Fondazione Barilla
il tuo cibo, la tua terra

EUROPE AND FOOD

ENSURING ENVIRONMENTAL, HEALTH AND SOCIAL BENEFITS FOR THE GLOBAL TRANSITION

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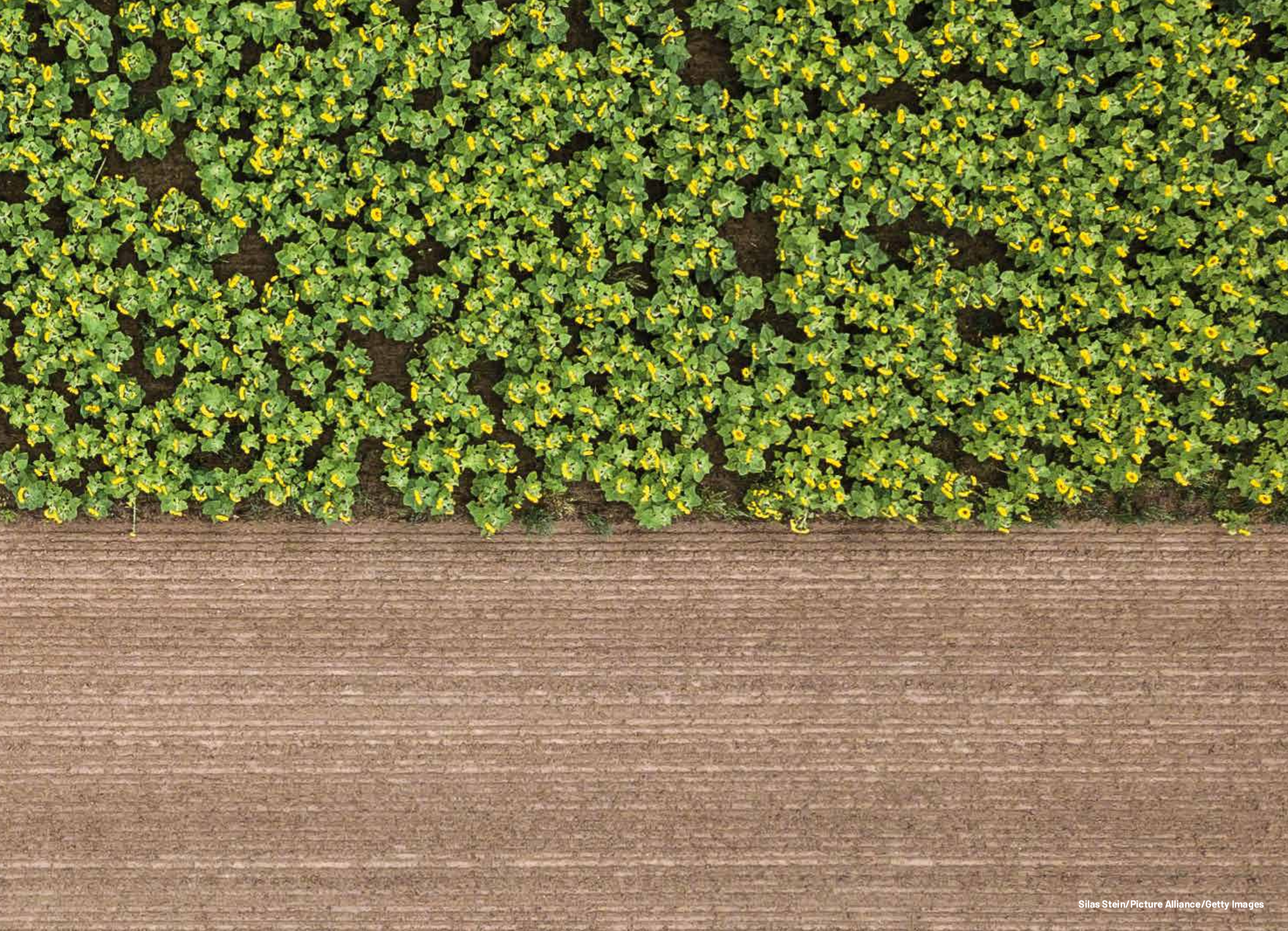

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RESETTING THE FOOD SYSTEM FROM FARM TO FORK

Let's make the future grow

Food systems dominate every aspect of our lives and inter-connect us all – families, communities, nations. When food systems fail, health, education, economy, environment, peace, and security are all threatened. Resetting the food system is critical to national, regional and global agendas, and requires urgency and bold leadership to achieve the Sustainable Development Goals (SDGs) and the Paris Agreement. Our agricultural and health systems have to pivot quickly to grow nutritious food that is accessible to all people in the world, in a way that is regenerative for the planet. This requires a holistic vision that connects food, health and environment, especially in light of Covid-19. An interconnected food systems approach is urgently needed going forward.

The "Resetting the Food System from Farm to Fork" forum, jointly organised by the Barilla Foundation and Food Tank, is intended to accelerate change, encourage systemic thinking, break persistent silos and advance a solution-oriented approach. The main messages emerging from the keynotes and panel discussions are the following:

1. Farmers, fishers, and pastoralists play a pivotal role in fostering change in global food systems.

They are custodians and stewards of valuable traditional and indigenous knowledge and urgently need to be brought to the table to effectively shape decision-making processes. Farming communities need support and incentives to shift towards more sustainable and agroecological farming approaches to ensure food sovereignty, increase productivity and resilience against external shocks, while preserving biodiversity and ecosystems. The key challenge is to provide equitable access to land, markets, seeds, and technologies to all farming communities, as well as ensuring decent livelihoods for all, especially for the most vulnerable groups such as women, indigenous people and youth.

2. Innovation in technologies, financial incentives, public policies must accelerate the transition of agri-food systems towards equity, resilience, healthiness and sustainability.

Technology must be appropriate for diverse communities and cultures. Farmers and businesses need to be supported in having access to the innovation ecosystem and strong capacity building. Regulation and public policy must ensure that the value generated with the use of digital technology along the agri-food chain is distributed fairly to farmers. Public policies, distributed and decentralised governance, and elevating community-led data management is necessary to transform the food system. Large public investments (e.g., in water and logistics infrastructures, digital connections and technical assistance) are also important.

3. Sustainably produced, high-quality nutrient-dense foods must be accessible and affordable for all.

This is fundamental for global health, well-being and environmental security and requires coherent policy reforms and serious economic incentives. Traditional sustainable diets, integral to local communities, should be recognised. Food and agriculture related policies and actions that deliver multiple benefits (e.g., in terms of poverty reduction, increased equity, job creation, economic growth, and reduced environmental impacts) should be prioritised – as championed by the EU Farm to Fork Strategy.

4. Food businesses across the globe must urgently rethink their strategies and operations to align with the SDGs and the Paris Agreement on climate change.

To do this we need: engagement with farmers and food suppliers; investment in sustainable agricultural practices that also contribute to equitable livelihoods; agreeing performance measurements better aligned with Agenda 2030; scaling up of sustainable practices and promoting sustainable dietary patterns. Food and agriculture businesses must boost resilience to grapple with current and future global shocks. We urge them to demonstrate strong commitment to achieve the purposes of the UN Food Systems Summit.

5. Alliances between chefs and hospitality, producers and consumers are vital to introduce responsible consumer habits, enhance regional food systems and uncover the true costs of food.

Although the hospitality sector represents just one part of the food chain, chefs can act as key connectors and use their influence to help consumers break cultural, political and economic barriers and shift to better diets and lifestyles through delicious meals and menus.

The Barilla Foundation and Food Tank jointly welcome the 2021 UN Food Systems Summit, a collective journey for the transition to healthier, more sustainable and equitable food systems, as part of the Decade of Action to achieve the SDGs. This is intended to be a people's and solution-oriented summit, and will require all of us – civil society, scientists, businesses, policymakers, farmers, fishers, pastoralists, indigenous people, activists, citizens – to engage and become key agents of change to transform global food systems in a circular way, from farm to fork to disposal. We urge the global community to join forces by igniting a multi-stakeholder debate and working synergistically towards a UN Food Systems Summit that successfully:

1. Aligns around a shared sense of purpose, that enables all stakeholders to craft their diverse visions for a healthier, more inclusive, sustainable and resilient food system. These visions are essential to provide clear guidance around the concrete and tangible actions that are required to advance towards the 2030 Agenda for Sustainable Development and to change the narrative of food system transformation.

2.Connects, mobilises and invites all actors in the food system on a collective journey that leads to a transformed food system. This requires establishing and strengthening partnerships for change and aligning investments. Knowledge exchange, sharing of experiences and good practices – as well as greater coordination, transparency and accountability – can ensure that no one is left behind and that collective action is larger than the sum of its parts.

3.Raises awareness and empowers citizens to make appropriately sustainable choices as consumers, by fuelling a scientifically grounded and action-oriented public discussion. This will enable us to be change makers for a transformation of the food system. The establishment of a multidisciplinary inter-governmental body to provide science-based knowledge and risk assessments on the state of agri-food systems will have the potential to support the transition and inform policy making.

The Covid-19 pandemic is a global wake-up call to reset our global food system now.
Join us to nourish our people, our planet, and our economies.

The future of food is in our hands.
Let's make the future grow!

Marta Antonelli[1], *Million Belay*[2], *Barbara Buchner*[3], *Danielle Nierenberg*[4], *Livia Pomodoro*[5], *Gabriele Riccardi*[6], *Camillo Ricordi*[7], *Gerry Salole*[8], *Riccardo Valentini*[9], *Stefano Zamagni*[10]

[1] *Barilla Foundation*
[2] *Alliance for Food Sovereignty in Africa*
[3] *Climate Policy Initiative*
[4] *Food Tank*
[5] *Milan Center for Food Law and Policy*
[6] *University of Naples Federico II*
[7] *University of Miami*
[8] *Impact Trust*
[9] *University of Tuscia, RUDN University of Moscow*
[10] *Johns Hopkins University*

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List of acronyms

BMI	Body Mass Index
BMJ	British Medical Journal
CAP	Common Agricultural Policy
CEPS	Centre for European Policy Studies
CSO	Civil Society Organisations
DEDIPAC	Determinants on Diet and Physical Activity Knowledge Hub
EC	European Commission
EEA	European Environment Agency
EGD	EU Green Deal
EIU	Economist Intelligence Unit
EU	European Union
EUPHA	European Public Health Association
EUROSTAT	Statistical Office of the European Communities
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FCRN	Food and Climate Research Network
FLW	Food Loss and Waste
FSI	Food Sustainability Index
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HALE	Healthy Life Expectancy
IAI	Infection and Immunity (journal)
IEEP	Institute for European Environmental Policy
IFAD	International Fund of Agricultural Development
IFPRI	International Food Policy Research Institute
INFORMAS	International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support
IPCC	Inter-Governmental Panel on Climate Change
IPES-Food	International Panel of Experts on Sustainable Food Systems
JPI HDHL	Joint Programming Initiative on a Healthy Diet for a Healthy Life
JPI PEN	Joint Programming Initiative Policy Evaluation Network
LANCA	Land Use Indicator Value Calculation in Life Cycle Assessment
LCA	Life Cycle Assessment
MENA	Middle East and North Africa region
MOL	Municipality of Ljubljana
MUFPP	Milan Urban Food Policy Pact
NCD	Non-Communicable Disease
NGO	Non-Governmental Organisation
NIH-AARP	National Institutes of Health
PEN	Policy Evaluation Network
PRIMA	Partnership for Research and Innovation in the Mediterranean Area
SDGs	Sustainable Development Goals
SOC	Soil Organic Carbon
UNCCD	United Nations Convention to Combat Desertification
UNESCO	United Nations Educational Scientific and Cultural Organization
UNICEF	United Nations International Children's Fund
WFP	World Food Programme
WHO	World Health Organization

Pascal Saez/VW Pics/Universal Images Group/Getty Images

Sustainable food systems and the 2030 Agenda

Across the world today, food systems exact a high toll on both human health and the environment, and change is still unacceptably slow. 690 million people in the world go hungry, a substantial cut in estimates that shows no change in the alarming trend, while two billion people are overweight[1]*, the latter representing an astonishing 38.9% of the adult population across all continents*[2]*. Of these, over 650 million were obese in 2016. Nearly one third of food production is lost before it reaches the market or wasted by the end user. Agriculture is the largest consumer of fresh water (around 70% on average around the globe)*[3]*, uses 12% of the globe's land surface (arable and permanently cultivated land), and is responsible for soil degradation, loss of biodiversity and the pollution of terrestrial and aquatic ecosystems*[4]*. Overall, food systems produce 21% to 37% of the world's anthropogenic greenhouse gases so there is a great potential for mitigation*[5]*.*

On 25 September 2015, during the United Nations Sustainable Development Summit, the 2030 Agenda for Sustainable Development was adopted by the 193 Member States of the United Nations. The adoption of the 2030 Agenda, together with the Paris Climate Agreement, which called on all nations to pursue efforts to limit global warming to 1.5° C, were fundamental steps which set a global holistic framework to address the world's economic, environmental and social challenges. The Agenda's 17 Sustainable Development Goals (SDGs) and 169 targets, set precise goals that need to be achieved and call for deep transformations in society, with time-bound objectives for 2030, requiring engagement and bold action by politicians, citizens, businesses and civil-society organisations. These transformations need to take place in a number of areas, namely: (1) Education, Gender, and Inequality; (2) Health, Wellbeing, and Demography; (3) Energy Decarbonisation and Sustainable Industry; (4) Sustainable Food, Land, Water, and Oceans; (5) Sustainable Cities and Communities; and (6) Digital Revolution for Sustainable Development[6]*.*
However, while these transformations have started in some countries, at the moment the world is not on track to meet the majority of the 2030 Agenda objectives, as recently highlighted by the first digital SDG progress report released by FAO[7] *in which key data and trends for 18 SDG indicators relating to sustainable agriculture, food security and nutrition were considered. Excluding targets for which enough data to make a reliable forecast are not yet available, the world is only on track to meet 3 of the targets (14.7.1, 15.2.1, 15.6.1) and off track on 9, especially the one related to SDG2 ("Zero hunger").*

António Guterres, current Secretary-General of the United Nations, called on society to mobilize global, local and people action, for accelerating sustainable solutions to all the world's biggest challenges. Achieving the SDG2 target, as well as contributing to the whole of the 2030 Agenda, heavily depends on the transition towards a more sustainable food system capable of producing

healthy food for all, in a way that protects rather than degrades the planet, and that is resilient to environmental stresses, especially the climate-related stresses that lie ahead[8].

The European Commission has recently presented the European Green Deal, aiming at becoming the first climate-neutral continent by 2050. The roadmap for making the EU's economy sustainable just and inclusive for all, can be the cornerstone for implementing the SDGs in the EU. The Farm to Fork Strategy, part of the European Green Deal, is integral to the ambitious plan to turning the EU into the gold standard of a fair, healthy and environmentally-friendly food system.

Climate and environmental challenges must become opportunities, and on 14 January 2020 the European Commission presented the European Green Deal Investment Plan, which would lead to at least EUR 1 trillion of sustainable investments over the next decade. It will enable a framework to facilitate public and private investments needed for the transition to a climate-neutral, green, competitive and inclusive economy. The success of the European Green Deal Investment Plan will depend on the engagement of all actors involved.

TRANSFORMING FOOD PRODUCTION, CONSUMPTION AND TRADE INTO A HEALTHY AND ENVIRONMENTALLY SUSTAINABLE SYSTEM IS POSSIBLE

The starting point for moving to an agri-food system able to effectively contribute to achieving the SDGs, should be a ***focus shift from feeding people to "enabling people to nourish themselves" in a way that is sustainable***[9]*. Some studies*[10] *have suggested a paradigm shift to policies on agri-food systems that are aligned with the 2030 Agenda for Sustainable Development instead of focusing only on food supply. In order to achieve this,* ***four types of transformation*** *are required. Firstly, a change is required in the patterns of food consumption so as to lead to* ***healthy and sustainable diets****. Secondly, a* ***more sustainable, inclusive and nutrition-sensitive mode of agricultural production*** *and the other steps subsequent stages of the* ***food chain*** *(i.e., processing, distribution, and marketing) would be necessary. Thirdly, far-reaching changes to agricultural systems would need to be effected to promote agricultural practices that* ***mitigate and reduce emissions*** *of greenhouse gases whilst strengthening the* ***resilience of rural communities and agricultural landscapes****. Finally, a* ***regeneration of rural areas*** *- that is able to redress the deprivation that has been directly caused by the process of urbanisation - would need to be activated by local and national institutions.*

To ensure that SDGs are achieved worldwide as far as food systems are concerned, it is essential to improve our ability to measure system performances in order to monitor the progress of each nation[5] *in relation to the SDGs. That is why, over the last few years, frameworks and indexes have been created to enhance and standardise the assessment and comparison of initiatives and the performance of different countries* [11]*. Within this context, the purpose of this report is to stimulate debate, concrete actions, policies and solutions for an EU food system that provides safe, affordable, nutritious, and environmentally sustainable food for everyone. Transforming food production, consumption and trade, into a system that is healthy and environmentally sustainable is possible, but it will require a major shift in public attitudes, policies and knowledge and a seizing of current opportunities for change.*

The engagement and collaboration of all stakeholders is highly necessary: from citizens, called

upon to adopt a healthy and sustainable diet, to policymakers, who will need to address social, economic, health and environmental concerns with an integrated approach, to businesses, that will need to act as catalysts for food system transformation, to educators, who will be required to build a new generation of responsible global citizens.

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EXECUTIVE SUMMARY

The "Europe and Food" report presents an assessment of food systems in the European Union (EU) in terms of nutritional challenges, agriculture, food loss and food waste. The analysis covers the EU Member States as well as the United Kingdom. The analysis has generated eight major findings.

1. Alarming trends in nutrition

All EU countries present high levels of overweight and obesity, both among adults and children, as well as insufficient levels of physical activity. Southern European countries and the UK have the highest prevalence of overweight in children and adolescents. In all the countries analysed, adult overweight exceeds 50% of the population. These trends are concerning as a high Body Mass Index and a lack of physical activity are risk factors for the development of non-communicable diseases (NCD) thus burdening health systems and economic development and hindering the well-being of large parts of the population.

2. The potential of healthy and sustainable diets is still to be unleashed

Dietary guidelines are published in all EU countries, but not all of them are updated at the same rate. Only in a few cases are sustainability-related concerns integrated into dietary recommendations, despite the fact that the potential for improving both planetary and human health through diets has been widely studied and reported.

3. The EU faces a nutrition transition towards a Western diet

In the EU, nutrition seems to be transitioning towards a common westernisation of diets. Westernised diets are characterised by a high protein, saturated fat, refined grain, sugar, alcohol, salt and corn-derived fructose syrup content, with an associated reduced consumption of fruit and vegetables. In terms of diet composition, the EU consumes much more sodium than is physiologically necessary. All countries fall within the second quartile or below, with consumption of sodium ranging from 3g/day in Denmark and the Netherlands to 4g/day in all the other EU countries. Lower sodium intake can reduce the burden of NCD morbidity and mortality.

4. At the forefront of global climate action

Agriculture is responsible for about 10% of total greenhouse gas emissions (GHG) in the EU. Livestock rearing contributes to 61% of total GHG emissions from EU agriculture, while crop cultivation produces the remaining 39% (excluding GHG emissions from land use change). The European Green Deal is an ambitious package of measures intended to enable the EU to be the world's first climate-neutral continent by 2050 and decouple economic growth from the use of resources. The post-2020 Common Agricultural Policy (CAP) will attempt to place a greater emphasis on the environment and climate. Key enablers for the progress of EU agriculture towards the goals of the 2030 Agenda are also education, training, science, technology, research, innovation and digitisation.

5. Soil degradation is a major area of concern

The degradation of agricultural soils is a crucial issue especially in southern European countries, which are characterised by a soil carbon content, as a percentage of weight, below the critical 1.5% threshold. The soil of 17 out of the 28 countries that were investigated showed soil carbon content below this threshold. Agriculture is a major cause of depletion of the soil carbon content which leads in turn to the degradation of soil structure and consequent increases in soil erosion, nutrient leaching and gaseous emissions. The EU has the greatest proportion of organically farmed agricultural land out of its total area of agricultural land than all of the regions analysed in the FSI 2018. The area taken up by organic farming has increased by 70% in the last ten years and is still increasing.

6. Agriculture lacks youth

Participation of young people (under 35) in farming is generally low in the countries that were analysed, accounting for an average of about 5% of the young population. Romania and Bulgaria are the only two countries with rates higher than 10%. All the other countries are below 10%. The average age of EU farmers is 53. Women account for about 50% of the farming population on average.

7. Food waste is still high

Over 20% of the food produced in the EU is wasted. Every EU citizen generates around 58 kg of food waste per year on average, with the highest level registered in Belgium (87 kg per capita) and the lowest one in Cyprus (36 kg per capita). Food losses account for about 3% of total food production.

	FSI	FOOD LOSS AND WASTE	FOOD LOSS	END-USER WASTE	SUSTAINABLE AGRICULTURE	WATER	LAND	AIR	NUTRITIONAL CHALLENGES	LIFE QUALITY	LIFE EXPECTANCY	DIETARY PATTERNS
Austria	Very High	Medium	Very High	Low	Very High	Very High	Very High	Very High	Very High	Very High	High	High
Belgium	Medium	Low	Medium	Low	Very High	High	Medium	Very High	Very High	Very High	Very High	Medium
Bulgaria	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Medium	Low	High
Croatia	Very High	High	Very High	Medium	Medium	Very High	Medium	Low	Very High	Very High	Low	High
Cyprus	Medium	Medium	High	Medium	Low	Medium	Medium	Low	High	High	High	High
Czech Republic	Very High	Very High	Very High	High	Very High	Very High	High	Very High	High	High	Low	Medium
Denmark	Very High	Medium	High	Medium	Very High	Very High	Very High	Very High	Very High	Very High	Very High	Very High
Estonia	High	High	Very High	Low	High	Medium	Very High	High	Very High	High	Medium	Very High
Finland	Very High	Very High	Very High	Low	High	Medium	Very High	High	Very High	Very High	Very High	High
France	Very High	Very High	Very High	High	High	Low	Very High	Very High	Very High	High	Very High	High
Germany	Very High	Medium	High	High	Very High	High	Very High	Very High	High	Very High	High	Low
Greece	Medium	Low	Medium	Medium	Medium	High	High	Low	High	High	Medium	Very High
Hungary	Very High	Very High	Very High	Medium	Very High	Very High	High	Very High	Medium	High	Low	Medium
Ireland	High	Medium	High	Low	Very High	High	High	Very High	Very High	Very High	High	High
Italy	High	High	High	High	High	Medium	High	Medium	Medium	High	High	Low
Latvia	Low	Medium	Very High	Low	Low	Low	High	Low	High	Medium	Low	Very High
Lithuania	Medium	Medium	High	Low	Medium	Low	High	High	Medium	High	Low	Medium
Luxembourg	High	Very High	Very High	Medium	Low	Low	Medium	Low	High	High	Very High	Low
Malta	Low	Low	Low	Low	High	High	Medium	High	High	Very High	Medium	High
Netherlands	Very High	Very High	Very High	High	Very High	Very High	High	Very High	Very High	Very High	Very High	Low
Poland	Very High	Very High	High	Medium	Very High	High	Very High	Very High	High	Medium	Medium	Medium
Portugal	High	Medium	High	Low	High	Low	Very High	Very High	Very High	Very High	High	Very High
Romania	Medium	Medium	High	Low	Medium	High	Medium	Medium	Medium	Medium	Low	Low
Slovakia	Low	Low	Medium	Low	Low	Low	High	Low	Very High	Very High	High	High
Slovenia	Low	Low	Low	Medium	Low	Low	Very High	Medium	High	High	High	Medium
Spain	High	Very High	Very High	High	Medium	Low	Very High	Medium	High	Very High	High	Low
Sweden	Very High	High	Very High	High	High	High	Very High	Medium	Very High	Very High	Very High	High
United Kingdom	High	Very High	Very High	Medium	Low	Low	High	Low	Very High	High	High	High

Very High High Medium Low

8. Policy responses to food loss and waste are taking place at regional and national levels

Three important steps have been achieved by the EU in the last few years. Firstly, the issuing of guidelines on food donations, secondly, new guidelines for feed use of food no longer intended for human consumption and finally a new common methodology starting in 2020 for measuring food loss and waste (FLW). At national level, noteworthy policy responses can be observed in France and Italy. The former was the first country in the world to publish a national law against FLW in 2016. The latter has issued new legislation to facilitate food donations by easing bureaucratic burden that hinders them, relaxing food safety requirements and regulations around labelling and food safety, and offering tax incentives (i.e., waste tax deductions). Digital tools are offering more and more options to citizens to enable more sustainable lifestyles and reduce the level of food waste. Finally, several cities in Europe are launching significant initiatives to tackle the paradoxes of the food supply chain and set up a true circular economy for food.

THE EU FOOD SYSTEM

UNLEASH THE POTENTIAL OF HEALTHY AND SUSTAINABLE DIETS

Food based dietary guidelines are not updated at the same time

Only Sweden and Germany include environmental concerns

ENABLE HEALTHY AND SUSTAINABLE DIETS

Food education, value chain development for nutrient-rich foods, food reformulation and labelling laws, review of food subsidies

ALARMING TRENDS IN NUTRITION

59% of adults, **28%** of children and adolescents are overweight

Most populations do not attain recommended levels of physical activity

TRANSITION TOWARDS A COMMON WESTERN DIET

High consumption of protein, saturated fat, refined grains, sugar, alcohol and salt

FOOD LOSS

Food losses at post-harvesting and processing phases account for **3%** of total food production

CHALLENGES AT A GLANCE

SOIL DEGRADATION IS A MAJOR AREA OF CONCERN

17 countries have a soil carbon content below the critical threshold of **1.5%**

THE AGRICULTURAL SECTOR LACKS YOUTH

Youth in agriculture is about **5%**

53 years is the average age of farmers

FOOD WASTE IS STILL HIGH

20% of the food produced in the EU is wasted

58 kg/yr per capita on average at the end-user level

CO_2 AT THE FOREFRONT OF GLOBAL CLIMATE ACTION

With the European Green Deal and the Farm to Fork Strategy, the EU aims to be the world's first climate-neutral continent by 2050

TURNING AGRICULTURE FROM A PROBLEM TO A SOLUTION

Regenerative and agroecological approaches and techniques, innovation, engagement of farmers - especially young farmers

POLICY RESPONSES

Guidelines on food donations

Circular economy approach and digital tools

New common methodology for measuring and reporting

Chris Niedenthal/The LIFE Images Collection/Getty Images

1. Nutritional Challenges

Highlights

Overweight and obesity are a serious challenge in the European Union (EU), among both adults and children, from which no country is exempt. More than half the adults are overweight, and at least 1 child in 4 is affected.

Life expectancy at birth has risen from an average of 69 years in 1960 to 80 in 2016. **Healthy life expectancy**, i.e., the years of good health that a new-born can expect to live without disease and/or injury, is 10 years shorter on average than overall life expectancy.

Most populations across EU countries **do not attain recommended levels of physical activity**. The World Health Organization (WHO) recommends engaging in approximately 150 minutes of moderate-intensity aerobic physical activity each week to reduce the risk of non-communicable diseases (NCDs) and increase overall wellbeing.

The WHO European Region **has the lowest global breastfeeding rates in the world**. Breastfeeding ensures the best trajectory for growth and development, while preventing NCDs later in life.

Populations in the EU consume **much more sodium** than is physiologically necessary. The WHO recommends limiting sodium consumption to 2 g/day (equivalent to 5 g salt/day).

In all EU countries, **healthy eating guidelines** are published at a **national level. The environmental impact of food choices** has been included in the Swedish and German guidelines.

Education on nutrition is compulsory in the national curriculum for primary and/or secondary schools in **19 EU countries**.

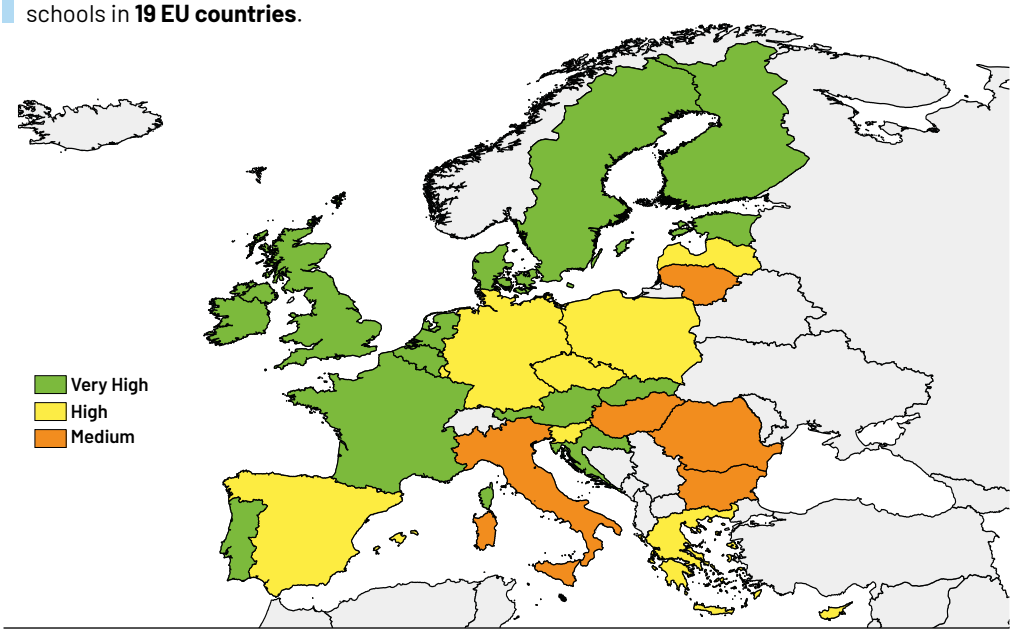


Figure 1.1. EU performance in the FSI Nutritional Challenges pillar.

1.1. Introduction and background

According to the World Health Organization (WHO)[12], global demographic, economic, environmental, and cultural changes occurring in the past decades have led to more than 1.9 billion overweight and 650 million obese adults in 2016. Obesity has nearly tripled since 1975. In 2016, over 340 million children and adolescents aged 5-19 were overweight or obese. In the EU, a trend has been observed towards less sustainable and less healthy diets, with European citizens consuming too much energy, sugar and salt, and moving too little.

Overweight and obesity is also widespread among adults and children in the EU and this has a strong impact on peoples' health and well-being. Obesity is a major cause of NCDs[13], which have been on the rise for several decades. By 2010 they accounted for 86% of deaths and 77% of the disease burden[14].

The overall performance of the EU as a region is higher than other regions, such as North America and the Mediterranean, and comparable to high income countries analyzed in the FSI. Only Denmark has a uniform performance, performing very high across the three categories (life quality, life expectancy and dietary patterns). Finland and Sweden show a slight reduction (high) in dietary patterns, while Portugal performs high in life expectancy. On the other side, Romania performs low and very low in life expectancy and dietary patterns indicators (Figure 1.2).

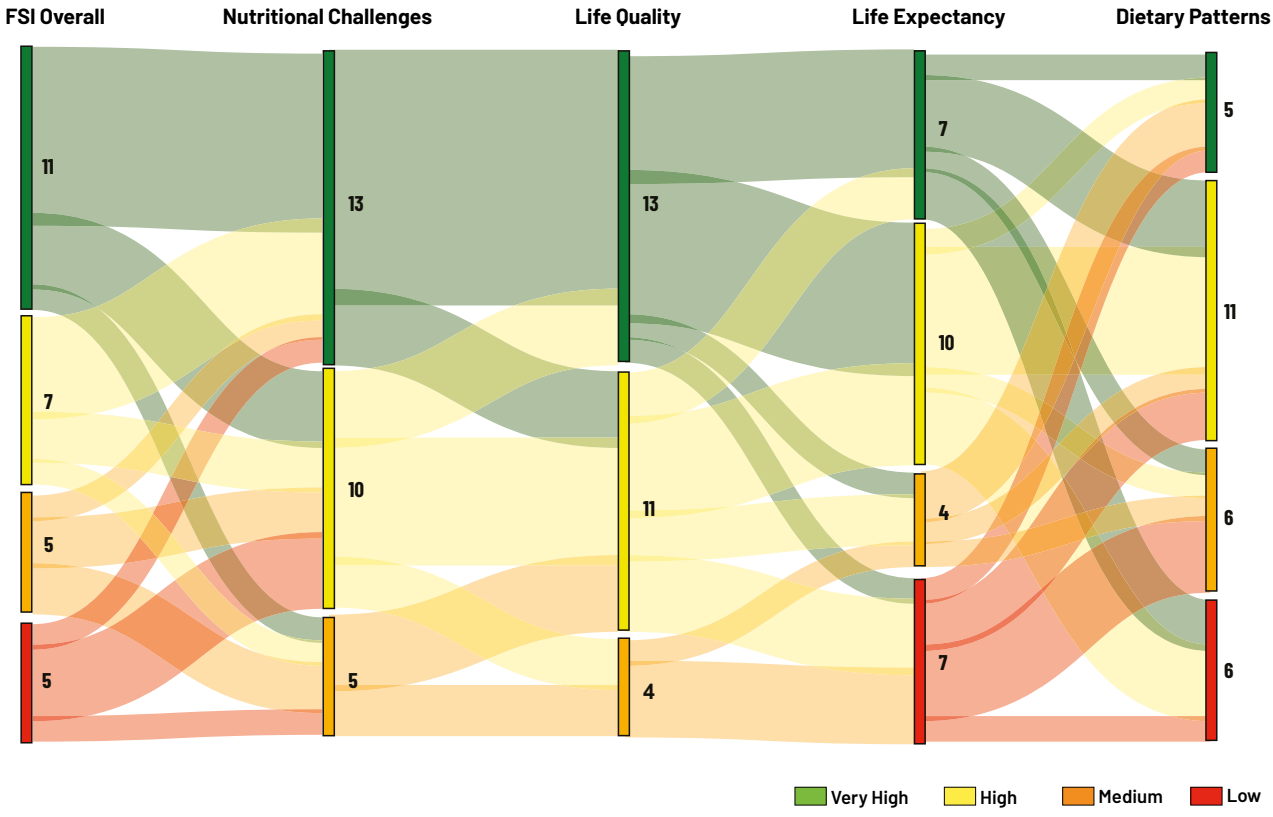


Figure 1.2 *EU performance clusters and categories (red = low; orange = medium; yellow = high; green = very high) in FSI nutritional challenges. The five axes represent overall FSI ranking, nutritional challenges and its three dimensions (i.e., life quality, life expectancy, dietary patterns), the blocks represent clusters of nodes. These blocks are proportional to the number of countries belonging to each performance cluster (the number is also shown next to each block). The stream fields between the blocks represent changes in performance, and the height of a stream field represents the number of countries contained in both blocks connected by the stream field.*

The **challenges are systemic, and there are no simple solutions**. Supporting individual choices will continue to be important but knowledge about what constitutes a healthy lifestyle is not necessarily followed by appropriate lifestyle changes. Priority should be given to policies addressing specific contexts that encourage excessive consumption of energy and nutrients. Responding to the challenge involves many different policy actions and requires collaboration across many stakeholders, from individual citizens to education providers to the food industry.

MORE THAN HALF THE ADULTS IN THE EU ARE OVERWEIGHT, AND AT LEAST 1 CHILD IN 4 IS AFFECTED

In this context, the SDGs, and in particular SDG2 and SDG3, commit governments to addressing all forms of malnutrition and preventing avoidable premature mortality from non-communicable diseases.

1.2. An overview of nutritional challenges in the EU

1.2.1. Overweight and obesity

The causes of overweight and obesity are largely related to both genetic predisposition and environmental susceptibility (i.e., the physical and social surroundings that influence what we eat) to gaining weight due to increased energy intake and reduced energy expenditure. Structural environmental changes have occurred worldwide since the 1980s, creating an **obesogenic environment** with an abundance of high-caloric density, low-quality food and under activity. All of this has led to increased body weight gain and has become a global public health problem[15]. This scenario is further aggravated by the lack of integrated and supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing, and education[16].

According to the Food Sustainability Index (FSI) ranking, all European countries **fall in or below the second quartile for the overweight indicators** which measure the prevalence of overweight among adults and among children and adolescents aged 5-19.

In the Baltic countries the prevalence of overweight (Body Mass Index (BMI) > +1 standard deviation above the median) in **children and adolescents aged 5-19** is the lowest in the EU, affecting 21% of the young population in Lithuania and Estonia, and 22% in Latvia. About 1 in 4 children and adolescents are overweight in Germany, Austria and Finland, and about 1 in 3 in the United Kingdom (31%) Portugal (32%) Cyprus (33%) and Spain (34%), with the highest prevalence recorded in Malta, Italy and Greece (37%). In the global context, the prevalence is higher only in the United States, with 42% of children and adolescents being overweight.

Between 1990 and 2008, the number of overweight infants and children in the WHO European Region[17] rose steadily. Studies have shown that over 60% of children who are overweight before puberty will be overweight in early adulthood. This is of particular concern as it will reduce the average age at which NCDs become apparent, increasing the burden on health services to provide treatment during much of their adult life[18]. Moreover, childhood obesity can profoundly affect children's physical health, social and emotional well-being and self-esteem. It is also associated with poor academic performance and a lower quality of life experienced by the child[19].

More than half the adults in the EU are overweight. Overweight is defined as BMI > 25 and the term includes obesity which is equivalent to a BMI > 30. Prevalence in the EU ranges between 54% in Austria and 55% in Denmark, 60% in Belgium, France, Croatia and Lithuania, 64% in the UK and 66% in Malta. Overall, the average prevalence of overweight in adults is 59%, and 28% in children and adolescents.

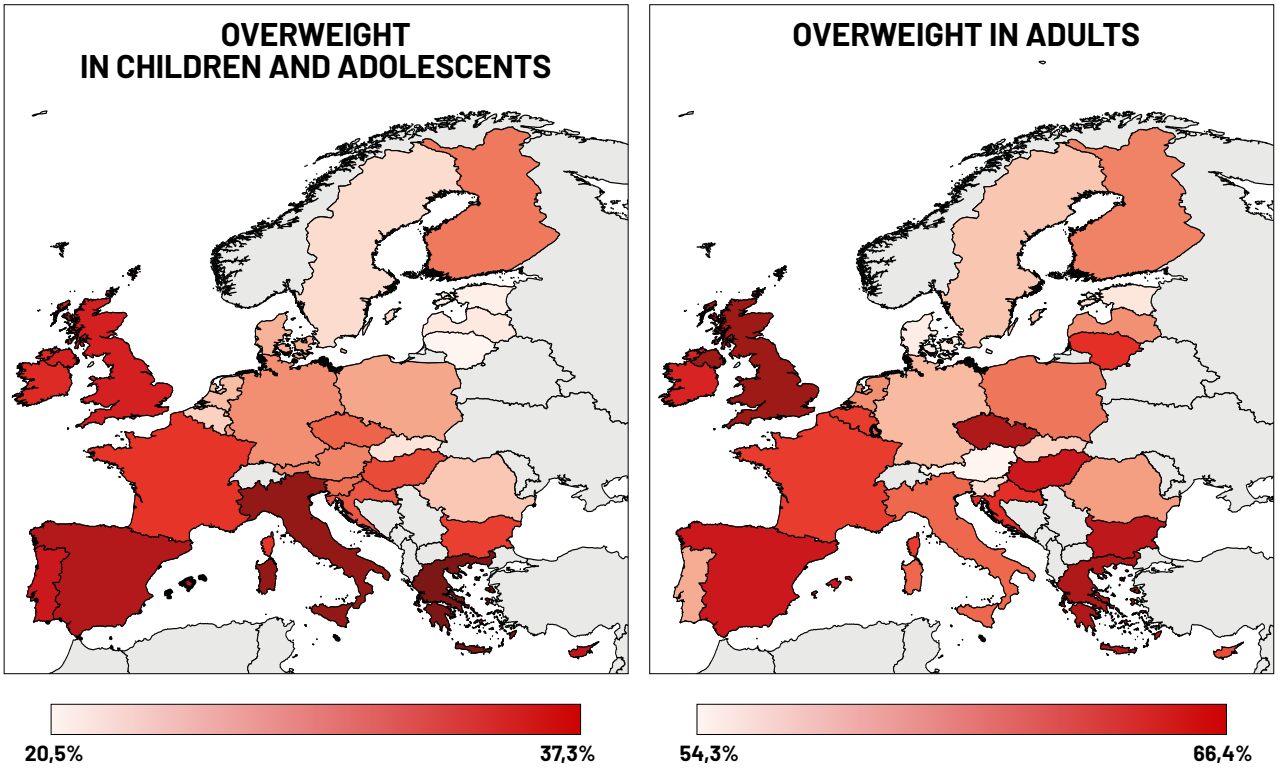


Figure 1.3. *Prevalence of overweight in children and adolescents (BMI >+1 standard deviation above the median) and in adults (BMI > 25) across EU countries*

1.2.2. Life expectancy at birth and healthy life expectancy

In the EU, life expectancy at birth has improved during the last century due to reductions in infant mortality, rising living standards, improved lifestyle and better education, as well as advances in healthcare and medicine[20]. In the high-income countries analysed by the FSI[i], the average life-expectancy at birth is 79 years. In the EU, it has risen from an average of 69 years in 1960 to 80 years in 2016[21]. The highest life expectancy, 83 years, is found in Spain and Italy. Globally, only Japan surpasses this number with an expectancy of 84 years.

IN THE EU, LIFE EXPECTANCY AT BIRTH HAS IMPROVED, BUT IS OUR LIFE ALWAYS SPENT IN GOOD HEALTH?

Increasing longevity poses the crucial question of whether this is spent in good health. Figures for life expectancy at birth do not give any indication of this, whereas **healthy life expectancy (HALE)** indicators measure the number of years of good health that a newborn can expect, lived without disease and/or injury. Cyprus, with 74 years and Italy and Spain with 73 years, have the highest HALE in the EU, while Latvia and Lithuania have the lowest, 65 years, followed by Romania, Hungary and Bulgaria, with 66 years. These statistics are directly related to the prevalence of overweight and obesity and NCDs. Increases in BMI not only have consequences with regard to disability and quality of life but entail a higher risk of developing NCDs such as type 2 diabetes, cardiovascular diseases, several forms of cancer, osteoarthritis and other health problems[22].

i. High income countries, based on the World Bank classification, include: Australia, Argentina, Austria, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Israel, Ireland, Italy, Japan, the Netherlands, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Saudi Arabia, Slovakia, Slovenia, South Korea, Spain, Sweden, UAE, United Kingdom, United States.

1.2.3. Physical activity

According to the WHO, recommended levels of physical activity for adults aged 18-64 years include participation in **150 minutes of moderate-intensity aerobic physical activity or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week**. These levels are estimated considered to reduce the risk of ischaemic heart disease by approximately 30%, the risk of diabetes by 27%, and the risk of breast and colon cancer by 21-25%[23]. Adequate physical activity levels are key for functional health and a determinant of energy expenditure, contributing to energy balance and healthy weight control[24].

The term "physical activity" should not be confused with "exercise". Exercise is a subcategory of physical activity that is planned, structured, repetitive and purposeful in maintaining physical fitness. Physical activity includes other activities which involve bodily movement and are done as part of playing, working, active transportation, household chores and recreational activities[25].

THE ROOT CAUSES OF OVERWEIGHT AND OBESITY ARE MULTIFOLD AND CONNECTED TO OTHER ISSUES

Except for Finland and Sweden, with 83% and 77% of the population being physically active, most populations across EU countries **do not reach recommended physical activity levels**. The lowest levels of engagement are recorded in Portugal (57%), Cyprus (56%), Germany and Malta (58%) and Italy (59%).

Increasing physical activity is a societal, not just an individual problem. Physical inactivity is partly due to an increase in sedentary behaviour during occupational and recreational activities. A decline in walking and cycling in favour of using motor vehicles, and the urban design of towns and cities have also been associated with declining physical activity levels. Violence, traffic, poor air quality, lack of parks, sidewalks and recreational facilities are some of the factors that can discourage a physically active lifestyle[26].

National policies and action plans are essential for the promotion of physical activity. All EU Member States have reported at least one national sports-for-all policy or action plan for promoting physical activity[27]. Many policies have consisted of a national physical activity plan to create opportunities in sectors such as health, transport, education, workplaces and urban planning. A successful promotion of physical activity on a national level requires action and a good coverage across these sectors as well as coordinated, concerted steps to avoid duplication and contradictions[28].

1.2.4. Enabling factors, with a focus on breastfeeding

According to the WHO[29], **breastfeeding ensures the best trajectory for growth and development while preventing NCDs** later in life. It should be done exclusively during the first 6 months of life and is considered one of the most critical factors for health promotion and protection. **The WHO European Region has the lowest global breastfeeding rates**. In 2006-2012, only an estimated 25% of infants were exclusively breastfed for the first 6 months, as compared with 43% in the WHO South-East Asia Region[30].

There are marked differences between countries in terms of breastfeeding practices. The

percentages of children under 6 months and at 6 months that are exclusively breastfed is as low as 4% in Poland, 2% in Bulgaria and 1% in the UK and Greece, and reaching 44% in Hungary, 49% in Slovakia, and up to 52% in Croatia[31]. Despite several health benefits and policy initiatives relating to optimal breastfeeding practices, the findings indicate that exclusive breastfeeding remains far below the global recommendation and the national target in EU countries. Furthermore, there is a wide disparity in adopting the WHO recommendations. According to a review, only eight EU countries had adopted this recommendation, while others recommended the introduction of complementary feeding as early as between 4 and 6 months[32].
Poverty, difficulty accessing health services, social marginalisation, obesity, policies in the workplace and the employment market, marketing of breast-milk substitutes, commercial "follow-on" and complementary foods, are just some of the underpinning reasons[4].

Studies have shown that breastfeeding is not promoted and supported enough in the EU, and even health and social services, cultural practices and the media operate in ways that discourage mothers from breastfeeding or reduce the length of time for which they do it[33]. With the support of the European Commission, countries have joined together to develop the Blueprint for Action on Breastfeeding in Europe[34]. Objectives include the improvement of breastfeeding practices in health services and social institutions, increasing the number of mothers who choose to breastfeed, and help them feel more confident, in control and satisfied with their experience, and improve the skills and job satisfaction of health workers.

1.2.5. Dietary patterns

Although EU countries are geographically diverse, the direction of change seems to be towards a common westernization of diets. **Westernized diets** are characterized by a high protein, saturated fat, refined grain, sugar, alcohol, salt, and corn-derived fructose syrup content, with an associated reduced consumption of fruits and vegetables[35,36]. Some common changes are evident across economically and geographically diverse EU countries, such as the increasing availability of meat, especially poultry[37], an increased supply of dairy products in southern and eastern Europe, reaching levels observed previously in northern and western Europe[38], and an increase in meals commonly being eaten out[39].

NCDS AND OBESITY INCREASE IN COUNTRIES NOT ADHERING TO HEALTHY DIETS SUCH AS THE MEDITERRANEAN DIET

The past decades have seen a **decline in adherence to the so-called 'healthy diets' such as the Mediterranean diet**[40], and research points to increased incidence of NCDs and obesity in countries adopting a westernized lifestyle[41]. The analysis of diet composition developed by the FSI draws attention to indicators associated with the development of health conditions.

A **high-level intake of free sugars is of concern** because of its association with poor dietary quality, obesity and risk of NCDs. The term "free sugars" includes 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. For both adults and children, the WHO recommends reducing the intake of free sugars to less than 10% of total energy intake, with a further conditional recommendation of further reduction of the intake of free sugars to below 5% of total energy intake[42].

Only 8 EU countries follow the recommendation. **Sugar in diets, expressed as a percentage of total caloric intake**, is lowest in Romania, Portugal and Slovenia (7%), followed by Estonia and

Greece (8%) and Italy, Finland and Luxembourg (9%). Countries falling in the fourth quartile are, with 13% of calories from sugar, Poland, Sweden, Croatia, Belgium, the Netherlands and Germany, and, with a value as high as 14% in Denmark, followed by Slovakia (15%) and Malta (16%).

Data on **sodium intake** shows that populations across the EU are consuming much more sodium than is physiologically necessary and more than the WHO recommendation on sodium consumption for adults, which is 2 g sodium/day (equivalent to 5 g salt/day)[43].

The FSI highlights how **all EU countries fall in the second quartile and below for consumption of sodium** ranging from 3 g/day in Denmark and the Netherlands, to 4 g/day in all the other EU countries. Decreasing sodium intake in the population is a cost-effective public health intervention that could potentially reduce the burden of NCD morbidity and mortality and includes actions such as reducing sodium content in manufactured food, food and product labelling, consumer education and the establishment of food-based dietary guidelines.

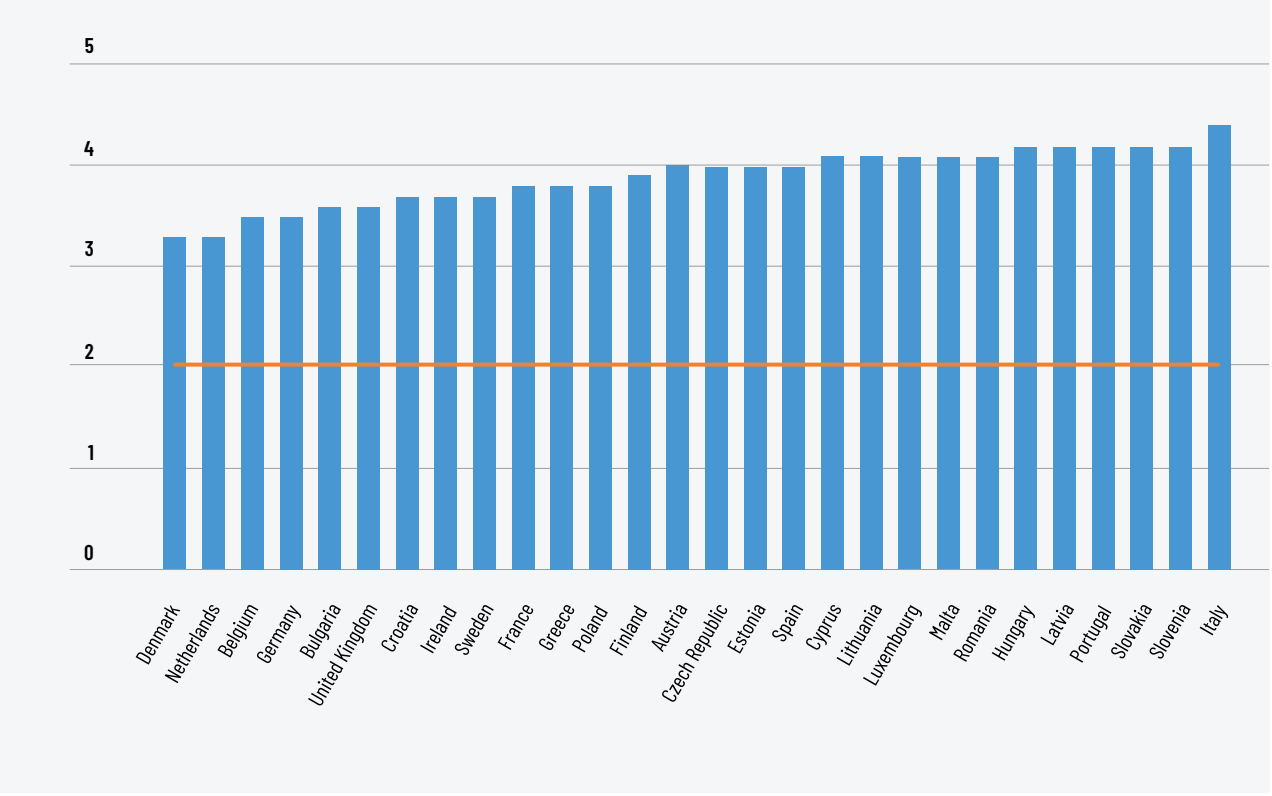


Figure 1.5. *Daily pro capita consumption of sodium (g/day). The WHO recommendation on sodium consumption for adults is 2 g sodium/day, or 5 g of salt.*

Cardiovascular diseases, especially heart attack and stroke, are the leading cause of death globally, with high blood pressure or hypertension being a major risk factor in their development. Evidence shows that reducing sodium intake significantly reduces blood pressure in adults[44]. Sodium is found naturally in a variety of foods, such as milk, meat and shellfish, but it is found in high amounts

Francesco Riccardo Iacomini/AWL Images

in processed foods such as breads, crackers, processed meats, snack foods and condiments[45]. A diet high in processed foods and low in fresh fruits and vegetables is often high in sodium[46].

In summary, a healthy diet that helps maintain energy balance and healthy weight, provides adequate population nutrition and reduces chronic disease risk consists of[47]:

- 15-30% of total energy as fat, of which saturated fat should be less than 10% and trans fatty acids less than 1%;
- 55-75% of total energy as total carbohydrate, of which added sugars should be less than 10%;
- 10-15% of total energy as protein from mainly plant sources;
- less than 5 g per day of salt;
- more than 400 g per day of fruits and vegetables.

HEALTHY DIETS SHOULD BE BASED ON WHOLE GRAINS, VEGETABLES, FRUIT AND PULSES, WHILE LIMITING RED AND PROCESSED MEAT

Regardless of latitude and geographical context, healthy diets should be based on whole grains, vegetables, fruits, and pulses, while limiting the amount of red and processed meat, resulting in a high intake of dietary fibre and micronutrients and a low intake of fats, saturated fatty acids, besides the above mentioned added sugars, and sodium[48].

It has been argued that transformation to healthy diets by 2050 will require substantial dietary shifts, with a greater than 50% reduction in consumption of red meat and sugar, and a greater than 100% increase in consumption of nuts, fruits, vegetables, and legumes in wealthier countries.

1.3. EU policies, initiatives and best practices

It has been variously suggested that a **substantial reform of the EU food systems is an opportunity to address health and well-being concerns as well as achieving the SDGs**. However, policies currently regulating the food system in sectors such as agriculture, trade, food safety, the environment, development, research, education, as well as fiscal, market and social policies have been developed in a siloed fashion. These policies have often resulted in multiple and contradictory objectives being pursued at a time when it is necessary to promote a system change approach addressing the entire food system[49].

It has been suggested that what is needed is **a new narrative that brings together multiple actors and sectors to work together simultaneously** to tackle overweight and obesity through rights-based policy approaches that address inequalities within all of the social and physical contexts[50].

Based on a three-year process of participatory research involving over 400 food system actors, the IPES-Food report **"Towards a Common Food Policy for the EU"** has underlined that the EU must work towards an integrated food policy. The report puts forward a blueprint for reforming European food systems under a Common Food Policy, with 80 concrete reform proposals sequenced over the short, medium and long term[51]. In order to promote sufficient, healthy and sustainable diets for all, proposals range from redesigning social policies to tackle the root causes of poverty and promote access to healthy food for all to reforming public procurement and VAT rules to restrict junk food marketing and shifting incentives in favour of healthy and sustainable diets.

A RANGE OF STRATEGIES HAVE BEEN DEVISED AT EU AND NATIONAL LEVELS TO PROMOTE HEALTHY DIETS

Meanwhile, a range of strategies have been devised at EU and national levels to promote healthy diets. EU countries adhere to the WHO's **European Food and Nutrition Action Plan 2015-2020**, which is intended to significantly reducing the burden of preventable diet-related NCDs, obesity and all other forms of malnutrition by taking integrated, comprehensive action in a range of policy areas through a whole-of-government, health-in-all-policies approach[52]. The Action Plan recognises the importance of policies in creating healthy food environments and protecting consumer rights and, most importantly, that proper nutrition and health should be acknowledged as fundamental human rights.

To achieve the WHO targets, such as a 25% relative reduction in premature mortality from NCDs by 2025, a halt in the increase of overweight among children under five years old and a reduction of the average population intake of sodium by 30%, incisive actions are still needed to improve food environments aiming at promoting, protecting or reinstating healthy and sustainable diets, high in vegetables, fruit and whole grains, with limited intake of saturated fat, *trans* fats, sugar and salt. These are schools, public institutions, catering establishments and retail environments and their responsibility is currently the object of debate. Arguments exist around individual and collective responsibilities, between hard regulatory or fiscal interventions and soft voluntary, education-based approaches. Genuine progress lies beyond these entrenched dichotomies and all players need to be accountable for obesity, for the reduction of NCDs and for improving general well-being[53].

Agriculture and trade policies are crucial determinants of what kind food is produced, sold, and consumed. To identify how agricultural policies can contribute toward promotion of healthy diets and

tackle non- communicable diseases related to diet, public health policy makers need to judge whether present agriculture and trade are contributing to, or detracting from, efforts to attain dietary goals[54].

Against this context, the **European Public Health Association (EUPHA)** recommends the establishment of a statutory Sustainable Nutrition Task Force responsible for formulating a strategic plan for moving towards healthy and sustainable alternatives, monitoring progress in the implementation of such policies and evaluating outcomes in relation to both healthy nutrition and sustainability. In addition, it states that the reformed Common Agricultural Policy (CAP) should take an integrated approach to tackling both nutritional and sustainability requirements, with subsidies being redirected away from meat production and in favour of the production of vegetables[55].

In 2018, a **progress report was released by the WHO**[56], on the achievements and challenges, among European Member States, of implementing the European Food and Nutrition Action Plan 2015-2020. Substantial progress had been made in areas such as school food provision, food product reformulation, fiscal approaches and surveillance of childhood obesity. Countries have adopted measures to promote healthy diets in schools, for example by setting standards for the foods available, by promoting the consumption of fruit and vegetables and by banning vending machines on school premises. Healthier food choices can be provided by reformulating foods and removing partially hydrogenated fats and salt. It is noteworthy that in high-income countries, about 75-80% of dietary salt comes from manufactured food[57]. On the other hand, areas of improvement include front-of-package labelling and comprehensive marketing restrictions. The report reveals how countries have taken steps to limit marketing of products high in fat, salt or sugar but many countries still report no action. The preference is for self-regulatory measures, with a focus on television and the exclusion of social media platforms, apps or advergames and the report suggests that these are critical areas that remain underused. Further steps and more ambitious policies are recommended for the years to come to achieve the SDGs.

IT IS NECESSARY TO PROMOTE A SYSTEM CHANGE APPROACH ADDRESSING THE ENTIRE FOOD SYSTEM

In 2019, the **Policy Evaluation Network** (PEN)[58] was launched with the aim of identifying, evaluating and benchmarking policies designed to directly or indirectly address physical inactivity, unhealthy diets and sedentary behaviour, while accounting for existing health inequalities. As part of the Joint Programming Initiative on a Healthy Diet for a Healthy Life (JPI HDHL), researchers from 28 institutions in 7 European countries and New Zealand combine their expertise, building on the DEDIPAC Knowledge Hub and the INFORMAS network, to give an overview of the 'best' public policies most likely to sustainably support more favourable health behaviours. These include food promotion, labelling, composition and retailing as well as both public and private sector policies and actions. Among the objectives, is the implementation of a Food Environment Policy Index (Food EPI) and a Physical Activity Environment Policy Index (PA EPI) in selected European countries, providing benchmarks for good policy practice to improve dietary behaviours and promote physical activity.

Petras Malukas/AFP/GettyImages

A multi-stakeholder initiative worth mentioning is the **EU Platform For Action On Diet, Physical Activity and Health**[60], a forum for European-level organisations, ranging from food business operators (manufacturers, retailers, caterers, fast food restaurants), to consumer organisations, public health NGOs and scientific and professional associations. Platform members commit to concrete voluntary actions such as reducing the intake of salt, saturated fat, trans fat and added sugars; reducing the exposure to and impact on children of food marketing; increasing regular physical activity; increasing the rates of exclusive and continued breastfeeding. In the first five years of operation of the EU Platform, this has resulted in over 300 commitments, collected in the Platform database[61]. The platform meets regularly and holds joint meetings with the high-level group on nutrition and physical activity.

Another example of integrated approach is the **"School Fruit, Vegetables and Milk Scheme"**[62] funded through the CAP. The scheme provides fruit, vegetables and milk to schoolchildren as part of a wider program of education about European agriculture and the benefits of healthy eating. Member States are responsible for the design of the EU school scheme in their country and are responsible for its proper implementation in terms of management, monitoring and control. The programme has been implemented in all EU Member States, reaching over 20 million children across the EU during the school year 2017/2018. The total EU budget for the scheme for the period 2017-23 is EUR 250 million per school year of which EUR 150 million is for fruit and vegetables and EUR 100 million for milk.

CITIES ARE RESPONSIBLE FOR CREATING SUPPORTIVE PHYSICAL AND SOCIAL ENVIRONMENTS AND DEVELOPING HEALTH PROMOTION PROGRAMMES

According to the **Food and Climate Research Network** (FCRN)[63], national governments can signal their commitment to a more sustainable and healthy future by developing **food-based dietary guidelines through an integrated approach**. Guidelines can be used to promote healthy diets and should form the basis of policies to foster such dietary patterns. Furthermore, these guidelines can incentivise the development of appropriate agricultural policies. FCRN's analysis highlights that despite this evidence, and the growing recognition of the intersection between health and environment, only Sweden, Germany, as well as Qatar and Brazil, have included sustainability in their food guidelines. In the UK, France, Netherlands, Estonia other 'quasi-official' guidelines are emerging.

In this context, the **role of local authorities** is pivotal. Cities are responsible for creating supportive physical and social environments and developing health promotion programmes. Thus, supporting better governance is fundamental to empowering cities and local authorities in their quest for achieving sustainable development.

ARE THERE ANY HEALTHY EATING GUIDELINES AT NATIONAL LEVEL?

YES

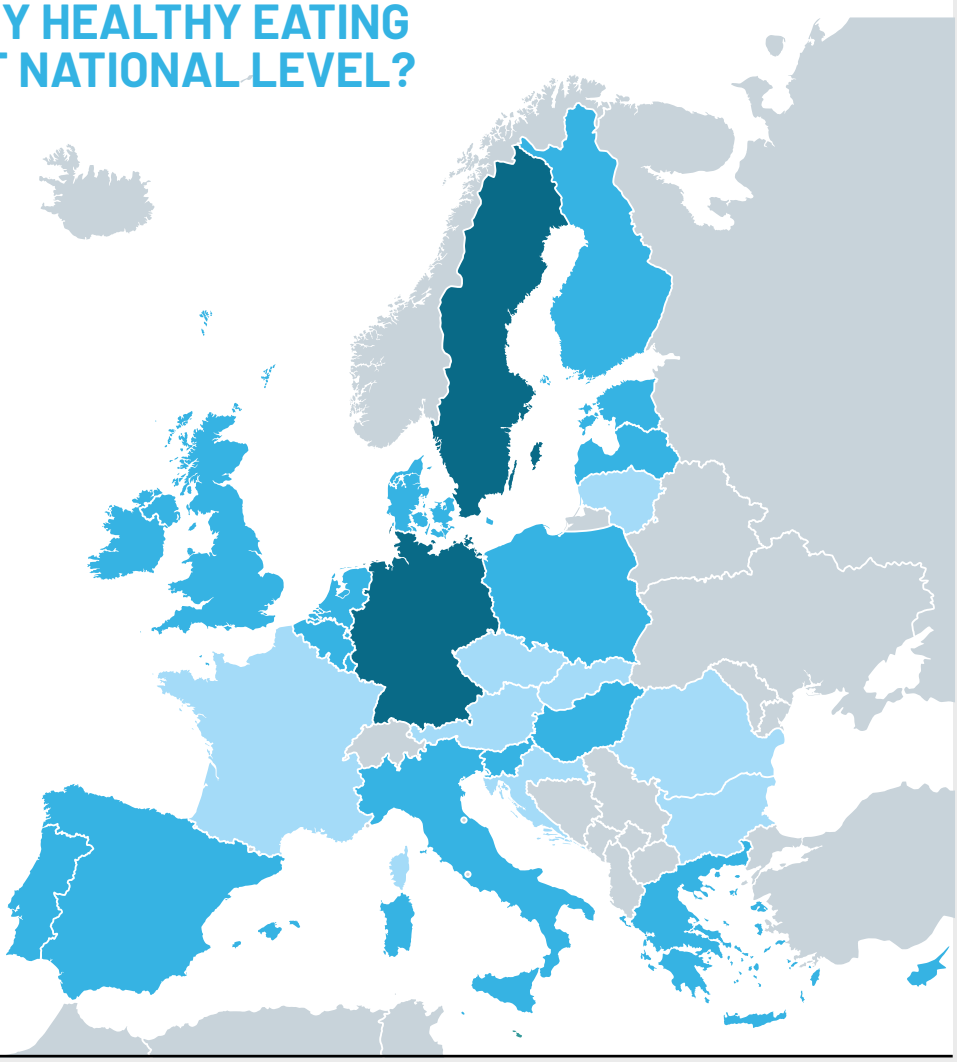
Austria, Croatia, Bulgaria, Cyprus, Czech Republic, France, Lithuania, Romania, Slovakia

YES, AND UPDATED WITHIN THE PAST 5 YEARS (2020)

Belgium, Denmark, Estonia, Finland, Germany, Greece, Hungary, Italy, Ireland, Latvia, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom

YES, AND REFER TO ENVIRONMENTAL SUSTAINABILITY

Germany, Sweden



COMPULSORY NUTRITION EDUCATION IN THE NATIONAL CURRICULUM FOR PRIMARY AND/OR SECONDARY SCHOOLS

According to research conducted in relation to the compulsory nutrition education indicator in the FSI, nutrition education is compulsory in the national curriculum for primary and/or secondary schools in the following countries: Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Greece, Ireland, Latvia, Lithuania, Malta, Poland, Portugal, Slovakia, Sweden, United Kingdom.

Lithuania: Healthy nutrition is mandatory, but is incorporated in several subjects, especially **biology and natural science**; school teachers are provided with guidelines for the promotion of healthy nutrition and physical activity in schools; these topics are also included in undergraduate/postgraduate training of teachers.

Greece: Health education programmes, conducted on an annual basis in Greek schools, may include basic knowledge of nutrition according to Law 2817/2000 of the Ministry of Education. The Ministry of Education has created educational material for students in primary and secondary education regarding Nutrition, Eating Habits and Consumer Education. Programmes on nutrition and eating habits are implemented by trained teachers from the relevant departments of universities such as Harokopio University of Athens and Medical Schools.

Denmark: The Ministry of Food, Agriculture and Fisheries cooperates with the Ministry of Children and Education to bolster Home Economics and support the subject of Health and Sex Education and Family Studies, e.g., in terms of materials. A new elementary school reform effective 2014/2015, sets new goals for **Home Economics and makes it mandatory that all students should be physically active for an average 45 minutes** during the school day (total teaching time).

SWEDISH NUTRITIONAL GUIDELINES: "FIND YOUR WAY TO EATING GREENER, NOT TOO MUCH AND TO BE ACTIVE!"

Swedish dietary guidelines[64], developed by the Swedish National Food Agency in 2015, integrate sustainability and health aspects and are the result of a multi-stakeholder collaboration. The content, language and images used in the guidelines were tested with citizens to ensure their effectiveness. The section on Food and Environment provides the following advice on making food choices that can help reduce greenhouse gas emissions and other environmental effects:

- Eat less meat, choose plant food instead. Try to exchange one or two meals of beef, lamb, pork or chicken every week with vegetarian meals, or eat smaller portions of meat.
- Choose fish from sustainable stocks or farmed in a sustainable way, for example certified fish.
- Choose fruits and vegetables that store well, for example field vegetables, and choose sensitive fruits and vegetables after season.
- Eat less sweets, cakes, cookies and snacks - they have an impact on the environment, but their nutritional contribution is low.
- Minimize food waste - store food properly, plan your purchases and use the leftovers!
- Learn more about eco-smart food choices and how to minimize food waste.
- Exercise for at least 30 minutes every day.

TEN GUIDELINES FOR WHOLESOME EATING AND DRINKING FROM THE GERMAN NUTRITION SOCIETY

The German dietary guidelines[65] are developed by the German Nutrition Society and endorsed by the Ministries of Health and Agriculture.

- Enjoy a variety of foods.
- Eat plenty of cereals, preferably wholegrain, and potatoes.
- Vegetables and fruits - eat 'five-a-day'.
- Eat milk and dairy products every day; fish once or twice a week; and meat, sausages and eggs in moderation.
- Eat small quantities of fat and high-fat foods.
- Eat/use sugar and salt only occasionally and in moderation.
- Drink plenty of fluids, at least 1.5 litres every day.
- Cook your meals carefully.
- Allow plenty of time for eating and enjoy mealtimes.
- Watch your weight and stay active.

The guidelines explicitly refer to sustainability when putting forward the following advice: to eat a variety of foods, mainly choosing plant-based ones as they have a health-promoting effect and foster a sustainable diet; to eat fish, preferring products from recognised sustainable sources; to cook meals using fresh ingredients so as to reduce unnecessary packaging waste; to stay active, which is a way to protect the environment and promote health.

1.4. Best Practices in cities

Cities consume up to 70% of the food produced at a national level[66], and the status of urban areas must change from being merely one of "consumers" to providing a catalyst for finding solutions for food and environmental sustainability. Interventions regarding urban layout, access to healthy food and shops and the social environment can support this transformation through the involvement of different entities.

1.4.1. Birmingham: tackling childhood obesity on multiple levels

Childhood **obesity is a relevant challenge** for the citizens of Birmingham, with studies indicating that 1 in 4 children are obese before leaving primary school, with levels rising sharply in the city's inner, more deprived areas. The prevalence of this situation in the city reflects a national challenge: according to the FSI, 31% of children aged 5-19 are overweight in the United Kingdom[67].

Peter Rigaud/Laif/Contrasto

Since the signing of the Milan Food Policy Pact, the Childhood Obesity Partnership[68] was set up to tackle multiple determinants of childhood obesity. Through the National Child Measurement Programme, a team analyses obesity rates to highlight areas of most need.

The city has also been working with "Shift Design", a **behaviour change** design charity, to make healthy food visible, tasty and affordable. The urban environment can be altered to make healthy food more available, limit unhealthy foods near schools and encourage active transport.

Public health professionals are being engaged in the **urban planning process** and have produced the Supplementary Planning Document (SPD) to reduce an existing 10% cap on hot food takeaway units in shopping centres down to 5%. Furthermore, Birmingham City Council is piloting a "No more

same old takeaways, proper dinner for the kids delivered hot to your door" scheme to provide a healthier alternative[69].

Changing behaviour is a complex process however and the adoption of a healthy lifestyle can be facilitated by providing an **opportunity for children to grow food themselves**.
Birmingham's "Tackling the Obesogenic Environment Team" has ensured **economic support** to schools and community centres for growing food, raising awareness of healthy diets and adopting an active lifestyle.

Birmingham is an example of efficient partnership for change, which includes producers, industry and institutions working towards a common goal. **Policy can affect all members of the network and determine a cultural shift towards healthier food preferences and lifestyles**.

1.4.2. The Organic Conversion in Copenhagen

Copenhagen is very active in **promoting sustainable diets and good nutrition**. In 2011, the Danish Ministry of Food, Agriculture and Fisheries launched the Danish Organic Action Plan 2020, intending to double the organic agricultural area in Denmark by 2020. The strategy aims to increase the overall demand for organic agricultural products, the main driver being **public procurement**, through a consistent intervention in all public canteens, public financing for conversion and education in public kitchens, and collaboration with organic farmers, food companies and wholesalers[70].

The Municipality of Copenhagen has taken this challenge one step further, through the Organic Conversion policy[71] instituted by the City Council. Their target over nine years is to go from 45 to 90% organic procurement across the city's entire public food system. The initiative concerns mainly childcare and elderly care institutions, but canteens and central kitchens have also been involved and, through their impact on the capital city's yearly food spend, **they have strengthened the market for organic and sustainable food in general.**

PEOPLE AND COMMUNITIES SHOULD BE EMPOWERED TO CHOOSE WHAT IS BEST FOR THEIR WELL-BEING

In organic procurement programmes that involve direct substitution, kitchens replace individual conventional food products with organic products, a conversion strategy that is possible where budgets are not a limiting factor. The conversion strategy adopted in Denmark on the other hand is a holistic approach in which the entire public kitchen food service system is re-organised[72].

The **organic conversion of 900 kitchens** in Copenhagen was made possible by cooperation between local authorities and various consultants and trainers and the spending of around EUR 6 million on information, training and advice, while procurement budgets across canteens remained unchanged.

The conversion included training kitchen staff in cooking techniques, teaching sustainable menu planning and cooking food from scratch, rather than using processed and pre-prepared food. It was reported that kitchen staff had stopped cooking and lacked basic cooking skills, with meal preparation consisting of heating frozen, processed food.

In 2016, **public organic procurement** in Copenhagen comprised 88% of the 80,000 meals served each day, translating into 141,800 kg of organic food served weekly, with a total yearly budget of EUR 40.3 million. The local authorities' yearly consumption of organic milk saved approximately 370.82 million litres of groundwater from being contaminated with pesticides.

Other environmental aspects, such as increased biodiversity, improved animal welfare and decreased use of chemical fertilisers are indirect benefits. The FSI points out how in 2016, the share by the three main crops (rice, soy and maize) of total agricultural production in Denmark was 74%[73] while the share of agricultural land that they took up was 90%[74].

1. 5 Future directions

Good nutrition and health are fundamental human rights and people and communities should be empowered to choose what is best for their well-being. Against the context outlined in this chapter, a number of actions are in place to promote healthier eating at the national level and EU level.

However, to meet the SDGs, **the broader food system needs to be addressed** with a systemic approach. The data on overweight and physical inactivity, as well as dietary patterns, predict a reduction in life expectancy in the future due to the impact on the development of risk factors and overall health. If not addressed, there is a real risk that **the EU will fall short of achieving SDG3**: "Ensure healthy lives and promote wellbeing for all at all ages". This goal is critical for achieving all other economic, environmental and social objectives, since they are only possible with a thriving, healthy human population[75].

According to Eurostat, the EU has made good progress in improving the living conditions of its citizens over the past five years. This improvement refers to gains in both **actual and perceived health** (SDG3), reductions in certain dimensions of **poverty and social exclusion** (SDG1) and improvements in the **quality of life in cities and communities** (SDG11). Increasing economic activity in the EU, however, has not always been accompanied by favourable developments in the use of natural resources and their negative environmental impacts[76]. The SDG12 "Ensure sustainable consumption and production patterns" includes relevant targets for achieving a sustainable food system but transformation will take multiple actions at multiple levels, from local level innovations to enhancing food access for vulnerable groups to the restructuring of global level governance of agriculture, food, nutrition and health[77].

It has been argued that the **international and national commitment to shift towards healthy diets globally**[78] should:

- improve availability and access to healthy diets from sustainable food systems;
- make healthy diets from sustainable food systems affordable, with special consideration given to the culture, geography and demography of the population and of individuals;
- put forward renewed efforts by governments, industry, and society to restrict advertising and marketing of unhealthy, unsustainable foods and to support positive discrimination of healthy diets that are based on sustainable food systems.

These actions are effective in raising awareness and creating an enabling environment for wider policy action. In this regard, further efforts are necessary to advance policy coherence for health equity. According to the WHO, these include transparency, accountability, ministerial linkages, also with public health ministers, interdepartmental committees, public engagement, joint budgeting and delegated financing [79].

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THE GLOBAL SYNDEMIC OF OBESITY, UNDERNUTRITION AND CLIMATE CHANGE

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Introducing the Global Syndemic

Malnutrition in all its forms, including undernutrition, obesity, and other dietary risks for non-communicable diseases (NCDs), is the biggest cause of ill-health and premature death globally[1]. This health burden is further exacerbated by the health impacts of climate change, for instance the impact climate change has on food insecurity through adverse weather conditions. There is growing recognition that significant changes are needed across our food systems to help improve population health and ensure sustainability.

In 2019, The Lancet Commission on Obesity (LCO) published a report which introduced the notion of the Global Syndemic of Obesity, Undernutrition and Climate Change[2]. The authors reflect on the way in which three pandemics - obesity, undernutrition and climate change - co-exist, interact and are driven by failures in the same systems, including food, urban design and transport systems. These systems share many of the same political drivers, economics, norms and governance mechanisms. Furthermore, the pandemics themselves interact, for instance climate change may increase undernutrition due to food insecurity, while infant malnutrition can increase the risk of adult obesity.

Although some of the greatest impacts of *The Global Syndemic* are seen in low- and middle-income countries, Europe is also experiencing significant impacts: no country on track to meet global targets for obesity[3,4]. More than half of adults in Europe are overweight and 1 in 4 affected by obesity, while 1 in 4 children child and adolescents are overweight. Meanwhile, agriculture is responsible for about 10% of EU GHG: in 2017, the sector was responsible for 415,000 Gg CO_{2eq}. Of emissions, increasing by 0.4% between 2016 and 2017.

Global food systems are having a detrimental impact on all aspects of *The Global Syndemic*, set up to deliver too much food which is harmful to health, insufficient food which is necessary for good health and unsustainable and inequitable distribution. The vulnerability of our food system represents a systemic failure in the way we produce, distribute and consume food.

Triple win policies to transform food systems

Opportunities to address the common drivers of malnutrition and climate change, and implement policies that create healthy, sustainable food systems, are not being sufficiently embraced by governments. As highlighted by the LCO, this policy inertia is largely due to policymaker reluctance to implement effective policies, insufficient consumer demand for change and power opposition from vested interests.

To seriously address *The Global Syndemic* there is a need to focus priority on cross-cutting, triple win policies that can transform our food systems in a sustainable way, while addressing the underlying societal, political, socio-economic, and commercial drivers. Examples of triple-win food policies identified by the LCO include:

- **Re-orientate diets to be more plant-based, so as to improve health**, improve land efficiency and lower greenhouse gas emissions
- **Sustainable dietary guidelines** to promote healthier food, improve breastfeeding and education about healthy diets and decrease demand on unsustainable food options

- **Restricting commercial influences** to reduce opposition to obesity and climate related policies, and reduce corruption and poverty
- **Framework convention on food systems** to ensure policies are enacted for healthier food environments, poverty reduction, food security, and greenhouse gas emissions.

The identification, development and implementation of context specific triple-win policies are a key next step for translating the LCO report into action.

Five recommendations to address *The Global Syndemic* in Europe

The LCO presented a number of recommendations relevant to food systems, including joining up silos to create platforms for collaborative work; strengthening national, individual and municipal governance levers and accountability systems; strengthening civil society; creating sustainable health-promoting business models; improving the evidence base of systemic drivers and actions related to *The Global Syndemic*[2,5]. Building on these, we offer five priority actions for addressing *The Global Syndemic* in Europe:

1. ***Eliminate subsidies for products that contribute to The Global Syndemic and redirect funding to actions that mitigate it.***
   - Increase awareness of the impact of subsidies on the true costs of food to build support for sustainable agriculture
   - Redirect existing government subsidies for beef, dairy, sugar, corn, rice, and wheat to sustainable farming for healthful foods

2. ***Provide clear and understandable information to consumers on the health and environmental impacts of food products to enable informed choices and create a demand-driven market shift for products that support sustainable food systems.***
   - Use mass communication campaigns to better understand what messages resonate with consumers about the Syndemic, plant-based diets, and the consequences of the current agricultural production system
   - Use nutrition labelling to alert consumers to products high in sugar, salt, and saturated fat, and stimulate industry reformulation
   - Add sustainability indicators, such as carbon and water footprints, to food labels to help consumers make sustainable choices

3. ***Expand municipal actions on air pollution and traffic congestion to include action on healthy and resilient urban transport and food systems.***
   - Invest in urban design and transportation systems to support active transport and build urban food systems for resilience, health and equity
   - Strengthen networks of cities across the EU to share resources and innovative strategies to address *The Global Syndemic*

4. ***Support community coalitions to mobilise action at the local level and to create pressure for national policies that reduce The Global Syndemic.***
   - Support systems-oriented, community-based interventions that create healthy, resilient and sustainable local environments and advocate for supportive national policies

5. ***Re-orient business models to produce beneficial outcomes for people, the planet, and profits, shifting business focus from short-term, profit-only outcomes to sustainable models that benefit society and the environment.***
   - Incorporate the costs of damage to health and the environment from business processes and products into the costs of doing business rather than onto taxpayers or future generations

Concluding thoughts

The Global Syndemic provides a new perspective and insight into the ways in which we can transform European and global food systems to improve the health of people and the planet. Triple-win actions will have the greatest impact, and only by joining up silos and working together can we hope to address *The Global Syndemic of obesity, undernutrition and climate change*.

About the Lancet Commission on Obesity

The Lancet Commission on Obesity is a joint venture between The Lancet, The University of Auckland, George Washington University and World Obesity Federation. The Commission involved 25 Commissioners and 17 Fellows from around the world, with expertise in obesity, nutrition, climate and related issues. The Commission met between 2016 and 2018 before the report launch in 2019. More details are available here: https://www.worldobesity.org/what-we-do/projects/lancet-commission-on-obesity.

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TOWARDS A SUSTAINABLE PREVENTION OF TYPE 2 DIABETES

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Type 2 diabetes (T2D) is one of the most common chronic noncommunicable disease representing a growing public health challenge, with a high economic impact on healthcare systems worldwide[1]. T2D is also the most common type of diabetes - accounting for around 90% of all diabetes cases - and results from a gradual loss of beta-cell insulin secretion observed frequently on the background of peripheral insulin resistance[2]. Poor glucose control in diabetic patients can lead to macrovascular complications (coronary artery disease, stroke, and peripheral artery disease) and microvascular complications (diabetic nephropathy, retinopathy, and neuropathy)[3]. It is worth noting that cardiovascular disease represents the leading cause of death in diabetic patients[4,5].

Despite the great efforts of scientific and medical communities to promote health policies and community interventions for prevention of the disease, the worldwide prevalence of T2D has dramatically increased over the last decades[6]. Therefore, T2D has attained the status of a global epidemic, spreading from affluent industrialised nations to middle- and low-income countries[7]. Globalisation, nutritional transition to Western diets (with high contents of processed and refined foods), economic growth, urbanisation, increasingly sedentary lifestyles, changes in agricultural system and environmental pollution dramatically contributed to this growing epidemic, which has spread in parallel with the global rise in obesity[8,9,10].

According to the *International Diabetes Federation Diabetes Atlas* (9th edition), the global diabetes prevalence in 2019 is estimated to be 9.3%, which corresponds to 463 million people[11]. This number is expected to rise further to 578 million people (10.2%) by 2030 and to 700 million people (10.9%) by 2045[11]. In addition, T2D is no longer regarded as a disease of primarily adult onset; in fact, its prevalence is also dramatically increasing among children and adolescents, resulting in a longer disease exposure and a subsequent increased risk for chronic complications[12,13].

In light of the current COVID-19 pandemic and the epidemic proportions reached by diabetes, it is also worth mentioning that diabetic subjects exhibit an increased risk of adverse outcomes following severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, particularly in presence of other comorbidities, such as obesity, metabolic syndrome and hypertension[14]. Therefore, the current pandemic scenario demands to prioritise health policy interventions to effectively protect individuals with diabetes and other chronic noncommunicable diseases from SARS-CoV-2 infection.

As the epidemic of T2D continues to grow, there is an urgent need for a cross-country collaboration to build high-value, homogeneous and sustainable health policies and interventions aimed to counteract or reverse this dangerous trend.

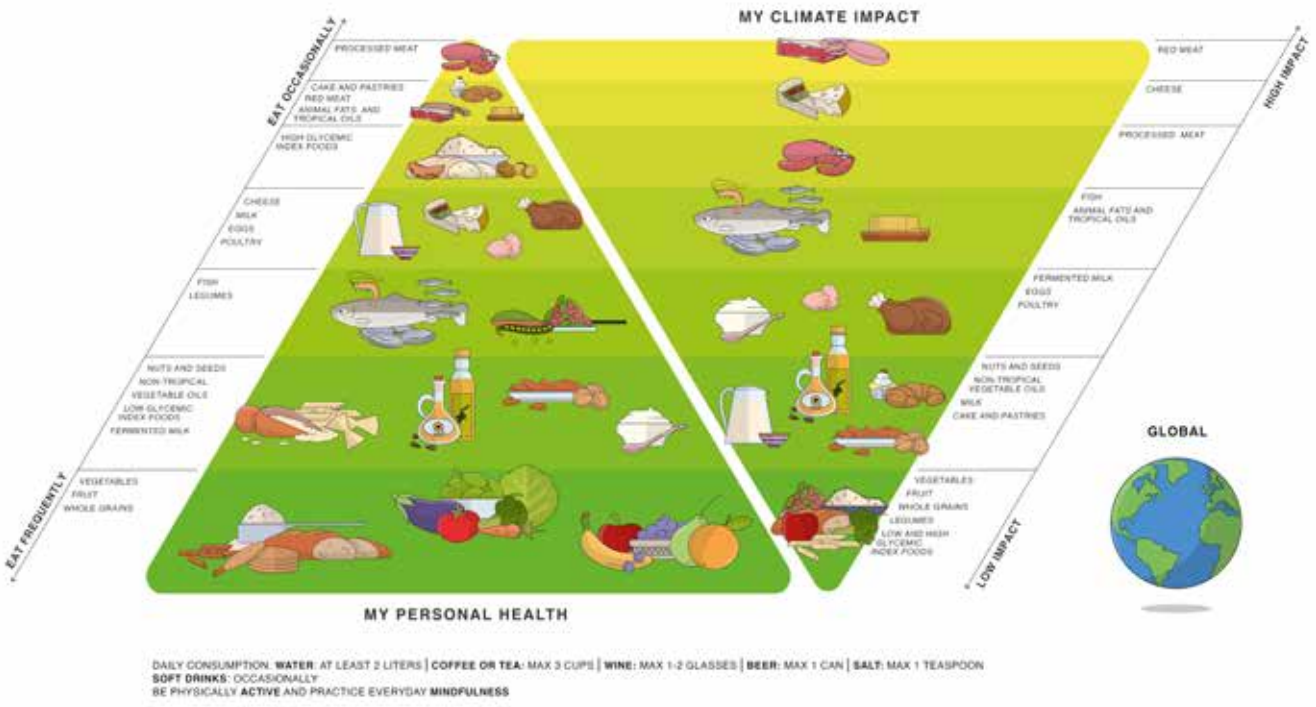
The Mediterranean diet has long been considered as one of the most valid eating patterns for prevention of T2D and for improvement in glucose control and reduction in cardiovascular risk among patients with established disease[15,16,17]. The beneficial effects of the Mediterranean diet are attributed to its high levels of minimally processed plant-based foods, fruits, vegetables, whole grains, omega-3 polyunsaturated fatty acids, and monounsaturated fatty acids and polyphenols from extra virgin olive oil (EVOO), along with low levels of saturated fat, red meats, dairy products and refined sugar[18,19,20].

Notably, the Mediterranean diet offers remarkable benefits to patients and clinicians in terms of palatability, nutritional completeness, achievement of short- and long-term weight loss, as well as ease of explanation and use[16]. Not surprisingly, the Mediterranean diet was ranked as the best diet for diabetes (and also as the best diet

overall) by a panel of experts at US News and World Report for the two-year period 2019-2020[21].
Yet, it is worth outlining that food processing should be minimised even in the context of the Mediterranean diet, since it can alter the nutritional quality of certain foods (e.g., olives, olive oil, vegetables and nuts) and negatively influence their protective effects on human health[22].

Importantly, the classical food pyramid model, which forms the basis of the Mediterranean diet, has recently been modernised through the so-called "Double Health and Climate Pyramid"[23]. This novel pyramid model represents an evolution of the classical food pyramid: it takes into account the dual impact of food on human health and environment, and outlines the strict relationship between the nutritional value and the carbon footprint that every food has through the stages of its production (see figure below).
It is worth noting that foods associated with the highest health benefits are generally those with the lowest carbon footprint. By contrast, foods exerting detrimental effects on human health when consumed in large amounts are those with the highest carbon footprint.
Thus, a Mediterranean diet should be recommended by nutritionists and clinicians in order to create a virtuous circle, where both healthy subjects and individuals with chronic noncommunicable diseases (including T2D) eat sustainable foods with the dual aim of promoting human and environmental health and reducing the environmental impact on human health[23]. In a broader view, the term "environmental health" should be focused on human health and well-being as impacted by the environment and environmental changes, rather than solely the health and well-being of the environment[24].

VIEW A LARGER IMAGE



The Double Health and Climate Pyramid (Barilla Foundation, 2021).

Ambient air pollution and climate change also appear to have an impact on the increasing incidence of T2D and other chronic noncommunicable diseases[25,26,27,28,29,30]. According to recent estimates conducted on a global scale, 67% of subjects with diabetes (2 in 3 people) live in urban areas, and diabetes prevalence is higher in urban than rural areas (10.8% vs 7.2%, respectively)[11]. In this context, the novel disease entity known as "urban diabetes" has recently emerged[31].

In addition, several environmental pollutants known as "endocrine disrupting chemicals" (EDCs) have the

ability to interfere with the functioning of the endocrine system and are present in the atmosphere, food, and consumer products[32,33]. These compounds are released into the atmosphere during human activities, such as agriculture[33]. It has been suggested that chronic exposure to EDCs may have substantially contributed to the increasing incidence of various noncommunicable diseases - including T2D and obesity - observed over the last decades[32,34,35].

In light of all the aforementioned considerations, the application of the "One Health" concept beyond the context of emerging infectious diseases has recently been proposed as a valid tool to promote healthy interactions at the level of human-animal-ecosystem interface with the additional aim to prevent chronic noncommunicable diseases, including T2D[36]. Therefore, a better knowledge of the strict relationship existing between human-, animal-, plant- and ecosystem health will be critical in the near future to properly interpret human disease dynamics and design cost-effective global health policies aimed to effectively prevent or counteract the growing epidemics of T2D, obesity and other chronic noncommunicable diseases[36].

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DIETARY HABITS OF EUROPEAN POPULATIONS IN RELATION TO THE RISK OF NONCOMMUNICABLE DISEASES

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Europe is the continent most severely affected by chronic noncommunicable diseases that represent the leading cause of disability and death; cardiovascular diseases, diabetes, cancer and respiratory diseases together account for as much as 77% of the burden of disease and almost 86% of premature mortality in this region. In particular, each year, cardiovascular disease (CVD) is responsible for almost four million deaths in Europe (45% of all deaths). CVD mortality is generally higher in Central and Eastern Europe than in Northern, Southern and Western Europe[1].

CVD death rates are declining all over Europe, including Central and Eastern European countries, in which there were considerable increases until the beginning of the 21st century. Similarly, over the past 25 years, the standardised prevalence of CVD in Europe has dropped, with greater decreases in Northern, Western and Southern regions, compared with less significant declines in Central and Eastern European countries[1].

This is consistent with the downward trends in several key CVD risk factors such as smoking, alcohol consumption and levels of blood pressure and plasma cholesterol, and with the improved screening and treatment of this disease. However, levels of other CVD risk factors, particularly overweight/obesity and diabetes, have increased considerably in Europe in recent years (more than 50% and 25%, respectively, in the last decade), reducing the prospect of maintaining the observed reduction in CVD events and deaths in the years to come[1].
Food choices are the most important factors that undermine health and well-being in European countries accounting for as much as 50% of all CVD deaths. Excessive consumption of energy, saturated fats, trans fats, sugar, and salt, as well as low consumption of vegetables, fruits and whole grains are leading risk factors and major causes for concern[2].
In particular, both energy intake and fat available for consumption have increased in Europe over the last two decades. The rise in energy intake is driven mainly by upward trends in Eastern Europe - where food globalization and nutrition transition occurred at a later stage - and, to a lesser extent, in Northern and Western European countries. Conversely, energy supply in Southern Europe has decreased slightly since 2000 and has become the second lowest after Eastern Europe. According to food balance sheet data from the FAO, fat availability for human consumption has also grown gradually in Europe during the last decade. Once again, this has been driven mainly by the increase observed in Eastern Europe, where fat supply has risen by 22% from the beginning of this century. Fat available for consumption has remained relatively stable in Western, Northern and Southern Europe since the mid-1980s[1,3].

Over the past two decades, fruit consumption has increased overall across Europe while vegetable consumption has increased only slightly. Consistent with global trends, in this period the availability of fruit has increased in Europe by nearly 30%. At regional level, it has increased more sharply in Northern Europe although, in more recent years, it has shown a slight decline. A similar trend has been observed in Southern Europe. In Eastern Europe, the supply of fruit has risen steadily in the last twenty years, even though it is still the lowest among the European regions. Meanwhile, in Western Europe fruit consumption has remained relatively stable[1,3].

Vegetables available for consumption in Europe have increased by 10% on average in the last twenty years. In Northern Europe, where it was lower than in any other European region, it increased gradually since the mid-1990s, and is now roughly equal to that in Western Europe where rates have remained stable over time. During this period, the availability of vegetables has increased also in Eastern Europe where it is now greater than the European average. Southern Europe has historically had the greatest supply of vegetables (twice that in other European regions) and this has remained relatively stable until the early years of this century when it started to slightly decline[1,3].

Other dietary features contributing to the risk of CVD are salt and sugar consumption. Populations across Europe consume at least 50% more sodium than is physiologically necessary and more than that recommended by WHO, which is 2 g sodium/day (equivalent to 5 g salt/day). A small reduction has been observed in recent years, but the habitual salt intake is still much higher than that recommended[4].
The amount of free sugars consumed in Europe exceeds levels recommended by WHO (5-10% energy). A significant proportion of free sugars in the diet comes from manufactured foods, such as baked goods, breakfast cereals and sugary drinks. Consumption of these food items has been fairly constant in Europe over the last decades[5].

Wholegrain consumption in Europe is also rather low, except for the Nordic countries. Despite a trend towards a larger intake observed in many European countries, it remains well below the recommended target of 50% of the total consumption of cereal foods.
Looking at the available data, it seems clear that the actual picture of dietary habits in Europe is rather disappointing as these fail, to a large extent, to follow World Health Organization recommendations to eat at least 400 grams of fruit and vegetables a day, to increase the consumption of wholegrain foods, to limit salt, sugar and fat intake and to balance energy intake with energy expenditure. In fact, rising rates of overweight and obesity have been reported in almost all countries; moreover, the food choices of most European populations are far from being appropriate and in recent years there has been no indication of a shift towards the recommended targets, with the exception of Eastern European countries in relation to fruit and vegetables.

Faced by this worrisome scenario there is increasing awareness, not only in European countries but also at a more global level, that a healthy and varied diet plays a fundamental role in improving the health, well-being and quality of life of European people[6]. Therefore, there is an urgent need for an appropriate strategy involving the European Union and national governments to increase public awareness of the relationship between food habits and health and to improve the nutrition skills of health professionals, particularly in the primary health care context. However, nutritional education alone will not be sufficient to change the lifestyle of European citizens and, therefore, policy options to be considered should necessarily include initiatives for facilitating the production, marketing, availability and affordability of healthy foods in each and every European country[7].

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THE STOP PROJECT: DEVELOPING A MULTIDISCIPLINARY EVIDENCE BASE FOR EFFECTIVE AND SUSTAINABLE POLICIES TO PREVENT AND MANAGE CHILDHOOD OBESITY

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Introduction

Childhood obesity is rising around the world and Europe is no exception. Approximately 41 million children aged 5-19 across Europe were affected by overweight or obesity in 2016, an increase of 12% since 2010[1].

Childhood obesity has a number of serious health consequences, including hypertension, insulin resistance and psychological distress, amongst others. Approximately 70% of children who are affected by obesity remain so in adulthood[2] and are in turn are at higher risk of a number of chronic diseases, such as heart disease, diabetes, some form of cancers and musculoskeletal disorders. The economic benefit of addressing childhood obesity has been calculated in a number of countries across Europe. For instance, data from Ireland suggests a reduction in childhood BMI by 5% could save €1.1billion across the lifetime[3], while in Germany it has been estimated that €835million could be saved if steps were taken to reduce childhood obesity levels back to 1999 levels[4].

Based on the best available evidence, the WHO Commission on Ending ChildHood Obesity (ECHO) and the EU Joint Action on Nutrition and Physical Activity (JANPA) have both identified a package of policies that governments should implement to address childhood obesity[5,6]. However, there remains a need to better understand the factors that have contributed to childhood obesity in Europe, causes of differences between populations and communities, and the effects of different policy options on childhood obesity. The STOP Project aims to fill some of these evidence gaps in Europe.

What is the STOP Project?

The Science & Technology in childhood Obesity Policy (STOP) Project is a four-year (2018-2022) European Commission-funded Horizon 2020 project which aims to expand and consolidate the multidisciplinary evidence base upon which effective and sustainable policies can be built to prevent and manage childhood obesity. The STOP Project takes both a life course and intergenerational approach, in line with the ECHO and JANPA recommendations, to assess the role that a range of determinants play in childhood obesity throughout the life course. The primary focus of STOP is on the cumulative impacts of multiple and synergistic exposures in vulnerable and socially disadvantaged children and their families, as well as the role of obesogenic environments as a driver of childhood obesity.

To achieve these aims, the STOP project brings together a number of key health and food sector actors including scientists, health professionals, government policy makers, national health agencies, international organisations, civil society and business organisations, to generate new insights and scientifically sound and policy-relevant evidence for childhood obesity across Europe.

Project objectives and outcomes

The STOP Project aims to produce comprehensive and policy-relevant measures of childhood obesity in all European countries and generate new trans-disciplinary evidence about the key determinants of childhood obesity, emphasising the role of different environments surrounding children. The STOP Project will also assess the impacts of policies and actions to address childhood obesity based on observations in the same children cohorts and policy simulations of the health, social and economic outcomes of policies.

To date, a number of important early findings have come out of the STOP Project, including:

- Differences between countries in height-for-age patterns and trends as a factor contributing to heterogeneity in obesity patterns across European countries;
- The high prevalence of obesity in rural areas, despite most research focusing on the obesogenic nature of urban environments;
- A "molecular signature" of childhood obesity based on a range of epigenetics, metabolomics and proteomics biomarkers, representing a fundamental step in assessing causal pathways to childhood obesity, including those implicating obesogenic environments in neighbourhoods at different socioeconomic levels;
- A link between maternal pre-pregnancy BMI and microcirculation changes, providing evidence of increased cardiovascular risk originating in the early years of life and even before birth;
- Consolidated knowledge of the policy space for addressing childhood obesity through behavioural nudges, interventions on the food and physical activity environment, regulatory and fiscal policies and interventions in primary health care, through systematic reviews;
- Evidence of the barriers faced by health professionals in persuading parents, especially those in vulnerable socioeconomic circumstances, of the importance of addressing their children's weight problems, based on experiences of recruiting families with young overweight children.

Research is ongoing, and by the end of the project the goal is to have strengthened the evidence base on childhood obesity in a way that will complement, systemise and partly reframe the established body of research on childhood obesity in a state of art way. In addition, the STOP Project will use the findings to develop policy briefings and tools to support policymakers in addressing childhood obesity, and a multi-stakeholder accountability framework to support actions and engagement between a range of actors working to address childhood obesity.

Conclusion

To change the trends of childhood obesity across Europe it is clear that comprehensive action, using a wide range of innovative and novel approaches, will be needed. The STOP Project aims to provide unique and much needed evidence and resources to help governments and other stakeholders address childhood obesity at a European, national and local level. The Project website - www.stopchildobesity.eu - provides information and updates about the emerging findings from this project.

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COVID-19 HAS BROUGHT US ALL TO THE SAME TABLE AND GIVEN FOOD FOR THOUGHT – LET'S NOT WASTE IT

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Start with what they know,
Build with what they have.
Lao Tsu 700 BC

Several years ago, the Barilla Foundation curated an exhibition on food waste at Philanthropy House in Brussels. One part of the exhibit was a huge glass box containing the packaging discarded by an ordinary household in a year. It was a compelling feature and children were particularly riveted by it and paid relatively scant attention to the other interactive features of the exhibition. The single-mindedness of school children and their reaction to the climate and energy crises were already strong features of the pre-lockdown context. Since then, thought about food - and all its ramifications - has taken centre stage for all of us. This short commentary focuses on how the lessons and insights we are collectively learning offer decision makers, philanthropists and others seriously worried about the distressed planet we share an opportunity to rethink food education.

The Barilla Foundation's work on understanding the entire food system and the early insistence on education about food and food systems being an integral part of the basic life curriculum for us all, has been abundantly vindicated in the last few months. Their appeal to ensure that food education is mainstreamed from early childhood should now resonate clearly in high places. This coronavirus is teaching us due respect for the resilience and coping skills of ordinary folk, alongside, surely, long- overdue gratitude and appreciation for key food actors: farmers, seasonal pickers, processors, quality controllers, delivery people, truck-drivers, transporters, packers, butchers, greengrocers, supermarket workers, food-store owners, nutritionists, food scientists, waste disposal personnel and, not least, cooks. Culinary wellbeing and nutritional communal knowledge have been brought to the fore by the simple fact that we are confined to our homes and are forced to rethink how we purchase, collect, store, preserve and consume our food. Food has become a vehicle for the transfer of skills and entertainment in the challenges of extended family interplay.

At the same time, coincidentally, we have rediscovered both the resilience and the fragility of the interrelationship between complex systems of agriculture, food chains, food storage and food delivery and disposal systems. It's an all too unusual example of when the private and the public sphere sit at the same table grappling with the same set of challenges. Surely, after this lockdown, we can no longer contemplate, let alone justify, not making the food system a paramount priority.

This pandemic and its lockdown thus provide us with a rare moment for contextual rather than situational responses. Despite the tragedy unfolding around us, such a rare moment must be seized. This is particularly true in food education, since it is now at the forefront of everyone's psyche. A contextual response in terms of food education demands two things:

First, that we all step back from the immediacy of current decision-making in order to properly understand some of the change (and perhaps space) that force majeure has abruptly injected into our systems. If our weeks "confined to barracks" are to mean anything worthwhile in this "war", our leaders must take responsibility for holding on to the beneficial changes that have happened along the way. The trick, of course, is going to be how we separate the beneficial from the negative changes: Was it a "pause "or a "reset" button that was pressed? It looks like a straightforward exercise, but we will now see how brave, diligent, and focused our leaders are and will be as we ease back into the "new normal". Maybe children, as they have already done with the climate strikes, can help keep everyone's eye on the ball.

Second, I believe that we are now afforded a unique opportunity to fundamentally rethink and recalibrate the relationship between formal education and socialisation in our societies. Here I mean socialisation in its

sociological sense: how we inculcate cultural knowhow and imbibe our understanding of the world, and how our resilience is built.

Lockdown in Europe has meant that "teaching" through surrogates (a combination of parents and/or electronic devices) has been an integral part of daily life. For school children, this "teaching" and "learning" had to be done alongside other, albeit surreal, "unprecedented" things. It has also brought parents much closer to the formal "teaching" process. Likewise, by simply being confined together, children are likely to have experienced new facets of food. Children will have closely observed, even if they have not participated themselves, in the stratagems, the choices, the interplay between food, nutrition, and health. The messages about poor diets, poverty and health will have surely made their mark. Whilst formal classes were temporarily truncated and put on hold, socialisation is simply too unconscious and informal a process to be turned off like a tap. The collision between formal education and organic socialisation has, to varying degrees no doubt, resulted in a heuristic moment that is unique because no one would have had the gall, temerity or vision to even imagine pressing a reset button on education.

We now have a fortuitous opportunity to consolidate this or lose the momentum of having brought parents, pupils, teachers, and the educational and technological experts into new temporary coalitions. Who would have dared suggest an experiment to shake-up certainties about didactic practice on such a scale? We must deepen and secure a holistic contextual appreciation of the changes in our way of living and consuming. The happy coincidence is that we can safely assume that parents, teachers, pupils, and decision makers are closer to reading from the same page on the need to get our food systems right than they have ever been. Now is the time to seize the respite provided so fleetingly by the accidental pause in our educational systems. It is our responsibility to ensure that it was not the "pause" button but rather the "reset" button that was pressed. Let's indeed assess what we now know and build on what we already have. Opportunities such as this, like the food in the cube at Philanthropy House, are far too precious a commodity to waste.

YOU CANNOT HARVEST WHAT HAS NOT BEEN PLANTED

MAINSTREAMING THE RIGHT TO FOOD WITHIN EU PUBLIC POLICIES – GENEALOGY AND FUTURE PERSPECTIVES

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The COVID-19 pandemic outbreak coupled with the lockdown measures undertaken by the majority of EU countries have placed enormous pressure on both national and transnational public policies. They have demonstrated how participatory institutions and coordination mechanisms, as well as multi-stakeholder platforms at all levels, can greatly facilitate the design, implementation and monitoring of human rights-based policies and make duty-bearer relations accountable.

Within this setting, the right to food as a prospectively constitutional milestone aimed at ensuring universal freedom from hunger, fervently supported by the EU through the wide range of standards, should be promoted and positioned at the heart of public policy making. The normative form we need to elaborate under current conditions is rooted in General Comment No. 12 on the right to food[1] which, for the first time (May 1999), established the duty of States to respect, protect and fulfil the right to food, although its conceptual development began much earlier[2]. Despite its non-binding nature, the General Comment has had significant practical repercussions[3] and as such can be considered a turning point in positioning the right to food in the international context.

It has leaned on the international regimes understood as sets of implicit or explicit principles, norms, rules and decision-making procedures around which actors' expectations converge in a given area of international relations[4] and consequently on food regime theory whose early versions provided a compelling alternative to the rather linear and deterministic narratives of agricultural change[5]. However, public policy framing on regional or local questions is not just a matter of regime definition but of scaling which can provide a dynamic political sophistication of power relations within which right enforcing mechanisms are situated.
Therefore, when determining the best strategy for advancing the right to food, the use of legal strategies should be carefully balanced against the advantages and disadvantages of other strategies, such as social mobilisation, political negotiation and monitoring and civil society participation in the formulation and implementation of public policies[6].

Europe is one of the six WHO regions most severely affected by noncommunicable diseases mainly attributable to dietary risks, with high social and economic costs for individuals, families, communities and governments[7]. These worrying data led to the adoption of the Vienna Declaration on Nutrition and Noncommunicable Diseases (2013)[8], which calls for decisive, concerted action. It acknowledged that strategies to improve dietary health require government-led action in a broad range of areas and should be supported by increasing evidence of the efficacy of a comprehensive response incorporating a core set of public policies, encompassing education and economy. It also recognised that the successful adoption and implementation of these policies requires continuing emphasis on health-in-all-policies and whole-of-government approaches for the creation of healthy and sustainable food systems in line with the European Health 2020 strategy, confirming that what is required lies outside the mere health sector. Correlations between the right to food and public policies have been identified by the High Level Task Force on Global Food Security (HLTF) recommendations for member states to undertake impact assessments of public policies, including market and trade policies to protect the right to adequate food[9].

In putting these principles into practice and in recognising their importance for citizens' wellbeing, the European Commission has changed its governance structure by establishing the Directorate-General for Health and Food Safety (DG SANTE)[10], until 2014 known as the Directorate-General for Health and Consumers (DG SANCO). Policy options that governments might consider in ensuring all intrinsic dimensions of the right to food (accessibility,

availability and affordability) consist in raising public awareness through an adequate two-way communication strategy and in providing national law- and policy-makers with practical information consistent with the pertinent norms of international law. At parliamentary level there is the European Parliamentary Alliance on the Fight against Hunger as a cross-party and cross-committee group with more than 30 parliamentarians from different nationalities, political affiliations and parliamentary committees, that provides a space for policy dialogue and awareness raising on the right to adequate food for all[11].

For the EU to fulfil its global responsibilities and cope with economic slowdowns and disproportional downturns that might undermine food security, further public policy integration is expected at executive level through the proposed regulation on the Common Agricultural Policy beyond 2020 presented on 1 June 2018, which highlighted the importance of adaptive mechanisms to climate change and generational renewal to be enforced by agricultural knowledge and innovation systems (AKIS) as outlined in article 102, the efficient operation of which will avoid duplication of efforts, save costs, increase the impact of EU and speed up innovation[12].
Therefore, the EU has demonstrated a firm and explicit commitment to implement a rights-based approach in its operational activities. In light of this, the right to food remains one of the cornerstones to be improved by building partnerships with other stakeholders in order to garner widespread support and get a "good harvest".

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THE GEOPOLITICAL CONSEQUENCES OF THE COVID-19 PANDEMIC ON THE EU

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The virus has suddenly exposed the old rifts that divide Europe and the competition between countries that had remained hidden for years under the banner of the integration project. The pandemic will not change European geopolitics, although it risks exacerbating pre-existing trends. Which is perhaps even worse.
The COVID-19 pandemic confirms that there is not one single Europe. On the contrary, we can count as many 'Europes' as the countries that make it up. When the crisis broke, each national government moved on its own, to protect itself and its people, in spite of every common commitment. Two fears prevailed over rationality: getting infected and running out of already scarce supplies of medical equipment. The EU has proved powerless to shape events, which is a simple function under the powers granted to Brussels by individual Member States.

Borders that were thought to have been set aside reappeared in a flash, with the indefinite suspension of the free movement of people. One of the pillars of the European integration project was hit head on, fuelled by the re-emergence of national identities. This may have serious implications, for instance, on the functioning of Western Europe's agri-food production and distribution which relies heavily on foreign labourers from the East. Germany alone needs 300,000 seasonal workers to harvest its crops, while in Italy more than 25% of the food produced relies on the labour of over 370,000 regular foreign workers.

Another equally important pillar is at risk too: it is the movement of goods, which calls into question the stability of the common market and therefore the wealth of the European nations. Once again, food trade may face significant logistical challenges at a time when domestic supply concerns in food-exporting countries can cause a massive curb in exports, to the detriment of trading partners that depend on imported food.
In general terms, the pandemic has revealed how deeply interconnected food systems are, both within and outside the EU. It is not only food cultivation and distribution that are at stake here, but also workers' health if the imperatives of supply chains take over the pandemic.

In Spring 2020 in Italy, farmers' organisations have lobbied the government to implement special "green lanes" to allow the circulation of seasonal workers within the EU, in order to overcome labour force shortages as a consequence of COVID-19. Despite the gloomy atmosphere, the pandemic could prove instrumental in reshaping migration policies for the better. In recent years, Italy's agriculture demand has been met largely by asylum seekers, refugees and undocumented third country migrants arriving by sea and often exploited by illegal gangmasters. Such migrants are not only prevented from looking for different job opportunities but, in some cases, are demonised by powerful political parties. This time could be an historic opportunity to implement a regularisation mechanism for all migrants and to facilitate their access to health and social services when needed.

The arrival of the summer season and the re-start of migration across the Mediterranean Sea has reopened the public debate on the future of thousands of people doing essential but undervalued jobs for Western Europe's food supply chains and essential social services. In Italy, the Law Decree 34/2020 has introduced measures to tackle undeclared work in the agriculture, care and domestic sectors, with the aim to regularise approximately 200,000 irregular migrants. This has triggered a heated political row within the former ruling coalition, which demonstrates how the issue remains highly divisive. In the meantime, Portugal has given temporary residence to migrants with pending applications in order to ensure they have access to social security as well as job and housing stability.

While it is true that each EU country acted on its own to tackle the pandemic, in doing so some capitals behaved similarly. During the first wave two groups emerged. The first centres around the trio of initially most infected

countries: Italy, Spain and France, which have put the health of their citizens before any other consideration and striven to contain COVID-19. The second brings together those who initially resisted taking equally strict measures, such as Germany, the Netherlands, Sweden, Denmark, and Finland, so as to not compromise the vital functions of society and the functioning of the economy. And even when they were forced to react, they moved late and, most importantly, not comprehensively.
Of course, the health emergency worsens financial difficulties too, laying bare the inability of European countries to find a common solution to the current crisis and casting more than a shadow over their ability to recover jointly from the economic meltdown caused by COVID-19; – which is the real test for the integrity of the European project. On this matter the continent has again split into two, between the North, led by Berlin, and the South which is vaguely guided by Paris and in which Rome tries to get some leeway. Compared to the past, though, Germany is struggling with a crisis of influence and appears less and less able to manage the issues of its continental satellites with a firm hand.

Meanwhile the question of saving Italy from bankruptcy has returned to the fore. The Italian economy is simply too big to fail, but equally to be saved, and therefore it appears capable of taking everybody down with it. Against this backdrop, Rome is trying to assert its industrial-financial deterrent to avoid the financial storm. The power of Italian manufacturing and the integration of the country's northern regions into the German supply chain have had a fundamental role in convincing Berlin to make some concessions to the financial initiatives aimed at helping ailing EU economies, beginning of course with the Italian one.
In late April 2020, European governments gave the green light to the Recovery and Resilience Facility (the so-called Recovery Fund). The EU partners agreed that the Facility would consist of 672.5 billion euros in loans and grants available to support reforms and investments undertaken by Member States. The management of the Fund is likely to become more acute in the coming months once the economic consequences of the pandemic become clearer, but it again highlights the differences that are keeping Europeans apart, regardless of COVID-19.

Into this chaos Russia and China boldly stepped forward, with the aim of seizing a golden opportunity to deepen their penetration and influence in Europe. With remarkable results in term of soft power. Especially in Italy, where a poll taken in late March 2020 showed that Italians consider China (52%) and Russia (32%) to be their best friends, with the USA only achieving 17% of preference. On the other hand, Germany (45%) and France (38%) were perceived as the main enemies[1].
Instead of anticipating an unlikely shift in the balance of power, this confirms the Old Continent as being centre stage for the great power struggle – despite the illusion of having entered into a century dominated by Asia.

The key issue probably relates to the US which, from the beginning of the crisis, has shown little interest in reaffirming its cultural hegemony in Europe, namely the most precious part of the American global sphere of influence. This is not a withdrawal, as tens of thousands of US troops remain firmly deployed across the whole continent, but rather the renouncement of a leading role in aid diplomacy during a critical phase of the emergency, as would have been expected from the lone superpower.
This stance has completely floored Washington's European allies, paving the way for its main rivals and exacerbating all the other issues at stake, starting with the risk of an EU breakdown.

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The European Green Deal

On 27 November 2019, the new EU Commission President Ursula von der Leyen, launched the European Green Deal (EGD), an ambitious package of measures that aim to turn the EU into the world's first climate-neutral continent by 2050 and to decouple economic growth from consuming resources. This new growth strategy proposes to protect, conserve and enhance the EU's natural capital and to protect the health and well-being of citizens from environment-related risks and impacts[1] by providing a roadmap of interventions in all sectors of the economy so as to accelerate the transition to a clean, circular economy and also halt climate change, revert biodiversity loss and prevent pollution. This shift towards a greener economy, will be implemented through a Just Transition Mechanism (JTM) to provide targeted support to regions and workers most affected by the transformation, and make sure that no one will be left behind, mobilising a financial package worth at least EUR100 billion. This is particularly important as the EU faces the looming threat of an economic downturn in the aftermath of the COVID-19 pandemic[2].

The European Green Deal was launched with the promise to bring the EU onto a sustainable path, but it will also face numerous challenges, which will require a holistic and multi-stakeholder approach to counterbalance the environmental, economic and social dimensions of sustainability by concurrently minimising trade-offs for farmers and the private sector[3]. Moreover, as highlighted by a recent assessment of the Institute for European Environmental Policy, the Deal still lacks adequate proposals for a number of environmental objectives such as the protection of species and habitats, the preservation of quiet areas, sustainable usage of the sea, the issue of water abstraction and its effects on surface and groundwater, the pressures of pollution on water, population exposure to environmental noise and impacts on human health[4].

It has been argued that for the European Green Deal to drive the achievement of the SDGs, policy coherence and consistency must be ensured. For example, since agriculture is the biggest driver of biodiversity loss, the new European Biodiversity Strategy to 2030 needs to be central to the CAP 2021-2027, which in turn must be integrated with the Farm to Fork Strategy.

This call for an alignment on objectives and targets of other sectoral policies (including the CAP) was advocated also by 30 NGOs who, in a letter to Vice-President Timmermans, welcomed the adoption of the Farm to Fork Strategy, but also asked for the introduction of further actions and objectives to make the policy more effective[5].

Adopted on May 20 together with the new Biodiversity Strategy for 2030 to bring "nature back into our lives, the Farm to Fork Strategy for a fair, healthy and environmentally friendly food system

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is an integral part of the European Green Deal and is central to the EC's commitment to achieve the Sustainable Development Goals, and has the potential to set a new global standard for more sustainable and healthier food systems. The Farm to Fork Strategy "lays down a new approach to ensure that agriculture, fisheries and aquaculture, and the food value chain" contribute to climate neutrality, while making sure that everyone has access to sufficient, nutritious, sustainable, affordable food. Its goals are "to reduce the environmental and climate footprint of the EU food system and strengthen its resilience, ensure food security in the face of climate change and biodiversity loss and lead a global transition towards competitive sustainability from farm to fork and tapping into new opportunities."

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The Common Agricultural Policy

Since its creation in 1962, with the main aim of providing food security, the Common Agricultural Policy (CAP) has been one Europe's most important policies. In 2018, the CAP accounted for around 37% of the total annual EU budget through the allocation EUR 41.74 billion as income support to farmers, EUR 14.37 billion for rural development and EUR 2.7 billion for market measures[1].

After the 2013 reform, the CAP started a new reform process launched in 2017 with a public consultation to investigate how the CAP could be further modernised and simplified. The consultation results have now been formalised into nine objectives for the 2021-2027 CAP[2] aiming to continue to support European farmers for a sustainable and competitive agricultural sector and, at the same time, to make the policy more responsive to current and future environmental (i.e., climate change) and social (i.e., generational renewal)[1] challenges.

The reform aims to:

1. Ensure a fair income for farmers. Since the income of EU farmers is still below the average income, the role of CAP subsidies is still important in supporting farm income.
2. Increase competitiveness: the role of productivity. A number of policy tools are available for triggering productivity in a sustainable way to meet the challenges of higher demand for food production in a resource-constrained and climate changing world.
3. Rebalance the power in the food chain. The key objective here is to improve and strengthen the farmers' position in the value chain.
4. Climate change action. Contributing to climate change mitigation and adaptation, as well as to sustainable energy production. Using strategies like carbon sinks through better soil management, biomass production, reduction in the fossil fuel intensity of farm production, and reduction in the losses and waste of agricultural production.
5. Care of the environment. Fostering sustainable development and efficient management of natural resources. Soil health is decreasing around the Member States and therefore both agroecology and precision farming should be integrated in sustainable practices to improve both economic and environmental performance.
6. Preserve landscapes and biodiversity. Biodiversity of EU farmland is reducing. The new reform should consider links to EU environmental legislation, Member States' overall planning of their use of CAP funding, obligations for individual CAP beneficiaries, and the detail of policy measures available in order to protect biodiversity and enhance ecosystems.
7. Support generational renewal and structural change in order to modernise the agricultural sector by attracting young people and improving their business development.
8. Jobs and growth in rural areas by promoting employment, growth, social inclusion and local development, including bio economy and sustainable forestry.

Blickwinkel/Alamy IPA

9. Protect food and health quality by improving EU agricultural response to societal demands including safe, nutritious and sustainable food, animal welfare and reducing food waste.

These objectives attempt to align the CAP to the global agenda on sustainable development but different organisations[3] have claimed that the new reform is inadequate for dealing with the magnitude of the environmental and social challenges facing Europe's farming sector. They have particularly questioned the large budget[4] reduction in the European Agricultural Fund for Rural Development and the fact that the CAP budget will continue to support intensive agriculture, which is a major driver of biodiversity loss and climate change[3]. Also, the introduction of a New Delivery Mode, which represents a shift from a compliance-based to a performance-based governance system and includes an increased subsidiarity mechanism for Member States[5], has been found to present both opportunities and risks. The EC's proposal introduces more flexibility for the new reform implementation: Member States are required to design a Strategic Plan by following a set of rules set out by the EU Commissions but with the possibility of tailoring it to the national needs of the farming sector. Each Member State will have to perform and design a national assessment of needs, an intervention strategy with targets and the specific CAP objectives to be achieved. However, while on the one hand this should make the reform more efficient, it also increases the risk of losing a common approach towards food systems. With this in mind, a more integrated policy approach to tackle the *food system as a whole*, taking into account also the environmental issues and nutritional outcomes, has been variously advocated at the EU level[6]. Different organisations

have praised the fact that the new reform will have transformed the CAP from an agricultural policy to a *food policy*: a policy bringing together the whole food system, integrating the various sectoral policies that affect food production, processing, distribution, and consumption, able to push forward the transition to more sustainable food systems[7].

For example, considering that over 50% of the European population is overweight, more than 20% are obese[5] and about EUR 700 billion are spent on healthcare relating to non-communicable diseases, where poor diets are a major risk factor[4], it is of primary importance that the new reform should also include health and nutritional aspects as part of the agricultural policy in order to promote sustainable and healthy diets. As food production directly influences the food environment, contributing to healthy food availability, quality and affordability, a nutrition focused CAP could encourage more diverse, environmentally sustainable plant-based consumption patterns and ultimately promote dietary changes and support healthy diets. In this respect, multi-disciplinary research can play a crucial role in providing evidence-based policies[8] through integrated multi-dimensional evaluation frameworks[9] that can be used to assess the impact of policy interventions[10] on dietary changes and consequent effects on public health[11], and to improve the environmental profiling of different agricultural systems throughout Europe[12].

Only by improving the CAP's coherence and integration with other EU policies and by adopting a whole-food system approach (i.e., Common Food Policy) can the new reform help the EU to lead the transition towards a more sustainable and healthy food system as advocated by the international community and the global Agenda.

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2. Sustainable Agriculture

Highlights

In the EU, **agricultural water withdrawals** range between 0.01% and 57.43% of national renewable freshwater resources. The majority of EU countries are **net importers of water**, embedded in agricultural trade, with the few net exporters suffering from water scarcity.

Degradation of agricultural soils remains a crucial issue in Europe especially in southern countries, which are characterised by soil carbon content below the critical 1.5% threshold. Member States are major promoters of **organic agriculture** at global level, showing the highest regional proportion of agricultural area given over to organic agriculture (8.1% of the total agricultural area).

Women's participation in farming is slightly below 50% but there are differences between countries, ranging from 37.7% in Malta to 63% in Sweden.

Participation of young people (under 35) in farming is commonly low in the EU group: only 5% engage in agriculture.

Livestock activities contribute to 61% of total GHG emissions from EU agriculture, while crop cultivation causes the remaining 39% (excluding GHG emissions from change of land use). Within the latter, the use of synthetic fertilisers makes a significant contribution equal to 17% of total agricultural GHG emissions.

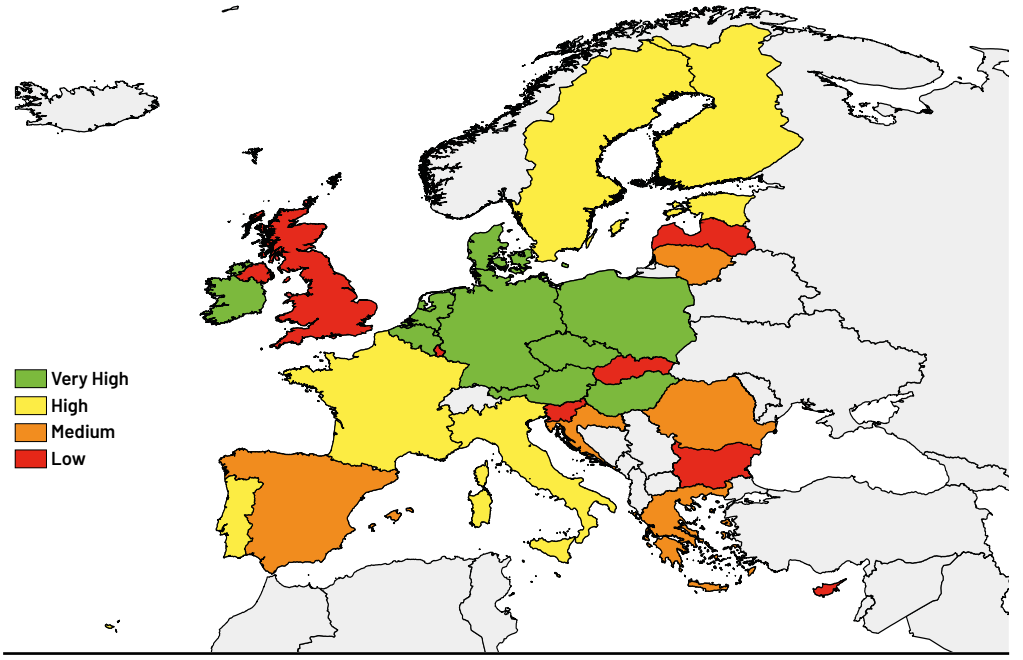

Figure 2.1. EU performance in the FSI Sustainable Agriculture pillar.

2.1. Introduction and background

Today, agriculture is both a cause and a victim of climate change. It accounts for about 23% of total anthropogenic GHG emissions. When the whole food system is taken into account, this proportion goes up to 37% of total GHG emissions. From 1961 to today, per capita food supply has increased by 30%, cereal production by 240%, water withdrawal for irrigation has more than doubled and the use of fertilisers has increased by 800%[80].

THE WHOLE FOOD SYSTEM ACCOUNTS FOR UP TO 37% OF TOTAL ANTHROPOGENIC GREENHOUSE GAS EMISSIONS

Sustainable food and agriculture are at the core of the 2030 Agenda. Promoting proper nourishment for an ever-growing population, so that society can thrive and prosper, requires us to nurture the land, preserve natural resources and adopt a climate-resilient agriculture. This entails embracing an integrated approach that simultaneously looks at food, agriculture, livelihoods and the management of natural resources, striving to achieve the objectives called for by the SDG2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture. This set of actions has the potential to catalyse progress in many other SDGs, including the eradication of poverty (SDG1), guaranteeing health (SDG3), promoting access to education and gender equality (SDG4 and 5), preserving water resources (SDG6), fighting inequality (SDG10), spurring sustainable production and consumption (SDG12), accelerating climate action (SDG13), the preservation of seas, oceans, ecosystems, biodiversity and forests (SDG 14 and 15) etc. Investing in food and agricultural systems, as well as promoting partnerships and cooperation, can thus drive change and make the 2030 Agenda a reality[81].

The transformation of land-use and food systems, however, brings **numerous trade-offs across interventions, therefore any course of action should be pursued with an integrated approach**[82]. In broader terms, a decoupling of human wellbeing from environmental degradation and the adoption of the principle of circularity is fundamental to achieving all SDGs[83].

Sustainable agriculture has also been a crucial topic in the EU since its inception. The Common Agricultural Policy (CAP) is one of the oldest EU policies. The budget allocated to the CAP exceeded 70% of total EU budget in the 80s[84] and, despite a significant reduction, this will remain at around one-third of the total EU budget in the 2020-2027 period (EUR 365 billion)[85]. Over the years, the CAP has increasingly integrated environmental and social aspects into its agenda. The 2013 reform put increased emphasis on the environment and climate and all farmers receiving funds have to comply with a range of requirements related to climate change, water, soil, biodiversity and landscapes, as well as to public health, plant and animal health and welfare. In the next post-2020 CAP reform, environmental pressures and climate change have been included among the main objectives[86,87].

In this context, an analysis of the performance of the EU in the agricultural sector shows that eight EU countries are among the FSI's top 10 in terms of sustainable agriculture (Israel is 3rd and Colombia 8th). This includes three dimensions: (i) water, encompassing agricultural water consumption and management and fisheries; (ii) land (land use, biodiversity and human capital), covering the environmental impacts of agriculture on soil and biodiversity and socio-economic indicators of the farming population; (iii) air, comprising agricultural contributions to climate change. The overall performance of the EU as a region is slightly lower than other regions such as North America, East Asia and the Pacific and Latin America. A focus on the three categories mentioned above shows that only a few countries have a uniform performance (Figure 2.2): Austria and Denmark always

perform *very high* (green stream field at the top of Figure 2.2), while the Netherlands and Hungary show a slight reduction (*high*) in the land category. At the opposite end, Bulgaria's performance is always *low* except in the land category, in which it shows medium performance.

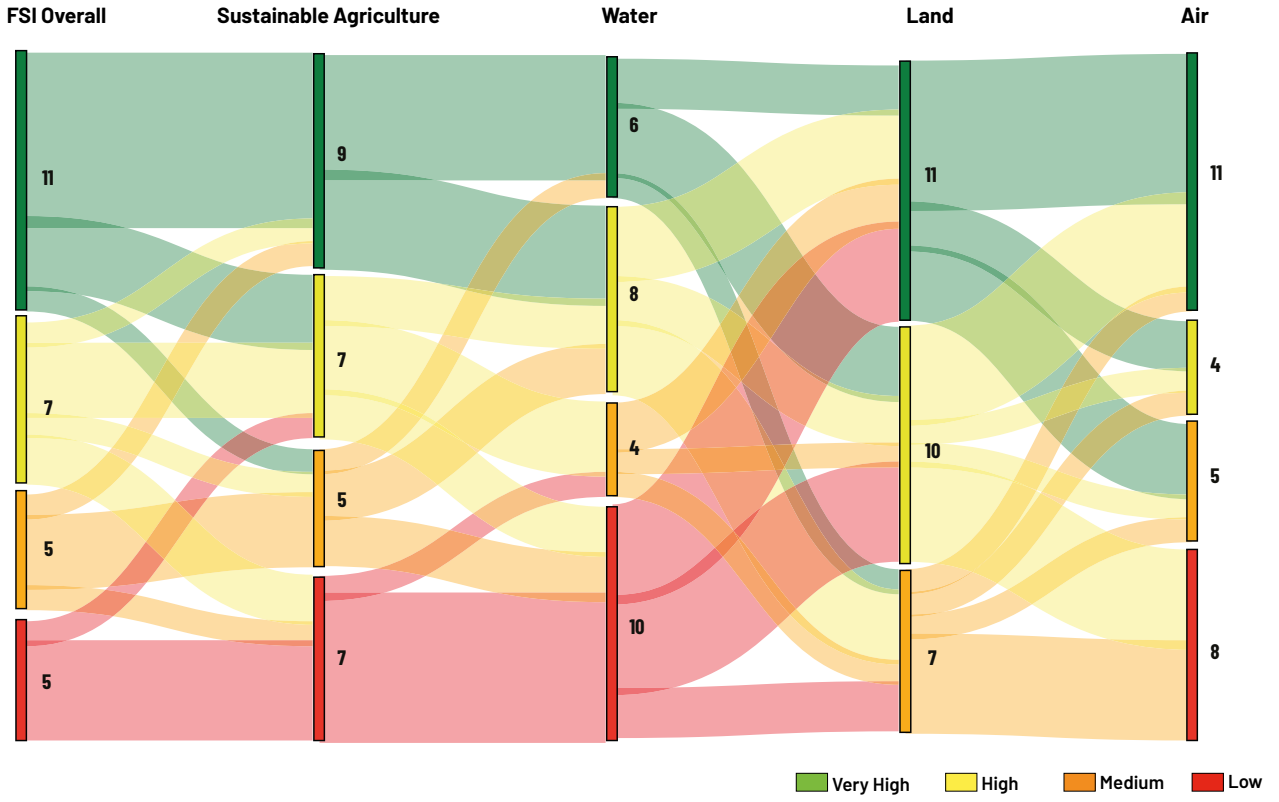

Figure 2.2. *EU performance clusters in the FSI for sustainable agriculture and its categories (red = low; orange = medium; yellow = high; green = very high). The five axes represent overall FSI ranking, sustainable agriculture and its three dimensions (i.e., water, land and air) and the blocks represent clusters of nodes. These blocks are proportional to the number of countries belonging to each performance cluster (the number is also shown next to each block). The stream fields between the blocks represent changes in performance and the height of a stream field represents the number of countries contained in both blocks connected by the stream field.*

2.2. Water resources

Agriculture is among the main pressures on EU water resources in both quantitative and qualitative terms. Water availability is generally higher in the northern countries than in the southern ones. Nevertheless, water scarcity is on the rise in western and northern Europe as well, especially due to climate change[88,89].

The FSI results on water use in agriculture show that EU performs below the overall FSI average and only the Middle East and North Africa (MENA) regions have a lower performance. At the global level, agriculture causes 92% of humanity's water footprint [90]. When looking at the **water footprint** of national productions, agriculture in the EU accounts for an average 90% (from 53% in Belgium to 99% in Croatia and Lithuania)[91]. The main contributors to EU agricultural output are France, Spain and Italy [92] where agriculture represents 89%, 98% and 85% of the national water footprint, respectively[91].

National food systems do not only rely on national food production, but also on food imports carrying **virtual water** [ii]. At global level, about one-fifth of the global water footprint relates to production for export[93]. In the EU, only Spain, Greece and Cyprus are net blue water exporters, while in the other 25 countries virtual water imports are higher than exports, with the highest net water imports registered in Italy, the United Kingdom and Germany. It has been shown that the overall trend in changes in virtual water trade does not seem to be in accordance with the EU 2000 Water Framework Directive, established to achieve good water status across the EU water bodies[94].

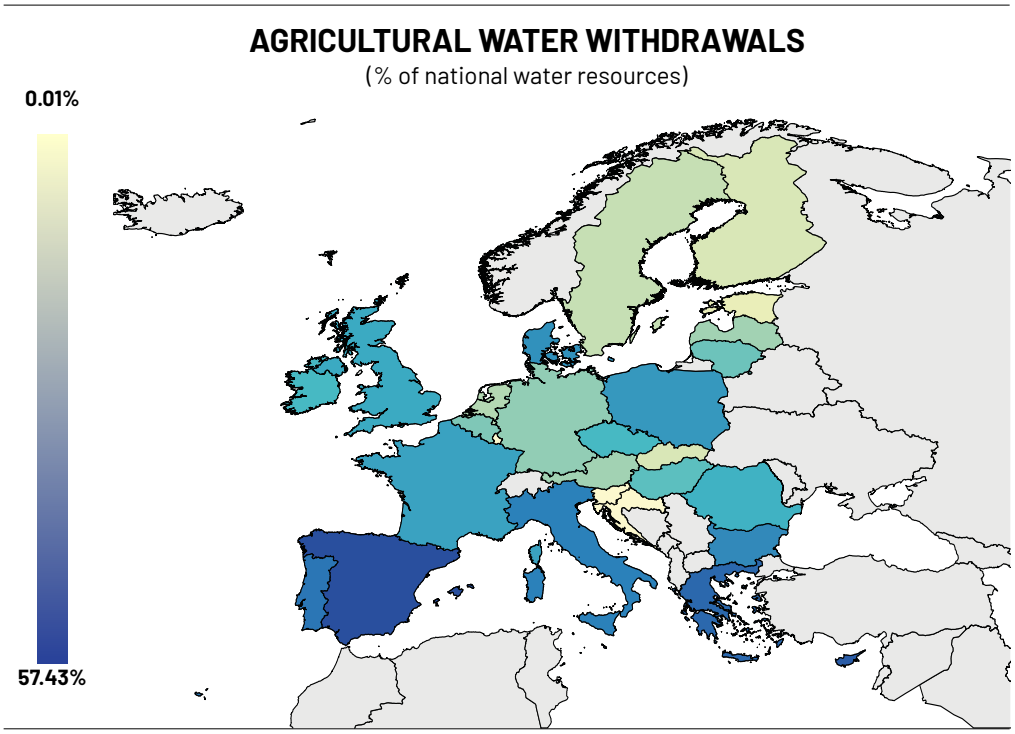

Figure 2.3. *Agricultural water withdrawals as percentage of national renewable freshwater resources (AQUASTAT, 2003-2017).*

SUSTAINABLE WATER MANAGEMENT IS FUNDAMENTAL TO ALLEVIATE WATER SCARCITY

Sustainable water management is fundamental to alleviate water scarcity and is at the core of SDG6 (target 6.4). **Agricultural water withdrawals** represent on average 5% of national total renewable freshwater resources, ranging from 0.01% in Croatia to 57.43% in Malta[95]. The three water exporters have three of the four highest percentages (only better than Malta), namely 22.84% in Spain, 21.49% in Cyprus and 11.58% in Greece (Figure 2.3). These figures underline that agricultural water use for export can cause pressure on the national water resources in areas affected by water scarcity, like the Mediterranean region.

Besides water consumption, **water quality remains an environmental hotspot in the EU** and a crucial issue to be tackled. Despite the fact that agricultural water pollution has decreased over the last two decades and that concentrations of nitrates and phosphate in European rivers have reduced[96], diffuse pollution sources from agriculture remain the main concern in regard to about 40% of European water bodies[97], and further efforts are required to achieve SDG6.3 on water quality.

ii. Virtual water is the amount of water consumed along product supply chains. This water is traded with foods and other products, so namely exported and imported between countries.

Fisheries are the core of SDG14.14 and play a key role in the EU food system and the blue economy[iii,98], but unsustainable fishing has emerged as the main cause of fish stock decline. At the global level, slightly more than 30% of stocks are classified as overfished[99,100]. Among the 23 EU coastal countries[iv], this proportion ranges between 1.3% (Estonia) and 75.1% (Italy). In particular, 12 EU countries suffer from more than 45% of fish stock depletion (45.8% in the case of Sweden and 75.1% in Italy).

Nevertheless, progress in the sustainability of fisheries has been recorded, also thanks to the EU Common Fishery Policy. Namely, in the North-East Atlantic, where 75% of the EU's catch originates, the number of commercially important fish stocks caught at sustainable levels has increased from 34% in 2007 to 60% in 2015. On the other hand, fisheries in the Mediterranean and Black Sea are not progressing towards sustainability at the same rate, and more than 75% of stocks are overfished in the Mediterranean Sea[101,102].

UNSUSTAINABLE FISHING HAS EMERGED AS THE MAIN CAUSE OF FISH STOCK DECLINE

iii. The EU blue economy generated EUR 658 billions of turnover per year and employed 4 million people in 2017.
iv. Austria, Czech Republic, Hungary, Luxembourg and Slovakia are excluded because they are not coastal countries.

2.3. Land use, biodiversity and human capital in EU agriculture

FARMERS HAVE A CRUCIAL IMPORTANCE AS MANAGERS AND STEWARDS OF LAND HEALTH AND SOIL FERTILITY

In the EU, **40% of total land is utilised for agriculture[v], and an additional 9% is either wooded or unused agricultural land belonging to agricultural holdings**. These facts highlight the crucial role of farmers as managers and stewards of land health and soil fertility. The effects of human activities, in particular of agriculture, on land degradation and biodiversity loss have been widely acknowledged[103,104], and significant effort will be needed to combat desertification and restore degraded land and soil, including land affected by desertification, drought and floods as claimed by SDG15.3. In particular, all EU countries show a reduction in **soil organic carbon (SOC)** content with respect to estimated original conditions[105,106], and loss in EU agricultural productivity due to soil erosion in the EU is estimated to be around EUR 300 million[107,108].

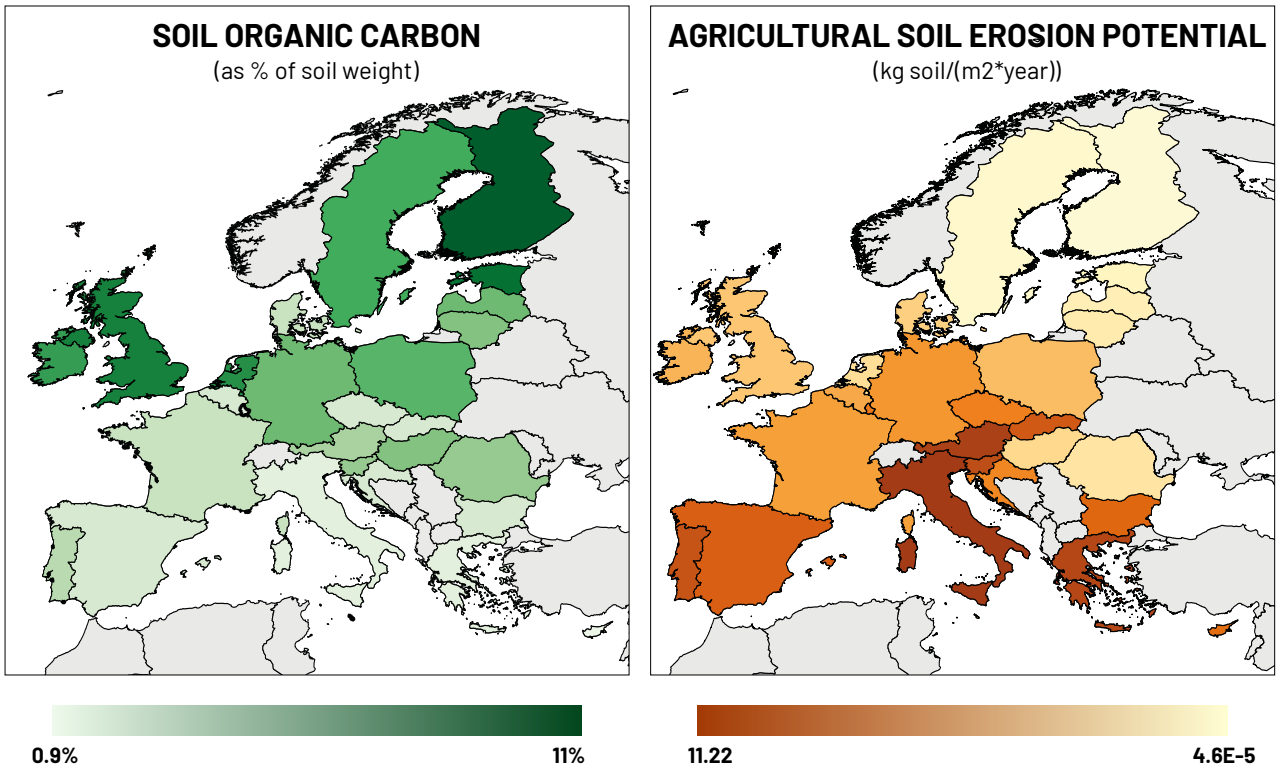

Figure 2.4. *Soil health status in Europe - Soil Carbon Content (SOC, FAOSTAT, 2008) as percentage of weight (on left) and erosion potential (on right, Laurentis et al., 2018).*

The above-mentioned SOC makes an important contribution to soil fertility because it is essential to soil structure and aggregation, water and nutrient retention and use efficiency[109]. The average carbon content in EU agricultural soils is about 2.8% in weight, above the average of 2.1% calculated across all 67 FSI countries and above the critical desertification threshold of 1.5-2%[110]. Nevertheless, there are differences among EU countries (Figure 2.4): southern countries registered an average carbon content below 1.5%, while northern countries show higher percentages, with Finland ranking overall first at 11%. Although these results are influenced by the site-dependency of SOC[111], agriculture is a

v. Data referring to 2013.

major cause of soil carbon depletion[112] (e.g., through tillage) which leads to degradation of soil structure and consequent increases in soil erosion, nutrient leaching[113], and gaseous emissions (e.g., CO_2, CH_4, N_2O)[114]. This latter aspect underlines the importance of soils as carbon sinks and how agriculture should promote strategies to increase the SOC such as soil restoration, woodland regeneration, no-till farming, cover crops, nutrient management, improved grazing, water conservation and harvesting, efficient irrigation and agroforestry practices[115].

The organic content of soil also influences the resistance to erosion. **Soil erosion** is the process of removing and transporting particles by means of water or wind[116]. This phenomenon is site specific and depends on soil characteristics (e.g., structure, texture and organic matter content), rainfall patterns (e.g., amount and intensity), slope and land cover and management[117,118].

Data on soil erosion potential confirms that agricultural soils in southern European countries present the most critical conditions (Figure 2.4). Italy shows the highest erosion potential (11.2 kg soil/(m^2*year))[119,120], mainly due to unfavourable soil characteristics (e.g., limited soil drainage, unfavourable texture and stoniness, shallow rooting depth, and poor chemical properties[121]) followed by Austria, Greece, Slovenia, Portugal, Slovakia and Spain. On the other hand, Scandinavian countries have the lowest erosion potential: Finland shows the lowest (4.7 kg soil/(m^2*year)), followed by Sweden, Estonia, Latvia and Lithuania.

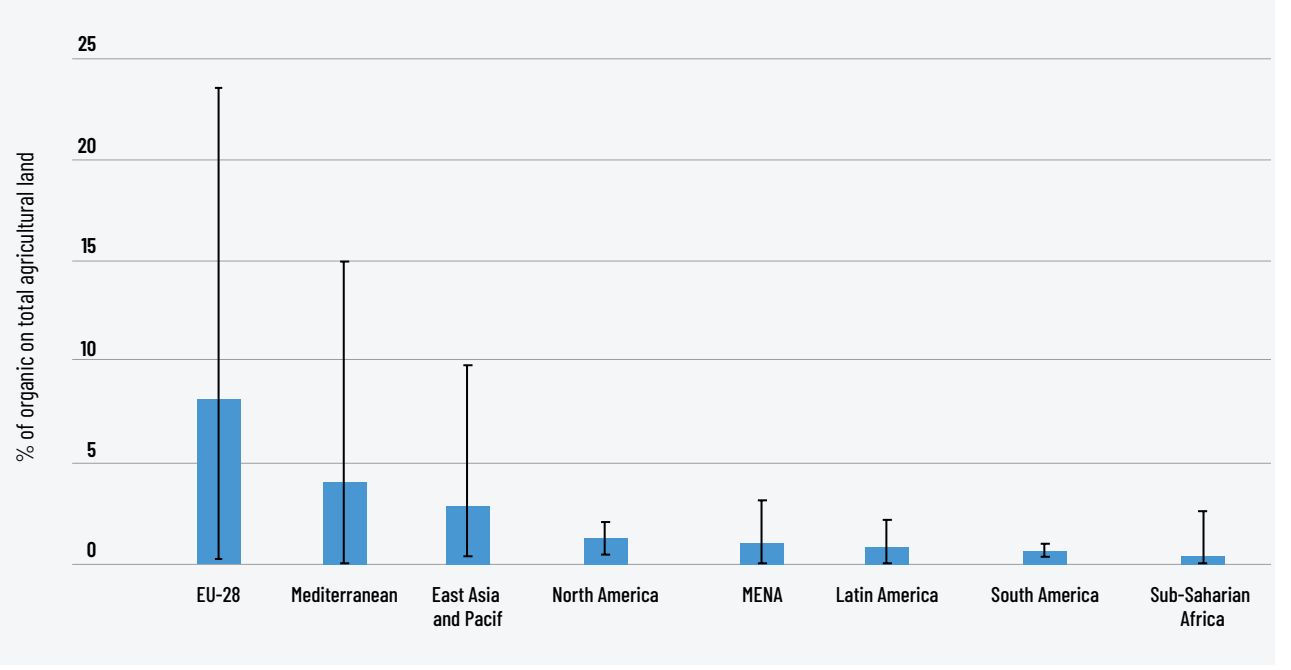

Figure 2.5. *Regional implementation of organic agriculture. The bars show what percentage of total regional agricultural land is dedicated to organic agriculture. The variation bars show the regional maximum and minimum percentages (FAOSTAT, 2020).*

Among existing agricultural practices, **organic agriculture** is considered a promising measure to preserve soil fertility and increase SOC[122,123,124,125]. Across all EU Member States, agricultural holdings implementing organic agriculture have been steadily increasing since 2003 and are expected to keep growing and the EU's organically managed area has increased by 70% in the last ten years[19,120]. The EU has the highest percentage of organic agricultural land out of total agricultural land of all the

regions analysed in the FSI (Figure 2.5)[vi,127], and it is still increasing. The average percentage of organic agricultural land is 8.11% (almost 12 million hectares[128]) more than double the average of 3.93% from across all of the 67 FSI countries. In eight EU countries, the figures go above 10% (i.e., Austria, Estonia, Sweden, Italy, Czech Republic, Latvia, Finland and Slovakia) with a maximum of 23.38% in Austria. Only Romania, Ireland and Malta show results below 2%.

Agriculture is central in maintaining biodiversity and achieving the SDG2.5, but, as previously mentioned, agriculture is the biggest driver of **biodiversity loss**[129]. According to the EU State of Nature[130], biodiversity loss and ecosystem degradation are still ongoing in the EU and consequently many species and habitats are not in a favourable status, a depletion process in which unsustainable farm practices play a crucial role. Within this context, forests are pivotal to the conservation of biodiversity. The presence of forests is not homogeneous in EU countries. In Finland and Sweden about 70% of land is covered by forests but in the majority of EU countries this percentage drops below 40%, with a minimum of 1.1% in Malta[131]. For this reason, EU countries should increase their efforts to conserve forests, implement sustainable forest management, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation as proposed in SDG15.

AMONG EXISTING AGRICULTURAL PRACTICES, ORGANIC AGRICULTURE IS CONSIDERED A PROMISING MEASURE TO PRESERVE SOIL FERTILITY

As regards **land diverted to biofuels and animal feed production**, EU countries divert on average 2% of their agricultural land to biofuels and feed and all the countries divert less than 5% of their national agricultural area except for Croatia (14.4%). This is considerably lower than in the USA (21.9%), Brazil (40.2%) and Argentina (49.3%). On the other hand, the majority of EU countries are major importers of biofuels and feed. Only Estonia, Luxembourg, Croatia and Portugal import less than 1 million US $ of biofuels and animal feed per year. All the other EU countries import higher amounts, ranging from Malta with about 2.8 million US$ to the Netherlands which imports about 2 billion US $[132].

From a socio-economic perspective, the average rate of **women's participation** is about 49.8%. In southern countries, such as Italy, Portugal, Greece and Spain, the participation of women is lower with Malta showing the lowest rate at 37.7%. In northern countries, we find higher rates of participation, with Sweden having the highest in the EU at 67%. Among the other regions to which the FSI has been applied, Africa has the highest average rate for women's participation at 53% with Uganda and Tanzania having the highest rates of all 67 FSI countries (87.5% and 78.2%, respectively).

The average age of EU farmers is 53 and the proportion of young people in agriculture is about 5%. Romania has the highest proportion (17%) and it is the only country together with Bulgaria (15%) with rates higher than 10%. All the other countries have rates below 10% with Sweden registering the lowest result (below 1%).

SDG2 calls for an increase in investments in rural infrastructure, agricultural research, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity. The EU government **R&D expenditure in agriculture** is on average about 1.5% of GDP, slightly higher than the average across the whole of the 67 FSI countries (1.2%). Sweden has the highest expenditure at 3.25% of its national GDP, only lower than Israel (4.25%) and South Korea (4.24%). Nevertheless, nine countries invest less than 1% of their national GDP in agricultural R&D (Poland, Croatia, Lithuania, Slovakia, Bulgaria, Malta, Cyprus, Romania and Latvia), with Latvia having the lowest expenditure at 0.44%.

vi. Data for Sudan refers to 2016; no data available for 2017.

Clifford Norton/Alamy Photo Stock

2.4. Air emissions and climate change

The EU has been at the forefront of global climate deals and measures. It has committed to cut its greenhouse gas emissions by 20% by 2020, at least by 40% by 2030 (from 1990 levels) and it is working towards climate neutrality by 2050[133]. Currently, agriculture makes a significant contribution to GHG emissions in the EU: it is responsible for about 10% of EU greenhouse gas emissions[134], only below contributions from fuel combustion (e.g., to produce energy) and transport, and it accounts for a major part of total contributions from the whole food system, which causes overall between 19 and 29% of global GHG emissions[135]. For this reason, agriculture plays a key role in achieving SDG13 "Take urgent action to combat climate change and its impacts".
In 2017, agriculture in the EU as a whole emitted about 415,000 Gg $CO_{2eq.}$, slightly above the US (+14%) and less than national emissions from Brazil (-11%), India (-54%) and China (-64%)[vii,136].

Emissions from the agricultural sector increased by 0.4% between 2016 and 2017[137], mainly because of digestion in ruminant animals (enteric fermentation) and agricultural soils (mostly due to the use of fertilisers). Nevertheless, preliminary estimates for the year 2018 are positive: agricultural emissions have decreased by 0.7% with respect to 2017[138].

AGRICULTURE IS RESPONSIBLE FOR ABOUT 10% OF EU GREENHOUSE GAS EMISSIONS

The 2017 data shows that national agricultural GHG emissions depend on different factors such as agricultural production and production efficiency. In terms of total emissions, major agricultural producers such as France, Germany, Spain, Italy and UK (overall more than 60% of total EU agricultural output[viii])[139] produce above 29,000 Gg $CO_{2eq.}$. Whereas, countries with the lowest contribution to EU agricultural output such as Malta, Cyprus, Luxembourg, Slovenia, Slovakia and Estonia (overall below 2% of total EU agricultural output)[140] are among the top ten performers, with less than 2,500 Gg $CO_{2eq.}$, in terms of annual emissions from agriculture.

These statistics show the contribution of each country to global agricultural GHG emissions with figures depending on the agricultural land and production of each country. When referring GHG emissions to the national agricultural area and economic value of agricultural production[ix] , some peculiarities emerge[141]. The Netherlands show the maximum GHG per unit of area, equal to 10 Mg of $CO_{2eq.}$ ha^{-1} (Figure 2.6, on left), but it has among the lowest emissions per economic value (1.3 kg $CO_{2eq.}$ $\$^{-1}$, Figure 2.6, on right). This could be due, on the one hand, to the small amount of agricultural area available in the country and, on the other, to the high production efficiency of Dutch agriculture. The opposite picture results for Latvia (1.4 Mg of $CO_{2eq.}$ ha^{-1} and 2.9 kg $CO_{2eq.}$ $\$^{-1}$). Ireland, however, is characterised by low performance in both indicators (5.1 Mg of $CO_{2eq.}$ ha^{-1} and 4.3 kg $CO_{2eq.}$ $\$^{-1}$) while Greece has one of the most positive performances (1.2 Mg of $CO_{2eq.}$ ha^{-1} and 0.91 kg $CO_{2eq.}$ $\$^{-1}$).

vii. Percentages are calculated with reference to regional EU-28 emissions.
viii. The output of the agricultural industry comprises the output of agricultural production and the output of non-agricultural but closely related secondary activities.
ix. The Agricultural area includes: cropland, arable land, land used for temporary crops, land used as temporary meadows and pasture, land temporarily fallow, land used as permanent meadows and pasture, cultivated permanent meadows and pasture, naturally occurring permanent meadows and pasture, land under protective cover. The value of agricultural production corresponds to the *Gross Production Value (constant 2004-2006 1000 I$)* indicator; since the most up to date data refers to 2016, values for GHG are also from the that year.

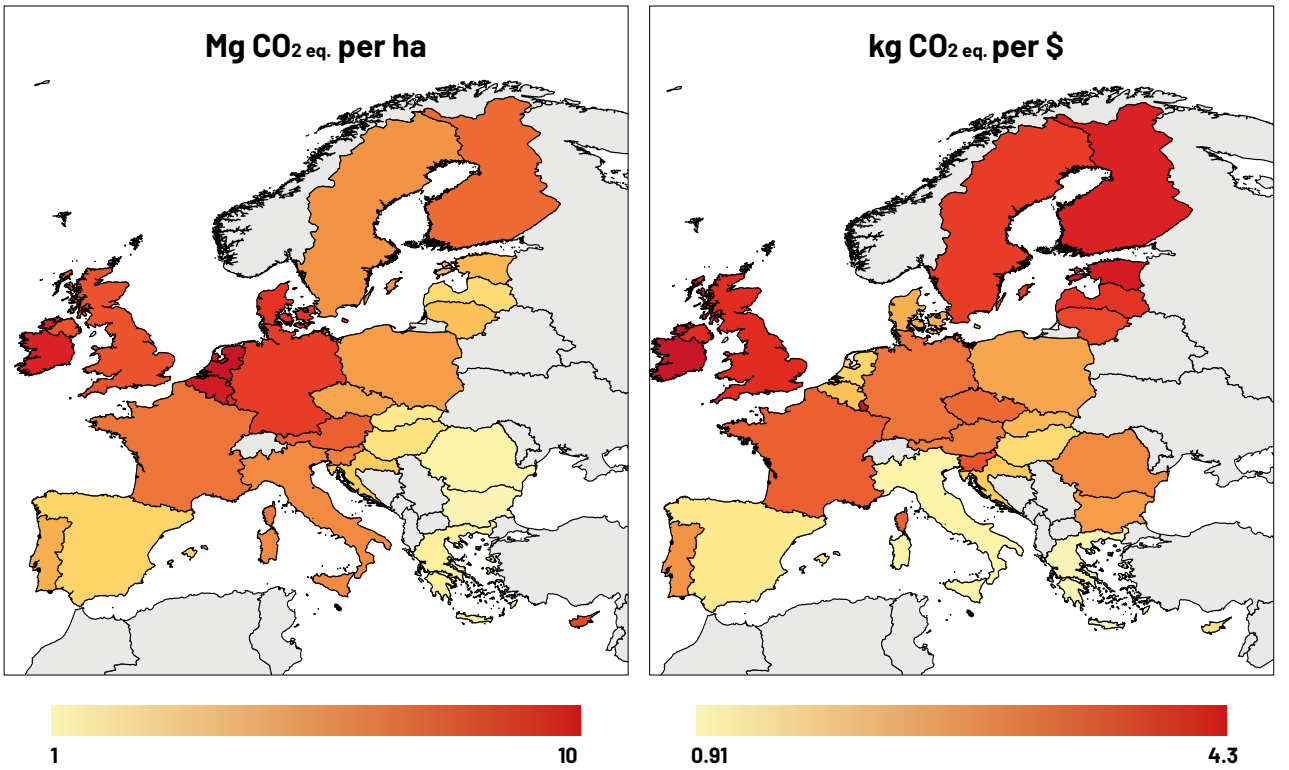

Figure 2.6. *EU agricultural GHG emissions (kg CO2eq.) referred to each unit of agricultural area (ha, left side) and to each unit of value of agricultural production ($, right side) (FAOSTAT, 2020).*

Agricultural GHG emissions are due to crop cultivation, livestock activities and land-use change intended to create new agricultural land (e.g., via deforestation)[x]. Considering the two agricultural activities (i.e., excluding land-use change), livestock activities cause on average 61% of total agricultural GHG emissions in the EU, ranging between 80% in Malta and 35% in Hungary and Bulgaria. Crop production causes the remaining 39% of direct GHG emissions, with opposite national statistics with respect to livestock activities. Focusing on synthetic fertilisers, the average contribution to EU GHG emissions is equal to 17%, ranging between 6% in Malta and 42% in Bulgaria (Figure 2.7).

THE EU HAS COMMITTED TO CUT ITS GHG EMISSIONS TOWARDS CLIMATE NEUTRALITY BY 2050

Land-use change, however, makes a positive contribution to climate change mitigation with carbon removals exceeding on average the emissions: in the EU, around 450,000 Gg $CO_{2eq.}$[142] are removed every year from the atmosphere through land-use change mainly thanks to forested areas. In 5 countries, GHG emissions due to land-use change are higher than removals: in Finland, Hungary, Portugal and Luxembourg these emissions are associated with carbon losses from cropland soil, while in Portugal the main cause is deforestation[143]. Despite the positive result, croplands remain the main cause of GHG emissions with more than 62,000 Gg $CO_{2eq.}$.

x. The estimate of emissions from animals and crops cultivation is based on FAOSTAT data on agricultural GHG emissions. Emissions from animals include enteric fermentation, manure management and manure left on pasture. Emissions from crop cultivation include synthetic fertilisers, manure applied to soils, crop residues, cultivation of organic soils, burning - crop residues, rice cultivation. The emissions due to "Burning - savanna" have been excluded because they can occur to either create new cultivation fields or pasture for livestock.

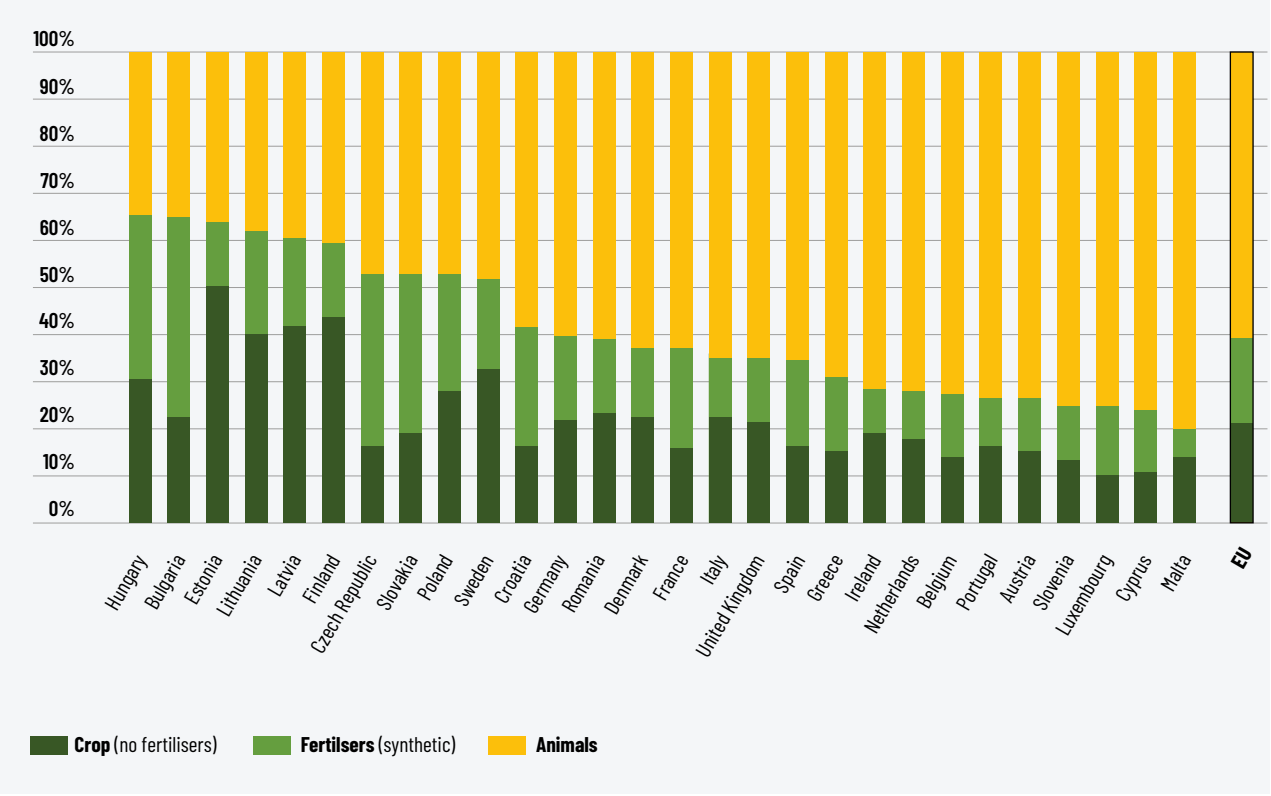

Figure 2.7. *Agricultural GHG emissions in EU caused by crop cultivation and livestock activities. Emissions due to synthetic fertilisers come under emissions due to crop production, but they have been highlighted in the histogram due to their importance in terms of climate change (FAOSTAT, 2020).*

2.5. Agricultural policies, initiatives and best practices

The EU can be considered a frontrunner in the promotion of sustainable agriculture at global level. EU policies and action plans for achieving the SDGs, Aichi Biodiversity Targets[144], the Paris Agreement on climate change and the Green Deal[145] show its commitment towards sustainability and agriculture is a key part of this pathway. The 2019 Europe Sustainable Development Report has highlighted the importance of integrated policies to promote sustainable land use and food systems by the year 2050[146].

The post-2020 CAP will also attempt to place a greater emphasis on environment and climate, for instance, with new obligations on preservation of the soil carbon content, and an obligatory nutrient management tool to improve water quality while reducing ammonia and nitrous oxide levels. Moreover, each Member State will have to develop eco-schemes to support and incentivise agricultural practices in this direction, beyond the mandatory requirements. Despite the promising proposals, budgetary limitations and trade-offs between diverse policy objectives challenge concrete steps towards CAP integration with other EU policies and towards a comprehensive, multi-disciplinary and whole-food system approach[147]. Given the importance of the next CAP reform, civil society organisations are advocating a "more sustainable" CAP and are promoting sustainable agriculture among citizens, both at national and European level. The main examples at national level include *Cambiamo agricoltura*[148] (*Let's change agriculture*) in Italy, *Pour une autre PAC*[149] (*For another CAP*) in France, and *Meine Landwirtschaft*[150] (*My agriculture*) in Germany. At

European level, we find the multidisciplinary *Sustainable Food and Farming Platform*[151,152] and *Good Food Good Farming*[153], which both bring together several NGOs and other stakeholders in the EU-food system and are carrying out advocacy activities with European institutions and raising awareness of sustainable agriculture among citizens.

EU-funded research programmes such as Food 2030[154], the LIFE programme launched in 2018[155,156], and the Horizon2020[157] foster sustainable agriculture. For instance, the latter allocates EUR 10 billion to support specific research and innovation in food, agriculture, rural development and the bioeconomy[158,159]. Among other EU-funded research initiatives, the Partnership for Research and Innovation in the Mediterranean Area (PRIMA), a EUR 494 million initiative, focuses on water scarcity, agriculture and food security in the Mediterranean region.

At national level, several initiatives address the sustainability challenges of agriculture as described in this report, from water conservation (1) to environmental and agro-biodiversity (2 and 3) and marine ecosystem health and sustainability of fisheries (4). Existing initiatives include:

1. **Larnaca Water Reuse Schemes**[160,161] (Cyprus): Project aimed at promoting recycled water in Cyprus as a resource for irrigation;
2. **The Recovery of Biodiversity, Nature and Landscapes law**[162] and the **Agency for Biodiversity**[163] (France): New law and national agency aimed at addressing climate change and biodiversity together by setting new targets for green urban areas, agroecology and soil protection, and actions such as payments for environmental services, pollinators and ecosystem restoration;
3. **The Swedish national gene bank**[164] (Sweden): National programme aimed at promoting agro-biodiversity through which seeds of older varieties are being collected throughout the country and preserved in the Nordic Gene Bank, and old cultivated plants are reintroduced into the market;
4. **Clean Archipelago**[165] (Italy): A multi-stakeholder public-private partnership led by the Tuscany Region in Italy, in cooperation with the Italian Ministry of Environment, which strives to clean up the sea from litter, while incentivising fishermen to collect fished plastics and bring them to the collection points inside the harbours.

EU countries are also implementing new precision farming[166] and agroecology techniques to reduce environmental impacts[167,168,169].

The EU is also working to foster the sustainability of food systems beyond its borders. The EU-Africa partnership on food and nutrition security and sustainable agriculture, launched in April 2016, fosters research and innovation cooperation in the areas of sustainable intensification, agriculture and food systems for nutrition and agricultural markets and trade. As for fisheries, the All Atlantic Ocean Research Alliance, launched in 2017, is a collaboration between the EU, Brazil, and South Africa aiming to deepen scientific knowledge of marine ecosystems and interrelations with oceans, climate change and food.

2.6. Best practices in cities

2.6.1. Ecological public procurements: the ÖkoKauf Wien programme in Vienna

The City of Vienna provides about 100,000 hot meals every day to its public facilities such as schools, hospitals, nursing-homes and retirement homes.

In 1998, the **ÖkoKauf Wien** (EcoBuy Vienna) programme introduced high standards for sustainable

Flament /Andia/Universal Images Group/Getty Images

THE CITY OF VIENNA PROVIDES ABOUT 100,000 HOT MEALS EVERY DAY TO ITS PUBLIC FACILITIES

public procurement that go beyond the European legislation and guarantee high quality and nutritious food produced in a manner, which is as environmentally friendly as possible. In particular, the Food Workgroup of the ÖkoKauf programme formulated a list of quality and environmental sustainability criteria for the food public procurement. These criteria include the selection of seasonal and fresh food from organic farms located in the nearby region, respect of animal rights, high social standards in production and trade, minimal food processing, exclusion of foods using genetically modified organisms, prevention of artificial ingredients and transfats in food, reduction of animal products, and minimisation of waste[170].

Among the main practical implementations of the ÖkoKauf programme there is a focus on the procurement of fresh eggs and egg products. The current standard requires eggs and egg products from organic or free-range origins (at least from ground-kept hens). This requirement complies with Austrian legislation that has banned the caging of chickens since 2015. Similar animal welfare criteria are also planned for meat and their by-products.

A second application of the programme is the **Natürlich gut Teller** (Naturally Good Dish) initiative. It introduces additional eco-friendly criteria[171] applicable to meals served two to three times per week in several Viennese canteens, e.g., in retirement homes or in hospitals. The five mandatory criteria relate to organic, seasonal and regional food, the presence of meat (i.e., smaller amount, produced by organic farms that respect animal rights), and fish produced from national aquaculture. Furthermore, two of the additional seven criteria relate to vegetable content, fair trade ingredients, requiring healthy food be respected in a naturally good dish.

The ÖkoKauf Wien programme has had positive impacts on the urban and regional food system,

from sustainable agriculture to healthy diets. Among the most significant achievements is the supply of organic food, which amounts to more than 30% (by value) of food served in public facilities. In kindergartens and schools, the amount is even higher - about 50 percent. This result has a positive impact on the environment, with an average estimate of 15,000 tonnes of CO_2 equivalent saved per year (between 2008 and 2012 a total of approximately 58,600 tonnes of CO_2 equivalent were saved)[172]. Additionally, it fosters the implementation of less intensive agriculture in the rural areas: 70% of food products sourced from Austria, which shows the highest organic agriculture implementation rate in the EU (more than 20% of the national agricultural area)[173]. Moreover, the Food Workgroup aims to raise awareness of food sustainability among Vienna's citizens, by sharing the list of criteria and the benefits of organic, seasonal, sustainable and healthy food with citizens via easy-to-understand brochures.

THE MUNICIPALITY OF LJUBLJANA IS IMPLEMENTING A RURAL DEVELOPMENT STRATEGY TO STRENGHTEN THE LINK BETWEEN FARMERS AND URBAN POPULATION

2.6.2. Short food supply chains to reconnect farmers and citizens

In the Municipality of Ljubljana (MOL)[174], rural areas account for two-thirds of the total surface and the 1,000 small farms operating in these areas represent a fundamental resource to feed the around 300,000 people living in the city. The MOL has understood this opportunity and developed a **Rural Development Strategy** for the years **2014-2020** with the aim of strengthening the link between farmers and urban population and increasing the city self-sufficiency[175]. The main objective of this strategy is to create shorter sales channels to increase access to locally grown and seasonal food for the citizens of Ljubljana and a short food supply chain is the key concept.

The Rural Development Strategy includes different actions and approaches that allow different target groups to be reached, from producers to food sellers and citizens. Firstly, on the production side, the "Basket of Ljubljana" initiative established standards for growing food in the City of Ljubljana, according to the principles of organic or integrated production. Additionally, the Municipality has established allotments for urban agriculture and related activities such as educational training in the field of agroecology. Altogether, the city allotments cover an area of 65,292 m^2. Secondly, the Municipality promotes short supply chains to efficiently link local farmers and urban caterers, hoteliers, and other providers of catering services. Particular attention has been paid to kindergartens, where 20% of public procurement has been used to purchase locally grown products. In addition, urban markets and sale areas arranged on farms are supported by the municipality to improve direct access to locally-grown food to citizens. Finally, events such as the weekly organic market and Ljubljana's rural area festival that takes place every year in October allow different local food suppliers to be presented to citizens.

This diversified portfolio of actions leads to the multifaceted success of the Rural Development Strategy and allows different aspects of the sustainability of the food system to be improved. The main output of the **Rural Development Strategy** has been an increase in the consumption of locally produced food, particularly thanks to the establishment of markets and gardens. Markets play an important role in interconnecting producers to provide diverse and organic food to citizens, from asparagus to strawberries, pumpkins, milk and grains. The short supply chains developed allow

primary production to be supported and suppliers to be trained, providing financial assistance to local farmers while improving job opportunities along the food chain. Moreover, a focus on local growing and selling allows for a better match with consumers' needs, avoiding surplus production and thus food waste, while increasing the resilience of the city thanks to the greater availability of food in case of extreme weather conditions and unforeseen events. The other main investment of the Municipality of Ljubljana has been on future generations: training has been organised for and nutrition planners have been involved in primary schools and kindergartens to enhance healthy diets and reduce food waste.

2.7. Future directions

The EU has constantly increased its efforts to promote the sustainability of its agriculture. In the last 30 years, GHG from agriculture has decreased by 20% and nitrate levels in rivers by 17.7% since 1990[176]. Thanks to the CAP, land affected by the risk of severe soil erosion (by water) decreased from 6.0% to 5.2% between 2000 and 2012. Nevertheless, no significant progress has been made in terms of biodiversity and soil fertility remains an environmental hotspot. Support to young farmers, e.g., in terms of access to land, is of great importance to ensure the generation turnover and not to jeopardize future competitiveness of agriculture and food security. Bold action is needed to achieve the SDGs and other sustainability targets. Key enablers for the path of EU agriculture towards the SDGs and the Agenda 2030 include education, training, science, technology, research, innovation and digitisation (artificial intelligence can support more efficient farming). Last but not least, in a world of radical uncertainty, it is not easy to anticipate the nature of future crises, such as the current COVID-19 pandemic, it is fundamental to devise an agricultural system that is robust and resilient to such shocks.

IN A WORLD OF RADICAL UNCERTAINTY, IT IS FUNDAMENTAL TO DEVISE AN AGRICULTURAL SYSTEM THAT IS ROBUST AND RESILIENT TO SHOCKS, SUCH AS THE COVID-19

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Vadym Lavra/Alamy IPA

SUPPORTING FUTURE FOOD LEADERS

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It's no secret that the world is going through an unpredictable and uncertain time. The COVID-19 pandemic has created anxiety about our food system, health, and the global economy. But it is also a time to feel very hopeful about the future of food - and the youth led movements who are working to create resilience in agriculture.

Once this crisis is over, there will not be a return to business as usual in agriculture. Young farmers, food workers, scientists, and advocates will not tolerate the normal that created the situation we're in today. They're ready for a food system that is truly revolutionary - that nourishes people who grow, harvest, process, distribute, cook, serve, eat, and dispose of our food. The people who have been deemed "essential" by those in power, now need to be respected, protected, and compensated justly and fairly for their efforts, today and beyond.

Cultivating Community

For the next generation of farmers to not only survive, but thrive, they will need education and mentorship. And during this critical time in the world because of COVID-19, older generations of farmers will need to depend on younger farmers and farm laborers for help with distribution of crops.

The National Young Farmers Coalition, for example, is working with the Glynwood Center for Regional Food and Farming in the Hudson Valley of the United States to bring young and older farmers together via Zoom calls. Each week the farmers gather online to discuss the current COVID-19 crisis, share resources, and check in on one another. Young farmers are also helping protect older farmers - who because of their age are more susceptible to the virus - by transporting and selling food at markets.

And Soul Fire Farm - a farm devoted to education and empowerment - is hosting an online gardening program called "Ask a Sista Farmer". Black women farmers answer questions from the audience about different subjects including medicinal plants and food preservation[1].

Organizing for Change

While Greta Thunberg is likely the most famous young activist on the planet, other young people across the globe are also bringing youth together to fight for a better food system.

In South Africa, PhD student in Johannesburg at Witwatersand University Ndoni Mcunu says that while Africa is not contributing to climate change "we are the most impacted by it. Almost 20 million people have fled the continent due to these changes, she says." And she adds that has led to almost 52 million Africans to become food insecure. She recognizes that many Africans are unaware of the impacts of climate change on the environment and food security and is working to urge government leaders to take action so that "no one is left behind."[2]

In the U.S., the Sunrise Movement - a youth-led climate activist group - is advocating for a Green New Deal that creates legislation to improve energy efficiency and build a better food system. Last year the organization launched, with the organization Regeneration International, The U.S. Farmers & Ranchers for a Green New Deal coalition. The coalition brings together 10,000 farmers who want to ensure that any legislation around climate also includes agriculture[3].

Also, globally we are seeing workers across the food system forming unions and using their collective influence to ensure better safety standards, benefits, and protected wages on the job. For example, Saru Jayaraman of One Fair Wage is calling for better protection of restaurant and food service workers who are not only vulnerable to illness, but also sexual harassment in the work place. These movements are growing across all sectors of the food system - farmworkers, food manufacturing, food service, hospitality, food transport, and more[4].

Creating Innovation

Digital technologies that allow farmers to communicate are more important than ever before because they can bring people together online, not in person. For example, in 2016, young IT expert turned farmer Noah Nasiali had a problem. He was left with 75,000 cabbages he had grown, but nowhere to sell them when his buyer pulled out. But he did what many young people do - he created a Facebook Group. The Africa Farmers Group allows new and beginning farmers as well as those who have more experience to share resources and ask questions. The Group now has 1 million farmer members across Africa and Nasiali has received international recognition for his efforts, including a US$1 million grant from the Facebook Community Leadership Program. He is now training farmers through a Satellite Farmer Program to help them learn basic agriculture skills as well as the business side of agriculture[5].

In the U.S., the Food Recovery Network is helping students develop solutions for food loss and waste on college and university campuses across the country. The organization was founded by students at the University of Maryland, College Park who noticed that perfectly edible and delicious dining hall food was being thrown away. The students came up with a plan to recover that food and donate it to area non-profits fighting hunger. Since then, the organization now has chapters on 230 campuses, have recovered more than 3.9 million pounds of food, donated more than 3.2 million meals, and prevented more than 7.4 million pounds of carbon dioxide emissions. And the organization is doing more than recovering food or feeding the hungry - they're building youth leadership skills[6]. At their recent annual summit, youth shared successes and challenges they face in their communities and how to work with deans, kitchen staff, and non-profit organizations.

Conclusion

Young food and agriculture leaders face challenges that may have seemed unimaginable just a few months or years ago. And while new global problems may slow down their advocacy and activism, it won't slow down their enthusiasm for creating a better world. Our house may be on fire, as Greta Thunberg points out, but there are millions of young people prepared to make sure that farmers can communicate and share resources despite geographic boundaries or quarantines and lock downs, push for policies and laws that fight climate changes.

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COVID-19 AND AGRIFOOD: BACK TO THE FUTURE

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When facing catastrophic events such as the current pandemic, commentators are tempted to predict that "everything will change" when the emergency is gone. However, policymakers are often faced with a much stronger urge to restore life "as it was", as businesses and civil society long for a swift restoration of the *status quo ante*. Our society is path dependent, and evidence from past crises (including the 2008/2009 financial crisis) suggests that the post-lockdown will mostly mark a comeback of our past habits, good and bad. After all, finding the right balance is not easy. Enlightened, future-proof thinking is easier in times of prosperity, rather than during a global emergency. From Albert Camus' *La Peste* to José Saramago's *Cegueira*, great authors of the past have written enlightening pages on the irrationality of mankind when struggling with an epidemic. The COVID-19 outbreak imposes rational choices: political leaders have the double responsibility to follow the precepts of science, and take action to relaunch the economy and society, possibly towards a more sustainable, resilient path.

It is of utmost importance, in this context, to keep reminding decision-makers that there is no state of grace to go back to. The pre-COVID situation was unsustainable from an economic, social and environmental perspective. Among the many sectors that were off track, agrifood was certainly the king. Responsible for a significant part of greenhouse gas emissions and global warming, notably through excess methane and nitrous oxide, the agrifood chain uses too much land and too much freshwater; sprays excessive toxic pesticides and relies too much on monoculture; loses or wastes too much food and fosters unhealthy and unsustainable diets. It leaves 800 million people without sufficient food, and even more people prey of dangerously unhealthy diets. It causes massive risks for global warming, biodiversity, and for economic and social sustainability. In a nutshell, it abuses the planet, stretching it way beyond its sustainable limits. It is no wonder that Commissioner Wojciechowski, during his confirmation hearing before the European Parliament, stated that "industrial farming is a disease": evidence suggests that current industrial modes of production increase the risk of spread of zoonoses and can increase antimicrobial resistance. In a nutshell, agrifood is not only a cause of environmental and social imbalances: it bears a share of responsibility also in the current pandemic.

The European Commission has shown awareness of the need to foster a more sustainable approach to the agrifood chain. As part of the European Green Deal, the Farm to Fork (F2F) Strategy promises to revolutionise farming, distribution, consumption and also tackle food waste. The F2F Strategy was launched in May 2020. At the same time, agrifood will feature prominently in the forthcoming EU Recovery Fund, which will focus on the Green Deal as well as technologies such as 5G and Artificial Intelligence. Part of these funds, including investment in new technologies, will be used to support the agrifood chain; however, it is unclear whether this will be done through unconstrained funding, or through sustainability-oriented conditionalities. Once again, it will be extremely difficult to talk about sustainability at a time in which many farmers and employees at all phases of the supply chain need direct financial support. At the same time, the disruption brought about by COVID-19 gives us a potential opportunity to achieve important progress, such as shifting from animal to plant-based food production, and thus change the composition of our diet; shortening the supply chains, achieving important social and environmental benefits; and deploying digital technology for good, enabling productivity increases in developed and developing countries.

This is not going to be easy. Even if the short term disruption of supply chains, at least in Europe, has been minimal, the FAO observed that "there are countless ways the global food system will be tested and strained in the coming weeks and months", and a crisis is likely "unless measures are taken fast to protect the most vulnerable, keep global food supply chains alive and mitigate the pandemic's impacts across the food system". The social dimension of the crisis is already seen in the emerging shortage of (foreign) seasonal workers, only partly offset by the reallocation to agriculture of workers laid off by restaurants and caterers.

In paving the way for sustainable agrifood after the lockdown, a number of priorities have to be taken into account. First, the globalization of the value chain threatens food security, causes pollution and the spread of diseases, and leads to undesirable long-haul transportation of live animals. Second, even if the age of mass food retailing may be at least temporarily fading, it is important to avoid concentrating online delivery in the hands of a handful of large tech giants: more decentralised food supply would leave more value and resources in the hands of the local communities. Third, the EU should support more resilient and sustainable approaches such as agro-ecology, including organic farming. Fourth, support for the use of precision agriculture and the implementation of digital technology along the supply chain should only come with clear conditionalities, otherwise the concentration of market power, the energy consumption of data centres and the explosion of e-waste would make technology a cure that is worse than the disease. Fifth, the rise of a more decentralised, localised agrifood chain should be complemented with education and community-based incentives to make the most of data generated by the land and soil, so as to empower farmers vis à vis technology providers. And sixth, all EU policies, from the mission on Soil Health and Food to the upcoming data space on agriculture announced in February 2019, should converge towards re-orienting the agrifood chain towards the sustainable development goals.

In doing all this, policymakers should remind citizens that going back in not an option, and that bouncing forward is not necessarily going to be more costly, or more painful. As we get ready to change our habits after weeks of lockdown, we have a chance to make our new behaviour different, and more respectful of the environment, than the one that led us here.

THE ROLE OF INNOVATIVE FINANCE IN PROMOTING SUSTAINABLE AGRICULTURE

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Today, we face an unprecedented crisis in the wake of the COVID-19 pandemic. The immediate priority must be to protect public health as governments and healthcare workers get the pandemic under control and address the economic toll this crisis is taking. But as the COVID-19 pandemic drives the world into one of the worst economic recessions of history, a fast and unmatched rise in food insecurity is also expected globally[1]. Alongside the pandemic disrupting food value chains, extreme climate events could lead to a broader threat to nutritional security worldwide. This will hit the poorest and most vulnerable farmers most.

Restarting the economy in a green mode would tackle the two most pressuring issues of our time - the corona virus pandemic and climate change - simultaneously. But, in the haste for countries to find ways to restart their post-pandemic economies, there is a risk that climate measures, which were already severely underfunded, get disregarded. And while Climate Policy Initiative's Global Landscape of Climate Finance shows that all sustainable activities are severely underfunded and need to scale, the scenario is most dire for sustainable land use: only 8% of public climate finance being channelled to the sector[2], exacerbating the growing crisis of food security in many nations.

Thus, more than ever, there is an urgent need to accelerate financial solutions that can drive resources for sustainable agricultural supply chains and its various stages, from production to distribution. Several of these have been developed under the Global Innovation Lab for Climate Finance (the Lab) and provide useful models for channelling sustainable agriculture investments at scale.

The Lab is an investor-led initiative that identifies, develops, and launches financial solutions to drive public and private investment to action on climate change in developing countries. In collaboration with the International Fund for Agricultural Development, the Lab's sustainable agriculture stream supports ideas to mobilize investment that overcomes existing barriers to climate-resilient, low emission agriculture[3].

The Lab instruments address cross-cutting risks with the potential to affect all segments of the agricultural supply chain, related to environmental protection and sustainable use of natural resources. They integrate the United Nations' Sustainable Development Goals and are aligned with the Principles for Responsible Investment in Agriculture and Food Systems[4]. With that in mind, the financial solutions endorsed by the Lab constitute ready-to-use blueprints that can be adapted to mobilize financial resources, both public and private, towards major strategies such as The European Green Deal, specifically the upcoming 'Farm to Fork' Strategy and the Sustainable Europe Investment Plan.

For instance, one of the Lab endorsed instruments is the Responsible Commodities Facility, which addresses the growing global demand for soy that is currently coupled with agricultural expansion and deforestation in Brazil. It provides attractive loan conditions to incentivize soy producers to use land that has already been cleared from native vegetation[5].

The instrument's innovative design also includes a dedicated selling platform linked to a blockchain registry to sell the commodities to international markets, and a range of traceability systems to monitor production and compliance with eligibility criteria.

Another example is the Climate-Smart Lending Platform, which helps agricultural lenders incorporate climate change in their loan portfolios, thus increasing their agricultural lending portfolio climate resilience. Beneficiaries of these loans can be aggregated into groups of smallholders, such as cooperatives and farmer producer groups[6].

The tool also helps produce buyers include sustainable or climate-smart agricultural requirements in their smallholder produce purchase agreements and monitor farmers' compliance. As a result, the platform improves food security levels through financing and incentives that promote a more resilient flow of products, less affected by climate change stresses such as droughts, floods or variations in rain patterns. Last but not least, the Lab class of 2020 includes two additional sustainable agriculture instruments currently under development. One of them is the Land Accelerator Bond, which uses credit to stimulate climate smart agriculture uptake by working with three different segments of the supply chain: small and medium enterprises providing agricultural inputs, farmer organizations and wholesalers of agricultural produce[7].

In addition, the initiators of the bond and the Lab analysts are exploring whether this instrument could channel investments from multinational food companies that are interested or are already investing in making their supply chains more sustainable and resilient to climate change. Such a scheme could decrease their transaction costs and logistical efforts.

Lab instruments represent a wide range of investment-ready financial innovations that would help scale climate action for sustainable agriculture, thus enhancing food security in the world. In the face of two major global crises - the immediate COVID-19 pandemic and climate change, which will be bigger in every way and stay with us over a much longer period of time - these and other innovative solutions are actionable opportunities for public and private actors to immediately scale up green investments in more resilient and sustainable food chains, avoiding the most severe scenarios related to food demand and supply in the years to come, and accelerating a transition towards a better world - strong, inclusive, sustainable and resilient.

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BUSINESS INNOVATION TO TACKLE POST-COVID EU CHALLENGES

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The EU agri-food system was in difficulty even before the COVID crisis. Excessive use of natural resources, air pollution, loss of biodiversity and soil degradation were among the consequences of unsustainable farming practices, worsened by climate change. While a significant amount of food was being wasted, an increasing number of people, even in Europe, were suffering from a lack of nutritious food. Low quality diets contributed to obesity and food related diseases.

The European Green Deal[1] recognises the role of agri-food systems 'in tackling climate change, protecting the environment and preserving biodiversity', following the so-called "from farm to fork" approach, which clearly refers to an integrated and lifecycle-oriented rationale.

Due to COVID-19, the problems of European agri-food systems are increasing. In short, food security is becoming a hot issue in Europe too, and the link between the health of the environment, food and people is definitively confirmed.

In this context, agri-food systems can make a positive contribution to European recovery and to a more sustainable Europe, provided that high levels of technological, organisational and social innovation are introduced. Business as usual would only worsen the situation.

The call for more innovation has been around for a long time.

What is new, is that COVID shows, if the current way of eating, producing and transforming food doesn't change, the consequences will hit us much sooner than expected.

Businesses have a key role to innovate EU agri-food systems. Digital solutions and scientific advancements offer them great opportunities. Precision agriculture, big data, artificial intelligence, blockchains, drones, sensors, DSSs, e-commerce, digital solutions, genomics, nanotechnologies offer opportunities to experiment with more sustainable, healthier and more convenient ways of producing, transforming and distributing food.

The key issue is how to convince businesses in a conservative field such as agri-food systems to adopt innovative solutions.

A first condition is to clearly show that such changes are a real priority of the EU (and national policy makers).

This means, first of all, defining a clear *food strategy* that is able to integrate agriculture and food industry policies, setting strategic goals for the European agri-food system, in line with the Agenda 2030 and new post-COVID needs. Given the lessons just learnt, such long-term goals need to include the promotion of the widest possible use of digital technologies. In order to reverse the current and unsustainable trend towards high trophic food patterns, the research into new sustainable sources of proteins should also be included among the EU's priorities.

A unique opportunity to discuss strategic the long-term goals for EU agri-food systems is given by the definition of the Common Agriculture Policy. Otherwise, CAP will be seen just as a mechanism to share available resources among countries.

EU and national policies should promote sustainable and healthier diets, particularly through major educational

programmes. The Mediterranean diet, in particular, should be recommended for its positive impact on health and the environment.

Furthermore, legislators should link more sustainable and healthy food systems with the health of the soil, in a circular economy perspective, going from the production of food and organic waste to the production of quality compost to improve soils and carbon conservation.

Such policies would not be enough without rigorous research activities. Following the excellent results achieved by Horizon 2020, strong support will come from Horizon Europe (HE), the next EU Research and Innovation Investment Programme (2021-2027), with its budget of 100 billion euros and its clear focus on benefiting from world-class research and transforming this into leadership in innovation and entrepreneurship. In line with this goal, within Pillar 2 of HE, 'Global Challenges and European Industrial Competitiveness', Cluster #6 is focused on Food, Bio-economy, Natural Resources, Agriculture and Environment, while in Pillar 3, Innovative Europe, strong attention is given to food systems and to measures to bring research and innovation within companies. Furthermore, one of the 5 missions that define Horizon Europe is dedicated to Soil Health and Food.

In order to benefit from innovation, it is crucial to improve the alignment within and among European, national and local research and innovation initiatives.
However, sound policies and financial incentives are not enough to induce EU agri-food businesses to adopt innovation.

For small businesses, a major obstacle is the horizontal and vertical fragmentation of food value chains and the small size of companies. This often prevents them from accessing the innovation ecosystem and building adequate capacity (with the exception of start-ups and spinoffs). European and national policies should facilitate such access, introducing new channels of knowledge exchange between businesses and Universities and research centres. This requires the creation of new supporting structures and professional figures to mediate between the needs of companies and the results of research activities. Research institutions should give a strategic value to such relationships, mobilising an adequate amount of financial and human resources.

Organisational innovation plays a key role in tackling the challenge of company size and fragmentation. Given the difficulties for companies in the sector to merge, strategic partnerships with other companies and research centres would be useful. In many areas, cooperatives and consortia among businesses can be a valuable response to the need for innovation.

To implement change, the mind-set of the entrepreneur matters a lot. Changing the value system of farmers and small entrepreneurs is not an easy task. Training programmes and extension services are useful. Sometimes innovation is fostered by generational change, which introduces new ideas and openness. Promoting success stories within business communities is also a powerful tool in clarifying that innovation is doable and convenient even for small companies. Supply chain leaders can play a valuable part in promoting sustainable innovation among their suppliers, acting as a role model or promoting contractual and digital solutions for a better management of their relationships.

A key role can also be played by financial institutions, if they are able to link their funding to the capacity of businesses to implement innovative programmes. Regulators and tax authorities can promote innovative solutions through ad hoc policies.

In short, to convince businesses to implement innovation a systemic approach is needed, involving policy makers, regulators, research centres, funding agencies. Such actors should define aligned innovation priorities, based upon extensive stakeholder engagement. Partnerships should be built among diverse actors in terms of values and competences.

The task is difficult. However, through smart innovation, businesses can make a valuable contribution to making 'European food famous for being safe, nutritious and of high quality', the 'global standard' not only for sustainability, as stated by the European Green Deal, but also in the fight against global health issues.

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WILL THE TERRITORIAL APPROACH OF THE AU-EU AGENDA FOR RURAL TRANSFORMATION WORK FOR RURAL ETHIOPIA?

Million Belay

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In 2010, MELCA Ethiopia[1], an indigenous NGO working on rural development, started working with a rural community called Telecho. It is about 12 km from another small town called Holeta and about 40 km from the capital, Addis Ababa. Despite its short distance from the capital city, there was no electricity, road or any of the infrastructural amenities that urban areas enjoy. Telecho has one centre with a few bars, a weekly market and a church, but not much to show off in terms of a rural town. The local people are mainly farmers growing barley and wheat, as it is a highland and the soil suffers from land and forest degradation.

How can the social, economic and ecological life of this community be improved/developed? One approach espoused by the African Union (AU) and the European Union (EU) is a *territorial rural development* approach.

In March 2019, a task force assigned to advise on AU - EU cooperation in rural development produced a report titled 'An Africa-Europe Agenda for Rural Transformation.' The report aimed to provide guidance for the implementation of the agricultural side of the Africa-Europe Alliance for Sustainable Investment and Jobs, which guides the direction of cooperation between the two continents. The Alliance was announced in late 2018 and its content stems from the commitments made at the 5th African Union-European Summit held in late 2017.

The report proposes four key strategic areas for action over the long term. These four main strategic areas that shape the EU-African agriculture and rural transformation programme are: a territorial approach for income and job creation; sustainable land and natural resource management and climate action; sustainable transformation of African agriculture; and development of the African food industry and markets.

The territorial approach to rural development originates from the European concept of Territorial Approach to Local Development (TALD) articulated by Leonardo Romeo[2]. He defines TALD as a national policy that promotes endogenous, integrated, multi-scalar and incremental local development. This is designed to give local authorities the autonomy and resources to design their development in collaboration with local actors, including businesses and Civil Society Organisations (CSOs), and to integrate with regional and national agendas. They can also raise their own resources. There is scant literature on the success or failure of this approach of decentralizing power with resources to local actors, the previous approach being decentralizing without resources.

According to the report 'An Africa-Europe Agenda for Rural Transformation', the reasons for suggesting the Territorial Approach for Africa are i) the history of spatial developments in Africa ii) the changing relationship between urban and rural areas, and iii) the development options available to Africa within the framework of current globalization patterns.

The main purpose of the approach for Africa is income and job creation, looking beyond the agricultural sector to unlock the potential of rural areas and secondary cities, to strengthen the capacity of local people, and to empower local/regional/national institutions[3].

Although there is general agreement with this strategy, as compared to the other three approaches within this report, some cautionary notes are in order.

Africa is a diverse continent, not a single entity, and this diversity exists even within a nation. It is very important, therefore, not to follow a blanket approach. While improving the infrastructure of rural towns and connecting them with bigger urban areas is a fresh approach to the usual focus on big cities, we must be careful not to conflate every socio-cultural value with market value and destroy the diversity of socio-cultural responses to

life. The bulk of food consumed transits through territorially embedded markets, which need infrastructural development in a gender, resource poor and culturally sensitive way. This is because African markets are trading places for goods and services as well as social and cultural spaces.

The approach emphasises government funding but also espouses the Public Private Partnership (PPP), which raises the question of power imbalances between rural rights holders and corporate and government duty bearers. To be successful, then, it needs to follow a rights-based approach, as espoused by FAO, where the rights holders are the driving force in development and the duty bearers have responsibility for ensuring the participation of people in any development activity.

There is also an emphasis in the report on using digital technology for development. Although there might be certain technological advances that could be useful, there is a concern that, since African governments have no regulation to manage data ownership and usage, information under the control of corporations and western governments is highly insecure, as well as being a tool for corporate control in agriculture. Digitalisation of African agriculture should only happen after open discussion with citizens of their pros and cons and after a mechanism is put in place for vetting the technologies and systems are put in place for data regulation and management.

In conclusion, this AU-EU proposal for a territorial approach as well as the European Green Deal could be good news for the farmers of Telecho but it can only work if the approach to agriculture is agroecological and if the farmers do in fact participate actively in the design of the approach. The 'value chain' approach also needs to be nuanced. The recent recommendation from CSOs states that 'The notion of 'value chains' needs to be defined in the context of multifunctional small-scale family farming systems, acknowledging that the 'value added' is not only economic and cannot be produced by a simple linear input-output economic model[4].'

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THE VALUE OF THE FSI AT A COUNTRY LEVEL

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Challenging leadership claims

Being a world leader on food and farming requires taking food sustainability seriously. At a time of so much 'fake news' and unsubstantiated claims, the Food Sustainability Index ('FSI') is proving to be a valuable tool.

Part of our mission at the Food Ethics Council is to redefine what is meant by 'success' in our food systems and to track progress. Back in 2016, we scoped out the idea of an 'in the round' food index comparing how countries were doing on a range of tackling health, environmental, social justice and animal welfare concerns. But when we heard about the development of the FSI later that year, we breathed a sigh of relief and changed our approach. Our strength lies in bringing stakeholders together to unlock contentious ethical issues in food and farming, and to push for inclusive, fair and sustainable food policies. As such, the Economist Intelligence Unit ('EIU') together with BCFN were much better positioned to do a data analysis exercise of this sort.

The development of the FSI meant we could instead focus on three areas. Firstly, we are using the tool to shine a spotlight on UK performance and what it needs to do to improve. Secondly, we are using that to stimulate important debate on what the UK can learn from other countries, not least on food and farming policy. And thirdly, being independent of the FSI, we are able to constructively challenge FSI metrics. We want the metrics used to be further strengthened, to ensure the FSI is sufficiently robust and considers an appropriate range of environmental, health, social justice and animal welfare measures.

Shining a spotlight on national performance

For every year that the FSI has been published, we have produced an analysis of how the UK has done on food sustainability. Overall the UK's performance is disappointing (16th out of 28 EU countries in 2018), particularly given the resources that the UK government has at its disposal. However, our analysis does not end with the disempowering message that the country is not doing as well as it should. We have used this to call for new approaches, new policies and a long-term, integrated approach to policymaking - some of which are now being adopted (e.g., the UK government's commitment to a net zero carbon target). Our 'Measuring UK food sustainability' programme of work includes 'Snapshot', our most recent mini analysis of how the UK is doing in the FSI, and is freely available here: https://www.foodethicscouncil.org/programme/measuring-uk-food-sustainability/.

We were also invited to speak to key Labour party officials to share our 'Snapshot' analysis (using the FSI) and to talk about the implications for food and farming policy. Having a basket of qualitative and quantitative measures that look at food sustainability in the round enabled us to give a subjective and grounded assessment, rather than merely guessing at how the UK is really doing. The FSI tool allowed us to critique UK performance, opened doors in terms of access to Parliamentarians and encouraged a much-needed, outward-looking, internationalist approach.

A tool to stimulate multi-stakeholder debate and learn from other countries

One of the most effective ways we have used the FSI has been with food and farming businesses, and invited policymakers, via our Business Forum - a community of leaders asking the big questions in food and farming.

These are regular dinner meetings held under the Chatham House rule, where we explore contentious ethical issues in depth with expert speakers and business executives.

We have used the FSI in country-specific events to learn from what leading countries in the index are doing, and what UK food & farming business and government can learn from them. Hence, we held a session seeing what we can learn from France in 2018, another exploring 'lessons from Denmark on food sustainability' in 2019 and another looking at the Netherlands in 2020. The FSI proved an excellent springboard into a discussion about what UK food and farming businesses - and UK government - should do to learn from food sustainability leaders. Crucially this has also been feeding into the development of the UK's national food strategy. Write-ups of these country case study Business Forums are available on our website here: https://www.foodethicscouncil.org/learn/.

Constructive challenge

We believe that the FSI is the best index currently available of its kind, which is why we have been promoting its use in a UK context. However, like any index, the FSI faces legitimate challenges about the timeliness and accuracy of data sources, the weighting of different indicators and the issues covered by existing metrics. We have attended meetings and roundtables with BCFN, EIU and others to suggest new metrics and data sources. This open approach and desire for continual improvement is something we welcome. The FSI has expanded its global scope since the first edition and, with input from organisations like ours, it has also introduced some new metrics.

There are two areas in particular where we think the FSI would still benefit from new measures. The first of these is the set of (social and environmental) impacts beyond agriculture. Failing to include for example climate change emissions that result from food processing, distribution and retail misses out an important piece of the overall jigsaw.

The second area that urgently needs strengthening is that of farm animal welfare. At present there is only one such indicator included in the FSI, which does not have sufficient weighting and which relates only to quality of animal welfare legislation, rather than how animals are looked after in practice. We have developed ideas for a number of farm animal welfare metrics that would help put animal welfare on more of a level footing with other social and environmental concerns. We have put those to BCFN and EIU for consideration of inclusion in future versions - see here: https://www.foodethicscouncil.org/stronger-focus-needed-on-animal-welfare-metrics/.

What next?

The UK has now left the EU and its relationship with the EU is currently fragile. There has arguably never been a more important time for the UK government to be humble and to be open to learning from how other countries do things.

We encourage the EIU and BCFN to continue to publish the FSI on a regular basis and to continue to further strengthen the index each year. In particular we urge the inclusion of more farm animal welfare metrics.

Finally, we encourage NGOs and policymakers in other countries to use the FSI tool to drive a race to 'goodness' on food sustainability - not a selfish 'race to the top' at all costs, but a desire to be in the leading pack and to help raise the bar across the board. Let's all join the food sustainability journey.

About the Food Ethics Council

The Food Ethics Council is an independent UK think tank whose purpose is to bring ethics to the centre of the food system. Our mission is to accelerate the shift towards fair food systems that respect people, animals and the planet. To get involved in our work, visit our website https://www.foodethicscouncil.org/ or follow us on Twitter via @foodethicsnews.

SU-EATABLE LIFE: CLIMATE CHANGE MITIGATION THROUGH SUSTAINABLE AND HEALTHY DIETS

Riccardo Valentini

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Anthropic activities are dramatically changing the planet, modifying the climate and impacting natural ecosystems. The recent IPCC report underlines the connection between the global agricultural system and greenhouse gas (GHG) emissions, and the significant contribution of the agricultural sector to global warming. Emissions from the global food system as a whole, including transport, packaging, processing, distribution and consumption, amount to 21–37% of total net anthropogenic GHG emissions. In addition, producing food requires land and natural resources, such as water and nutrients.

In return, climate change puts global food security at risk due to increased temperatures, changes in precipitation and the increased frequency and intensity of extreme weather events. The effects are already visible and include decreased production yields, poorer nutritional quality of food, increased commodity prices, and food chain interruptions. In southern Mediterranean countries, a decline in corn, wheat, soy and rice yields is expected by 2050 unless adaptation actions[1] are undertaken. A rethink of the food system therefore appears to be an imperative.

The European Green Deal is a response to these challenges. By 2050, it aims to transform the EU into a fair and prosperous society, with no net GHG emissions and with a modern, resource-efficient and competitive economy where economic growth is decoupled from resource use.

The food system thus becomes a lever for climate change mitigation and must be at the centre of ambitious commitments. This call to action is the ground-breaking declaration of the IPCC special report, confirmed by numerous studies highlighting the importance of transitioning to diets that include mainly plant-based foods, in order to remain within the "limits of the planet"[2] through consumer campaigns[3], product labelling[4], nutritional guidelines[5], and taxes[6]. Specific nutritional transition pathways need to be tailored for different countries, in order to mitigate climate change, the global water crisis and improve human health[7].

The catering industry, in particular, is a tremendous opportunity to deliver healthy and sustainable food to its customers. Food consumption is worth 1.617 billion Euros in Europe, with 36.7% spent in catering, which represents 47% of food consumption in the United Kingdom, 52% in Spain and as much as 57% in Ireland. In Italy the share stands at 35%, six percentage points above France. The United Kingdom, Spain and Italy are the largest catering markets[8].

With European Commission funding, the Su-Eatable Life project[9] (LIFE16 GIC/IT/000038) aims to engage EU citizens in adopting a sustainable and healthy diet through a series of experiments performed in university and company canteens and by implementing an easy-to-use information system to achieve a substantial reduction in GHG emissions and water footprints in the 2019-2021 timeframe. The experiments, conducted in canteens across Italy and the UK, have a threefold objective: to increase the awareness of canteen users of the benefits of a healthy and sustainable diet; to evaluate the effectiveness of various actions taken to encourage healthy and sustainable choices, and the results in terms of carbon footprint and the water footprint reductions; and to make recommendations about improving the food offer in canteens.

Making the environment a priority starts at individual level[10], and the choices that people make every day are a fundamental step in enhancing sustainability at EU and global level. The Su-Eatable Life project wants to prove this by adopting the suggested best practices because sustainable diets are good for our environment, our health, and for the future competitiveness of the EU.

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ETHICAL PREREQUISITES TO ACCELERATE IMPROVEMENTS IN FOOD AND NUTRITION FOR THE POOR

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1. One of the most characteristic marks of our time is the constant call for ethics, which has progressively replaced, in the last couple of decades, the persistent call for politics typical of the 1970s and 1980s, when the slogan was "everything is politics". However, this consensus about the primacy of ethics ceases when it comes to practical issues. As Alasdair McIntyre observed in this famous book *After virtue*, the apodictic use of moral principles serves only to put an end to the ethical dialogue itself. In other words, the broad convergence on ethics in public debate almost never translates into ethical consensus. Yet, the phenomena of globalization, the digital revolution and now the COVID-19 pandemic, make a new update of ethical principles urgent and necessary.

   Today, this is particularly the case in the area of global food systems. The Global Hunger Index (GHI) indicates a decline in the global score since the year 2000, coinciding with a decline in poverty at the global level (from 28.6 percent in 1999 to 9.9 percent in 2015). However, the prevalence of undernourishment reverted in 2015, remaining virtually unchanged in the past three years at a level slightly below 11 percent. More than 820 million people in the world were still hungry in 2018, underscoring the immense challenge of achieving the Zero Hunger target by 2030. Furthermore, it is estimated that two billion people suffer from "hidden hunger", a deficiency in micronutrients (Vitamin A, iron, zinc, etc.). These problems are most prevalent in low- and middle-income countries, but also exist, partly unnoticed, in advanced countries. With the global population expected to increase to 9.9 billion before 2050 and the expectation that agriculture will produce 70% more food, while protecting the environment against the additional limitations arising from climate change, this is a timely and pressing topic.

   The future of the Earth's climate, hence of human beings, is becoming today a central issue not only in science and in politics but also in ethics. Mitigating global warming, adapting to its worse consequences, designing new ways of living, producing food and energy, are the subject of considerable research, policies and actions, even at the grassroot level. Entering the Anthropocene, to use the term coined by Paul Crutzen, is a great mutation in the course of history. In this regard, the 1946 call by Albert Einstein, initially on the risk of a nuclear war, may well apply today: "A new type of thinking is essential if mankind is to survive and move to higher levels" (*New York Times*, May 25, 1946, p.13).

2. Where do we begin if we want to cope with the present-day disquieting problems of sustainable development? I have no hesitation in suggesting how we should move forwards to new forms of solidarity. The principle of solidarity is an ancient one, so what do we mean by new forms? It is a fact that we are facing in this time a silent counterrevolution, one of social de-solidarity that manifests itself in the growing expansion of many areas of exclusion that tend to drive the "existential outskirts", as Pope Francis calls them. What do we find at the roots of such a tendency? One specific cause is the endemic and systemic increase in structural inequalities, which are advancing faster than the increase in income and wealth. Yet, inequality is neither fate nor a historical constant. It is not fate because it has to do with the institutional structure, that is, with the rules of the economic game that society decides to give itself.

   We only have to think of institutions like the labour market, the banking system, the welfare system, the tax system, the educational sector. Depending on how they are designed, different consequences affect how income and wealth are distributed among those who have contributed to produce them. Nor are rising inequalities a historical constant, because there have been times when in some countries they diminished. The question then arises: if inequalities do not increase because resources are scarce, or because we do not know how to act, or because they are due to particular hardships affecting certain categories of persons or certain territories, what are they the ultimate result of? My answer is that this is due to the widespread belief in two dogmas of social injustice. The first is that society as a whole would benefit if

individuals acted for their own personal gain as the *homo oeconomicus* metaphor dictates. That is doubly false, as the scientific literature has demonstrated for a long time. I will just point out that the poor are not so by nature, but because of the way economic institutions are designed. Condorcet had already realised this in 1794 when he wrote, in his *Esquisse*: "It is easy to show that fortunes tend *naturally* to equality and that excessive disparity either cannot exist or must quickly cease unless civil laws impose *artificial means* to perpetuate them" ('Civil laws' are nothing but what we call today the rules of the game).

The other dogma of injustice is the belief that elitism has to be encouraged because it produces efficiency, in the sense that the welfare of the majority increases all the most if the abilities of the few are promoted. Therefore, resources, incentives, attention should be reserved to the most gifted, because it is their commitment that advances the progress of society. The exclusion of the less talented from economic activity, for example in the form of job insecurity and unemployment, is something to be accepted to foster growth. Also, this dogma, lacks any scientific foundation. Indeed, it has been disconfirmed both theoretically and empirically. Yet, there are many 'rational fools' (in Amartya Sen's sense) who continue to believe it.

3. Talking of a new solidarity is tantamount to talking of the need to adding to the ancient notion of responsibility as imputability the notion of responsibility as taking care, as defined by Hans Jonas. Bearing responsibility is one of the elements that marks us as human (animals do not bear responsibility!). In as much as we bear responsibility, we also take on obligation. This implies that we are responsible not only and not simply for the evil that we generate - this is the accountability version of the principle of responsibility - but also and above all, for the good that we do not do, which we could have done given the circumstances. As one can imagine, such a distinction becomes particularly relevant when we consider the issue of intergenerational justice, i.e., of sustainability.

   This word is used, today, in a downright inflationary manner. Compared to its original meaning in forestry - the obligation to plant saplings to replace felled trees - this concept has extended a lot (Von Carlewitz coined the term in 1793 when he was director of the Prussian government's forestry department!). Sustainability is demanded everywhere: in entrepreneurship, financial policy, energy, health, agriculture. The term has become to a large extent metaphorical, meaning durability and resilience. Thinking two or three generations ahead means to apply the strong version of the responsibility principle: taking care of future generations. Indeed, the fact is that fundamental human rights do not expire. Hence certain obligations are unlimited. It follows that not considering the basic human rights of future generations would violate the principle of ethical universalism - a principle endorsed by all ethical systems, irrespective of differences in other respects.

   I do not wish to hide the difficulties lurking in the practical implementation of a cultural project targeted at no less than a "paradigm shift" in our way of thinking about food regimes, value chains, agri-food systems. As in all human endeavours, it would be naive to imagine that certain changes do not create conflict. The differences of vision and the interests at stake are enormous. It is no accident that a kind of widespread anguish about the future is running throughout society today. It is precisely against such a fear that all those who believe in basic human rights and liberal democracy have to battle today, accepting as a guiding principle what Boyer (1996) has called the "scholarships of engagement": moral commitment and cognitive interest should remain intertwined and reciprocally combined.

4. We bear responsibility for the ideas upon which institutions, both political and economic, are based. And we bear responsibility for what bears us: nature. It is a well-recognised fact that market systems are consistent with many cultures, conceived as tractable patterns of behaviour or, more generally, as organised systems of values. In turn, the type and degree of congruence of market systems with cultures is not without effects on the overall efficiency of the systems themselves: in general, the final outcome of market coordination will vary from culture to culture. Thus, one should expect that a culture of possessive individualism will produce different results from a culture of reciprocity, where individuals, although motivated also by self-interest, entertain a sense of solidarity. In the same way, a culture of cooperative competition will certainly produce different results from a culture of positional competition. But cultures are not to be taken for granted. Cultures respond to the investment of resources in cultural patterns, and in many circumstances it may be socially beneficial to engage in cultural engineering. Indeed, how good the performance of an economic system is, depends also on whether certain conceptions and ways of life have achieved dominance. Contrary to what might be believed, economic phenomena have a primary interpersonal dimension. Individual behaviours are embedded in a pre-existing network of social relations which cannot be seen as a mere constraint but rather as one of the driving factors that prompt indivi-

dual goals and motivations. People's aspirations are deeply conditioned by the conventional wisdom about what makes life worth living. The truth of the matter is that it is thanks to culture that mankind does not need to be transformed into a different species in order to adapt to the environment, which human beings themselves have helped to modify.

To conclude, people with no hope for the future have only the present and those who have only the present have no compelling reason to be interested in sustainability and innovative endeavour. But fortunately, people who continue to entertain a hope in the future have not disappeared altogether: Barilla Foundation's people are an example.

Frischknetcht, P./Juniors@Wildlife/Alamy IPA

Digitising agri-food

The nine objectives selected by the EU Commission for the CAP reform made extensive reference to the significant role that digital technologies can play in the future of EU agriculture. The spread of digital technologies in the agri-food chain was deemed to potentially contribute to the achievement of the SDGs by increasing yields, reducing waste and supporting changes in consumption patterns. Artificial Intelligence in combination with the Internet of Things, blockchain, satellite imagery together with data analysis, remote sensing and the use of drones and robots are just some of the tools in the digital technology arsenal that, if combined with inclusive and holistic approaches, can improve the management of the agri-food chain[1]. Moreover, digital technologies can have a substantial impact on the way individual consumers manage and approach their consumption behaviour and decisions. As was highlighted in one report from the Refresh Working Group - consisting of around 40 food chain stakeholders brought together by Google and committed to identifying sustainable and equitable ways of leveraging data-driven technologies to improve the US food system - data-driven technologies can be used to improve nutrition and health outcomes at individual and global level. For individuals, there are lots of mobile health apps related to fitness, diet or medical health, while other digital tools are helping to drive innovations in food distribution and food delivery that offer the potential to address food insecurity by bringing lower-priced fresher food to more people[2].

However, digital technologies require resources that are largely missing in many parts of the world and also bring new challenges: they consume energy to work, they lead to electronic waste and may trigger market concentration and job automation. Moreover, policy makers need to focus on small-scale farmers that are more exposed to the risk of being excluded from the benefits of the digitising process. Therefore, small-scale farmers are the ones that deserve more support in order to lead the agri-food chain towards a more sustainable path, with interventions bridging the digital divide and empowering producers.

The EU is in a privileged position to lead the great transformation in the agri-food sector that is needed to achieve the objectives set by the 2030 Agenda. To do this by also untapping the potential of digital technology, a coherent policy framework and a holistic policy mix need to be developed. In particular, it has been suggested that the EU should ensure adequate connectivity with agriculture, deploy the full technological arsenal available, build supportive policies and programmes for developing digital strategies and improving the processes of generating and sharing data through a community-led data management strategy. Once connectivity, data and technology have been deployed, the government level should intervene to rebalance the bargaining power of small-scale farmers, distributors and data manager, by at the same time

providing incentives to shorten the supply chain and attributing responsibility for negative externalities introduced by digital technologies (i.e., energy consumption costs). Finally, the EU should promote and integrate public policies to reallocate FLW while developing an ethical and policy framework for artificial intelligence and data management[3].

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3. Food Loss and Waste

Highlights

Over 20% of the food produced in the EU is wasted, accounting **for 88 million tons per year**, with an economic cost of **143 billion euros**. This accounts for **6% of total EU GHG emissions**.

EU citizens generate on average around 58 kg of food waste (FLW) per capita every year.

The EU has published **guidelines for food donations**, for its use as **animal feeding**, as well as a **common methodology** for assessing and measuring FLW.

Several actors ranging from private companies, local authorities, research institutions and app developers have started to tackle the phenomenon using a circular economy approach.

Although the EU is committed in reducing the phenomenon, much has to be done in order to have a **more established target reduction across the States**.

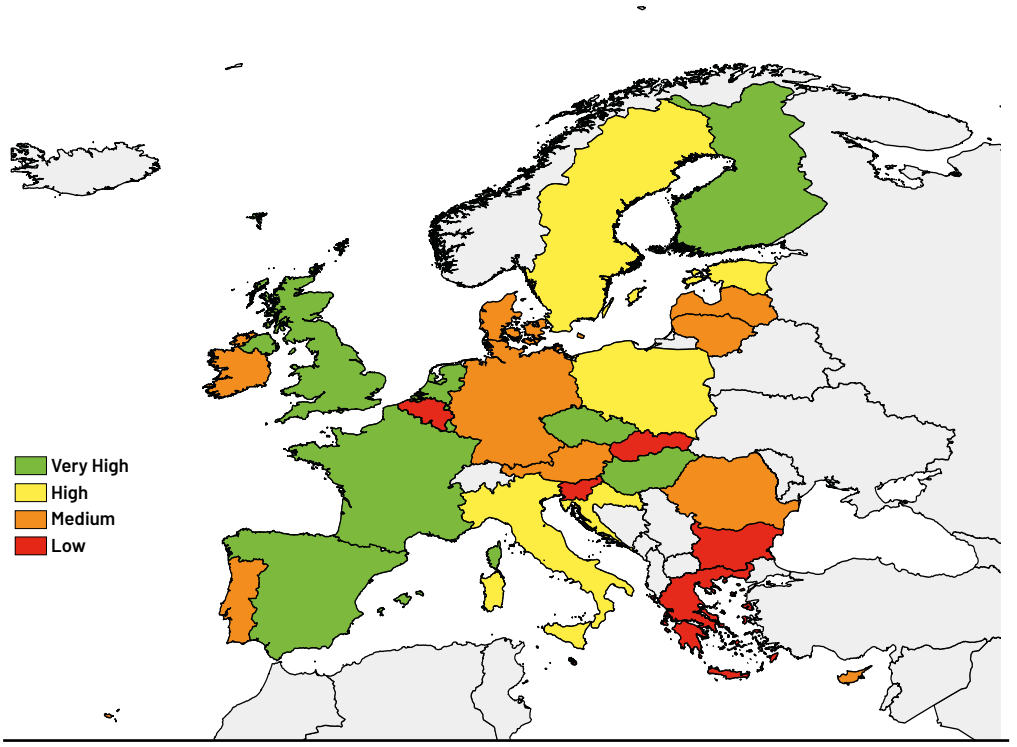

Figure 3.1. EU performance in the FSI Food Loss and Waste pillar

3.1. Introduction and background

At global level, **one third of food produced is lost or wasted all along the food supply chain**[179], causing serious economic, environmental and social costs. In 2014, the Food and Agriculture Organization (FAO) estimated that the total cost of global FLW was around **2.6 trillion dollars, including 1 trillion dollars of economic costs, 700 billion dollars of environmental costs and 900 billion dollars of social costs**[180]. Food loss represents the waste that occurs during the initial stages of the food supply chain, from agriculture to industrial processing, whereas food waste is the food wasted during the final retail and consumption stages[181]. The former depends on a series of factors ranging from cultivation techniques, quality of infrastructure, storage facilities and access to market. The latter is more related to consumer behaviour, retail sector and catering. In this sense, FAO estimates that fruits and vegetables account for the largest percentage of food loss stemming from inefficiencies in food supply chains[182].

In order to determine the **root causes behind FLW**, a broader sustainable development perspective needs to be applied, in **synergy with other SDGs**[183], including those dealing with responsible production and consumption (SDG12), sustainable agriculture (SDG2), climate action (SDG13) and life on land (SDG15). **A true circular economy for food** can unlock an enormous potential linked to its reuse and recycling, bringing both economic and environmental benefits for all actors involved in the food supply chain[184]. Yet so far, it has been **difficult to calculate the economic, social and environmental costs of FLW**. Among other issues, globally **FLW is responsible for about 8% of total anthropogenic GHG emissions**[185] almost reaching the quantity of global road transport emissions[186]. A recent report by the Intergovernmental Panel on Climate Change[187] highlighted that FLW represents 8-10% of global emission (around 3.3 tons per year) and that reducing FLW has a mitigation potential between 0.8-4.5GT CO_{2e} per year). In addition, FLW produces a strong stress on land resources, accounting for around **30% of the world's agricultural land. Finally, FLW has a tremendous water footprint (250 km³)**[188] and it threatens biodiversity[189]. Nonetheless, more research is needed in the future to fill these gaps and to determine the root causes of FLW throughout all the stages of the food supply chain.

A TRUE CIRCULAR ECONOMY BRINGS ECONOMIC AND ENVIRONMENTAL BENEFITS FOR ALL ACTORS OF THE FOOD SUPPLY CHAIN

At global level, there are several examples of countries that have set up important strategies to meet the target 12.3 of the UN Agenda 2030[190]. Among them, the **United States** has launched an ambitious plan to **halve FLW all along the entire food supply chain by 2030**, using 2010 as a baseline[191]. In the last years, other countries have followed this path. The 2017 **Australian *National Food Waste Strategy***[192] has created a framework to achieve this goal through a voluntary commitment programme that will engage businesses and a monitoring and evaluation framework to be developed to track progress towards the goal. In addition, in 2018, **Japan** announced its plans to **reduce household food waste by 50% by 2030**, using 2000 as baseline[193]. Finally, in 2018 the **African Union** Commission launched the "Continental Post Harvest Management Strategy", with the aim of **halving food loss by 2025**, as stated in the Malabo Declaration[194]. **EU countries have gradually turned into strong advocates** of a more sustainable food supply chain[195] although important differences between countries persist.

The following sections present an overview of the current status of FLW across EU countries, by taking into account two main indicators: food waste per capita per year and food loss as a percentage of total food production.

3.2. An overview of food loss and waste challenges in the EU

The overall performance of the EU as a region is lower than other regions, such as North America and Latin America, and higher than the Mediterranean region. It is comparable to high income countries analyzed in the FSI. Figure 3.2 highlights how no country in Europe has a uniform very high performance across the categories analyzed, with only Italy having a high performance. Czech Republic, France and the Netherlands present a constant high performance (green stream field at the bottom of the Figure), while other countries show a slight (Luxembourg) or stark reduction (Finland) in the End-User-Waste category. Malta and Bulgaria, on the other hand, show low performance across all categories.

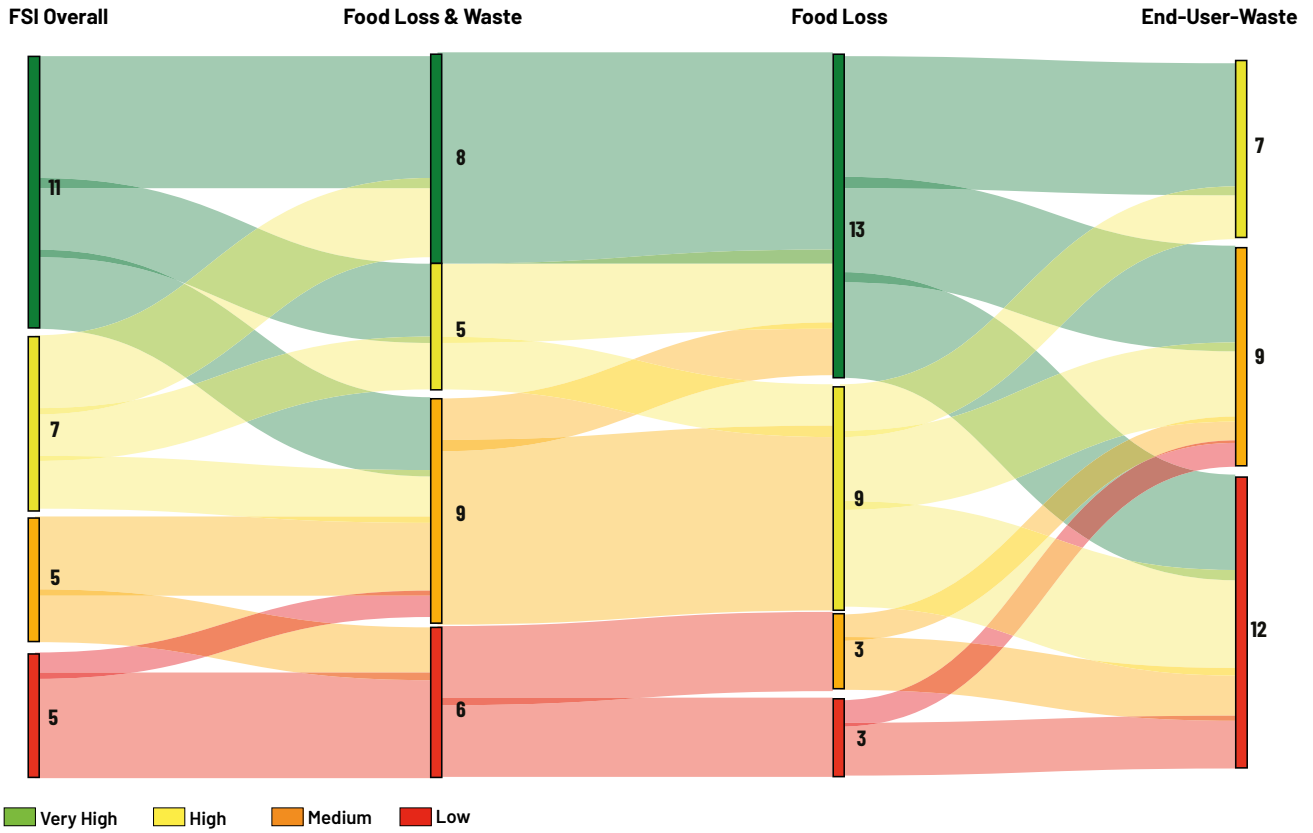

Figure 3.2 EU performance clusters in FSI Food Loss and waste and its categories (red = low; orange = medium; yellow = high; green = very high). The four axes represent the final FSI ranking, Food loss and waste and its two dimensions (i.e., food losses as a total of food production and food waste at the end user level) and blocks represent clusters of nodes. These blocks are proportional to the number of countries belonging to each cluster performance (also reported close to each block). The stream fields between the blocks represent changes in performance, and the height of a stream field represents the number of countries contained in both blocks connected by the stream field. FSI data processed by the authors (2018).

According to the FSI, three quarters of European countries fall in or below the third quartile for the FLW indicators. **As for end-user food waste, every EU citizen generates around 58 kg of food waste per year on average, with the highest level registered in Belgium (87 kg per capita)**[196] **and the lowest one in Cyprus (36 kg per capita)**. The EU average is higher than the average food waste level of the group of **high-income countries** analysed in the FSI (57 kg per capita). In this sense, the best performances are recorded in Saudi Arabia (21 kg per capita), United Arab Emirates (23 kg per capita) and Israel (26 kg

per capita). The worst performers are instead the United States, with 95 kg of food waste per capita, followed by Canada (78 kg) and Australia (76 kg).

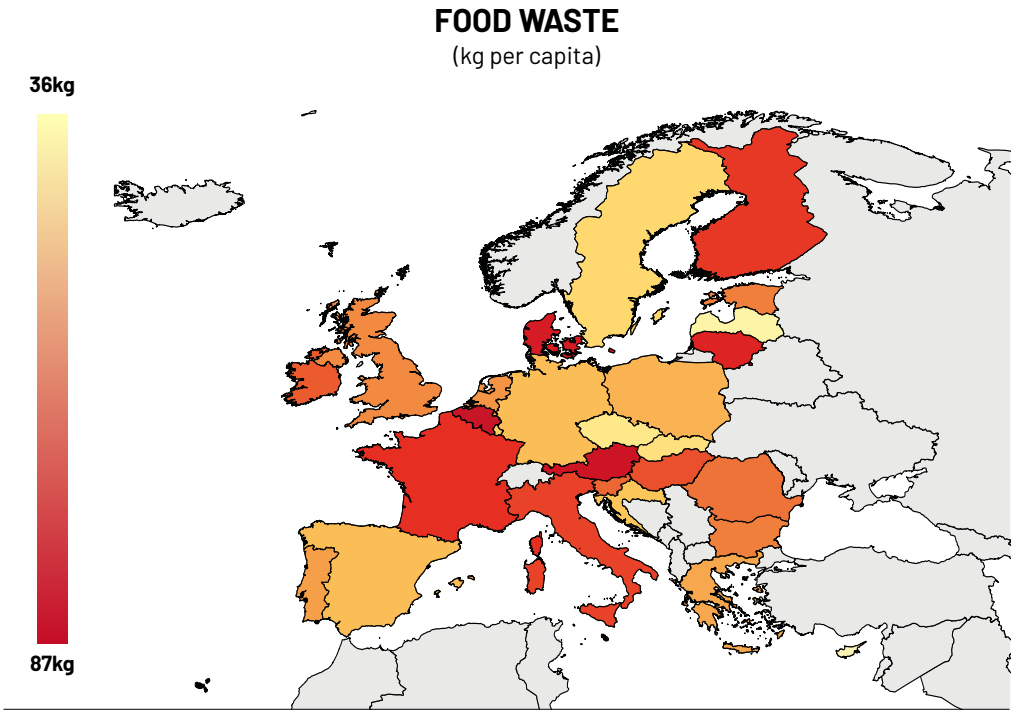

Figure 3.3. *Food Waste per capita per year in the EU* [197].

As for food loss[198], on average **3% of the total food production is lost** with the lowest levels registered in Finland (less than 1%) and the highest ones in Slovenia (11%). This means that three quarters of EU countries fall in or below the third quartile for the FLW indicators. **The EU average is lower than that of high-income countries** (almost 5%). In this respect, the best performance is recorded in Australia (1%), the United States (1%) and Canada (2%), whereas the worst performers are the United Arab Emirates (59%), followed by Saudi Arabia (12%) and South Korea (8%).

Measuring FLW has always proven to be complicated[199]. The reasons range from a lack of data and a commonly shared definition of the phenomenon, to capacity building and budget constraints[200]. At EU level, there have been many efforts to set up both a definition and a clear methodology to measure it. The **FUSIONS project** estimated that over **20% of the food produced in the EU is wasted** (88 million tons per year), with an economic cost of **143 billion euros**, accounting for **6% of total EU GHG emissions**[201]. In addition, it identified the sectors contributing the most to FLW in the EU, with households coming first (53%), followed by processing (19%), the retail sector (17%) and finally production (11%). This is even more dramatic, considering that in 2018, 36 million people in the EU could only afford a quality meal (including meat, chicken, fish or vegetarian equivalent) every second day[202]. Finally, the REFRESH project recently confirmed the findings of the FUSIONS project, by formulating recommendations for three policy impact areas: consumer behaviour, voluntary agreements and unfair trading practices and finally valorisation of food waste[203].

3.3. EU policies, initiatives and best practices

AT EU LEVEL, THERE HAVE BEEN MANY EFFORTS TO SET UP A DEFINITION AND A CLEAR METHODOLOGY TO MEASURE FLW

3.3.1. An overview of policies

The magnitude of FLW and the tremendous costs it places on the environment, the economy and the people has pushed the EU to become one of the strongest advocates of a more efficient and circular food supply chain. This is why EU Institutions have started to **launch different measures at various levels** - political, economic, regulatory and cultural - in line with the target set by the 2030 Agenda, which requires "global food waste at the retail and consumer levels to be halved and food loss along production and supply chains, including post-harvest losses, to be reduced by the end of the decade[204]".

In 2012, the European Parliament adopted a resolution that called on the Council, the Commission, the Member States and all actors involved in the food supply chain to address the problem of food waste along the entire supply and consumption chain as a matter of urgency[205]. Since then, many institutional players (i.e., the European Commission, the European Economic and Social Committee, the Court of Auditors) have worked to set up a clear framework to tackle FLW[206]. This has been a long and difficult journey. **FLW crosscuts a variety of policies**, including waste, food safety and information, research and innovation, environment, agriculture, education and social policy[207] involving also producers, processors, retailers and consumers. For these reasons, gaps and overlaps are almost inevitable. Within the Commission, although the DG Health and Food Safety (DG SANTE) is the one in charge of the food waste file, other DGs also deal with this issue.

Against this complex backdrop, the **EU institutions have worked to bring some clarity** to this dynamic - and to a certain extent confusing - picture, with several regulatory gaps and overlaps. Among them a

waste hierarchy[208] not fully applicable to food waste, a chaotic labelling system[209], a lack of binding targets for food waste reduction, the regulation of VAT exemption as well as incentives for food donation[210].

Nowadays, the EU agenda on FLW is part of a wider attempt to set up a circular economy, with a proposal for a **Directive** started by the European Commission in 2015 that became law in June 2018 (Figure 3.4). In addition, the actions taken are part of broader work undertaken to revise the 2008 Waste Framework Directive, a process that was positively concluded in 2018[211]. The new Directive has introduced **new obligations for Member States**, with the aim of reducing food waste generation at each stage in the food supply chain (i.e., primary production, processing/manufacturing, retail/other food distribution, restaurants and food services, households).

THE TREMENDOUS COSTS OF FLW HAVE PUSHED THE EU TO BECOME ONE OF THE STRONGEST ADVOCATES OF A MORE EFFICIENT FOOD SUPPLY CHAIN

One of the most interesting initiatives launched by the Commission has been the so-called **EU Platform on Food Losses and Food Waste**, a place where several actors have had the chance to meet, share **best practices** and guide the Commission's work on some controversial topics. Among them, the definition of FLW, the creation of a **common methodology**[212], the establishment of precise guidelines to facilitate **food donation** and the promotion of a better understanding of **date marking**. In this sense, the Commission, supported by EFSA is expected to publish an EU date marking guidance by 2021. This wide consultation work has allowed the Platform to formulate a series of recommendations for the future. Some of them are 'cross-cutting' as they refer to several actors operating at various stages of the food supply chain, whereas others address more specific sectors (i.e., primary production, manufacturing, retail, hospitality, consumers) and suggest some actions to be implemented in order to halve FLW by 2030[213].

Three important steps have been achieved by the EU in recent years. Firstly, the **release of guidelines on food donations**[214] is an attempt to try to shed light on a very complex phenomenon and help to lift barriers to food redistribution within the current EU regulatory framework by giving space to Member States to opt for the best solutions to address the problem at national level. Secondly, in April 2018, the EU published the **new guidelines for the feed use of food no longer intended for human consumption**[215]. The new guidelines will facilitate the safe feed use of former food, in line with food use hierarchy, and prevent food waste. Thirdly, in May 2019 the European Commission presented the **new common methodology to measure FLW starting from 2020**[216]. The aim is to drive Member States to put in place, in a flexible way, a monitoring framework and provide new data on food waste levels by mid-2022 in order to publish a first EU-wide report. The EU has not defined a single method of measurement but rather a list from which the Member States will pick the solution that best applies to them and provide a detailed explanation.

The Delegated Act issued in May 2019 and the Commission's Implementing Decision of November 2019 are set to produce significant results[217]. On the one hand, they will push Member States to start collecting data on food waste as of 2020 and report on national food waste levels by mid-2022. This will increase standardization of reporting and allow better monitoring in line with the SDG Target 12.3. On the other, Member States data will have to follow a precise format, that will allow the Commission to undertake a quality check report, in order to help verify the quality of the data and improve data collection in the

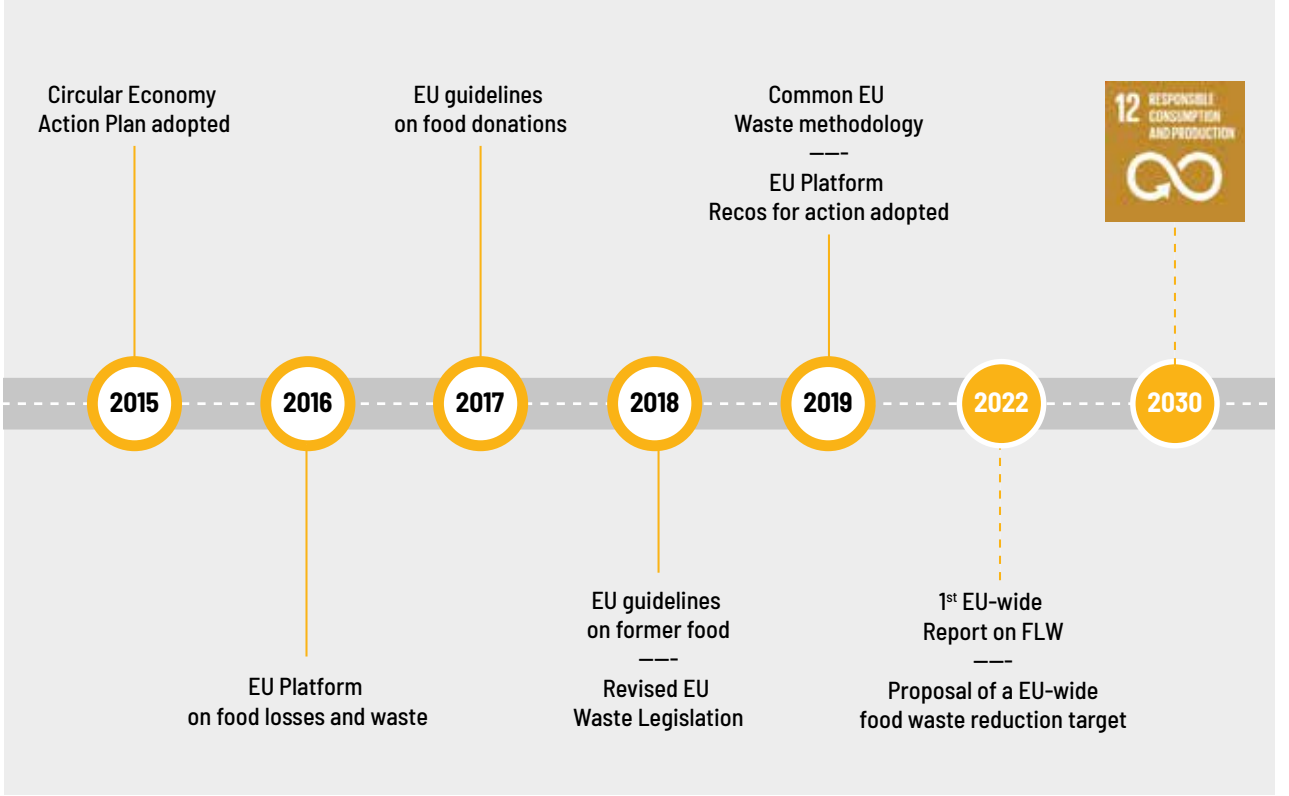

Figure 3.4. *Key milestones in the EU fight against FLW . Source: European Union (2019).*

future. Therefore, **the common methodology is a crucial step for at least two reasons**. Firstly, it will allow the European Commission to issue a report accompanied, if appropriate, by a proposal by end-2023 **to set up an EU-wide food waste reduction target**. Secondly, it is likely to produce a **spill-over effect**, pushing other countries or regional organizations to adopt it. All these steps are even more important in light of the From Farm to Fork Strategy and will play a decisive role in creating a more circular approach to the whole food supply chain, as requested by many civil society organisations in December 2019[218]. Therefore, the Strategy will be pivotal to achieving the EU climate crisis agenda, preserve biodiversity and strengthen the position of farmers and fishers in the value chain[219].

3.3.2. National initiatives

Two countries in the EU have launched the most innovative legislation to address FLW. These laws draw on two different concepts of the role of the state in tackling FLW. On the one hand, France has opted for giving the state a very strong role with a very punitive approach. On the other hand, the Italian legislation is based on the idea of central government acting as an enabler that sets the preconditions for reducing FLW. However, both laws share the idea that adapting food distribution represents an efficient and coherent remedy against the unacceptability of waste[220].

TWO COUNTRIES IN THE EU, FRANCE AND ITALY, HAVE LAUNCHED THE MOST INNOVATIVE LEGISLATION TO ADDRESS FLW

In 2016, **France was the first country in the world to publish a national law[221] against FLW, with specific obligations and sanctions** on all retailers with a sales surface area of at least 400 square meters. These were obliged to sign contracts with charities to distribute their food waste or face penalties including fines of up to EUR 3,750. This law has already produced important results. The national Food Bank has declared that **food donations rose from 36,000 to 46,000 tons between 2015 and 2017**. A recent study

by Comerso[222] has highlighted that **two thirds of the 164 big supermarket managers they interviewed** had started to launch initiatives to reduce FLW and to reduce inefficiencies in their food supply chains[223]. Yet, it has been argued that the main driver of this trend was the possibility of tax reductions on up to 60% of donated food, as well as a reduction of waste tariffs. Another **limitation** is that **it applies only to big supermarkets and retailers** whereas it would be necessary to extend it to smaller shops, school canteens, hospitals, and to make a stronger effort to educate people in adopting different lifestyles, by also shedding light on topics such as food labelling[224].

Similarly to France, **Italy** issued new legislation to facilitate food donations (the so-called Gadda Law)[225], with the aim of **easing bureaucratic burdens** that hinder food donations by relaxing food safety requirements[226], changing the discipline around labelling and food safety, and providing tax incentives (i.e., waste tax deductions). The new Law draws on the *Good Samaritan* law issued in 2003 and is intended to have both a direct and indirect positive impact on food donations through the involvement of charities. During the first three years of implementation of the Gadda Law, the Italian Fondazione Banco Alimentare estimates that the Law contributed to generate a 60% increase in food donations, with significant performances registered among big retailers and food industries[227]. However, more work is needed in the future for instance by allowing charities to **transform surplus food** (e.g., transforming unsold bread into other products such as beer) and by setting up agreements with farmers to **reduce FLW occurring during the very first stages** of the food supply chain.

SEVERAL PLAYERS IN THE EU, FROM PRIVATE COMPANIES TO LOCAL AUTHORITIES, HAVE STARTED TO TACKLE THE FLW BOTTOM-UP

Overall, despite these notable changes, it is important to note that **neither the French nor the Italian laws have introduced binding targets to be achieved by 2030**. Furthermore, the lack of specific instruments to monitor national performance risks making it harder for these two countries to meet the goals set in the Agenda 2030.

3.3.3. Best practices

There are several examples of good practices in fighting FLW at EU level. Several players, from private companies to local authorities, research institutions and app developers, have started to tackle the phenomenon bottom-up. All these efforts show that there is great market potential for food that would otherwise be lost. Many food businesses still look at food waste reduction as a burden, ignoring the economic benefits derived from a more circular approach to food. Recent studies like the Champions 12.3 initiative highlight that every dollar invested in food loss and waste reduction processes may generate up to 14 dollars return[228].

At the agricultural level, the Italian start-up **Bella Dentro** operates on food loss, intervening in support of farmers and promoting at the same time the consumption of fruit and vegetables, including those that for aesthetic reasons will not reach supermarkets.

On the supply side, **European retailers** are particularly active in addressing and leveraging food waste as a green marketing or corporate social responsibility strategy. For example, the supermarket chain **Tesco** has recently launched a line of frozen fruits claiming that it would help reduce household waste as people can defrost only the quantity they need[229].

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MANY INSTANCES SHOW THE POTENTIAL OF NEW DIGITAL TOOLS AS WELL AS IC TECHNOLOGIES TO TACKLE FLW

In addition, several instances show the potential of new digital tools as well as Information and Communication Technologies to tackle FLW. For instance, in Italy, the ***Last Minute Sotto Casa*** app helps small retailers sell their fresh products to neighbouring households at a discounted price, by sending a notification to everyone who has people registered via the app. This has made it possible to save up to 3 tons of food every month just in Turin[230]. Another example is the ***Too Good To Go*** app, which allows citizens to buy fresh unsold food at the end of the day from shops. With more than 10 million users spread across 15 European countries, the app allows retailers to avoid FLW and increase revenues, while ordinary citizens can buy fresh food at lower prices using the so called "Magic Boxes" at a cost ranging from 2 to 6 euros. Moreover, one of the most innovative systems currently used in the United Kingdom is the so-called Food Cloud, which is already helping big companies to easily match supply and demand of surplus food through very user-friendly software at very limited costs. Every morning, the company's staff quantify the total food surplus in their branch and upload the data to a shared platform from which charities can order the amount they need and pick it up at the end of the day. However, the app requires a 24/7 help desk, not something that can be easily provided by smaller organisations.

Another interesting case is the **REGUSTO** online platform, that targets local authorities to facilitate waste prevention and redistribute surplus food to vulnerable citizens by matching supplies from potential donors (e.g., supermarkets, canteens, industries, restaurants, etc.) with the demand from non-profit charities. The system also allows for the monitoring of food saved and for the production of statistics and data to assess the social and environmental impact of the initiative.

Finally, thanks to technology and digital solutions, companies like **Winnow** are helping the foodservice

and hospitality sector to reduce FLW by making kitchens smarter. In particular, Winnow allows FLW to be tracked, helping chefs to reduce costs and save time. They only need to take pictures of the wasted food and the software captures the data and records the weight while the user selects the reason for the waste and identifies the item/dish using the tablet. The system obviously needs constant training, as the machine may struggle to identify all kinds of food, but developers are working so that future updates will make it easier for the machine to identify food automatically, thus reducing manual input and saving more time[231].

3.4. The role of cities in tackling food loss and waste

Many initiatives have been put forward at urban level to tackle FLW. Some of these are aimed at reducing loss and waste, others at reusing or redistributing food, others still at campaigning to raise awareness[232]. The city of **Milan** could be seen as a role model in tackling FLW. The City has included this goal as a priority in its action plan, with several initiatives to be implemented in a synergic way with other players and the target of **halving FLW by 2030**. These initiatives are not pursued only at municipal level but also within international fora, especially the Milan Urban Food Policy Pact (MUFPP), as well as other groups such as EUROCITIES or C40. Among them, the city has also introduced **tax incentives**, including **a waste tax reduction** of up to 20% for the first pilot year to benefit food businesses (supermarkets, restaurants, canteens, producers, etc.) that donate their food surplus to charities. After six months of implementation, **over 840 tonnes of food were recovered**[233].

MANY INITIATIVES HAVE BEEN PUT FORWARD AT URBAN LEVEL AIMING AT REDUCING FOOD LOSS AND WASTE, REUSING OR REDISTRIBUTING FOOD, AND RAISING AWARENESS

3.4.1. The Foodsavers Platform in Ghent

Two cities in Europe have made impressive progress in the fight against FLW at urban level: Ghent and Riga. In 2017, Ghent launched the "Foodsavers" multi-stakeholder platform that allowed the city to involve supermarkets and producers in donating surplus food to local charities. The platform was based on a three-layered approach and was part of a broader initiative to set up a food policy in the city of Ghent, under the so called "Ghent on Garde" initiative[234]. Firstly, food donations were aimed at significantly reducing the environmental footprint of food surpluses, with a potential reduction of 250 CO_2 tons per 100 tons of surplus food donated. Secondly, the project strived to have a deep socio-economic impact on the local population as it allowed for the training and eventual employment of long-term unemployed citizens. Finally, it was an attempt to make quality food available and accessible to the poor/people on low income[235].

The impact of the Foodsavers platform has been significant as, after only ten months of implementation, 300 tons of food were redistributed, involving a broad range of stakeholders, such as 24 retailers, a wholesale market, two retail distribution centres, an organic farm and a company providing food products. The platform also benefited from the involvement of around 58 local charity organisations and social restaurants who played a very active role in the distribution activities. The project reached out to almost 19,000 citizens in need, it employed 19 people and had an important environmental impact, with an estimated overall reduction of 762 tons of CO_2 emissions[235].

3.4.2. Riga: Converting food waste into healthy off-season food

Riga has invested a lot in using food waste management as a lever to generate a positive spill-over effect in environmental, economic and social terms. The city has invested in turning the Getlini landfill into an innovative and environmentally-friendly waste management site. The conversion plan has allowed almost 150,000 tons of waste to be converted into biomass, reducing negative impacts on the environment and soil. Food waste is deposited in environmentally safe biodegradable cells that channel the landfill gas to *ad hoc* power units. This has turned Getlini into one of the largest producers of green energy in Latvia (31 to 33 GWh annually). Furthermore, the heat produced as a by-product of energy production (20 GWh in 2015) has provided up to 400 tons of off-season organically produced tomatoes and later cucumbers to the citizens of Riga, distributed through the leading supermarket chains[237].

IN THE LAST FEW YEARS, THE EU HAS ATTAINED IMPORTANT GOALS IN REDUCING FLW. THERE ARE, HOWEVER, MANY CHALLENGES

The industrial conversion plan has been accompanied by a series of awareness-raising campaigns and education programmes involving pre-schools, schools, universities, companies, the tourist industry, environmental activists, etc. Moreover, it has generated several beneficial effects. Firstly, it has helped to convert waste into both green energy and highly nutritious food, thus saving the atmosphere from 2,000 m^3 of potential environmentally harmful gases per hour and providing citizens with quality vegetable supplies even during cold seasons. Secondly, it has dispelled the myth that greenhouses and food production are not compatible with landfill sites. Thirdly, it has turned one of the most degraded areas of the city into an attractive destination for ornithologists from all over the world as well as attracting government, municipal and corporate delegates interested in urban regeneration. Finally, it has generated employment in the suburbs from which 17% of new employees have come[238].

3.5. Future directions

In the last few years, the EU has attained important goals in reducing FLW and it is set to remain a reference point at global level in the tackling of this dramatic phenomenon. There are, however, many challenges.

Firstly, the lack of **specific and binding targets to halve FLW** as stated in the Agenda 2030 and the decision to leave it to individual Member States to act at national level may lead to a **"multi-speed" Europe** with only some countries adopting legislation to handle these issues. In addition, some studies warn that problems may emerge with regard to food donations, as the rigid, top-down approach of the EU General Food Law, the 'hygiene package' and Regulation 1169/2011 on food information may affect some policies already implemented for instance in France and Italy.

Secondly, current legislation on FLW, although innovative, is still too focused on **redistribution and market efficiency rather than on prevention and reduction**. The linear "take-make-consume-throw away" pattern of current agri-food system should be challenged to address the root causes of FLW. The risk is that it will gradually be taken for granted that there will always be **two classes of citizens** - those who are rich enough to buy and waste food and those who are poor but can still be fed with donated surplus food.

Thirdly, **local authorities and cities** will play a pivotal role in tackling these challenges. In Italy for instance, to ensure that the incentives envisaged by the *Gadda Law* are effectively implemented,

cities will need to be encouraged to **review local waste taxes, to map** as much as possible the real demand of food to be redistributed and to **monitor** data accordingly in order to tailor their policies. This is not an easy task, as it requires the training of public officials and causes a short-term reduction in revenues from local taxes. In this sense, looking at best practice in other cities could be a significant driver for change. The ***Monitoring Framework*** recently developed by FAO and MUFPP, with a list of 44 indicators to improve urban food governance could also provide a useful tool.

Fourthly, **educating** people to eat better and produce less waste is a crucial challenge. This will necessitate a stronger link between institutions, producers, retailers and consumers. More work is needed on understanding the **ethical and behavioural reasons that push consumers to produce FLW**. A key effort would be to better study food labelling. Recent studies and polls[239] have shown that many **European citizens poorly understand the difference between "best before" and "use by" dates**, which tends to generate a lot of FLW at the household level. It will therefore be necessary to promote **new consumer habits** and to clarify the true cost of food.

Finally, it will be essential **to support further research on FLW**. So far, it is still hard to measure its exact economic, social and environmental implications. The complexity of the issue - with several players and competencies involved - makes it a unique topic on which future research on the sustainability of our agri-food systems will need to concentrate. This is essential to ensure that **all policies launched at regional, national and local levels are fully in line** with the SDGs and do not hamper the efforts made to achieve the ambitious targets of the Agenda 2030.

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TOO GOOD TO GO: A MOVEMENT AGAINST FOOD WASTE

Daniel Frey Longholm

Global Education Manager, Too Good To Go

Too Good To Go is a Social Impact company fighting food waste around the world with both a direct and indirect impact. The company was founded as an app and quickly became the world's largest B2C marketplace for surplus food, which the company calls its direct impact. To achieve its vision of a planet with no food waste, it has expanded into building a wider Movement against Food Waste, and also builds public and private partnerships with producers, schools, NGOs and governments to drive real change in global food systems and supply chains. Driving real change means inspiring and empowering everyone to fight food waste *together*. Too Good To Go works with every segment of society to do this: consumers, politicians, business leaders, and future generations. Empowering generations to come to make a change is crucial in building a better tomorrow and Too Good To Go has several initiatives with and for schools across Europe.

Food Waste is a huge issue that involves every part of the supply chain and will require multiple solutions to be tackled fully. In recognition of this reality, the Movement being built by Too Good To Go focuses heavily on inspirational partnerships for innovation.

Following population trends in general, today's children are more aware and engaged in climate change than ever before, and scientific research is arguing that good environmental education is key to driving the change we want for our planet[1]. Children are learning about their environment and passing new information onto their parents, influencing household behaviours. Environmentally-influenced education will not only feed into the megatrend of caring about climate change but will actually inspire and equip children with the right tools and knowledge to ensure a more sustainable life on this planet.

In 2019, Too Good To Go brought on board an education specialist to curate free educational toolkits and exercises for all ages. Education for Sustainable Development is increasingly a feature of studies in European and especially Scandinavian schools[2,3]. Too Good To Go works to ensure the issue of food waste makes its way onto curricula and to make the next generation aware of how food waste impacts climate change and equipping them with the tools they need to fight it, which is vital in securing a sustainable future for them. The material is available to download for free from the company's Movement website and has been translated into many different languages. Allowing students and teachers to easily and actively include these toolkits in their curricula can create long-lasting behavioural change and bring a greater respect for food back into our lives.

In the UK, Too Good To Go launched a national "Save The Food Poetry Competition" for primary school-aged children, and has partnered with DEFRA to reach the maximum number of school children with the message. The competition is designed to get children excited about the fight against food waste and clued up on the impact that wasting food is having on our environment.

Poetry is just one example of how to creatively engage children in a topic that is usually crammed with facts and figures. With nothing needed but pen and paper, it is also intentionally accessible. As of the end of April, Too Good To Go has received over 500 entries from children under the age of 11 with 100+ schools actively involved[4].

Too Good To Go and the FAO, DO GOOD: SAVE FOOD!

The comprehensive approach needed to achieve this entails a partnership with the Food and Agriculture Association of the United Nations (FAO) and its Save Food Initiative to push educational content entitled 'DO GOOD: SAVE FOOD!'[5] across several European countries. An example of using impact at scale to help share other educational initiatives.

The materials, developed between 2015 and 2018, are tailored for use by four defined primary and secondary

school age groups: 5-7 years, 8-9 years, 10-13 years, and 14+ years. They are available in both English and French (C'EST FINI, ZÉRO GASPI!). At Too Good To Go they believe that these materials from the FAO and International Food Waste Coalition (IFWC), together with their own free toolkits, will provide an easier and more accessible way for educators to include food waste education and awareness in their classrooms.

All packages contain two core lessons with follow-up activities for both. The first core lesson is the information-centred, "DO GOOD: SAVE FOOD!". The second is the practical, activity-based, "Feed yourself, not the bin".

It is no secret that kids learn from their parents, copy their daily behaviours, and see them as their lifelong teachers. In many ways, parental behaviour does impact child development. Too Good To Go has realised that this relationship is also reciprocal and that children can indeed shift elders' attitudes and behaviours. The company's experience has shown that education on food waste for children (and adults) is considered as one of the keys to reducing and in the long term tackling the food waste issue. Those not taking direct action will naturally be influenced by those who do[6]. Teachers have reported back with stories of young students returning home to inspect what's been thrown out, literally becoming Food Waste Warriors and doing everything in their power to make sure nothing ends up in the bin. Parents listen to their children and will change their own behaviours if they believe that will positively impact their development.

When everyone, across generations, comes together to fight food waste, the global society will generate a positive change in society and for the environment.

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Policy recommendations

The EU is at a tipping point in reversing current nutritional trends, reducing the pressure on the environment and ensuring a fair transition of food systems.

The pathway set by the European Green Deal, which aims to *"transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use"*, has been further strengthened by the Farm to Fork Strategy launched in May 2020. The Strategy aims to make the EU food system the global standard for sustainability and to reconcile the *"food system with the needs of the planet and to respond positively to Europeans' aspirations for healthy, equitable and environmentally-friendly food"*[1].

The transformation of the EU food system will require a number of actions and interventions to deliver benefits for food, health, agriculture and society at the same time. For this purpose, the policies influencing these areas directly and indirectly will need to be cross-cutting, coherent, and mutually reinforcing, to maximise synergies and avoid trade-offs, with all the necessary governance interventions. The Farm to Fork Strategy has the potential to bring economic opportunities and lay the foundations for a more resilient, equitable, sustainable and healthier food system, putting the EU on a pathway to recover from COVID-19, and prevent future pandemics, and achieve the Sustainable Development Goals. The implementation of the Strategy will have to be coherent with other policies and elements of the European Green Deal, such as the Common Agricultural Policy (CAP) and the Biodiversity Strategy for 2030.

A non-exhaustive list of recommendations is provided below to contribute to informing the transition of EU food systems in the Decade of Action.

1. Harness societal change resulting from the COVID-19 pandemic to tackle the root causes of broken food systems

The COVID-19 pandemic is affecting food systems in several ways, acting directly on supply and demand, while exacerbating existing challenges, especially for the most vulnerable farmers and households. Nutrition is being affected in several ways, from people choosing more shelf-stable and pre-packaged foods to fresh fruit and vegetables becoming less available and food security being compromised.
In this context, EU leaders are urged to harness societal change to tackle the root causes of broken

1. European Commission 2020, Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions. A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system.

food systems, building agri-food systems that deliver safe, sustainable, healthy food for all, and that are able to respond to and recover from sudden shocks and disruptive stressors. A holistic approach that looks at processes, value chains, actors and interactions to improve the resiliency of food systems is urgently needed. Key measures include full coverage of social protection mechanisms that incorporate provisions on the right to food for the most vulnerable segments of the population[2]; as well as addressing the issue of seasonal and informal labour forces, especially for high-value supply chains which are at risk of disruption. 33 million Europeans cannot currently afford a quality meal every second day[3].

2. Adopt a fully integrated policy strategy to reconnect food, nutrition and agriculture, based on the principle of good food system governance

Agriculture, food, nutrition and health are inextricably linked and must be reconnected in their strategies, priorities, policy, and analysis[4]. Adopting a multi-dimensional and comprehensive food system approach can deliver multiple co-benefits in the field of nutrition and health, economy and the environment. The CAP, for instance, has deep implications for nutritional outcomes and public health in EU countries[5]. The objectives of the Farm to Fork Strategy include healthy food consumption, better informed and empowered citizens, food loss and waste reduction, as well as affordable and sustainable food for all[6].

Adopting a fully integrated and coordinated food, nutrition and agriculture policy strategy at EU level, aligned with the broader framework of the SDGs, is thus key to achieving a greener EU, as set out in the ambitious European Green Deal. This requires good governance, strong leadership, as well as bold and forward-looking policy measures that accelerate the transition at the global, national and local level. Data and metrics can also inform comprehensive and integrated food policy. Policy can play a crucial role in enabling food system transformative change by removing barriers and providing incentives to influence stakeholder behaviour; ensuring the transparency and accountability of operators; mobilising public and private resources for addressing priority areas; encouraging multi-stakeholder initiatives and solutions that involve communities, advocacy groups, businesses and academia[7]. Progressing step-wise has been recommended to mainstream food system thinking into sectoral policies at the EU level, based on the principles of food system governance and engaging stakeholders with bottom-up and top-down approaches[8]. The development of city region food systems is a promising strategy to strengthen urban-rural

2. Impact of COVID-19 on Food Security and Nutrition (FSN) Draft issue paper by the High-Level Panel of Experts on Food Security and nutrition (HLPE). Available online: https://fscluster.org/sites/default/files/documents/2020-03-19._impact_of_covid-19_on_fsn_-_hlpe_-_final_draft.pdf.
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linkages and support the resilience of food systems, as shown by the current COVID-19 pandemic[9].

3. Address the nutrition transition through a comprehensive approach and multi-stakeholder partnerships

The EU is faced with a number of nutritional challenges, including overweight and obesity in adults, children and adolescents. Unhealthy diets are the largest modifiable risk factor in the onset of non-communicable diseases, currently accounting for 71% of all deaths globally. COVID-19 infection and fatality rates have been shown to be higher among patients with comorbidities, especially cardiovascular diseases, hypertension and type 2 diabetes[11,12].

The adoption of balanced diets - emphasising the consumption of fruit and vegetables, whole grains, legumes and nuts - can have substantial health benefits in terms of preventing and treating chronic diseases, and improving the immune function and longevity. Healthier diets are generally consistent with environmentally sustainable dietary patterns, such as in the case of the Mediterranean diet and the New Nordic Diet. The Farm to Fork Strategy states that, "if European diets were in line with national dietary recommendations, the environmental footprint of food systems would be significantly reduced"[13].

Policy makers are urged to seek improvements in dietary patterns, health and wellbeing, by adopting a comprehensive approach that combines their efforts with the individual's role as the agent of change[14]. Transparent and well-governed public-private partnerships are key to implementing effective programmes and policies, if their governance ensures that actions are in line with principles of ethics, transparency and accountability[9,15]. Research, innovation and investments are essential to finding solutions for healthier food systems.

4. Create enabling food environments to mainstream healthy and sustainable food choices

The interaction between individual food preferences and the surrounding environment plays an important role in determining food choices. Effective policy actions can curb the pandemic of overweight and obesity, while contributing to reducing pressure on the environment, through systemic changes to "food, social, and information environments"[16] that make healthy and sustainable choices the easiest and preferred choices for individuals. Specific measures to improve food environments and support healthy diets, include, but are not limited to, promoting value chain development for nutrient-rich food crops, encouraging food reformulation and labelling laws, reviewing food subsidies and providing incentives for nutritious foods such as fresh fruit, vegetables

9. https://www.ecologic.eu/sites/files/publication/2020/wunder-20-farm-to-fork-strategy.pdf.
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and legumes, and establishing social protection policies to ensure that nutritious foods can be accessed by the vulnerable[17]. Entry points for improving food environments include the release of updated and consistent dietary guidelines which consider the health of the environment in nutrition recommendations. EU-wide dietary guidelines can be a valuable tool to clarify the common principles of a sustainable and healthy diet, despite regional, local and cultural differences.

5. Leverage food education as part of a wider strategy

Mainstreaming food education in the EU, from an early age, is key to building a new generation of global citizens and promoting healthy and sustainable food habits and lifestyles. As we strive to build a greener EU and accelerate the transition towards the SDGs, questions about how to educate the future generations of leaders in the policy, business and civil society domains, prominently come to the fore. Food education is a component of behavioural change[18], but needs to be considered as a part of a wider strategy that combines other complementary approaches. Examples include the combination of nutrition labels with education campaigns; cross-sector programmes and initiatives to reduce food waste; public awareness campaigns with food product reformulation, and school food standards (e.g., vending machines, canteens, procurement). In physical activity promotion, for example, creating an enabling environment is

17. World Health Organization (2018). The nutrition challenge: food system solutions.
18. Hawkes, C. 2013. Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness. Rome: Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. Available at www.fao.org/ag/humannutrition/nutritioneducation/69725/en/.

even more challenging, but essential for supporting active living for all. Adopting a combined approach can be more effective than either strategy implemented in isolation[19].

6. Turn agriculture from a problem to a solution

The reform of the CAP is essential to put forward a holistic and integrated approach to food systems in EU. The CAP will be an integral part of the European Green deal, from a sectoral and financial perspective, as well as the Farm to Fork strategy. It is fundamental that it reflects the objective of transforming the agricultural sector into a sustainable one, through the establishment of specific and quantifiable targets and key performance indicators.

To turn agriculture from a problem to a solution, it is pivotal to favour youth involvement in agriculture, promote regenerative agricultural approaches and techniques - such as organic agriculture and agroforestry, through an integration of agroecology, technology and digitisation -, tackling the digital divide, strengthening the resilience of rural communities and agricultural landscapes, and engaging farmers. Efforts are required to support farmers in becoming effective stewards of the EU's natural resources, ecosystems and biodiversity, as well as to increase the participation of younger generations.

Research, innovation and investments can play a key role in developing strategies, solutions and tools for more sustainable food systems, such as nature-based solutions. Participatory research, involving farmers, should be particularly encouraged.

7. Target, measure and report on food loss and waste

Food loss and waste (FLW) undermine the sustainability of global food systems. Despite the improvements achieved at EU level, there is a widespread lack of specific and binding targets to reduce food loss at farm level and to halve food waste at retail and consumer level, as stated in the Agenda 2030. Governments are urged to adopt the EU food waste methodology and to set binding commitments in line with the SDGs, as well as to design comprehensive policy interventions with clear measurement, monitoring and reporting of outcomes across the whole food supply chain, beyond the retailer and consumer level. An integrated EU governance would overcome the risk of multispeed progress, with only some countries adopting strong legislation and reduction targets. These policies can entail multiple types of interventions, which include fiscal and financial incentives for big and small public and private actors, supporting voluntary agreements between private companies and charities or NGOs to donate surplus food. The combination of these policies can bring about a circular economy approach to food, stimulate data transparency and foster collaboration among different sectors. In this context, cities can play a crucial role if supported by governments to revise local taxes and receive investments to build up the human and technical resources to map, monitor and manage FLW.

19. Story, M. and Duffy, E., 2019. Supporting Healthy Eating: Synergistic Effects of Nutrition Education Paired with Policy, Systems, and Environmental Changes. Nestlé Nutrition Institute Workshop Series, pp.69-82.

Methodology

The Food Sustainability Index (FSI) is a composite index that aims to assess the sustainability of national food systems across three areas: food loss and waste, agriculture and nutrition. The FSI gauges each country's performance in these three areas by applying 37 indicators and 89 sub-indicators (both qualitative and quantitative) covering environmental, social and economic factors.

Raw data is gathered from reputable international, national and industry sources such as the European Commission, FAO, the Sustainable Development Solutions Network, UNESCO, UNICEF, the World Bank Group, the World Health Organization and the World Resources Institute[xi]. Starting from raw indicator data, normalisation is applied to rebase them to a common unit and therefore to allow aggregation. All indicators are normalised to a 0 (lowest sustainability) to 100 (highest sustainability) scale and a set of weights is then applied to the obtained 0-100 scores. Finally, the weighted scores are aggregated into the FSI overall score (one for each country).

To cluster the analysed countries according to the obtained FSI results, four performance categories have been defined: low (below the 25th percentile or first quartile), medium (between the 25th and 50th percentile), high (between the 50th and 75th percentile) and very high (above the 75th percentile or third quartile).

In the latest edition of the FSI, 67 countries have been assessed representing over 90% of global GDP and four-fifths of the world's population. The present report has been produced using the FSI as a main source of data, unless otherwise specified, with the exception of the metrics and statistics presented below[xii].

Nutritional Challenges

Overweight and obesity, and breastfeeding rates: the study includes references to the **WHO European Region**. The WHO provides national level data, included in both the FSI and this report, and clustered regional level data. The WHO European region comprises 53 countries, covering a geographical area extending from the Atlantic to the Pacific oceans[240]. Regional data is provided in the report, when specific EU data is not available.

xi. In cases where data were incomplete or missing, EIU analysts developed custom estimation models that aggregate proxy data series and use statistical analysis to estimate data points, where appropriate.

xii. For further methodological information the reader is referred to: https://foodsustainability.eiu.com/wp-content/uploads/sites/34/2019/01/FSI-2018-Methodology-Paper_full_January-2019.pdf.

Percentage of babies under 6 months exclusively breastfed: to standardise the data source, rates for EU countries in this report are retrieved from *Breastfeeding practices and policies in WHO European Region Member States*[241]. In the FSI, some data for EU countries have been retrieved from the World Bank database (i.e., Croatia, where the reported rate is 98% and Romania 16%). As mentioned, national data on breastfeeding practices are difficult to compare due to considerable cross-national variation and lack of a standardised method for data collection. Although breastfeeding practices within the WHO European Region are far from being in line with the WHO recommendations, data is not necessarily nationally representative and not always of sufficiently high quality.

Dietary guidelines: the quality of policy response to dietary patterns in the FSI included an analysis of the existence of healthy eating guidelines, which was conducted in 2018. In this report, the answers have been updated by reposing the question in 2020, consulting FAO's analysis on national food-based dietary guidelines[242] and country-specific institutions in charge of developing national official dietary guidelines.

Sustainable agriculture

Soil erosion data has been taken from the publication Laurentis et al., 2018[243] (available in the Supplementary Materials). In particular we considered the characterisation factors for describing soil erosion for the category *agricultural land* (occupation). These factors have been defined via the LANCA method[244] as applied to environmental impact assessment on land and soil through Life Cycle Assessment.

GHG emissions - absolute values and grouping: The estimates for emissions from animals and crop cultivation is based on FAOSTAT data on agricultural GHG emissions (latest update refers to 2017). Emissions from *animals* include enteric fermentation, manure management and manure left on pasture. Emissions from *crop cultivation* include synthetic fertilisers, manure applied to soils, crop residues, cultivation of organic soils, burning of crop residues, rice cultivation. The emissions due to "Burning - savanna" have been excluded because they can be used to either create new cultivation fields or pasture for livestock.

GHG emissions referred to agricultural area and economic value. The total GHG emissions from agricultural activities refer to national agricultural areas and agricultural economic value. Agricultural area includes cropland, arable land, land used for temporary crops, land used as temporary meadows and pasture, land temporarily fallow, land used as permanent meadows and pasture, cultivated permanent meadows and pasture, naturally occurring permanent meadows and pasture, land under protective cover[245]. The *value of agricultural production corresponds to the Gross Production Value (constant 2004-2006 1000 I$)* indicator provided by FAOSTAT. Since the most up to date data refers to 2016, values for GHG are also from that year[246].

Food Loss and Waste

Food loss as % of total food production for the country. The indicator of food losses refers to losses occurring during post-harvest and up to the distribution phases, not including field losses.

The FSI draws on FAO's Commodity Balances, as so far this is the only aggregated source produced at the global level to estimate the level of food losses[247].

Food Waste per capita per year. The methodology used by FSI to obtain this indicator is a combination of the report produced by Gustavsson, et al., (2011)[248] and the data from 2013 collected from the FAO Food Balance Sheet. The FSI calculates these figures using the same types of commodities identified by FAO, applying different regional conversion criteria taken from a subsequent report published by Gustavsson, et al., (2013)[249]. The FSI then used the available data on population to calculate the level of food waste per capita per year.

Policy Response to Food Loss and Waste. The analysis of the policy response to FLW in Europe was undertaken by following a three-layered approach. The paper first undertook an *ad hoc* desk research throughout 2019 on the main policies launched at European level, through a combination of primary and secondary sources. It then carried out an analysis of the policies implemented in France and Italy, drawing on the FSI 2018 and then expanding it to have an as accurate as possible analysis of these two European countries. Finally, the paper presented an assessment of some policies undertaken at the urban level, using materials produced by FAO or collected from other secondary sources that allowed to have a deeper understanding of the three urban case studies.

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About the Food Sustainability Index

The Food Sustainability Index, developed in collaboration with the Economist Intelligence Unit, is a quantitative and qualitative benchmarking model, incorporating 37 indicators and 89 individual metrics, which measures the sustainability of food systems in 67 countries worldwide, including the EU countries. Since the inception of the program in 2016, several in-depth analyses have been published:

- Italy and Food (2019)
- Fixing Food (2018)
- Mediterranean region (2017)
- Towards a more sustainable Food System (2016)

For detailed information about the Food Sustainability Index go to https://foodsustainability.eiu.com/

Scores and country rankings can be displayed in the digital hub as heat maps, country scores or country profiles. To access the full data set, download and activate the workbook (Excel format).

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