the rest of the year.

An analysis of Zeri lamb, another Presidium breed from Italy, showed that it also has mild, tender meat, with a low fat content and a good fatty acid composition. The sheep produce very little milk, but it has such a high concentration of protein and fat that its yield for cheese is extraordinary.[324] In addition, the CLA level in Zeri lamb meat is higher than in other native breeds from the same area and the cholesterol is very low, similar to that found in bovine meat.[325] The quality of meat and milk could be thanks to the animals' way of life. They are kept indoors only during the coldest months and spend the rest of the year being pastured. In this part of Tuscany, pastures still cover large swathes of land, and thanks to the lack of industrial activity in the area, they remain wild and unpolluted.

A comparison between lamb meat from two other local sheep breeds from Tuscany, the Amiata and the Pomarancina (a Slow Food Presidium) showed that Amiata lamb meat had higher SFA and omega-6 rates, while Pomarancina lamb meat had a higher percentage of monounsaturated fatty acids (MUFAs).[326] While it is well established that SFAs increase low-density lipoprotein (LDL) cholesterol, a strong risk factor for cardiovascular diseases,[327] a diet rich in MUFAs has been associated with a decrease in triacylglycerols and blood pressure and an increase in high-density lipoprotein (HDL) cholesterol,[328] high levels of which may lower the risk of heart disease and stroke.[329] The health indices indicated that both meats are a favorable addition to the diet

and that their omega-6/omega-3 ratio is significantly lower than the maximum limit suggested by nutritionists.[330] Though there were differences between different breeds, these data confirm that native breeds have a beneficial nutritional profile for consumer health.

In conclusion, the analyses of Slow Food meat products show that these often little-known native breeds, able to graze on multiple varieties of grasses, fed hay and grains only when the ecosystem is not able to meet all of the animals' nutritional needs and not given silage and other low-quality industrial products, have a higher nutritional quality than conventional meat, thanks particularly to the quality of the fats.

It should be remembered that meat quality is determined by many aspects, including breed, farming conditions, diet, quality of the environment and ecosystems, soil health and pasture management. In order to achieve a quality product, these elements cannot be separated and considered individually, but must be managed simultaneously, as all of them together determine the quality of the product.

Poultry meat and eggs

Poultry meat is often considered healthier than red meat (from cows, horses, sheep and goats), which tends to have higher levels of saturated fat and cholesterol that can be responsible for increasing blood cholesterol and the development of heart disease.[331]

According to the International Agency for Research on Cancer (IARC), red meat is more dangerous to human health due to the presence of heme iron, a powerful oxidizer. Heme could theoretically be the component of meat responsible for triggering or aggravating cancer, particularly colorectal.[332, 333] Additionally, many studies have studied the role of red or processed meat consumption in the development of type 2 diabetes, cardiovascular diseases, various types of tumors, all causes of mortality[334, 335] and dementia.[336] However, some research has shown that there is not enough evidence that heme contributes to an increased risk of colon cancer, as long as red meat is consumed as part of a balanced diet.[337]

Excluding the form in which iron is found, the main difference between red meat and poultry meat lies in the fat content and fatty acid profile, which depends on many factors. Farming method, diet and genetics all play an important role in determining the final nutritional quality of the meat, including the quality of the fat. What's more, some specific farming techniques (organic and free range) have been shown to influence the nutritional composition of meat, particularly poultry.[338]

Industrial chicken farming has developed hybrids able to put on weight quickly. While in the 1950s it would take three months to obtain a ready-to-consume chicken weighing around 1.5 kilos, now a 2.5-kilo chicken can be slaughtered after just five weeks.[339] A study comparing the weight gain at 56 days of a chicken bred for meat in 1957 and the most common broiler[340] in 2005 (Ross 308) showed that the weight of a bird had effectively quadrupled.[341]

As chicken farming has been made intensive, the space available to the chickens has been considerably reduced, limiting their movements. Artificial lighting has been brought into the sheds to increase their appetite, and the birds are fed an energy-rich diet of soy, oils and vegetable fats. This makes it possible to produce more meat, more quickly and more cheaply.

These changes to poultry farming have also changed the nutritional characteristics of chicken meat, which is less lean than it used to be. Analyses carried out on chicken breasts on sale in supermarkets and farm shops in England between 2004 and 2008 showed they had fat levels

[340] Broilers are chickens bred and raised specifically for meat production. They have a high yield of meat and are adapted to intensive farming.

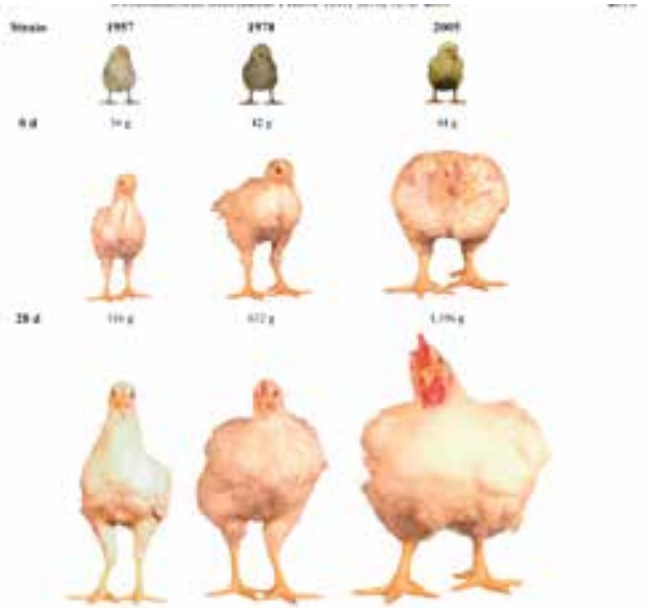


Figure 4. Age-related changes in size of University of Alberta Meat Control strains unselected since 1957 and 1978, and Ross 308 broilers (2005). Within each strain, images are of the same bird at 0, 28, and 56 days of age.

Source: Zuidhof MJ, et al. (2014). Growth, efficiency, and yield of commercial broilers from 1957, 1978, and 2005.

more than double that of chicken in the 1970s, and that these fats exceeded the energy provided by protein by as much as sixfold. Additionally, omega-3 fatty acids were lower than they were in the 1970s and the omega-6/omega-3 ratio was as high as 9, when the recommended value is 2.[342]

Traditionally farmed poultry and eggs represent one of the few non-fish sources of long-chain omega-3 fatty acids, particularly docosahexaenoic acid (DHA), produced from the linolenic acid found in green plants in pastures. Feeding chickens with grains or legumes like soya means producing meat and eggs with a low omega-3 content, which is particularly unfavorable given the rise of obesity, cancer and metabolic and cardiovascular diseases. A lack of omega-3s and a high omega-6/omega-3 ratio in our diet increase our risk of developing atherosclerosis and neurodegenerative diseases.[343]

The food industry justifies the intensive chicken farming system by claiming that consumers demand cheap food, but this argument does not take quality into account.

Taking DHA as an indicator of the quality and healthiness of meat, in order to get the same amount of DHA that eating one chicken would give you 50 years ago, now you would have to eat six chickens, ingesting around 9,000 kcal at the same time.[344]

The fat content also depends on the body part of the animal being eaten.

The leg contains a higher amount of fat than the breast, but the quality of its fat is different. Chicken legs are richer in monounsaturated fats (which are better for us) as well as containing

more iron, selenium, zinc and B vitamins. It is therefore not advisable to eat just one part of the animal, but better to alternate different cuts so as to ensure a varied quantity and quality of fats and micronutrients.

Genetics also plays an important role. A recent study compared chickens with the same diet (organic) and farming method (free range): a broiler (Ross 308), a slow-growing crossbreed (Kabir) and a very slow-growing native local breed (Robusta Maculata from Italy's Veneto region). Slaughtering took place at different times due to varying growing times: at 81 days for the first two breeds and at 120 days for the native breed. The Robusta Maculata and Kabir chickens grazed more, and as a result their meat had more antioxidants. The Ross 308 had a very high growth rate, a heavier carcass and a greater feed conversion ratio, but it also had a higher mortality rate, demonstrating that fast-growing breeds are not suited to organic and free-range production, even though this farming method ensures more nutritious meat. The antioxidant capacity of the broilers was also considerably lower than the other two breeds, which leads to to faster spoiling of the meat, as soon as 24 hours after slaughter. In general, local breeds had less fat but of higher quality, richer in omega-3.[345]

Unfortunately, the production performance of broilers (in this case, Ross 308) is much higher than the slow-growing local breeds, meaning they are more profitable for farmers. Nonetheless, the value of preserving native breeds is clear: Crosses with these breeds can offer opportunities to develop chickens that are suited to outdoor rearing and more productive. Extensive farming systems (organic, free range and low input) represent just a small percentage of chicken production, at least in the European Union (around 5%) but consumer interest is increasing and the annual trend is for growth, equal to about 10%.[346] In particular, in the EU 6% of laying hens are kept in organic systems.[347]

The consumption of poultry meat has increased by 45% compared to 2004[348] and is expected to rise further in coming years. By 2025, it is expected to have increased by 16% compared to the previous decade.[349] Over 95% of poultry production however, continues to be in intensive systems.[350]

Slow Food supports the consumption of meat from pasture-reared chickens. Organic feed is not sufficient if too unbalanced towards cereal grains. Farming outdoors—on grass, with the chickens able to wander freely, scratch around, access natural hiding places, feed on grass and small insects as well as grain and meet their species-specific behavioral needs—means higher welfare and a longer life compared to intensively farmed chickens.

Pasture-rearing also means an increased level of long-chain monounsaturated and polyunsaturated fatty acids, and lower levels of short-chain fatty acids, saturated fats and omega-6s. Phytanic acid, CLA, aromatic compounds, polyphenols and omega-3s all increase as well, bringing nutritional benefits.

Slow Food and poultry and egg production

Nutritional values of Slow Food Presidia

The producers of both the analyzed Presidia rear traditional native breeds suited to outdoor farming methods.

The Bianca di Saluzzo chicken, a Slow Food Presidium, also known as the Bianca di Cavour, is a very hardy and active breed, adapted to scratching around freely in the fields. It produces fewer eggs than modern hybrids, around 170 to 180 a year, compared to the 300 eggs laid by factory-farmed chickens. In the case of the sample analyzed, in addition to pasturing, the birds were also given corn, grain and fava beans. Their pink-shelled eggs have a slightly lower fat content than conventional eggs[351] and are of higher quality. The percentage of saturated fats is lower (2.47g/100g compared to 3.96g/100g for conventional eggs), as is the cholesterol (346mg/100g compared to 358g/100g), while monounsaturated fatty acids are slightly higher. Compared to the eggs commonly found for sale, the lipid profile of the Presidium eggs was better, making them a nutritionally more beneficial product.

The Gascony chicken has long been one of the most highly prized poultry breeds in south-western France. Due to its poor adaptation to battery farming, it was gradually abandoned from the 1950s on and replaced with more productive hybrid birds. It risked extinction, but was saved by a small group of farmers who began reviving the breed in 2003. Its high-quality meat is now sold under the "Noire d'Astarac-Bigorre" brand.

A very dynamic breed, the Gascony chicken requires extensive grassy areas. The grains and legumes needed to supplement its diet are grown by the farmers themselves. In addition to the grass and insects that the chickens find themselves as they scratch around in the fields, they also have daily access to wheat, corn and non-GM soy. Meat from three six-month-old chickens was chosen for the analysis, and various parts (breast, leg and wing, without skin) were examined. The pasture-based diet, plus the specific characteristics of the traditional breed, ensure a lower level of fat compared to regular chickens:[352] 1.33g/100g compared to 3.6g/100g, meaning their meat is almost three times less fatty than the average chicken found at the supermarket. The cholesterol was lower in the Gascony chicken (51.3mg/100g compared to 75mg/100g), while its meat had more protein (24.04g/100g) than the conventional chickens (19g/100g).

[351] The analysis of the Bianca di Saluzzo chicken Presidium was carried out by the Chemical Laboratory of the Turin Chamber of Commerce on a sample of eggs from the Cascina Roseleto in Villastellone, near Turin, and compared with data from the food composition tables provided by the Italian Council for Research in Agriculture and the Analysis of Agricultural Economics (CREA).

[352] The analysis of the Gascony chicken Presidium was carried out by the Chemical Laboratory of the Turin Chamber of Commerce on a sample of chicken from Ferme du Vidalies, Au Vidalies, L'Isle-de-Noe (France), and compared with data from the food composition tables provided by the Italian Council for Research in Agriculture and the Analysis of Agricultural Economics (CREA).

SMALL-SCALE PRODUCTION, SHORT SUPPLY CHAINS AND LOCAL MARKETS

The health of a society is closely linked to the ways in which food is produced, distributed and consumed. The spread of sustainable, healthy diets in a population can take place if the possibilities of accessing quality food are increased.

Empirical studies carried out in the USA[353] show how proximity to a farmers' market is often associated with a lower BMI (Body Mass Index),[354] a greater consumption of fresh fruits and vegetables and a greater likelihood to try new foods, like unusual varieties not found in the large supermarket chains, thanks to more dialog with the producers. They confirm the strong relevance of the food environment to a healthy lifestyle.

Over the last 60 years, government strategies to boost access to food have translated into the expansion of the global food market and the spread of large-scale, mass distribution channels like supermarkets. In the short term, this path has responded to the growing demand of a growing population, ensuring the low cost of goods thanks to economies of scale. This model, however, has shown itself to be unsustainable. As well as not being able to meet the needs of future generations, it has produced externalities in the most fragile contexts, encouraging production systems based on the massive use of synthetic fertilizers and fossil fuels, with a consequent increase of environmental degradation and pollution that is contributing to the current climate crisis.

The globalized food system has in fact eroded food security, in part due to the reduction of crop varieties being grown and the dwindling of biodiversity, both of crops and overall. The production of cheap raw materials and the application of economies of scale in the agrifood sector have also contributed significantly to growing industrialization, as well as the widespread distribution of highly processed foods at ridiculously low prices.

Intensive farming and production models, united with the increase in the global trade in goods, have also favored the rise of food-safety scandals and disease outbreaks that have had an important impact on consumer attitudes. As mistrust among consumers in the dominant distribution system has grown in the last few decades, alternative food systems have proven particularly popular, whether farmers' markets, food-buying groups or CSAs (community-supported agriculture projects).[355]

Ample evidence[356] supports the fact that the relocalization of food systems, in all the different

[355] CSA is a partnership between a farm and a community of supporters, directly linking food producers and consumers in a kind of association. The association members undertake to support the farm throughout the year and share in the costs, risks and rewards of production along with the farmer. In exchange, the farm supplies, to the best of its abilities, a supply of fresh and healthy seasonal products during the harvest.Read more.

ways this can happen, represents a promising path for increasing social, economic and personal well-being in local communities.

Local food supply chains are often considered more sustainable[357] due to the involvement of small-scale, multi-functional and often organic forms of agriculture, which reduce emissions and externalities caused by the long distances travelled by conventionally distributed food. In the literature on alternative food systems, farmers' markets are also explored for the opportunities they offer for networking, exchanging knowledge and constructing social and relational capital,[358] as well as their economic benefits[359] and the profiles and needs of visitors.[360]

Local markets and short supply chains can play an important role in ensuring the population has access to fresh, nutritious foods. At the same time, they can also improve the local economy and make it more stable thanks to the diversification of production and supply. By eliminating intermediaries, the products can be sold at competitive prices that are advantageous for consumers and profitable for producers.

Local governments and institutions are looking with growing interest at farmers' markets. Some initiatives, such as the Gus Schumacher Nutrition Incentive Program (GusNIP)[361] in the United States, are experimenting with social welfare programs and incentives that increase the buying power of low-income consumers at farmers' markets.[362]

Even though awareness about these processes is rising, these kinds of measures are still too marginal at a global level. This means their multifunctional potential[363] and ability to provide a series of services simultaneously is ignored. These services can be:

- Economic: producing and making available fresh, healthy and accessible food.
- Environmental: providing food with a low environmental impact, able to boost agrobiodiversity.
- Social: creating a strong link between rural and urban contexts and revitalizing communities, reconnecting producers and consumers.

Strengthening short supply chains also means making a strong contribution to achieving the Agenda 2030 Sustainable Development Goals,[364] as they promote the responsible production and consumption of food, help to alleviate poverty, encourage gender equality, combat climate change and make cities more inclusive, resilient and sustainable.

Slow Food Earth Markets

Slow Food's Earth Market project was started in 2004 and today encompasses over 75 producers' markets in 28 countries across all continents. The project has recently started to become more of an international network, in line with the movement's values, communicating its campaigns and its vision for the future. Joining the project means a market must facilitate and develop initiatives to protect biodiversity and participate in fundraising activities every year to support Slow Food's projects and campaigns.
Slow Food Earth Markets operate autonomously and have a range of formats and strategies. Some are outdoor urban markets in the heart of a city, others are neighborhood markets, some are covered and some are itinerant. The project reflects places and people with different cultures, all united by a common vision and guided by a series of key objectives:

- Making accessible local, seasonal products with a short supply chain, produced with respect for the environment and workers' rights.
- Creating marketing opportunities for small-scale producers who are often excluded from conventional sales channels.
- Promoting dialog between producers and consumers.
- Becoming places for exchanging skills, passing on knowledge, educating about a healthy diet and taste and training consumers to be more aware about the food system; places where a sense of community can develop.

Earth Markets are sites where the three pillars underpinning Slow Food's work can be put into practice: biodiversity, education and advocacy.

Biodiversity: The market must create a sales channel for local ecotypes (including Ark of Taste and Slow Food Presidium products) adapted to a more limited demand, aggregating the offer of small-scale producers and artisans who are safeguarding the culture and skills of good, clean and fair food production.

Advocacy: Food shopping is conceived as a political act, a tangible and everyday tool for fighting problems of immense consequence, such as the climate crisis and the loss of biodiversity. The market represents the first piece in the puzzle of creating local food policies and can demonstrate to institutions and civil society another way of selling and buying.

Education: A market is a place for consumer education, through what's on sale itself (varied and seasonal products) and exchanges of ideas. It strengthens relationships between all the actors involved, from producers to volunteers, consumers to cooks. Markets can fuel the education process by offering experiential tastings and in-depth learning activities for the community.

THE NUMBERS OF EARTH MARKETS AT THE END OF 2021

76 Earth Markets

+11 New Markets activated and 200 producers involved in 2021

28 Countries around the world

2000 Producers involved

44 Markets have formed a Slow Food Community



FOOD GARDENS AND FOOD SECURITY

According to FAO, food gardens can help to support food security by promoting access to nutritious, fresh food, while at the same time raising awareness of the importance of healthy diets and helping to shift households' food demand towards more nutritious foods.[365]

Moreover, gardens can also be part of an effective urban agriculture strategy by increasing the availability of fresh and nutritious foods for consumption. Any surplus can be sold in local markets, with a very short supply chain. This can be especially important in vulnerable zones by helping to generate income and lower the cost of food products. This means a network of urban gardens can significantly strengthen the resilience of local food systems.[366]

School garden programs can be another very effective way of improving the nutritional status of schoolchildren while promoting access to affordable and nutritious foods.[367] These programs, common in both high- and low-income countries, can represent a key intervention to promote healthier diets.[368]

Especially if garden activities in schools are combined with nutrition education, research has shown that children learn how to grow and like healthy foods such as fruits and vegetables. To be more effective, these programs should also be influencing the food behavior of the parents and increasing the availability of healthy foods within the household. Evidence suggests that it is vital to develop healthy food preferences and eating habits in childhood, as they tend to persist into adolescence and adulthood, making these programs especially important.[369] School gardens can help young people to pursue a healthy and sustainable diet, while also preserving biodiversity and becoming conscious consumers through direct involvement and learning-by-doing activities.

Because of their seemingly positive impact on both dietary patterns and household incomes, food gardens are a step in the right direction towards the formation of healthy and biodiverse alternative agrifood systems, while also educating everyone involved.

Slow Food's Gardens in Africa

In 2010, the Slow Food Foundation for Biodiversity launched the Thousand Gardens in Africa project. The aim was to develop food gardens in schools, villages and urban areas to give local people access to high-quality, healthy and sustainable food. Through the gardens, communities would be able to grow and eat fresh local food as well as gain a positive perspective on food

and agriculture. The project also aimed to safeguard and promote traditional knowledge and practices as a way of protecting food sovereignty and security, enabling local people to take on the challenge of freeing their continent from hunger and rejecting the corporate takeover of the African food system.[370] After the objective of creating 1,000 food gardens was achieved at the end of 2013, the initiative was relaunched in 2014 with the new target of creating 10,000 gardens across the continent. So far, 3,725 gardens have been established; more than a half are in schools and so far have involved approximately 410,000 students, parents and teachers.[371]

The project is grounded in concepts such as encouraging a model of agriculture based on an understanding of the land, raising the profile of biodiversity, protecting local cultures and their traditional knowledge and meeting the nutritional requirements of African communities through sustainable agriculture.[372] Agroecology is essential to this project, the key to ensuring access to sustainable, healthy and nutrient-rich diets for many households and communities. In 2014, José Graziano da Silva, FAO Director General at the time, supported the project, affirming that "10,000 food gardens will increase food production and the availability of local products, diversify diets and improve nutrition in the sustainable way that needs to guide all our action" and that "with the combination of gardens and youth, we have the possibility to improve food security through the local production of healthy food."[373]

A rich variety of traditional local plants characterizes these gardens. Some are used for food, while others have medicinal or soil-restoring purposes.[374] The gardens have been shown to increase the variety of local crops, boosting food security. Out of the total crops being grown in community gardens in Uganda, the percentage of local edible plant species increased from 53% to 78% between 2015 and 2018.[375]

The agroecological gardens that Slow Food has established in 35 African countries are a positive model of community participation and constitute a small but significant contribution to addressing the issues of food security, food sovereignty, nutrition and, most importantly, the malnutrition caused by micronutrient deficiencies.[376]

THE NUMBERS OF GARDENS IN AFRICA AT THE END OF 2021

SINCE 2010

3700

Food gardens established in 34 countries

51%

School gardens

470.000

People involved in Africa

1500

Hectares of land agroecologically managed

Monitoring and evaluating the impact of the Slow Food Gardens in Africa project

In 2020, the first pilot project to monitor and evaluate the impact of the Slow Food Gardens in Africa project was carried out by Slow Food in collaboration with the University of Turin. The study involved a sample of 131 gardens established in nine African countries and investigated three main thematic areas:

1. Adoption of an ecological approach at the local level

2. Increased production and protection of diverse, healthy and local food species

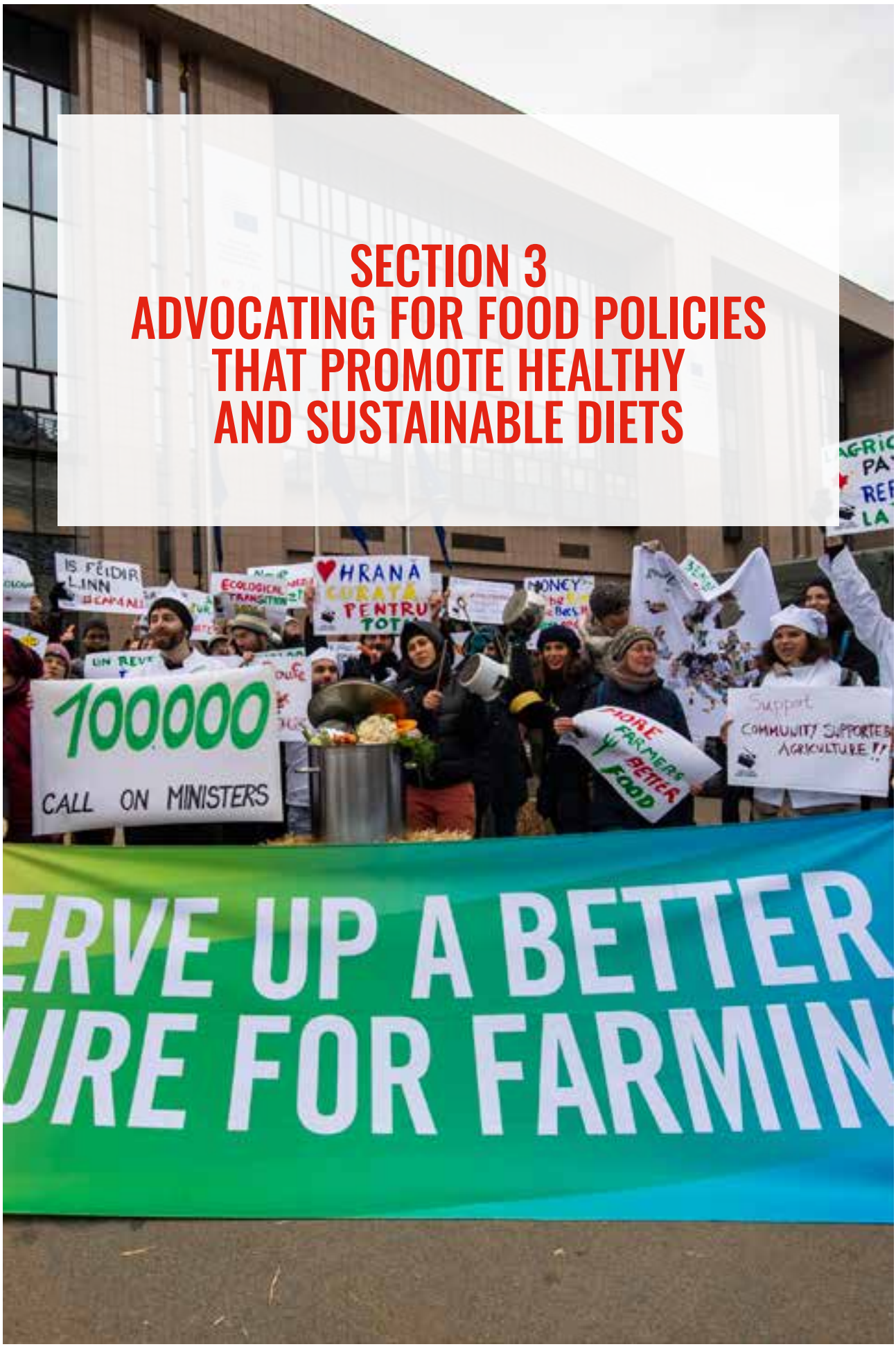
3. Increased consumption of local health foods among African communities

In regards to the health benefits, the results of the pilot project showed a decrease in diseases and improved physical strength. The gardens were fully supported by the communities, who remarked on the high quality of the food, which was free from pesticides and preserving agents, and the added benefit of being able to supply the surrounding community with fresh vegetables.[377]

In early 2021 a case study on three Slow Food community gardens in Kenya was conducted by an external consultant as part of the project "Building Local Economies in East Africa Through Agroecology." The 30 farmers interviewed listed positive benefits from the gardens, including an improvement in health and nutrition. Initially, farmers gain more awareness about better dietary habits, then this awareness motivates them to diversify their diets at the household level. After the food gardens were established, there was a systematic increase in crop diversity at the garden and farm level. Increases in vegetable, food and livestock diversity at the farm level facilitates access to a variety of food at the household level. This diversity brings nutrition diversity, which improves the families' nutritional intake. Diversity is thus intrinsically linked to people's health and nutrition.

[377] In 77 gardens the participants saw a decrease in diseases and improved physical strength, while in 88 they noted the quality of food produced without pesticides and preservatives. In 49 gardens, the garden members said they were able to supplement meals with healthy produce from the gardens.

SECTION 3
ADVOCATING FOR FOOD POLICIES THAT PROMOTE HEALTHY AND SUSTAINABLE DIETS



Introduction

Slow Food wants to see a world where everyone can enjoy food that is good for them, good for the people who grow it and good for the planet. For Slow Food, good food means food that is nutritious and healthy as well as tasty, fresh, wholesome and stimulating and satisfying to the senses. To make this vision a reality, we advocate for more transparent food and farming policies that support access to healthy and sustainable food for everyone.

Our global food system is driving the rise of unhealthy diets and is based on an unsafe food production system. Our governments must urgently change our current structures and align our food and farming policies to facilitate a transition towards healthy and sustainable food systems.

Section 1 of this paper shows clear evidence that even when people would prefer to eat well, the ability to access and consume a healthy diet is compromised by many barriers including price, the increased availability of industrial and unhealthy food and unsafe food production. This problem is particularly critical for lower socioeconomic groups.[378] In fact, evidence suggests that healthy foods are more expensive than less healthy alternatives, and healthy, culturally acceptable diets are often beyond the reach of low-income families.[379] Slow Food advocates for policies that create healthy and sustainable food environments where healthy food is the most easily accessible, available and desirable. In terms of food safety, Slow Food is campaigning for food and farming policies that will drive a shift away from industrial food production systems that rely heavily on unsafe synthetic pesticides and antimicrobials. Agricultural policies that focus on productivity rather than planetary and human health are in desperate need of overhaul.

This section will look at policy measures that can be taken by local, regional and national policymakers to make healthy and sustainable diets accessible to all and discuss the strengths and weaknesses of these policies. For specific recommendations, the focus is on the European Union.

TAKING A "FOOD ENVIRONMENTS" APPROACH

Over the last decades, the dominant food policy narrative has focused on promoting "responsible consumer choices,"[380] based on the idea that raising awareness and providing education about better food choices will make people change their food behaviors. This model largely absolves food industries and regulators while placing considerable responsibility on citizens. Consumers are expected to make the "right" food choices based on little more than information campaigns or prompts to adopt "green" and "healthy" lifestyles.

But this is not how things work as people go about their daily lives in the real world. The evidence is overwhelming that everyday food choices are not typically based on the best available information.[381] Food choices are constrained and shaped by a whole range of physical, economic, political and sociocultural influences, most of which are beyond an individual's control.[382, 383]

In contrast to the consumer choice model, the "food environment approach" recognizes that the choices we make about food and the impacts they have are, to a significant degree, shaped by the contexts within which they are made. It recognizes that the most effective and equitable way to change food behaviors is to change the structural factors that drive food choice. A food environment approach enables and empowers people to exercise choice in line with the much-needed shift towards sustainable food systems.

What are food environments?

Food environments can be defined as the "physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food."[384] Food environments can be seen as the spaces in which people make decisions about food: what to pick, where to buy it, where to cook it and when, where and with whom to eat it. Food prices, labeling, advertisements and the availability of food in retail outlets are examples of elements that shape food environments, and therefore how consumers make decisions.

Slow Food advocates for food policies that support the creation of "enabling food environments," which means ensuring that foods, beverages and meals that contribute to sustainable healthy diets are the most available, accessible, affordable, pleasurable and widely promoted. Such environments make the healthy and sustainable choice the default and most desirable choice, while limiting the availability and promotional opportunities for foods associated with unhealthy and unsustainable diets.[385]

For more information, read the policy brief "Food Environments & EU Food Policy: Discovering the role of food environments for sustainable food systems".

Unfortunately, it is widely understood that current food environments are not making sustainable food choices easy. On the contrary, today's food environments "exploit people's biological, psychological, social, and economic vulnerabilities"[386] making it easier to adopt unhealthy and unsustainable diets.

Creating "enabling food environments" means acting on:

- **food characteristics** to ensure food that is produced is safe, nutritious and sustainably produced;
- **food labeling**, so that healthy food is made appealing;
- **food promotion** to ensure the food that is most marketed and advertised is healthy and sustainable;
- **food provision** to make sure food offered through public procurement, e.g. in schools and hospitals, is healthy and sustainable;
- **food retail** to ensure the high availability of healthy and sustainable food options in retail outlets and to encourage
short supply chains;
- **food prices** to ensure healthy and sustainable food is accessible to all;
- **food trade and international agreements** to ensure food trade promotes sustainable food systems.

The power of public food procurement

Public procurement policies can be an important tool to enhance food environments by increasing the healthy food choices provided in schools, healthcare facilities, prisons and other public institutions. Because of the sheer volumes and costs involved, these policies have the potential to drive more sustainable food production and encourage healthier diets in a fair and transparent way. They influence a large portion of what people eat every day[387] as well as the whole food supply chain around those meals.

Adopting procurement criteria or guidelines that are sensitive to healthy and sustainable choices, such as by favoring organic and agroecological food, can significantly increase the consumption of quality foods and potentially lead to long-term healthier eating habits. Moreover, public procurement policies with a focus on healthy foods ensure a more equal access to healthy diets.[388] Such policies can produce a win-win effort by favoring small-scale and local food producers, with the dual benefit of providing healthier meals to the community and also strengthening the local food economy.[389]

Strategic public procurement can also bring benefits to a wide range of sustainability and social aspects such as climate protection, promotion of fair working conditions, improved animal welfare and the circular economy, among others,[390] and therefore stimulate the production and consumption of food that is healthy for both people and the planet.[391]

Contrary to what is commonly thought, sustainable procurement does not necessarily imply additional purchasing costs. Adapting menus and recipes, reducing the amount of meat in meals, cooking from scratch, reducing food waste, smart menu planning, flexible portion sizes and raising awareness are some of the actions that can allow a reduction of overall costs.[392]

The case of Mouans-Sartoux and its 100% organic school meals

Source: Milan Urban Food Policy Pact (2019). Train for a territorial sustainable food project.

Since 2012, all the food served in the school canteens in the French town of Mouans-Sartoux has been organic. To achieve this goal, the municipality implemented a multi-pronged strategy that included setting up an organic municipal farm which provides 85% of the vegetables used in school canteens, tackling food waste and organizing educational activities for students, including nutrition classes, gardening, cooking and meetings with producers. The town also modified its public procurement policies to allow local farmers to supply school canteens.

This strategy allowed a reduction in the price of school meals even though they were being prepared with fully organic produce. The costs of organic food were offset thanks to communal management of the canteens, the partial substitution of animal products with vegetable proteins and the reduction of food waste by 80%.

The project led to diverse positive spillover effects for families and the wider community. Thanks to the messages that children learned at school, families became more aware about their food choices, which led to a preference for a more local, healthy and organic diet, with less wasted food. Moreover, the local economy was also positively impacted: Bakers began preferring to bake organic bread, wholesalers were able to work more with local suppliers and local food producers visited schools and shared their knowledge with the children.[393]

Lastly, public procurement of food can act as an educational tool, since evidence suggests that procurement changes have an overflow effect into individual household consumption.[394] By stimulating healthy diets in the public sphere, people are trained to eat in a certain way, bringing long-term benefits. This is even more relevant in schools, and especially if sustainable food procurement goes hand-in-hand with educational programs, with the potential of addressing childhood obesity, teaching children about diets and nature, reducing health inequalities by providing good food for all and using the "transformational power of young people" to promote food system change.[395]

Public procurement in the European Union

The total European public food service market has been estimated at €82 billion.[396] Because of this value and volume, European public authorities have the potential to address many of the challenges of the EU food system, as outlined in the Farm to Fork Strategy, through action in public food procurement.[397]

Public procurement is very context-specific, since strategies are normally defined by different levels of government, from municipalities (in most cases) to national governments. However, it is fundamental to have a common understanding and clear guidelines and targets at the EU level in order to reach the shared goals outlined in the Farm to Fork Strategy and to overcome barriers represented by competition rules within the EU market.[398] Despite EU directives and the European Court of Justice (ECJ) confirming the compatibility of small-scale and local procurement strategies with EU laws on competition and public procurement, national and local public procurement policies have still often failed to promote healthy and sustainable options in public canteens.[399]

Green Public Procurement

At the moment, the only tool developed by the EU to promote more strategic procurement is Green Public Procurement (GPP), a voluntary instrument which recommends that Europe's public authorities purchase environmentally friendly goods, services and works, thus contributing to sustainable consumption and production. Though the GPP criteria for food services[400] are a good step forward, they remain limited; the criteria are still voluntary and their scope is narrow, barely considering the importance of local food production, healthy and balanced diets and the need to shift towards more plant-based meals.

Many European cities have been experimenting with more strategic sustainable public food procurement, with positive results. Copenhagen and Malmö already have an effective strategy for sustainable food procurement in place, while many cities in Italy and France offer sustainable and healthy school meals with the share of organic food ranging from 30% to 100%, including the use of fair trade products and sustainably sourced fish. Since August 2020 Italy has a revised mandatory procurement rate of organic fruit and vegetables of 50% and starting from 2022 France will also have a similar mandatory target.[401] Some Eastern European countries have also implemented mandatory organic food procurement rates, reaching 30% in Latvia and 15% in Slovakia.[402]

More sustainable food procurement is intrinsically connected with improving public health. The cost benefits of converting to healthier, organic and climate-friendly meals have been estimated at between €1.3 billion and €2 billion annually in Denmark, or €300 to €460 per person.[403]

The EU has the potential to enhance sustainable food environments through strategic public procurement policies in line with the goals of the Farm to Fork Strategy. Because of the significant value and volume of the public food procurement market, European public institutions have the possibility to positively impact the whole food supply chain by stimulating healthy food choices for all, while at the same time favoring small-scale, local, sustainable food producers.

LOCAL FOOD POLICIES

In 2018, 55% of the world's population was living in urban areas, and this figure is predicted to reach 66% by 2050.[404] Urbanization and growing inequalities are leading to the poorest populations being in closer proximity to cheap, convenient, processed foods, meaning they end up suffering from higher rates of overweight, obesity and other diet-related illnesses. These inequalities are often compounded by race and gender inequalities. For example, according to the US Census, low-income neighborhoods and communities of color generally have two to three times fewer options for healthy food compared to more affluent or white neighborhoods.[405] For these reasons, cities are taking actions to improve access to healthy, safe and nutritious food through targeted and varied food policies and governance structures. "Equal access for all to public goods and quality services in areas such as food security and nutrition" is highlighted as a key responsibility of cities in the New Urban Agenda[406] adopted at the United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador in 2016.

With overweight and obesity rates rising on all continents, and especially in lower-income neighborhoods and households, many cities are taking action to tackle obesity, particularly among children. These measures include implementing food policies that promote healthy diets and discourage the consumption of unhealthy foods, such as sugary snacks and ultra-processed

foods. Food environments play a central role in shaping diets and lifestyles. By adopting healthy food policies, local policies can be better equipped to address the challenges of obesity.

Increasingly, regions and municipalities are considered key actors in the sustainable food system. They are the ones implementing concrete measures on the ground and they represent the level of governance that is closest to citizens and local businesses. Additionally, through their unique position in the food supply chain, cities have the ability to stimulate their direct environment (through green public procurement, public canteens and municipal markets) and indirect environment (through peri-urban agriculture and food consumption choices) to create a healthy and sustainable local food system.

City and municipal governments can implement a variety of food policies to address food insecurity, malnutrition and food provision. These urban food policies often emerge after involving civil society and other stakeholders including academia, businesses, city departments (health, urban planning, etc.), community groups and others.[407]

For example, in 2012, Amsterdam launched its Healthy Weight Programme, which has significantly reduced the number of overweight and obese children—a decrease of 10% between 2012 and 2014. More importantly, the impact was significantly higher among children from very low socioeconomic groups. The strategy integrated actions across local government agencies (departments for public health, healthcare, education, sports, youth, poverty, community work, economic affairs, public spaces and physical planning), and external organizations, including religious groups, for example. It sought to tackle the root causes of obesity, including food environments and individual lifestyle factors. A key factor in the strategy's success was its holistic approach and the broad involvement of stakeholders.[408]

Food policy councils

Food policy councils have emerged in the 1980s, particularly in North America and Europe as a way to democratize food system governance and design policies that integrate food with other policy areas, including health, the environment, transportation and poverty reduction. The councils involve different groups (farmers, the public sector, local businesses, schools, citizens, non-governmental organizations, chefs, etc.) and adopt a holistic vision for meeting environmental and health challenges around the local food system. While food policy councils can take various forms, they usually serve four main functions:

1. Create a forum to encourage better coordination among stakeholders
2. Issue policy recommendations
3. Provide advice regarding implementation
4. Launch local initiatives that improve access to local and regional food[409]

These councils can play a key role in promoting healthy diets by connecting citizens with local producers offering fresh, seasonal food and advocating for health-oriented food policies. Some councils focus on access to food. For example, the Los Angeles food policy council works to eliminate food deserts[410] by encouraging the local government to locate grocery stores, farmers' markets and other healthy food retail outlets to areas lacking in healthy foods.[411]

Alternative food networks

Despite the supermarketization of food environments, a number of Alternative Food Networks (AFNs) exist and are flourishing around the world, driven by consumers who are concerned

about the origin of their food and how it is produced and want to relocalize food systems. In addition to reviving rural economies and improving the incomes of small-scale farmers, AFNs provide a different food offering, with a focus on more local, seasonal and fresh foods. For example, food markets or farmers' markets are becoming increasingly common in cities of all sizes, giving consumers access to varied and minimally processed foods. Farmers' markets also constitute an important opportunity for producers and consumers to meet and exchange ideas concerning food. This is a fundamental pillar of Slow Food's Earth Market project.[412]

Slow Food believes in the importance of markets as places for shopping that promote dialog between producers and consumers and give access to products from short supply chains that are local, seasonal and produced with respect for the environment and workers' rights. They are places for the exchange of knowledge and the transmission of skills, for taste and nutrition education and for raising awareness among citizens.

Community Supported Agriculture (CSA) is another example of an AFN with tremendous potential to influence consumers' behavior. These groups connect producers to consumers who pay an agreed amount at the beginning of the growing season and receive weekly or biweekly selections of fruit and vegetables, either delivered or picked up at a specific location. During the Covid-19 pandemic, subscriptions to CSAs soared, according to international CSA network Urgenci.[413]

Local food policies and food policy councils can play a critical role in further developing AFNs by facilitating the dialog between the different players involved in local food systems. Local governments can help to provide the physical infrastructure needed for both markets and CSAs.[414] At the same time, it is important for municipalities to ensure that these markets and networks are accessible and attractive to all, including low-income communities.

Slow Food believes municipalities are crucial actors to help tackle many of the crises related to food production (climate change, biodiversity loss, pollution) and consumption (obesity, non-communicable diseases, malnutrition). Municipalities are major drivers for cultural, social and economic changes and they can quickly design and implement policies affecting millions of people at a time. Cities are key actors in shaping the food environments that we need to accelerate the transition towards more healthy, resilient, just and sustainable food systems.

Slow Food advocates for communities to play a central role in the co-development of local food policies that are inclusive, effective, systemic and, most importantly, leave no one behind. We believe that certain structures such as food policy councils can have great power in getting citizens involved, although political will and support from municipalities are essential to bringing about consistent engagement from their citizens. Slow Food is a partner of the European Food Trails project, which aims at building long-term progress towards sustainable food systems through co-creation and citizen participation in the process of urban food policymaking.

Read more about Slow Food's involvement in the Food Trails project on urban food policymaking.

FOOD PRICING AND THE ROLE OF FOOD TAXES

One important driver of unsustainable food systems is the externalization of many impacts of food production and consumption on the environment and public health, i.e market prices do not reflect the total costs of food. In fact, food is around a third cheaper than it would be if these externalities were included in the price. Meanwhile, the benefits of healthy foods are often disregarded, contributing to healthy diets often being less affordable to consumers than unsustainable and unhealthy ones.[415] According to FAO, the high cost of healthy diets and persistently high levels of poverty and income inequality continue to keep healthy diets out of reach for about 3 billion people around the world.[416]

Price constitutes a key dimension of the food environments within which consumer choices are made. One way to adjust the price of food, at least in the short term, is to make use of food taxes: increasing the taxes on unhealthy food while decreasing or removing taxes on healthy and sustainable foods.

Various types of food taxes have been applied by different countries, with some encouraging results. It is important to note, however, that each tax must be adapted to its unique context.

The World Cancer Research Fund International provides a useful database that compiles and monitors economic tools used by governments all over the world to address food affordability and purchase incentives, including where food taxes have been implemented.[417]

How can taxes improve diets and enhance health?

Food taxes present a double benefit. Firstly, empirical evidence has shown that people are less likely to choose a food when its price rises, and even less so when an acceptable alternative food is available.[418] This is even more likely to happen for low-income households who are price sensitive, and young people whose buying behavior is more flexible.[419] Secondly, taxes can also push food companies to reformulate their products to make them healthier to avoid the price rise.[420]

These findings are supported by evidence from several countries that implemented food taxes with positive results. In 2011, Denmark introduced a tax on saturated fats that showed a 10 to 15% decrease in consumption of the targeted products. Although later abolished in 2013, the number of deaths attributable to non-communicable diseases was estimated to have decreased by 0.4%.[421] Hungary also introduced a tax on specific prepacked foods high in salt, sugar or caffeine (at varying rates), which has been associated with a decrease in their sales of 27%, consistent with a 25 to 35% decrease in consumption.[422] Mexico implemented an 8% tax on non-essential, energy-dense foods in 2014, which yielded a 6% reduction in the purchase of these foods.[423]

Another important measure to stimulate healthy diets is to make healthy food more accessible, through incentives and subsidies.[424] Food subsidies can take various forms: vouchers, financial incentives, fruit and vegetable boxes for low-income households and minimum or free Value-Added Tax (VAT) for fruits and vegetables.

The Navajo tribal community food tax

An example from the Navajo (or Diné) tribal community in the US helps to show how a double policy comprising both a food tax and a food incentive (with correspondent reinvestment) can help to improve food environments.

The Navajo Tribal Council, together with Denisa Livingston, a Slow Food International Councilor for the indigenous network, worked to introduce the first tax on junk food in the United States[425] through the Healthy Diné Action Act of 2014.[426] This imposed a 2% tax on "minimal-to-no-nutritional value food items," while at the same time abolishing a 5% tax on fruits and vegetables. Since its implementation, the tax has raised $7.58 million, which has been used for local wellness projects such as farming, traditional food demonstrations, walking trails and farmers' markets, directly benefiting the Navajo nation communities.[427]

The introduction of food taxes and other fiscal interventions to improve diets is often met with push-back from food industry groups.[428] In one county in the United States, a tax on sugar-sweetened beverages was revoked after less than a year. In South Africa, the sugar industry actively lobbied against the introduction of a tax on soft drinks and in Fiji a tax on soft drinks was reduced and reviewed after the soft-drinks industry complained about its irregular enforcement.

The sugar tax

A sugar tax is the most common food tax, and generally comes in two forms: a tax on sugar in foods or a tax on sweetened beverages. The latter has been the most widely adopted due to the particularly problematic nature of sugary drinks. Evidence shows that people who regularly consume them have a 26% greater risk of developing type 2 diabetes compared to those who seldom consume these products.[429]

Research has demonstrated that a tax on sugary drinks that increases prices by 20% can lead to a reduction in consumption by about the same percentage.[430.] Taxing sugary drinks in Mexico, Finland, the UK, France and Berkeley, California, has decreased consumption and produced good results.[431]

It is important that sugar taxes do not encourage the substitution of sugar with other sweeteners, whether natural or artificial. Slow Food believes that while adopting a sugar tax can be a good starting point, it must be part of a broader effort that includes reductions in the consumption of ultra-processed foods that are also rich in fat and salt.

The junk food tax

A junk food tax aims to reduce the consumption of products with high quantities of fat, sugar and salt. It can be implemented in different ways, with varying applied rates, and may tax each nutrient differently. As mentioned above, in 2011 Hungary passed a "public health tax" which is applied based on the salt, sugar and caffeine content of various categories of ready-to-eat food, including soft drinks and prepacked sugar-sweetened products.[432] After the introduction of the tax, the consumed quantities of processed food decreased significantly by 3.4% while the consumed quantities of unprocessed food increased by 1.1%. According to a comprehensive study on the Hungarian situation, taxing a relatively wide range of salty and sugary food items shifted part of the consumption towards healthier food. The tax brought moderate improvements in dietary habits especially among poorer households.[433]

The meat tax

Some countries have been experimenting with the implementation of a meat tax in an attempt to address both the environmental and health implications of meat. The industrial animal farming sector generates 14.5% of all greenhouse gas emissions, produces high volumes of polluting manure, is responsible for land use changes and deforestation and uses up 23% of the fresh water available on the planet. Besides the environmental cost, there are also consequences for our health. Excessive consumption of red and processed meat is associated with high blood cholesterol levels and a higher risk of cardiac disease, diabetes and certain forms of cancer.[434.]

Lawmakers in Germany, Denmark and Sweden have attempted to implement meat taxes, and the concept is gaining traction in other parts of the world as well, although it has yet to be put into practice. Slow Food believes that any fiscal incentive of this sort should clearly distinguish between production systems. Extensive and sustainable animal farming systems can help to maintain landscapes, conserve local ecosystems, fertilize the soil and improve farmers' livelihoods.[435] At the same time, an appropriate consumption of meat, both red and white, can be a key part of a nutritious diet, especially during key stages of life, such as early childhood, youth and pregnancy.[436] Slow Food believes that meat taxes and other fiscal incentives should be leveraged to nudge consumers to choose sustainably produced animal products over industrially produced ones.

Food choices are not made in a vacuum. They are intrinsically influenced by the food environment, which these days is highly determined by a food supply chain that delivers food with low nutritional value which poses a risk to public health. In combination with other measures such as education and public procurement criteria, taxes can be a useful tool for policymakers to correct the food environments in which food choices are made, encouraging healthy diets and improving the quality of life and wellbeing for all citizens.[437] Slow Food believes taxes can also be a useful source of revenues for governments. These should ideally be invested in education, including sensory education from a very young age, which can underpin conscious and healthy choices.

NUTRITION LABELING

In order for consumers to make informed choices when buying food, they must be able to access information about its nutritional value. Nutrition labeling can appear both on the back of pre-packaged foods and on the front (generally referred to as "Front-of-Pack" or FOP labeling). Nutrition facts tables appear on the back of food packages, and comprise a list of nutrients, their amounts and some form of numerical quantifier. These are generally strictly regulated by governments around the world and often mandatory, as they have been in the EU since 2016.[438] On the other hand, FOP labeling was developed more recently, and for a long time by the food industry itself. It displays nutritional information in a graphical way to help consumers see, read, interpret and act upon it.

Currently more than 40 countries around the globe have some type of nutrition labeling scheme on the front of food packaging, either on a voluntary or mandatory basis. Overall, there is a tendency for countries within the same geographical region to pick similar labels, while adapting certain aspects to the national context.[439]

Front-of-pack (FOP) nutrition label

Over the years, many nutrition labeling initiatives, including FOP labeling, have been launched by governments and the food industry, but the use of different schemes, by different actors, makes it very confusing for consumers to assess the nutritional value of food products. More recently, governments are experimenting with imposing one type of FOP nutrition labeling in order to amplify and simplify nutritional information and influence healthier choices. FOP schemes could help consumers improve their diets by providing critical and accurate easy-to-read nutritional information. However, there is no consensus on which FOP labels are most effective: Many different types of FOP schemes exist, making use of warnings, graded indicators or color coding, for example.

Chile was the first country to implement a mandatory national FOP label with warning symbols, and was followed by Peru, Uruguay, Israel, Mexico and Argentina.[440] Likewise, in Europe, several member states have also developed proposals, whilst the European Commission intends to deploy a unique harmonized FOP labeling scheme for the EU, as set out in the Farm to Fork Strategy.

There are two main categories of FOP nutrition labels: nutrient-specific labels and summary indicators (figure 5).

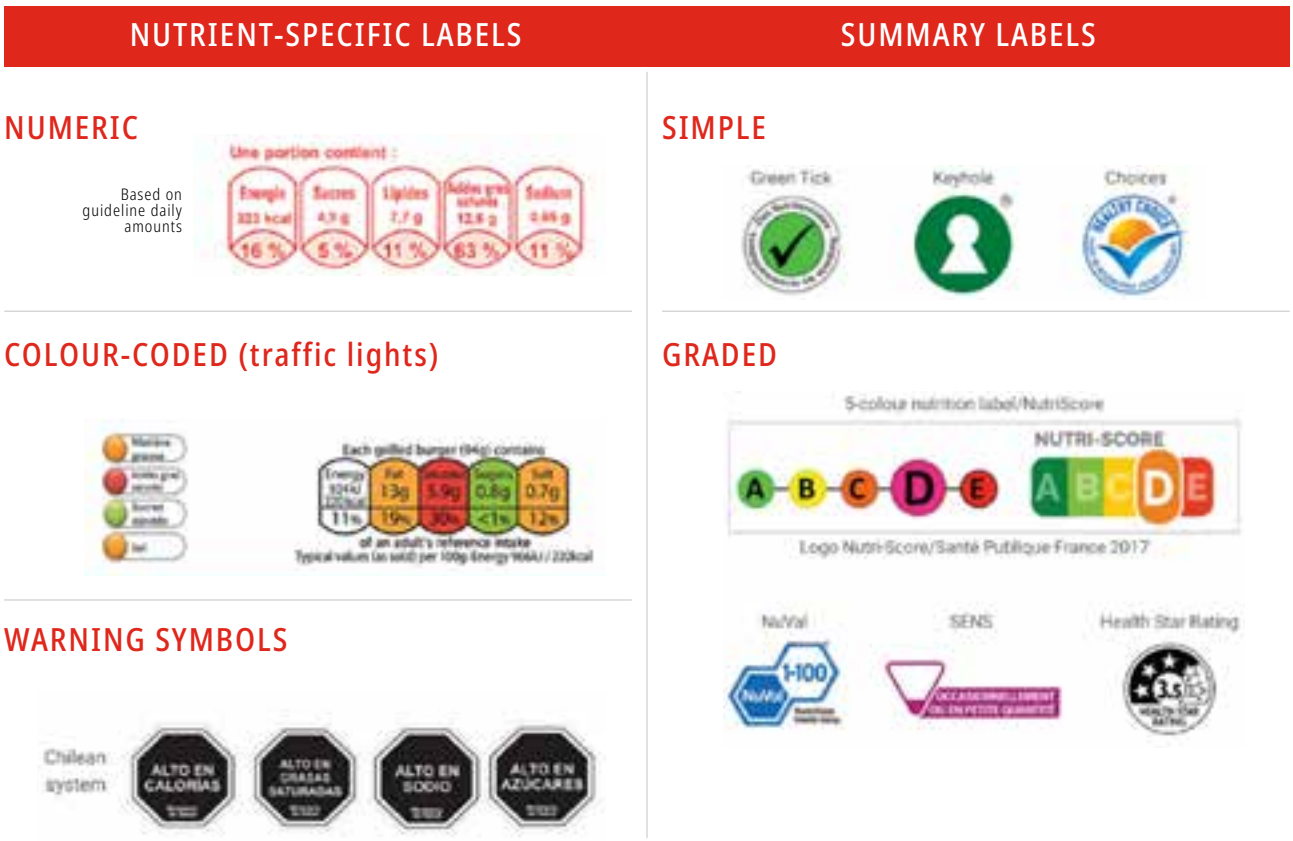


Figure 5. Types of front-of-pack nutrition label in use worldwide

Table adapted from Julia C, Hercberg S. (2017). Development of a new front-of-pack nutrition label in France: the five-colour Nutri-Score

The strengths of FOP nutrition labeling

Firstly, FOP labels are time-saving for consumers compared to nutrient tables, as they are easily recognizable, highly visible and graphically very clear.[441] Next, FOP labeling can incentivize food companies to reformulate unhealthy products in order to meet the requirements for a more positive FOP label, for example by reducing their sugar or salt content. Evidence from Chile shows that there were significant reductions in the proportion of products required to carry warning labels after the introduction of an FOP law.[442]

Thirdly, FOP labels can help educate consumers on nutrition; depending on the type of scheme, symbols can in theory help show the nutritional value of the product more clearly than nutrition facts tables. Consumer research carried out by Consumentenbond in the Netherlands showed that 90% of consumers correctly identified products high in salt, sugar and unhealthy fat when FOP labels used traffic light color coding, compared to only 43% without color coding.[443] Research also found that consumers prefer color-coded schemes which provide at-a-glance and easy-to-understand nutritional information and make it easier to compare similar products in the same category (for example different types of pasta sauce).[444] In a study comparing four different FOP schemes, the color-coded "Nutri-score" adopted in France scored better than other FOP labels in improving food purchases, although the improvement was very slight.[445]

Finally, FOP labels seek to help consumers understand the nutritional value of food items regardless of education and literacy level by using simple symbols and visible logos that communicate the healthiness of packaged food.[446] Although findings on the effectiveness of FOP labeling in actually nudging consumers into making healthier food purchases remain mixed, there is evidence indicating a greater

impact of FOP labels on people with a lower socioeconomic status. Focus groups conducted in Chile with low- and middle-income mothers suggested profound changes driven by the knowledge gained from these labels and by children telling their mothers not to purchase products with warning symbols.[447]

The limitations of FOP labeling

FOP labels aim to simplify nutritional information, so by their very nature cannot offer a deep understanding of the complex links between food and health. These schemes lead to a trade-off between giving accurate and detailed information to educate consumers and providing easy-to-read nutritional information that is simpler for lay people to interpret.

FOP labels also provide nutritional information according to portion size or a set quantity (e.g. 100 grams) although body sizes and types, metabolisms and appetites vary greatly among populations.

Third, FOP labels tend to lead to a classification of food as "healthy" or "unhealthy" which can be a dangerous simplification; food quality, portion sizes and diet diversity are all important factors that should be taken into account when qualifying the healthiness of food. Moreover, such classifications could particularly affect people with eating disorders or food-related anxiety, according to the Italian Society of Human Nutrition.[448] How the indicators and classifications are defined, and by whom, must also be carefully considered.

Finally, there is little evidence to suggest that such labels educate consumers about nutrition or improve diets in a durable way.[449]

Health and nutrition claims

Health and nutrition claims are statements that suggest a certain food has a beneficial health or nutritional benefit. "Good for your bones" or "good for your heart" are examples of health claims, while examples of nutritional claims include "low in fat" and "high in fiber", as illustrated in figures 6 and 7. Such claims tend to appear on the front of packaged foods to attract consumers. However, these health and nutrition claims are often abused by the food industry, which misleads consumers about the quality of their food. Foods bearing such claims often have high levels of fat, sugar and/or salt, which may be masked by the use of a nutrition or health claim on the label.

Even though the Health and Nutrition Claims Regulation[450] should theoretically protect consumers in the EU from misleading, scientifically unfounded or exaggerated health claims, the European Commission's reluctance to set "nutrient profiles," plus patchy implementation of the Regulation at a national level and industry tactics to circumvent the Regulation mean misleading claims continue to appear on food products.[451]

The Farm to Fork Strategy published in 2020 includes a proposal to publish "nutrient profiles" by the end of 2022, a measure that is supported by a majority of member states. Finally, nutrient profiles are also supported by a number of food industry groups as they believe that they would level the playing field between industry actors and support the production of healthier foods.[452]

Figures 6-7. Examples of health and nutrition claims

Nutrient profiles

"Nutrient profiles are thresholds of nutrients such as fat, saturated fat, salt and sugars above which nutrition claims are restricted and health claims are prohibited, thus preventing a positive health message on food high in these nutrients." Establishing nutrient profiles would help prevent the use of misleading claims as claims would not be allowed to appear on foods that do not fit nutrient profiles.[453] Nutrient profiles do not prevent foods from being produced and placed on the market, but rather ensure unhealthy foods cannot bear misleading health or nutrition claims.

Slow Food has always emphasized the importance of transparency in food labeling so consumers can be properly informed on the quality, wholesomeness and traceability of the foods they consume. This enables them to make informed choices.

Food environments, which include the way foods are marketed and labeled, deeply influence what people buy and eat, their dietary patterns and, as a consequence, their health. Slow Food believes Front-of-Pack labeling can be one tool among many others to be used to attempt to correct one of the main issues food companies have introduced: Packaged foods with high amounts of sugar, salt and fat.

Slow Food believes misleading nutrition and health claims must be eliminated as they can have important health consequences by distorting consumers' understanding of nutritional quality. Nutrient profiles must be set in order to strictly regulate the use of claims, and ensure only foods of good quality can bear such claims.

FOP labeling may be helpful to render healthy choices easier to make for some consumers, as well as to put pressure on food companies to reformulate unhealthy foods. Nonetheless, Slow Food believes that a deep transformation of our food system is needed to move away from the production and consumption of the industrial foods that are the most problematic, both in terms of health and environmental consequences. This transformation also requires a focus on educating consumers, which Slow Food does through food and taste education based on the reawakening and training of the senses, and the study of all aspects of food, from field to fork. Children and adults alike must be educated not only about the nutritional quality of foods, but also where their food comes from, how it is produced and by whom.

For these reasons, Slow Food has launched the Narrative Label project. As depicted in figure 8, the narrative label supplements the mandatory label by providing additional information regarding varieties and breeds, cultivation and processing methods, place of origin, animal welfare, storage and use. By Slow Food's definition, quality is a complex concept that starts from a food's place of origin. By adding this additional information, consumers can gain a more robust understanding of the actual quality of a product.

Grain producers

Hans Unterguggenberger, Mario Lugger, Johann Lugger, Josef Stabentheiner, Andrea Unterguggenberger

Bread bakers

Jakoberhof - Sieglinde Ortner, Untermoserhof - Katarina Unterluggauer, Peintnerhof - Andrea Unterguggenberger, Leachnerhof - Lugger Theresia, Joehrerhof - Andrea Unterguggenberger, Hausimahof - Maria Lexer, Volksmusikakademie

Slow Food **Presidia** are local projects that work to protect small-scale producers and safeguard quality artisanal products.

The **Slow Food Foundation for Biodiversity** promotes and coordinates 500 Presidia in the world.

www.slowfoodfoundation.org
www.slowfood.com

Lesachtal Bread

Product
Lesachtal Bread is a daily sourdough bread made from a mixture of rye and wheat flour. The typical crumb presents large pores and is light, compact, and humid. Before baking, the loaves are lightly drizzled with lukewarm water to ensure that the crust is crispy but not rock hard. The spicy and earthy smells of Lesachtal bread evoke a warm parlor with a wood stove and, at the same time, a beautiful cornfield.

Territory
The Lesachtal valley is located in the southwest of Carinthia, Austria, right on the border with Italy. The farms and fields of the Lesachtaler Bergbauernfamilien lie on hillside terraces up to 1,427 meters above sea level, in the "Valley of the Hundred Mills." Traveling to markets and cities was difficult until the middle of the 20th century, and almost impossible in winter. Self-sufficiency was vital, especially when it came to making flour, so the tradition of cultivating grain (especially wheat and rye) for bread persisted. The presence of many water-powered stone mills testifies to this long tradition.

Raw Materials
The basic ingredients for Lesachtal Bread are rye and wheat flours made from ancient local varities such as "Carinthia early" wheat and Upper Carinthia winter rye. The Presidium farmers cultivate the cereals according to organic guidelines: no seed dressing, no artificial nitrogen fertilization, and no chemical pest control. The bread is made with the bakers' own sourdough, which is based on local flours, water from the local mountain springs above 1,200 meters, salt, and some local spices like fennel and caraway.

Processing
The entire process of making Lesachtal Bread, from farming and threshing the grain to baking the bread, takes place in the "Valley of the Hundred Mills." The grain is ground in the traditional water-powered mills and also in conventional stone mills. After the dough is prepared, it is left to rest and then formed into loaves and baked in the in-house wood or electric stone ovens at 220 °C for about an hour. The baked bread is then placed on a wooden board for cooling.

Figure 8. An example of a Slow Food Narrative Label

REGULATING AND PHASING OUT THE USE OF SYNTHETIC PESTICIDES

Synthetic pesticides have important consequences on human health, causing disease and other health problems among rural communities and farmers as well as for consumers due to pesticide residues in our food, air, soil and groundwater. Among their many effects, pesticides can increase the risk of cancer and infertility, harm children's healthy development and disrupt our hormonal systems.[454] Every year around the world, more than 385 million people are estimated to suffer from pesticide poisoning, including agricultural workers and the general population.[455] According to the UN, more than 200,000 people (agricultural workers and the general population) living in developing countries die from pesticide-related poisonings each year.[456] Given the risk that pesticides pose to the environment and human health, the regulation of pesticides at multiple levels of government must be strictly based on their use, composition and distribution. It is also critical for farmers to be given support to adopt nature-friendly agricultural practices that do not rely on the use of synthetic pesticides.

The regulation of pesticides at the international level

The WHO, in collaboration with FAO, is responsible for assessing the human health risks of pesticides and recommending adequate protections. There are two overarching principles the WHO uses for its risk assessments:

• Ban the pesticides that are most toxic to humans and ban those that persist the longest in the environment.

• Protect public health by setting the maximum permissible levels of pesticide residues in food and water.

In 1985, FAO adopted a code of conduct now called the "International Code of Conduct on Pesticide Management" which establishes an international reference framework on the control of pesticides for governments and the private sector. The WHO's "Recommended Classification of Pesticides by Hazard"[457] provides a globally harmonized system to address the classification of chemicals, labels and safety data sheets and issues guidelines to individual countries. It classifies the active ingredients in pesticides as "extremely or highly hazardous" (classes Ia and Ib), "moderately hazardous" (class II), "slightly hazardous" (class III) or "unlikely to present acute hazard in normal use." Significant progress has been made since the introduction of these guidelines: Almost every country now has some type of legislation addressing pesticides and many countries have removed the most acutely toxic pesticides from the market.

Despite attempts to curb pesticide use, however, the increasingly powerful pesticide industry plays a great role in opposing any regulations. The agro-chemical industry, supported by large farming lobbies, uses scaremongering tactics, claiming that reducing the use of pesticides will lead to lower yields and increased world hunger. Far from shrinking, the global pesticide market has almost doubled in the last 20 years.[458] Between 2013 and 2018, the sale of agricultural pesticides grew most in Latin America and Eastern Europe, both major food-exporting regions.[459]

In countries where agricultural development is vast, the uptake of pesticides has outpaced farmers' and regulators' awareness of their dangers and the country's capacity to regulate them and adopt safe handling techniques. Moreover, low-income countries often lack data on pesticide usage, making monitoring difficult. At the same time, the organic food market is growing rapidly, and in 2018 reached $100 billion for the first time. The countries with the highest demand for organic food include the USA, Germany and France, while the highest number of organic producers are in India, Uganda and Ethiopia.[460]

The regulation of pesticides in the European Union

European Union legislation on the regulation of pesticides aims to ensure "a high level of protection of human and animal health and the environment" and states that pesticides shall not have "any harmful effect on animal health."[461] The legal framework regulates the authorization procedure for active ingredients in pesticides, which requires a preliminary risk assessment by the European Food Safety Agency (EFSA) of the impact that the pesticide may have. This evaluation is made on the basis of data that pesticide manufacturers must provide. The European Commission and member states then decide, based on the results of the risk assessment, whether a substance can be released onto the market. Worryingly, many unsafe pesticides continue to be authorized for use in the EU, despite its relatively rigorous authorization procedures and the fact that the "precautionary principle" is enshrined in EU law.

The EU legal framework also includes the possibility of revoking a pesticide's authorization, if it is shown to no longer meet the authorization criteria. This was the case for highly toxic neonicotinoids and fipronil-based insecticides. Since 2014, fipronil is no longer permitted to be applied to maize and sunflower crops, for which it was previously authorized in several countries.[462] In 2018, the EFSA published risk assessment reports that highlighted the risks of the neonicotinoid substances imidacloprid, clothianidin, and thiamethoxam. As a result, the EU voted to ban the outdoor use of neonicotinoids, an important victory for pollinators, people and the planet.

The double standards in EU trade

The EU continues to export many highly toxic pesticides to low- and middle-income countries, even though they may be banned for use in the EU. A study revealed that in 2018, EU member states approved the export of 41 pesticides banned for use in the EU.[463] Brazil, Ukraine, Morocco, Mexico and South Africa are among the top ten importers of pesticides that are supposedly banned in Europe, yet still find their way back to EU plates through food imports. This situation illustrates the incoherence between the EU's domestic and trade policies.

The urgent need to reduce the use of pesticides

The EU's Farm to Fork Strategy, published in 2020, sets the ambitious goal of reducing the use and risk of pesticides by 50% by 2030. This is an important target that will necessitate a true transition of EU farming towards sustainable agriculture based on agroecogical practices.

The European Parliament has noted that this pesticide-reduction target is "well within reach"

and has called for it to be made binding.[464] European citizens have also been voicing their deep concerns with the continued use of pesticides; in 2021, the European Citizens Initiative (ECI) "Save Bees and Farmers," a campaign which Slow Food helped steer, successfully reached the goal of collecting 1 million signatures calling for a pesticide-free Europe by 2035.[465] This ECI comes only a few years after another successful ECI calling for the ban on glyphosate and the reform of the pesticide approval process. That campaign successfully reached the threshold of 1 million signatures in 2017, which led to the revision of the EU's General Food Law Regulation to increase the transparency on food toxicity data.

The EU's Sustainable Use of Pesticides Directive (SUD), introduced in 2009, was at the time a novel legal framework aimed at reducing the use of pesticides and the risks inherent in their application. The directive makes it mandatory for EU member states to implement the principles of Integrated Pest Management (IPM). Each EU member state is required to set quantitative targets and indicators to reduce the use and impact of pesticides on human health and the environment. However, this directive has failed to achieve its goals. An evaluation of the regulation revealed that the majority of member states failed to set measures ambitious enough to bring about positive change. A revision of the SUD, which is set to be adopted in 2022-2023, is a crucial opportunity for the EU to listen to its citizens and to the European Parliament, propose a serious strategy to phase out the use of synthetic pesticides and set in motion the much-needed transition towards agroecological farming in Europe.

Integrated Pest Management

Integrated Pest Management (IPM) is an integrated ecosystem-based approach to managing pests, diseases and weeds, founded on solid agronomic practices. Chemical or synthetic pesticides are only used as a last resort, if at all. Food producers following IPM prioritize agroecological practices, such as crop rotation and intercropping, which keep pests and diseases at bay, before considering the use of mechanical or chemical means.

REDUCING THE RISKS OF ANTIMICROBIAL RESISTANCE (AMR)

AMR poses a growing threat to human and animal health due to the overuse of antimicrobials in medicine and food production. Antibiotics have become increasingly ineffective as drug resistance spreads globally, leading to greater difficulties in treating infections and ultimately an increased risk of death.[466] AMR is a global concern, increasing the risks of common treatments such as certain cancer chemotherapy treatments, organ transplants and other major surgeries.

Beyond setting maximum residue levels (MRL) for antimicrobials in meat, milk and eggs, policymakers must encourage the conscious use of antimicrobials and support farmers in transitioning towards animal farming that allows for improved animal welfare conditions and reduces the need for antimicrobials. AMR is estimated to have been responsible for over 1.2 million global deaths in 2019.[467]

The WHO is a major player in the effort to eliminate AMR. In 2015, it launched the Global Action Plan on antimicrobial resistance, which provides a framework for developing national action plans to combat AMR. It includes key actions that policymakers should take within five to ten years, such as improving awareness of AMR and optimizing human and animal health and the use of antimicrobials.[468]

Fighting AMR in the European Union

Since the adoption of Regulation (EC) No 1831/2003 on additives for use in animal nutrition, the use of antibiotics for growth promotion in animals is no longer permitted in the EU. Today, antibiotic use is uneven is uneven among EU member states, with Spain the leading nation in terms of sales of antibiotics destined for farm animals. The EU has an important role to play in coordinating efforts to limit antibiotic use in preventive health care for animals, although national governments are responsible for implementing and financing their own AMR strategies and activities.

The European Commission's "One Health Action Plan" sets out a vision for the EU's fight against AMR and was developed around the concept of "One Health," which recognizes the fundamental relationship between the health of animals, people, plants and the environment, and ensures a joined-up approach in tackling the health threats facing each of them. To reduce the risks of AMR, public health and food policy officials must work together to address antibiotic use in agriculture, a major source of AMR. The EU's commitment was again made clear in its Farm to Fork Strategy, which sets a 50% reduction target for overall EU sales of antimicrobials for farmed animals and in aquaculture by 2030.

Slow Food advocates for industrial animal farming—responsible for over 70% of all antibiotic use in Europe—to be urgently replaced with sustainable food and farming systems in which farmed animals are included as part of extensive, circular and mixed farming models. The fight against the phenomenon of antibiotic resistance is one of the focal points of the Slow Meat campaign[469] and is also reinforced in Slow Food's Position Paper on Animal Welfare (2022). The Slow Meat campaign was launched to denounce a model of meat production and consumption that has become unsustainable for the planet and to raise awareness among producers, consumers, chefs, experts and institutions about the need to change our approach to meat. Slow Food has been fighting for years to raise awareness of this issue, acting at various levels to educate all the actors involved, such as farmers and institutions, as well as consumers, so that their purchasing choices reward farmers who produce meat in a sustainable way, without the indiscriminate use of antibiotics.

THE EU'S COMMON AGRICULTURE POLICY AND FARM TO FORK STRATEGY

The European Union produces enough food to feed its 447 million citizens, yet poor diet is a leading risk factor for ill health among Europeans, especially affecting the most vulnerable social groups. Non-communicable diseases (NCDs), for which unhealthy diets play an important risk factor, account for 86% of mortality and 77% of the disease burden in the EU.[470] In addition, nearly 20% of Europeans are obese.[471] Childhood obesity continues to rise in the EU and it is estimated that 10 million children in the wider European region will be affected by obesity by 2030.[472] On average Europeans do not consume the WHO-recommended amounts of fruit and vegetables[473] while consuming over the recommended levels for meat and dairy.[474]

In addition to increasingly unhealthy diets, the use of pesticides and other chemicals in agriculture pose a risk to consumers' and farmers' health and antibiotics used in animal farming

threaten the effective prevention and treatment of infections. These trends are symptoms of the incoherence of EU policies around food and agriculture.

Reversing these trends will only occur through better-coordinated regulatory policies. The Treaty on the Functioning of the European Union (TFEU),[475] one of the founding treaties of the Union, explicitly states: "A high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities." Unfortunately, the Common Agricultural Policy, the major EU policy shaping food systems in the European Union, fails in its very structure to deliver healthy diets.

The Common Agricultural Policy

The Common Agricultural Policy (CAP) was primarily introduced as a public health measure to guarantee food security in post-war Europe. Today, it accounts for around 33% of the EU budget, approximately €55 billion per year. While it is not easy to determine precisely the extent to which the CAP contributes to unhealthy diets, it is clear that the CAP influences how food is produced, what is being produced and the price of food. Slow Food and other civil society organizations have for years been advocating for a holistic Common Food Policy,[476] which would cover not only the agricultural sector but other policies influencing and shaping European food systems, in order to deliver increased health and sustainability.

The latest CAP reform, which will come into effect in 2023, includes efforts to "improve the response of EU agriculture to societal demands on food and health" as one of its nine overarching objectives, and aims to promote healthy food.[477]

In terms of food safety, the CAP gives support to farmers to undertake sustainable practices including organic farming. This financial support directly contributes to reducing the exposure of citizens and farmers to toxic pesticides. The new CAP reform addresses antimicrobial resistance (AMR) by proposing a set of indicators to be monitored, including the sale and use of antimicrobials in animal farming, and requires EU member states to provide training to farmers to prevent the development of antimicrobial resistance.

When it comes to diets, the CAP has tried to influence healthy diets in several ways. The CAP has a long-standing program to improve children's diets through the School Milk Scheme (adopted in 1977). In 2007, it established the School Fruit Scheme. In 2017, these two programs were merged under the "EU School Scheme" whereby the EU helps support the distribution of fruit, vegetables and milk to schools (from nurseries to high schools), as well as supporting educational efforts regarding food and health.

While these few measures may make some kind of contribution to promoting healthy food, they are insufficient, in large part because CAP funds are allocated with a higher priority for agricultural production, rather than health and sustainability. The EU School Scheme functions on a limited budget, and involves only around a quarter of European pupils.[478] This constitutes a great missed opportunity to educate children about food, and raise their awareness of new and healthy foods.

The health consequences of industrial agriculture in the EU

The budget allocated to organic farming is also considerably small, accounting for only 3% of EU agricultural spending in 2018.[479] Consequently, only 9% of EU agricultural land was farmed under organic production in 2019. The EU has committed in its Farm to Fork Strategy to in-

creasing this to 25% by 2030, an ambitious target. However, citizens, food producers and the environment will continue to be exposed to pesticide residues and suffer the consequences of the widespread use of antibiotics in animal farming until we see a real transition of our food system towards agroecological principles.

By allocating support according to the number of hectares a farmer owns (known as hectare-based payments or decoupled payments), the CAP promotes large-scale industrial farming, the use of chemical inputs, mechanization and monocultures. This type of intensive farming has been identified as a key driver of climate change[480] and biodiversity loss, including in our soils,[481] which are intrinsically linked to food quality and citizens' health. Unfortunately, despite increasing pressure from scientists and civil society on the unsustainability of the current policy, the CAP is failing to properly address its shortcomings and support the development of agroecological practices and agrobiodiversity.

Despite the introduction of "greening measures" and more recently "eco-schemes" aimed at promoting sustainable agriculture, the CAP is far from ambitious enough to deliver a sustainable and healthy food system for the EU.

Another aspect that must be considered is the health of the farmers and farm workers themselves. In addition to exposure to pesticides and herbicides,[482] farmers are particularly vulnerable to poor mental health due to their difficult working conditions, including isolation, and financial problems. In France, one farmer every day commits suicide, a rate that is significantly higher than the national average. A survey carried out by the Farm Safety Foundation in the UK found that 88% of farmers under 40 believe mental health is the biggest hidden problem they face.[483]

A large part of the CAP budget is allocated as "direct payments" to farmers, based on their land area, subsidizing the production of certain food categories. Historically, the CAP has largely subsidized milk and beef, ensuring that foods with a high saturated fat content are more affordable for low-income households. Meanwhile, fruit and vegetables account for only a fraction of CAP spending.[484] According to an analysis by the European Public Health Alliance (EPHA), this results in payments to farmers being misaligned with the dietary targets of the WHO/FAO (Figure 9).

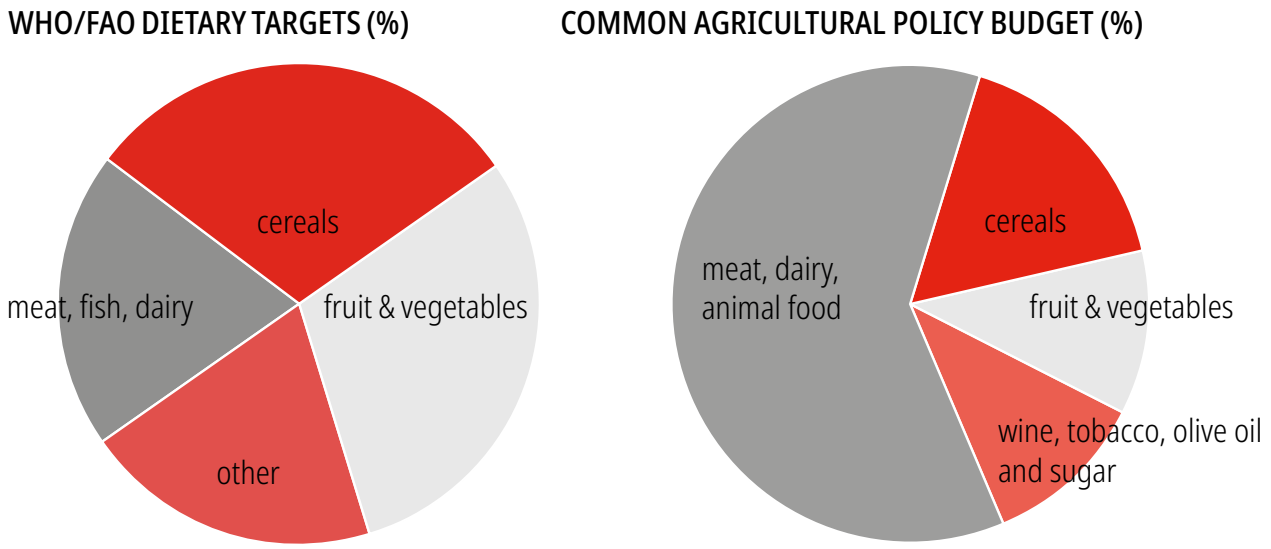


Figure 9. Dietary targets and CAP budget spending 2005.[485]

Graphics adapted from EPHA (2016). A CAP for Healthy Living

The CAP Promotion Programme

Beyond support to farmers for food production, an important part of the EU's CAP budget is dedicated to the "Promotion Programme": In 2020, €200 million was spent to promote certain food products in and outside of the EU. Between 2016 and 2020, around a third of the EU's promotion budget was spent on promoting just meat and dairy, compared to only 19% for fruit and vegetables.[486] Included in this program are the EU geographical indications (GI), certified "quality" products that have a specific link to the place where they are grown or made. Furthermore, the EU also spends a considerable budget on promoting alcoholic beverages.

Most of the Promotion Programme budget is spent on GIs, thus heavily subsidizing the promotion and marketing of animal-based products: Of the more than 1,500 GI-certified food products, only a quarter are fruit, vegetables and cereals, while more than 45% are animal products (excluding fish and butter). Slow Food has conducted two studies analyzing the production specifications for all cheese[487] and pork[488] GIs. The research showed that despite GIs being considered higher-quality products, their production rules (decided by and agreed among producers) generally show low ambitions in terms of reducing environmental impact, improving animal welfare and cutting back on chemicals and additives. Often they lack any specific reference to these aspects, all of which are fundamental to providing healthy and sustainable foods. In 2022, under pressure from civil society, the European Commission committed to shifting the program, which is currently under review, towards more plant-based products.[489]

Beyond the CAP: The EU's Farm to Fork Strategy

The food, beverage and retail industries are currently the key actors shaping European diets. For agricultural policy to deliver on health objectives, the EU needs to take a food systems approach and adopt an integrated food policy that aligns environmental, health and agricultural policies. This is why Slow Food and more than 50 other organizations are advocating for a more holistic and coherent approach, calling for a "Common Food Policy" that goes beyond just agriculture.[490, 491] A Common Food Policy would ensure that agricultural objectives line up with environmental and public health goals.

In 2020, the European Commission published the EU Farm to Fork Strategy under the umbrella of the EU Green Deal. The Farm to Fork Strategy is the EU's first policy that takes a systems approach, meaning that it considers the food system in its totality, taking into account all the elements, their relationships and related effects. Its Action Plan consists of 27 measures which aim to pave the way for greener food production, healthier and more sustainable diets and less food waste. Although its progress will need to be closely monitored throughout its implementation, the strategy advocates for several important measures to improve health.

Food production

The strategy proposes an action plan regarding organic farming, including the target of having 25% of the EU's agricultural land be devoted to organic farming by 2030, and proposes measures to stimulate demand for organic food through promotion campaigns and green public procurement.

The Commission has also set the targets of reducing the use and risk of pesticides by 50% by 2030 and a 50% reduction in the overall EU sales of antimicrobials for farmed animals and in aquaculture by 2030 by introducing new regulations on veterinary medicinal products and medicated feed.

Thirdly, it aims to reduce nutrient loss by at least 50% by 2030 (while ensuring no deterioration in soil fertility) and thereby reduce the use of fertilizers by 20% by 2030. Finally and importantly, the Commission sets out to increase the uptake of agroecological practices, a first in EU food policies. Though ambitious, these targets are realistic, and crucial to keeping food systems within planetary boundaries.[492]

Food consumption

The Farm to Fork Strategy also proposes several measures for downstream actions that target food processing companies and retailers, with the aim of improving food environments.

An important point of the strategy is its focus on improving food environments and the recognition of the public health and environmental benefits of moving to a "more plant-based diet with less red and processed meat and with more fruits and vegetables."[493] It also states that the average intake of energy, red meat, sugars, salt and fats is too high, while consumption of whole-grain cereals, fruit and vegetables, legumes and nuts is insufficient. It aims to reverse the increase in overweight and obesity rates across the EU by 2030.

To increase access to healthy and sustainable food, the Commission proposes setting minimum mandatory criteria for sustainable food procurement by helping cities, regions and public authorities to provide sustainable food for schools, hospitals and public institutions, and particularly to increase the availability of organic food. Secondly, the strategy proposes several reforms to improve food labelling, including having a mandatory nutrition label on the front of the packaging, including a label of origin, as well as a label related to animal welfare.

The strategy also recognizes the increasing role food processing companies have on people's diets and proposes creating nutrient profiles to encourage food companies to reformulate their products and lower their quantities of fat, sugar and salt.

Together, these commitments represent important improvements in the EU's attempt to align agricultural and health policies. However, it is important to keep in mind that the strategy and its targets are not binding—new legislation and reforms will have to be implemented to ensure progress. The strategy does not go far enough to address industrial animal farming, because it fails to include targets to reduce the consumption and production of animal products. Finally, it fails to provide sufficient support to transition to agroecology. These factors suggest that overall progress may be slow.

For a detailed analysis of the Farm to Fork Strategy, read Slow Food Europe's policy brief.

SLOW FOOD'S RECOMMENDATIONS ON FOOD AND HEALTH

The EU's commitment to transitioning to sustainable food systems that deliver on both public health and sustainability is made clear in the Farm to Fork Strategy published in 2020. However, in order for the strategy to deliver and for its objectives to be met, bold action must urgently be taken in the form of binding policies regulating the production, transformation, distribution and consumption of food.

1) **Slow Food calls on the EU to work towards an integrated food policy, bringing coherence between health, environmental and agricultural policies, as well as engaging actors at all levels including including national governments, EU institutions, local and regional authorities, civil society, the food industry, public food procurers in schools, hospitals and local canteens, community initiatives, local farmers and others.**

2) **Slow Food advocates for aligning the Common Agricultural Policy and pesticide policies with the objectives of the EU Green Deal and Farm to Fork Strategy to ensure the coherence of health, agricultural, and environmental objectives. To do this, the EU must put an end to industrial food production and urgently set in motion the transition to agroecology.**

• The CAP must **give greater support to agroecological farmers** who protect biodiversity (including agrobiodiversity), conserve soil fertility and limit the use of chemicals, and must **shift away from a hectare-based payment approach** towards one that delivers public goods.

• The EU must **ensure that budget expenditures under the CAP are aligned with both WHO dietary recommendations and promoting agroecology**. Greater support should be given to fruit and vegetable production and promotion, primarily supporting plant-based production aimed at food rather than feed, while reducing support for unhealthier foods, including industrially produced meat and other animal products, alcohol, sugar, etc.

• The **CAP Promotion Programme** should clearly shift its focus towards the **support of healthy food options**, in line with the Green Deal and the Europe Beating Cancer Plan objectives.

• The EU should revise its **geographical indication schemes** by demanding the specific **inclusion of environmental, animal welfare and health standards in the production rules**.

• The EU should tackle the threat of antimicrobial resistance by **setting higher animal welfare standards** that can reduce the risk of illness and the need for antimicrobials.

• The EU must provide **technical and financial support to farmers** for the development of farm management systems that aim to reestablish the symbiosis between pollinators and agriculture and which do not require the use of synthetic pesticides, by **making integrated pest management practices mandatory and promoting the transition to agroecology**.

• The EU must **set legally binding targets to reduce the use of synthetic pesticides by 80% by 2030, and propose a clear strategy to phase out their use entirely by 2035** as called for by 1.2 million EU citizens as part of the European Citizens Initiative "Save Bees and Farmers." To do this, it must ban the preventive use of pesticides in farming, gardening and forestry, ban more hazardous pesticides, and strengthen the definition of Integrated Pest Management.

• The EU must put an urgent end to the production and export of pesticides that have been banned in the EU for health and environmental reasons, in particular their export to low- and middle-income countries. In parallel, the import of food containing residues of pesticides that have been banned in the EU must be prohibited.

• The EU and its member states must **take a stand against the herbicide glyphosate**, and refuse its reauthorization in 2022.

• The EU must ensure that **pesticide authorizations are based on unbiased and independent research data and science**, and follow the precautionary principle. Conflicts of interest must be avoided and disclosed.

3) Slow Food calls on the EU to take a "food environments" approach to policy making and make sustainable and healthy diets the easy choice by ensuring that foods, beverages and meals that contribute to sustainable healthy diets are the most available, accessible, affordable, pleasurable and widely promoted.

• The EU must **adopt a holistic approach to food labeling** that informs consumers about the nutritional characteristics, food safety, quality, origin and overall sustainability of the product, ensuring full transparency for consumers.

• The EU must **adopt nutrient profiles** in order to strictly regulate the use of health and nutrition claims and prevent consumers from being misled about the nutritional quality of foods, and ensure only foods of good quality can bear such claims.

• The EU should **ensure that food prices send the right signal to consumers and reflect the food's true cost to society** (i.e. including environmental and health impacts associated with food production and consumption as well as allowing for a fair payment to workers in the food sector). One way to do this could be by increasing taxes on unhealthy products, whilst making fruit and vegetables tax-exempt.

• EU-wide **public procurement guidelines should be adopted that promote healthy, diversity-rich and environmentally friendly diets** in line with dietary and nutrition guidelines and discourage the consumption of unhealthy foods in public institutions including schools and hospitals.

• The EU should **leverage food procurement in schools**, tapping into its great potential to address childhood obesity, reduce inequalities and connect children with food production by integrating healthy meals with food education.

• The EU must **promote the development of short supply chains and alternative food network**s that can deliver healthy and sustainably produced food while supporting the local economy.

• The EU must **promote more food education in schools**. Children and adults alike must be educated not only about the nutritional quality of foods, but also where their food comes from, how it is produced and by whom.

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