POLICY BRIEF 31

Connecting food systems for co-benefits: How can food systems combine diet-related health with environmental and economic policy goals?

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This policy brief is one of a new series to meet the needs of policy-makers and health system managers. The aim is to develop key messages to support evidence-informed policy-making and the editors will continue to strengthen the series by working with authors to improve the consideration given to policy options and implementation.

What is a Policy Brief?

A policy brief is a short publication specifically designed to provide policy makers with evidence on a policy question or priority. Policy briefs

- Bring together existing evidence and present it in an accessible format
- Use systematic methods and make these transparent so that users can have confidence in the material
- Tailor the way evidence is identified and synthesised to reflect the nature of the policy question and the evidence available
- Are underpinned by a formal and rigorous open peer review process to ensure the independence of the evidence presented.

Each brief has a one page key messages section; a two page executive summary giving a succinct overview of the findings; and a 20 page review setting out the evidence. The idea is to provide instant access to key information and additional detail for those involved in drafting, informing or advising on the policy issue.

Policy briefs provide evidence for policy-makers not policy advice. They do not seek to explain or advocate a policy position but to set out clearly what is known about it. They may outline the evidence on different prospective policy options and on implementation issues, but they do not promote a particular option or act as a manual for implementation.

Connecting food systems for co-benefits: How can food systems combine diet-related health with environmental and economic policy goals?

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List of abbreviations

AMR	antimicrobial resistance
BMI	body mass index
CAP	Common Agricultural Policy
DG	Directorate General
DG AGRI	Directorate General for Agriculture and Rural Development
DG DEVCO	Directorate General for International Cooperation and Development
DG EAC	Directorate General for Education, Youth, Sport and Culture
DG ECFIN	Directorate General for Economic and Financial Affairs
DG EMPL	Directorate General for Employment, Social Affairs and Inclusion
DG ENVI	Directorate General for Environment
DG GROW	Directorate General for Internal Market, Industry, Entrepreneurship and SMEs
DG MARE	Directorate General for Maritime and Fisheries
DG RTD	Directorate General for Research and Innovation
DG SANTE	Directorate General for Health and Food Safety
DG TRADE	Directorate General for Trade
EAP	Environment Action Programme
EEA	European Environment Agency
EESC	European Economic and Social Committee
EHN	European Heart Network
EIP-AGRI	European Innovation Partnership for Agricultural Productivity and Sustainability
EPHA	European Public Health Alliance
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
GDP	gross domestic product
GES	good environmental status
GPP	Green Public Procurement
GVA	gross value added
ILO	International Labour Organization
INRA	French National Institute for Agricultural Research
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPES-Food	International Panel of Experts on Sustainable Food Systems
MSFD	Marine Strategy Framework Directive
NCD	non-communicable disease
NGO	Non-government organization
SCAR	Standing Committee on Agricultural Research
SDG	sustainable development goal
SME	small and medium-sized enterprise
WHO	World Health Organization

How do Policy Briefs bring the evidence together?

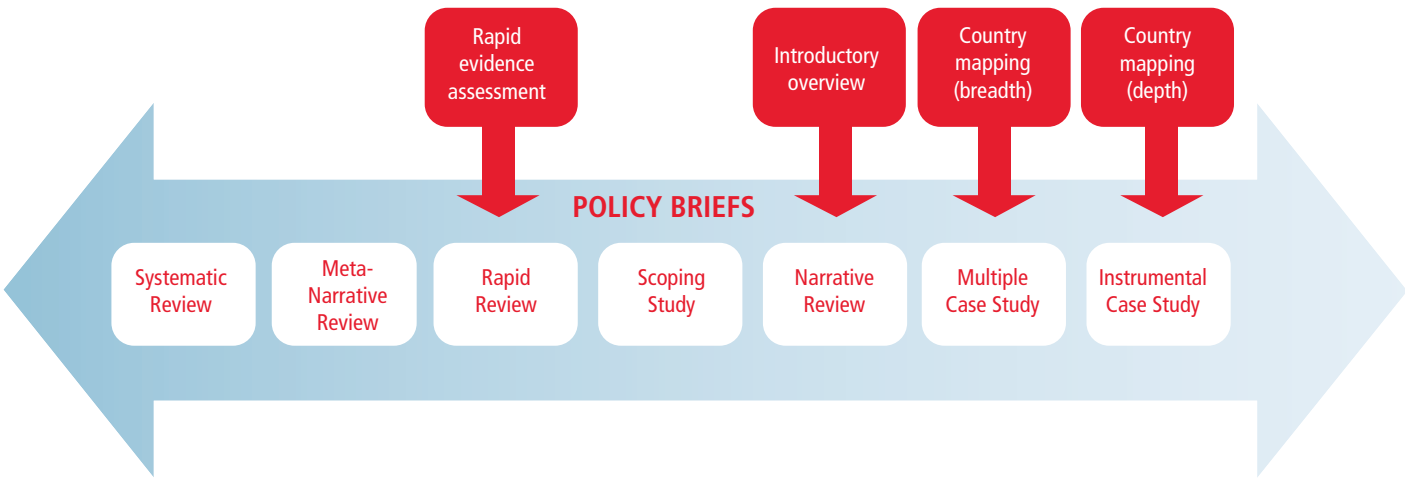
There is no one single way of collecting evidence to inform policy-making. Different approaches are appropriate for different policy issues, so the Observatory briefs draw on a mix of methodologies (see Figure A) and explain transparently the different methods used and how these have been combined. This allows users to understand the nature and limits of the evidence.

There are two main 'categories' of briefs that can be distinguished by method and further 'sub-sets' of briefs that can be mapped along a spectrum:

- **A rapid evidence assessment:** This is a targeted review of the available literature and requires authors to define key terms, set out explicit search strategies and be clear about what is excluded.
- **Comparative country mapping:** These use a case study approach and combine document reviews and consultation with appropriate technical and country experts. These fall into two groups depending on whether they prioritize depth or breadth.
- **Introductory overview:** These briefs have a different objective to the rapid evidence assessments but use a similar methodological approach. Literature is targeted and reviewed with the aim of explaining a subject to 'beginners'.

Most briefs, however, will draw upon a mix of methods and it is for this reason that a 'methods' box is included in the introduction to each brief, signalling transparently that methods are explicit, robust and replicable and showing how they are appropriate to the policy question.

Figure A: The policy brief spectrum



Source: Erica Richardson

Key terms

- **Co-benefits:** The additional benefits of tackling multiple issues simultaneously.
- **Food systems:** Food systems involve everything and everybody involved in producing, storing, packing, processing, distributing, consuming and disposing of food, including the social, political, economic and environmental systems which influence and are influenced by those activities.
- **Health in All Policies:** An approach to public policies across sectors that systematically takes into account the health implications of decisions, seeks synergies and avoids harmful health impacts in order to improve population health and health equity [1].
- **Nutritious foods:** The term 'nutritious foods' is used as shorthand for foods recommended by food-based dietary guidelines as positive for health, acknowledging its limitation in describing the full breadth of a diet that promotes positive health outcomes.

Key messages

- Thinking about food as a 'system' has gained increasing attention in recent years within the European Union (EU) (and beyond) and there have been calls for a more integrated approach to decision-making in this area.
- This approach recognizes that food systems involve a complex set of interactions that work together to influence multiple outcomes, notably health, environment, and the economy, including the livelihoods of farmers and the profitability of businesses.
- Improving health, environment and economy are important goals for governments across Europe and for the EU. Mapping these policy goals identifies explicit connections between these goals and shows that food systems present an opportunity to implement actions to achieve mutual "co-benefits" between them.
- Yet in practice there are conflicts between achieving these goals. Converting these conflicts into connections that yield co-benefits will require reorienting the entire system towards a vision where health, environmental and economic goals are met in synergy.
- In this vision, economic benefits for farmers and businesses would be created through the production and delivery of nutritious foods throughout the system, using environmentally-sustainable production methods.
- This vision for food systems remains highly aspirational; nevertheless, there are specific opportunities where diet-related health, economic and environmental goals could be connected for co-benefits, such as through public procurement and the Common Agricultural Policy (CAP).
- Making these connections requires cross-government and cross-sector collaboration, and could be supported through food systems policy audits, governance mechanisms to link food systems work across national governments and the EU and roundtables to identify specific steps for adaptation or change.

Executive summary

The problem being addressed

While modern food systems successfully deliver a huge range of foods to European citizens, they are also associated with multiple challenges. Poor diets are the leading cause of ill-health in Europe. Europeans eat more sugar, fats and meat than recommended; eat fewer whole-grain cereals and fruits and vegetables than recommended; and overall consume excess energy. In 2016, 62% of the adult population in Europe was estimated to be overweight or obese, with a higher prevalence in lower-income groups.

Food systems are also associated with adverse environmental impacts. The agricultural sector is, for example, responsible for an estimated 11.3% of greenhouse gas emissions. Farming is associated with declining bird populations, has the highest water demand of any sector and also causes pollution. Nevertheless, it is estimated that 100 million tonnes of food is wasted in the EU through the food supply chain.

Food systems are also critical to economies. The food manufacturing industry is a key pillar of the European economy, the largest of any industry sector in terms of turnover (€1098 billion annual turnover) and employment (4.24 million employees). Counting all food-related activities, a total of around 44 million jobs are linked to farming, food processing, and related retail and services in the EU. Yet people who work in food systems face many challenges. In particular, farmer livelihoods are fragile.

Reducing the burden of diet-related ill-health is an important goal for many European governments and many countries have implemented actions to address unhealthy diets. Improving environmental sustainability and building economic prosperity in an equitable manner are likewise key policy goals. Yet there is still significant incoherence between policies, and there is a long way to go to the full implementation of the "Health in All Policies" approach embedded in the EU constitution. In this context, an increasing number of governments and cities are exploring the potential of a more joined-up approach to food policy.

This Policy Brief

This Policy Brief explores how food systems can combine diet-related health with environmental and economic policy goals. It builds on considerable earlier work by analysing the *connections* between different policy goals, and between policy goals and food systems. Through this process it identifies three core aspects of food systems functioning which would need to connect in order to produce co-benefits: economic benefits for farmers and businesses being created (1) through the production and delivery of nutritious foods throughout the system (2), using environmentally-sustainable production methods (3). To move towards this aspirational vision for food systems, it identifies specific opportunities where diet-related health, economic and environmental goals could connect for co-benefits.

The Policy Brief takes a food systems approach in its analysis because different aspects of food are connected and do not exist in isolation. By focusing on connections, a food systems approach enables the identification of common causes of multiple outcomes and how these outcomes are connected, and therefore how connections can be leveraged for co-benefits for more than one policy goal.

The connections

All countries have numerous national policy goals. These are illustrated by the range of goals of the Directorate Generals (DGs) of the European Commission. A review of these goals shows that they concern health, the environment, economy and society, and that there are connections between the goals. For example, goals for agriculture and the oceans include: economic concerns – prosperity in rural and maritime economies; environmental concerns – ensuring the sustainability of the soil, water and fish stocks vital to maintaining production; and health concerns – producing sufficient nutritious foods to keep people healthy. This mapping shows that, despite concerns about policy inconsistencies, there is already a recognition of explicit connections between the overarching public policy goals of different parts of government.

Many of these public policy goals are also in some way connected to the workings of food systems, as reflected at the international level in the sustainable development goals (SDGs). For example, the nutritional quality of the foods produced and sold in the food system affect diet-related health goals, while the ways in which food is grown and distributed affect environmental goals, and employment and income generation in agriculture affects economic goals for producers and farmers. As a result of these connections, food systems emerge as a potential common space for advancing co-benefits for all of these policy goals efficiently and effectively.

The conflicts

Despite this potential, policies and actions designed to address these challenges often conflict and may undermine each other. For example, efforts to reduce sugary drink and meat consumption in Europe create challenges for economic interests and may be viewed as destroying jobs and farmers' livelihoods. Restrictions on neonicotinoid insecticides as a means of protecting pollinators such as bees have been viewed as limiting the economic potential of farming. The economic benefits of rearing livestock are viewed as conflicting with efforts to reduce greenhouse gas emissions. Even connections between health and sustainability face conflicts, such as harvesting fish to improve diets while maintaining sustainable fish stocks.

The vision

Converting these conflicts between goals into connections that yield co-benefits requires deeper change, in which the entire system is reoriented towards meeting health, environmental and economic goals together. This process of designing and managing food systems differently must

recognize that making changes in one part of the system will not necessarily have the intended outcome for diet-related health or other goals unless complementary changes are made in other parts of the system.

Food systems could combine the goals related to diet-related health, environment and economy if they involved farmers, entrepreneurs, small- and medium-sized enterprises and big businesses generating jobs and creating equitably-shared wealth for themselves and local and national economies by producing, distributing, trading, processing, marketing and selling nutritious foods aligned with dietary guidelines to European citizens at affordable prices, using a skilled and decently paid workforce and environmentally-sustainable methods and processes that protect biodiversity, water, soils and air and minimize environmental health risks, food waste and greenhouse gas emissions, with high standards of animal welfare.

The specific spaces of opportunity

While connecting food systems for co-benefits remains a formidable challenge, there are specific opportunities in which nutritious foods, environmentally sustainable production methods and more equitable economic outcomes could come together.

These spaces have the potential to connect all three aspects to achieve multiple goals and present potentially fertile ground for testing out how the necessary connections between the three aspects of food systems functioning could work. These include:

- public procurement
- the Common Agricultural Policy (CAP)
- school fruit and vegetable schemes
- investing in SMEs and entrepreneurship to bring nutritious, sustainably produced foods into deprived neighbourhoods
- short supply chains
- building skills.

Cross-government and cross-sector collaboration

Putting a food systems approach into practice to achieve co-benefits will require cross-government and cross-sector collaboration as well as a broader framework of enabling policy. Building on the considerable ongoing work in Europe, governments could collaborate through:

- conducting food systems policy audits
- creating governance mechanisms to link food systems work across national governments or across the EU
- starting a series of roundtables on the opportunity spaces and leverage points to identify specific steps for change.

These processes could provide the foundations for a new, more integrated policy approach to food systems in Europe.

Policy brief

Introduction

This Policy Brief explores the question: how can food systems combine diet-related health with environmental and economic policy goals? It builds on considerable earlier work [2–7], by analysing the *connections* between different policy goals, and between policy goals and food systems. It advances on work assessing the connections between health and environmental sustainability by building in economic concerns, and goes further than discussions about generic desirable food systems outcomes by focusing on existing, agreed policy goals. Through this process it identifies three core aspects of food systems functioning which would need to connect in order to produce co-benefits: economic benefits for farmers and businesses being created (1) through the production and delivery of nutritious foods throughout the system (2), using environmentally-sustainable production methods (3). To move towards this aspirational vision for food systems, it identifies specific opportunities where governments and actors could take certain steps towards food systems that improve diet-related health, environmental sustainability and equitable economic prosperity.

Box 1: What is a food systems approach and why does it matter?

Food systems are made up of many elements, including: food production (arable, livestock, fish, horticulture); the inputs into food production; food distribution, transport and trade; various forms of food processing; food retailing and other forms of provisioning (catering, restaurants); and the people, processes and infrastructure that constitute and connect these elements. They also include the social, political, economic and environmental systems which influence and are influenced by these activities (Figure 1).

Food systems operate at multiple levels, with interactions between policies and processes at global, regional, national and local levels. The range of food production and consumption activities, or 'food supply chains', are key components of food systems. 'Conventional' industrialized food systems typically have longer supply chains with many phases of transformation, while 'alternative' food systems often have shorter supply chains. These longer food supply chains dominate in Europe and are characterized by a web of interactions between multiple actors from farm to fork and geared towards maximizing efficiency to reduce costs and increase production.

Thinking about food as a system, or systems, is not new, but has gained increasing attention in recent years. Although there are different approaches and definitions, the basic principle behind such approaches is that different aspects of food are connected, rather than existing in isolation. This reflects the broader field of systems science in which interactions and feedback between different parts of the system are explicitly identified and recognized. By viewing food as part of a system, the activities of food producers, processors, distributors, retailers and consumers can be connected and placed in their social, political, economic, historical and environmental contexts.

Food systems involve multiple impacts on factors related to health, environmental sustainability, economy and society. The complex set of interactions in food systems work together to affect these outcomes. For example, the way food is produced, and the economic incentives which support that system, has an impact on the health of people and the planet, while actions to reduce the environmental or health impacts of particular types of food production may have a knock-on effect on economic factors, such as profitability. Likewise, the condition of the environment impacts on the ability to produce food. In practice, there will be conflicts in these goals, meaning trade-offs will need to be managed.

By focusing on connections, a food systems approach enables the identification of the common causes of multiple outcomes, how these outcomes are connected, and therefore how trade-offs can be managed and connections leveraged for mutual benefit. By understanding how interventions in one dimension affect others, both positive and negative outcomes can be addressed and key actions identified that will allow multiple positive outcomes to be produced – that is, to produce co-benefits (creating additional benefits through tackling multiple goals) for more than one policy goal.

Sources: [6,8–13]

In recent years, there have been numerous calls for a more connected approach to decision-making for food systems in Europe and around the world (Box 1) [14]. In 2014, the *European Commission High Level Forum for a Better Functioning Food Supply Chain* recognized "the importance of a holistic approach to ensuring the competitive position of the EU's agri-food sector", acknowledging the need for "consistency between all policy areas affecting the EU food chain: agriculture, food safety, nutrition and health, environment, trade, financial markets, research and innovation, and industrial policy more generally" [15]. In 2015, the *WHO European Food and Nutrition Action Plan 2015–2020* called for "coordinated action at different administrative levels and across government departments to ensure coherence among all policies that influence food systems" [16]. In 2016, the *European Economic and Social Committee (EESC) of the European Union* called for a comprehensive food policy in the EU [17]. This aligns with the sentiment voiced in the *Reflection paper on the future of EU finances*, which called for a "shift towards new, sustainable growth models that combine economic, social and environmental considerations in a holistic and integrated way" and a stronger focus on public goods [18]. In 2017, the *European Committee of the Regions* called for a sustainable EU food policy "establishing a link across different policy areas, including, among others, food production, agriculture, environment, health, consumer policy, employment and rural development, and creating jobs and growth in Europe's Regions and Cities" [19].

Non-government organizations (NGOs) are also calling for more unified 'food systems' approaches to policy-making (Box 1). In 2016, the European Public Health Alliance (EPHA) called for a sustainable food policy for Europe and the following year the European Heart Network (EHN) published a report calling for an integrated health and environment approach to food systems [3,20]. In 2018, the International Panel of Experts on Sustainable Food Systems (iPES-Food) proposed a model for a *Common Food Policy for the EU* following a consultation process with civil society [21].

National governments have also started to act. The idea of a 'food policy' has been on the Dutch Ministerial agenda since the publication of *Towards a Food Policy* by the Netherlands Scientific Council for Government Policy in 2014 [22]. In 2017, France launched the development of a new national food policy, which aims to balance issues of health, sustainability and economy, as well as addressing issues such

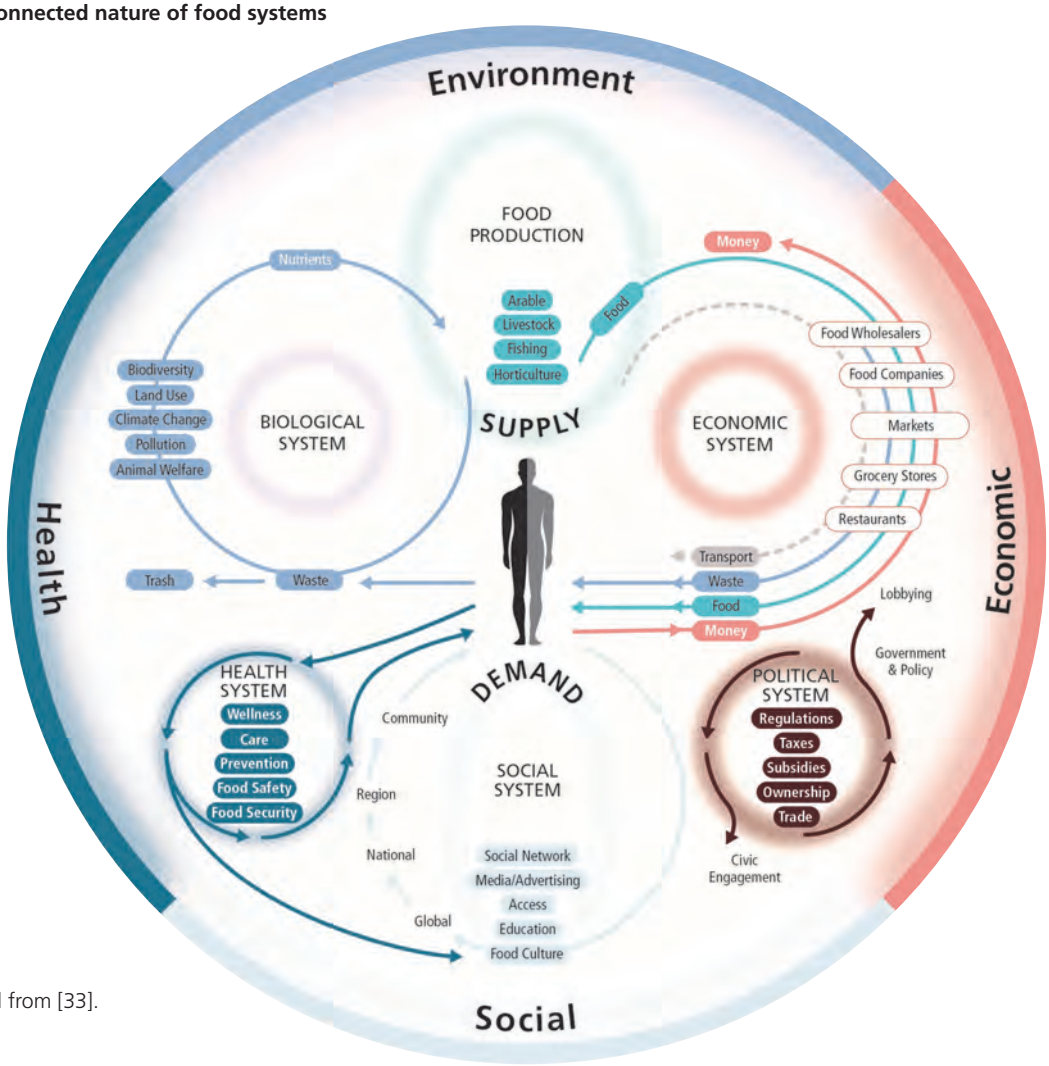
as waste, local provisioning and access to nutritious foods [23,24]. Elsewhere, the Canadian government is developing a *National Food Policy*, which aims to "set a long-term vision for the health, environmental, social, and economic goals related to food, while identifying actions we can take in the short-term" [25]. There has been even more activity at municipal level. As of September 2018, the Milan Urban Food Policy Pact (2015), which sets out steps cities can take to make their food systems more equitable and sustainable, had been signed by 177 cities, including many in Europe [26]. There are also national networks of cities dedicated to improving food policies in countries such as France, the Netherlands and the UK [27].

In addition, there have long been calls for Health in All Policies. Health in All Policies is embedded in Article 168 of the Lisbon Treaty, which requires that "a high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities" [28]. Yet, as the Helsinki statement on Health in All Policies (2013) notes, "governments have a range of priorities in which health and equity do not automatically gain precedence over other policy objectives" [29]. A recent review of EU food-related policies concluded that "health is not always integrated, and the health dimension was often absent, or may be narrowly conceived as food safety" [2].

Thus while there has been progress [26], in practice, Europe is far from a situation where regional, national and local policies explicitly acknowledge and leverage *connections* in food systems to consider health, environment and economy, and to address conflicts between goals [30]. For example, an analysis of EU policies published in 2018 showed numerous inconsistencies and incoherencies in EU food-related policies [2]. An analysis of sustainable food chains in Europe published in 2016 similarly identified "blind spots" where there are contradictory policy drivers in European food systems [31]. This reflects the situation for food systems in the rest of the world, where there are likewise an "increasing number of policies, programs and strategies designed to address specific problems" but they are "'silo' solutions" where "little thought is given to their consequences, trade-offs and impacts far beyond their intended effects" [32].

This Policy Brief takes a food systems approach (Box 1) to consider both what the connections are between the overarching policy goals, and between those policy goals and food systems. It then explores what aspects of food systems functioning need to be connected in order to produce *co-benefits* – the additional benefits of tackling multiple goals simultaneously. Our view is that it is only by

Figure 1: The connected nature of food systems



Source: Adapted from [33].

understanding these connections that conflicts can be managed, co-benefits created and specific spaces of opportunity identified where countries can take specific actions in food systems to bring benefits for diet-related health, environmental sustainability and economic prosperity.

The Policy Brief starts by setting out the *problem* – the food systems challenges in Europe. It describes the health and sustainability problems associated with food systems in Europe (the huge burden of diet-related ill-health and environmental degradation) as well as showing how vital food systems are to the European economy. It then moves on to map out the *connections*, highlighting how food systems are relevant across policy goals throughout government, and focusing on health, environmental and economic goals. Building on the example of the sustainable development goals (SDGs), it uses the policy objectives of the Directorate Generals (DGs) of the EU as broadly analogous to national level policy goals. It identifies the connections between policy goals, as well as the connections between food systems and the goals. The Brief then discusses the current reality of food systems as, in practice, many goals act *in conflict* with one another, and it provides a series of real examples. On the basis of this analysis, the Policy Brief then presents a *vision* of basic aspects of food systems functioning that would need to connect in order to deliver co-benefits for health, sustainability and economic equity (Figure 2). It then identifies specific spaces of opportunity where governments and actors across food systems could take action to move towards this vision. It ends by offering ideas for improving cross-government and cross-sectoral collaboration and governance. The methods used to produce the Policy Brief can be found in Box 2. It draws on a definition of food systems (Box 1) which emphasizes their breadth and interconnectivity.

Box 2. Methods

This Policy Brief was produced using three key methods:

1. A literature review on food systems challenges in Europe.
2. A policy analysis of the goals of the European Commission DGs.
3. A visioning exercise on potential synergies between goals.

The literature review involved examining academic sources and grey literature, as well as other sources on food systems and food policy. The primary focus was Europe, although some global and national level reports were included where appropriate.

A policy analysis of the DG goals, as broadly analogous to member state national policy goals, was completed by compiling a list of goals from each DG website, under 'Mission' or 'Responsibilities', or, failing that, via key documents such as the current strategies. Websites varied in style, so the goals vary stylistically. The most relevant 10 DGs (covering economy, health and environment) were used as the basis for a table to be analysed and to inform Figure 2. A further nine DGs, which were less directly relevant, were also used in the analysis (see Annex 1). The following DGs were not included as they were not deemed to be relevant or focused on support services: BUDG; COMM; ECHO; EUROSTAT; FISMA; NEAR; HR; DIGIT; SCIC; JRC; TAXUD; DGT.

The connections between the DG goals were identified by the authors through a brainstorming exercise. Inspired by the approach used by the Food and Agricultural Organization of the United Nations (FAO) to link the SDGs to food and agriculture, a subsequent analysis of connections between the various goals and food systems was grounded in the literature, in particular that which formed the basis of the 'Food systems challenges' section.

The visioning exercise was completed by the authors, drawing on the findings from the previous two methods, as well as their own knowledge and experience of working in food systems analysis and policy. Several food systems visions from policy projects were also identified and helped to inform the content.

The evidence

Food systems in Europe

Modern food systems deliver a huge range of foods to European citizens. Nevertheless, European governments, the food industry, NGOs and researchers alike recognize that this success in building food systems to deliver affordable and acceptable foods has led to multiple challenges [20,34,35].

Food systems challenges

One of the primary challenges is the high rates of diet-related ill-health. Diet-related ill-health is responsible for most morbidity and mortality in Europe and, indeed, globally. Europe faces huge and expensive challenges posed by obesity, diet-related non-communicable diseases (NCDs), micronutrient deficiencies and food insecurity [36]. The World Health Organization (WHO) estimated that almost two thirds (62%) of the adult population in Europe was overweight (body mass index (BMI) of over 25 kg/m^2) in 2016, including 25% obese (BMI of over 30 kg/m^2) [37]. In many countries, the prevalence of obesity has tripled since the 1980s, and obesity and overweight are increasingly common at younger and younger ages. Obesity and overweight are risk factors for a range of non-communicable diseases, most notably diabetes, cardiovascular diseases and many cancers [38].

Diet-related ill-health is socially patterned, and a major contributor to health inequalities [39]. Obesity, for example, is more prevalent in lower-income groups and in those with the lowest educational attainment: on average in the EU, 17% of the adult population is obese, but the figure is 21.4% for those with the lowest educational attainment, compared to 11.8% for those with the highest [40]. The indicators for self-reported diabetes follow the same social gradient, as do indicators for fruit and vegetable consumption. For example, on average in the EU in 2014, only 50.8% of adults reported consuming vegetables at least once a day; this decreases further to 46% of adults with the lowest educational attainment, compared to 58.1% of adults in the highest education level bracket [40].

These conditions are all influenced by the quality of the European diet. Europeans eat more meat, sugar and fats

than recommended; eat fewer whole-grain cereals and fruit and vegetables than recommended; and overall consume excess energy. For example, adults throughout Europe receive more than 5% of their energy from added sugars (roughly 25 g/day of added sugars, assuming an average 2000 kcal diet). Some population groups exceed 10% (roughly 50 g/day), with young men having the highest absolute intake. Children and adolescents obtain a higher percentage of their total energy intake from added sugars than adults, consuming more than 10% of their daily energy intake from added sugars [4]. Similarly, while data for other food groups is patchy, it suggests the majority of countries do not meet the carbohydrate, sugar or fibre guidelines, and most countries exceed the sugar, fat and saturated fat guidelines [41].

Dietary patterns are influenced by a broad range of social, economic, demographic and psychological determinants, one of which is the food supply chain (Box 1) [2,3,7,42,43]. The way in which food is produced, what is produced, how these products are transformed, the way economic value is generated, gained and lost, all influence what foods are available, what they cost and how they are marketed and promoted. Decisions made by key actors in the food system – food manufacturers, retailers, caterers, and the communications agencies which serve them – all affect these outcomes and the nature and extent of the advertising and promotion to which Europeans are exposed.

Understanding of diet-related ill-health in the context of the wider food system has grown in recent years and this has been recognized in a series of reports and initiatives [3,42,43]. These reports highlight the connections between different components of the food system (Figure 1), from agriculture to distribution, processing to retail, and what people eat.

There is also growing recognition that food production is linked to some of the world's most challenging health problems beyond diet-related health: food safety, antimicrobial resistance (AMR) and worker health [44,45]. In the case of AMR, it has been estimated that globally 700,000 people die of resistant infections each year and that, by 2050, 10 million lives will be at risk annually as a result of resistant infections [45].

Food systems also involve major environmental challenges: the ways in which food is farmed, processed, sold and consumed have significant impacts on the environment, including the depletion of soil quality and biodiversity (loss of plant, bird and insect life), as well as increasing greenhouse gas emissions (e.g. from transportation) [6,46–48]. In the EU, the agricultural sector was responsible for 11.3% of greenhouse gas emissions in 2014 [6]. Agriculture is associated with declines in common farmland birds (increased use of pesticides and herbicides results in reduced insect populations) and seed production by plants, thereby reducing food for birds. In the EU, the numbers of common farmland birds decreased by 32% between 1990 and 2015 [49].

The decline in pollinators is a particular cause for concern, given their important role in food production. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has noted that "the International Union for Conservation of Nature Red List assessments indicate that 16.5 per cent of vertebrate pollinators are threatened with global extinction (increasing to 30 per cent for island species)" and, while no global Red List assessments specifically for insect pollinators exist, "regional and national assessments indicate high levels of threat for some bees and butterflies. In Europe, 9% of bees and butterfly species are threatened and populations are declining for 37% of bees and 31% of butterflies (excluding data-deficient species, which includes 57% of bees). Where national Red List assessments are available, they show that often more than 40 per cent of bee species may be threatened" [50].

Food is a significant consumer of resources, such as land, soil, energy and water [51]. Cultivating, processing, packing and bringing food to the table represented 26% of the EU's total energy consumption in 2013 [6]. Agriculture has the highest water demand of any sector [6]. Annually, around 40–45% of total water use in Europe is allocated to crop irrigation; this is particularly intensive (80% of the total water used in southern Europe) between April and August [52].

Agriculture causes pollution. According to the European Environment Agency (EEA), "around 94% of ammonia emissions in Europe stemmed from agriculture in 2015, mainly from activities such as manure storage, slurry spreading and the use of inorganic nitrogen fertilisers. Agriculture is one of the main sources of nitrates in surface and ground waters. In several regions across Europe, often those with intensive agriculture, nitrate concentrations are still too high" [53]. High concentrations of nutrients (especially phosphates and nitrates) in water bodies cause eutrophication, which promotes algae growth and depletes oxygen in the water; this in turn has severe impacts on aquatic life and water quality that affect the availability of fish for consumption [54].

Food systems also involve waste, at all stages in the chain from production to consumption, and this must be disposed of. It is estimated that "annually, around 100 million tonnes of food is wasted in the EU, forecast to increase by 20% by 2020 without preventive action" [51].

Along with pollution, the 'good environmental status' (GES) of the marine environment is threatened by fishing beyond sustainable levels. The Seventh Environment Action Programme (7th EAP), in line with the Marine Strategy Framework Directive (MSFD), requires the EU to meet its 2020 objective of achieving GES of the marine environment, which means that the different uses made of Europe's seas are conducted at a sustainable level [55]. While there are signs of recovery in certain stocks since the 2000s, around 74% of fish and shellfish stocks in Europe's seas are not in GES and the EEA says that "Europe's marine ecosystems continue to display symptoms of degradation and loss of resilience, which will be exacerbated by the effects of climate change" [55].

Evidence shows that people who work in food systems – from farm to fork, in agriculture, manufacturing, retailing and food service – face many challenges. For example, it has been reported that "agricultural incomes lag behind income in other sectors, which encourages the outflow of young and skilled labour from farming" [56]. Also viewed as problematic is "the limited amount of agricultural land offered for sale or rent and the poor access to capital", which reportedly makes it "difficult for the younger generation to enter farming, while the high proportion of older farm operators moderates long-term return investments" [56]. These issues become more acute in the lower-income countries of Europe: International Labour Organization (ILO) data on employment in agriculture reveals that it represents 1.2% of the total labour force in Belgium and the UK, 1.4% in Germany, 13.6% in Greece, and 28.3% in Romania [57].

Consolidation of EU agricultural production is a further trend, which has led to the total number of farms in the EU dropping. The European Commission noted in 2016 that farm numbers had reduced from "14.5 mn in 2005 to 10.7 mn in 2013, equal to a decline of 26 per cent" and that "this consolidation process is expected to continue, and the number of units is expected to drop to 7 mn in 2020" [56]. Agricultural land use in the EU has been contracting: according to World Bank World Development Indicators, the proportion of total land area as agricultural land in the EU has declined from 50.2% in 1990 to 43.5% in 2015 [58].

Changing food systems

The changes in the environment, people's health and in farming outlined above, reflect the changing nature of food supply systems in Europe and globally since the Second World War, transforming from a system based on diverse farm production producing for local markets to a complex, globalized system characterized by high levels of food processing, supermarket retailing and heavy use of advertising (Box 1). Not only have production methods changed, but so have the types of produce being grown, with a greater dependence on a much more limited number of crop varieties. In Greece, 95% of local varieties of wheat have been abandoned, while Italian farming manuals at the start of the 19th century featured 100 varieties of apple whereas today just three varieties equal 80% of production [59]. The story in animal husbandry is similar, with high-performance breeds spreading and local breeds in decline [59].

How food is sold has also changed. Farmers now sell through an increasingly complex array of food chains involving food manufacturers, supermarkets and the restaurant industry. Both manufacturers and supermarket chains have gained power and influence in the food system. Of all the food manufacturers in the EU, 1% are responsible for 49.5% of total turnover, 52.2% of value and 35.5% of employment in the sector [60]. The remaining 99% are small and medium-sized enterprises (SMEs) (with fewer than 250 employees), 78.8% of which are 'micro-companies' (with fewer than 10 employees) [61]. The large companies typically focus on manufactured, packaged foods, such as snacks, soft drinks, dairy products and baked goods. In 2012–13, the sectors with most active R&D were: dairy products; ready-made meals; soft drinks; savoury frozen products; biscuits; meat, delicatessen, poultry; appetizer grocery products; chocolate products; cheeses; condiments and sauces [61].

High levels of concentration are also found in the retail sector; supermarkets, hypermarkets and discounters control 54% of total edible grocery sales in the EU [62]. The market is even further consolidated in some countries: the share of the top five retailers in 13 Member States exceeded 60% in 2014 [62]. Figures from the UK highlight where value from food production is concentrated. Of the £198 billion spent by consumers on food (£86 billion on catering services, £112 billion on food eaten at home), gross value added (GVA) for farming and primary producers, plus fishing and aquaculture, represents £10.4 billion; and agricultural wholesalers £2.1 billion; whereas the combined GVA for the food and drink manufacturing, wholesaling and retailing sectors amounts to £66.3 billion and £26.9 billion for catering [63].

Food is also increasingly traded. According to 2016 trade body figures on trade within the single market, intra-EU exports were worth €254.6 billion, representing three quarters of total EU food and drink exports (€356.6 billion) [64]. Extra-EU trade has risen from around €50 billion in exports and €50 billion in imports in 2008, to €102 billion exports and €71.9 billion imports in 2017 [64].

Food systems and the economy

As food systems have transformed, they have remained central to the European economy. The food industry trade body, Food Drink Europe, considers the industry to be a "key pillar of the European economy", reporting that it is "the first manufacturing industry in the EU, leading in terms of turnover (15.6%), value added (13%) and employment (15.2%)" [34]. Data from Food Drink Europe show that EU food and drinks manufacturing and processing had a turnover of €1098 billion and 4.24 million employees in 2015 [65]. Counting all food-related activity, a total of around 44 million jobs are linked to farming, food processing and related retail and services in the EU [66].

Trends in food production also have important implications for rural economies, which are important not only for employment, but also for recreation and tourism [66].

Policy goals and food systems

Connections across public policy goals

In 2015, the Member States of the United Nations adopted a new series of goals designed to drive development in all countries: the SDGs. This ambitious and aspirational set of 17 sustainable development goals (listed in column one of Table 1) and 169 targets were designed to advance the three pillars of sustainability – economic, environmental and social (including health) – in an integrated and indivisible manner [67].

Table 1: Food systems in the 2030 Sustainable Development Goal Agenda

	Goal	Relevance to food systems
1	No poverty	Almost 80% of poor people live in rural areas
2	Zero hunger	We produce enough food for everyone, yet about 800 million go hungry
3	Good health and well-being	Good health starts with nutrition
4	Quality education	Nutritious food is critical to learning
5	Gender equality	Women produce half the world's food, but have much less access to land
6	Clean water and sanitation	Sustainable agriculture holds potential to address water scarcity
7	Affordable and clean energy	Modern food systems are heavily dependent on fossil fuels
8	Decent work and economic growth	Agricultural growth in low-income economies can reduce poverty by half
9	Industry, innovation and infrastructure	Agriculture accounts for a quarter of gross domestic product (GDP) in developing countries
10	Reduced inequalities	Land reforms can give fairer access to rural land
11	Sustainable cities and communities	Rural investment can deter unmanageable urbanization
12	Responsible consumption and production	One third of the food we produce is lost or wasted
13	Climate action	Agriculture is key in responding to climate change
14	Life below water	Fish gives 3 billion people 20% of their daily animal protein
15	Life on land	Forests contain over 80% of the world's terrestrial biodiversity
16	Peace, justice and strong institutions	Ending hunger can contribute greatly to peace and stability
17	Partnerships for the goals	Partnerships help raise the voice of the hungry

Source: adapted from [69]

While these goals are broader than food, they have important relevance for food systems (as indicated in column two of Table 1). Improving diet-related ill-health is not explicitly mentioned in the SDGs, but it is implicit in both Goal 2 on food security and nutrition (summarized as 'Zero hunger'), which includes a Target (2.2) to "end malnutrition in all its forms"; and Goal 3 on improving health, which includes a Target (3.4) on reducing the burden of mortality from NCDs [67]. The *2017 Global Nutrition Report* showed clearly that achieving the SDG targets on nutrition and health would require putting this integrated approach into practice, by leveraging connections in the systems underpinning these multiple goals [68]. For example, improving nutrition is a means of reducing poverty and enabling the development of a knowledge economy; reducing poverty and shared economic prosperity are in turn ways of improving nutrition.

Table 2: Connections between policy goals and food systems: the example of the policy goals of 10 Directorate Generals of the European Commission

Policy area and DG	Selected core policy goals of each DG*	Examples of connections between policy goals	Examples of how policy goals are connected with food systems**
Health and Food Safety – DG SANTE	• Protect and improve public health. • Ensure safe food. • Protect the health of animals and crops.	• Good health is good for the economy. • Protecting animal and crop health affects environmental goals.	• Diet-related ill-health is affected by what foods are made available, affordable and appealing by food systems actors. • How safe food is, as well as animal and crop health, are influenced by food systems
Agriculture and Rural Development – DG AGRI	• Promote sustainable development of Europe's agriculture. • Well-being of rural areas including decent standard of living for farmers.	• Agriculture contributes to job creation for rural development. • Agricultural production methods affect the environment, food safety and the health of workers.	• Agriculture is an explicit component of food systems, affecting food safety, food availability and affordability, and the livelihoods of farmers, who represent a significant constituent of the rural population and economy.
Education, Youth, Sport and Culture – DG EAC	• Lifelong learning and mobility. • Quality and efficiency of education.	• Education provides skills needed to support economic competitiveness. • Learning is enhanced by good health.	• The availability of an educated and skilled workforce affects food systems; education is a source of people's knowledge about food systems.
Economic and Financial Affairs – DG ECFIN	• Raise economic welfare of citizens. • Promote economic growth.	• Economic welfare influences the ability of people to pay for goods and services that promote health. • Economic growth creates financing needed to protect the environment.	• Food systems make a major contribution to economies.
Employment, Social Affairs and Inclusion – DG EMPL	• Better jobs. • Promote skills.	• Being economically active and productive in the labour market requires good health. • Being an economically productive worker requires education and skills.	• Food systems employ people.
Environment – DG ENVI	• Citizens live well within the planet's ecological limits. • Protect, value and restore biodiversity.	• Environmental damage influences economic development. • Crop and animal health is important for the environment.	• Environmental degradation is part of food systems.
Internal Market, Industry, Entrepreneurship and SMEs – DG GROW	• Entrepreneurship. • Access to funding for SMEs.	• Entrepreneurship in businesses affects health and the environment	• The majority of food businesses in food systems are SMEs.
Maritime and Fisheries – DG MARE	• Thriving ocean economy. • Safe and stable supply of seafood.	• Consuming fish contributes to health. • Fishing has environmental impacts.	• Fisheries are an explicit component of the food system, and a source of food and employment
Research and Innovation – DG RTD	• Research, innovation, jobs. • Tackle societal challenges.	• Technologies can support environmental and health goals.	• Food systems are the subject of research and innovation, and a source of jobs.
DG TRADE	• Prosperity. • Solidarity and security.	• Trade can have environmental and health consequences.	• Food is one of Europe's top five traded products

Notes:

*Policy goals were primarily drawn from each DG's website under 'Mission' or 'Responsibilities' or, failing that, via key documents such as the DG's current strategy. Websites varied in style, thus the goals vary stylistically (see Box 2).

**Analysis of connections with food systems is drawn from the above section on 'Food systems challenges'.

Source: Authors' own compilation.

At a national level, governments have a wide range of overarching policy goals embedded throughout their policies, legislation and other official documents. These include a variety of economic goals, as well as those related to society, the environment and health. As an illustration of the wide range of goals that exist at the national level, Table 2 lists some of the core policy goals of 10 of the DGs of the European Commission. These 10 DGs were selected to provide representation of the health, economic and environmental dimensions of government, drawn from a broader list of the goals of 19 DGs (Box 2; Annex 1). By listing the policy goals in Table 3 it becomes evident that the goals of different government departments are interconnected, as shown in column three.

Reflecting national level policy goals, the economic objectives of the EU include strong growth, jobs, entrepreneurship, competitiveness and investment [70]. A strong European economy and prosperity is a central objective. "Jobs growth and investment" appears at the top of the 10 European Commission priorities for 2015–19, as highlighted by Table 3, which focuses specifically on how a selection of DGs present their contributions to overall priorities beyond their own policy areas [71]. These economic goals are not restricted to just the obviously economically oriented departments, such as the Directorate General for Economic and Financial Affairs (ECFIN), but are found throughout the DGs. DG AGRI, for example, lists its contribution to jobs, growth and investment as its leading contribution to the European Commission's top 10 political priorities (Table 2).

As highlighted in Table 2, DG AGRI also explicitly focuses on rural development and on decent standards of living for farmers [72]. The DG responsible for oceans, DG MARE, aims for a thriving ocean economy and prosperous coastal communities [73]. These shared goals are reflected by the European Commission's (2017) *Communication on the Future of Food and Farming*, which highlights contributions of the EU Common Agricultural Policy (CAP) to economic priorities including: boosting quality employment, growth and investment; harnessing the potential of the circular economy and the bioeconomy, while bolstering environmental care and fighting and adapting to climate change; fully connecting farmers and the countryside to the digital economy; and contributing to the European Commission's agenda on migration [66].

Table 3: DG contributions to current EU political priorities (2015–19)

Top 10 political priorities	DG SANTE	DG AGRI	DG CONNECT	DG JUST	DG ECFIN	DG EAC	DG MARE	DG RTD
Jobs, growth and investment	✔	✔	✔	✔	✔	✔	✔	✔
Digital single market	✔	✔	✔	✔		✔		✔
Energy union and climate		✔					✔	✔
Internal market	✔	✔						✔
A deeper and fairer economic and monetary union					✔			
A balanced progressive trade policy to harness globalization	✔	✔						
Justice and fundamental rights				✔				✔
Migration								✔
A strong global actor								✔
Democratic change				✔				

Source: Authors' own compilation, as stated on DG websites, where available.

Notably, economic goals are also a focus of the DG responsible for health, DG SANTE, which builds its strategy for 2016–2020 around using health to advance three economic priorities: a new boost for jobs, growth and investment in the EU; a deeper and fairer internal market with a strengthened industrial base; and a reasonable and balanced free trade agreement with the United States on the basis that "a population in good health is also good for the economy" [74]. It states that EU public health activities make an economic contribution by keeping people in work. It also highlights the additional benefit of tackling poverty and social exclusion, because the "single most important cause of poverty is inability to work", i.e., by reducing premature mortality and morbidity, fewer people are excluded from the labour market due to long-term health conditions [75].

Similarly, DG ENVI's development and implementation of an environmental policy framework that responds to environmental challenges within the EU has explicit aims to "create new business opportunities, stimulate jobs and growth and improve the sustainability of economic processes and the health and well-being of citizens and avoid financial and social costs associated with pollution and catastrophe" [76].

Government policy goals also include a broad range of social objectives, as reflected by "justice and fundamental rights" and "making the EU more democratic" being two of the top 10 political priorities for the EU [71]. Specific policy goals of the EU DGs (Table 3; Annex 1) include security, consumer rights in Europe and education.

Goals designed to protect the environment feature strongly at the European level, with climate change a top 10 priority for the EU with its own department (DG CLIMA). There is also a department for environmental protection (ENVI), which has explicit environmental goals, such as enhancing biodiversity (Table 2). The importance of achieving environmental goals extends beyond the obvious DGs. SANTE includes a goal to protect the health of crops and forests; MARE has one relating to preserving seas and oceans, and healthy seas; AGRI includes one covering environmental protection; the department dedicated to transport, DG MOVE, has a goal of environmentally friendly mobility solutions; and the department for international development, DEVCO, has one for sustainable development (Table 3). The EU also has a long-term vision of environmental sustainability that embeds health and economic well-being ("living well, within the limits of our planet") by 2050 [77].

Although the concept of Health in All Policies is embedded in the Lisbon Treaty, health does not feature as a top 10 political priority and features only significantly in the department dedicated to it – DG SANTE. DG SANTE has the broad goal to "protect and improve public health" and further objectives to:

- ensure Europe's food is safe and wholesome
- protect the health and welfare of farm animals
- protect the health of crops and forests.

The EU's food safety policy covers food from farm to fork. It is designed to "guarantee safe, nutritious food and animal feed, high standards of animal health and welfare and plant protection, as well as clear information on the origin, content, labelling and use of food" [78]. Nevertheless, the DG SANTE goal of safety for humans and animals is adopted by several other DGs: AGRI addresses food safety, while EMPL is concerned with health and safety at work, and the environmental DG ENVI is concerned with minimizing environmental health risks.

This mapping out of European-wide policy goals indicates that, despite analysis showing inconsistencies in EU food-related policies [2] and "contradictory policy drivers" (see 'Introduction') [31], there is recognition of the explicit connections between the overarching public policy goals of different parts of government (Table 3, column three). This indicates there is potential to build on these connections to support a more integrated approach to achieving policy goals associated with food systems.

Connections between food systems and policy goals

The next set of connections needed to assess how a food systems approach can contribute to creating co-benefits for diet-related ill-health, the environment and economy is therefore between these general overarching policy goals (grouped broadly into economic, environment and health) and food systems. The FAO has already mapped out these connections for the 17 SDGs (Table 1) [69]. Its analysis reveals connections between food systems and all of the SDGs. It identifies some basic connections, such as the importance of food systems in making food accessible to all (SDG 2), as well as some less intuitive connections, such as the link between fossil fuel use in food systems and the goal on energy use (SDG 7) and agriculture and greenhouse gas emissions (SDG 13). Their message is clear: investment in food systems will drive change across multiple goals.

Again, as is broadly analogous to national level policy goals, Table 2 (column three) shows how food systems are relevant to each EU policy goal. Drawing on the summary of evidence set out under 'Food systems challenges' above, there is often an explicit connection between food systems and policy goals. For example, what people eat – and therefore diet-related health – is inevitably affected by the food produced, processed, retailed and marketed in the food system, meaning that food systems are critical for any national health ministry. Likewise, the ways in which food is produced and consumed influence and are influenced by the environment, making food systems important for any ministry in government dealing with environmental affairs. The food supply chain influences farmer livelihoods, making it important for any ministry of agriculture. And, food is an economic sector, so it is linked to economic goals. In other cases, the connection between policy goals and food systems is indirect. For example, the majority of food businesses in food systems are SMEs and the availability of an educated and skilled workforce affects how food systems operate.

By taking this food systems approach to mapping out the potential connections, food systems emerge as a common

space for advancing co-benefits for health, environmental and economic goals, and thus have a potentially important role in achieving policy goals in all of these areas more effectively and efficiently.

Conflicts

Despite this potential, in practice, there are numerous examples of where the connections between goals, and with food systems, actually lead to conflict, with efforts to meet specific goals undermining other goals. Some examples of these food systems conflicts between health and economic goals, environmental and economic goals, and environmental and health goals are set out below.

Health and economic goals

As described in the 'Food systems challenges' section above, diets in Europe are high in fats, refined carbohydrates/sugars and salt. Selling these foods leads to economic benefits for businesses. While this can benefit economic objectives, such as jobs and growth, it does not benefit health goals. In this context, several European countries have implemented taxes to raise the prices of sugary drinks, including France, Hungary, Ireland, Portugal and the UK [79,80]. According to a report by the WHO Regional Office for Europe, "experience with the implementation of such policies in the Region has shown that they are feasible and can influence consumption and purchasing patterns as intended, with a significant impact on important dietary and health-related behaviour" [81].

Yet, attempts to influence food consumption, such as these taxes, potentially conflict with the economic goals of manufacturers [80]. For example, it was reported that the share price of one European drinks company fell 2.4% when the UK Sugar Levy was announced in April 2016, and in 2017 the same company incurred £1.4 million in costs in reformulating popular drinks to avoid their being subject to the levy [82]. In this context, the soft drinks trade association in Europe, UNESDA, has been a vocal opponent of such taxes, asserting on its specially formulated website (www.fooddrinktax.eu) that taxes will not solve obesity and have unintended consequences, such as job losses [83], echoing arguments made in other countries where taxes have been proposed and implemented [84]. Evidence from the United States and Mexico has found no impact on employment [85,86]. An analysis of the economic impact of taxes commissioned by DG Enterprise and Industry in 2014 noted that any economic impact of taxes would depend on a wide range of factors [80].

Another conflict that has been subject to both analysis and speculation is between the goal of diet-related health and the EU CAP [87]. A health impact assessment conducted in the 1990s concluded that the CAP had negative implications for the consumption of animal fats, and fruits and vegetables [87], and more recent research concluded that liberalizing sugar markets in Europe risks damaging public health [88]. While the accuracy of these connections has been roundly disputed [89,90], there remains widespread discussion of the need to mainstream public health into CAP reform (see section below) [3,66,91–93]. The complexity of this issue was confirmed by a recent study on the CAP and nutrition, which concluded there were very different world views on this apparent conflict and that "aligning agricultural policy such as CAP with nutrition is complex, not least because the aims of agricultural policy are predominantly economic" [94].

It has also been speculated that the CAP has negative implications for diet-related health in developing countries [95], reflecting broader global discussions about the relationship between the economic goals of trade with health goals [96]. Although also disputed [97], there are concerns too that achieving trade goals has the impact of facilitating the "nutrition transition" towards less healthy diets in low- and middle-income countries [98,99].

Environmental and economic goals

One high-profile example of a potential conflict between environmental and economic goals implemented at the EU level is the restrictions on neonicotinoid insecticides as a means of protecting pollinators. Neonicotinoids are one of the most frequently used pesticides in the world, applied to flowering crops [100,101]. The farming community has reacted strongly to this measure, designed to meet environmental goals, on the basis it has "serious consequences for farmers' ability to grow produce" [102,103].

The EU biofuels policy is another example. The EU policy to support increased biofuels has been criticized by NGOs for exploiting crops which could be used for food, driving up food prices, and having adverse environmental impacts linked to deforestation [104]. Yet the EU response – to downgrade biofuels targets – was then criticized by farmers for its negative impact on the rural economy, notably on jobs [105].

A particularly thorny issue is meat. Producing animals is associated with greenhouse gas emissions, and eating excess meat also has adverse health implications. Yet, at the same time, meat is a key export product and holds important cultural significance as an aspirational food [106,107]. Concerns have been raised that attempts to reduce the greenhouse gas emissions from meat production may inadvertently support more industrialized farming systems, thus while "livestock intensification may lower greenhouse gas emissions per kilogram of meat or milk output", it "raises animal welfare concerns, increases antibiotics use, or causes local job losses" [106]. Modelling studies on a switch from meat and dairy towards more plant-based diets have highlighted the trade-off between improved health and decreased environmental impacts, and the negative economic impacts on farmers [108,109].

Another key environmental–economic tension is how the costs of food production, including its impact on the environment, remain externalized. One UK study, for example, calculated "the annual total external costs of UK agriculture in 1996 to be £2343 million, equivalent to £208

per hectare of arable and permanent pasture", with significant costs arising from, for example, contamination of drinking water with pesticides (£120 million per year), damage to wildlife, habitats, hedgerows and drystone walls (£125 million), emissions of greenhouse gases (£1113 million), and from soil erosion and organic carbon losses (£106 million) [110]. On a global level, a recent FAO report highlighted how inputs have helped to boost food production, but also how the discharge of large quantities of agrochemicals, organic matter, sediments and saline into water bodies "affects billions of people and generates annual costs exceeding billions of dollars" [111].

Health and environmental goals

Recent analysis indicates that "sustainable diets" are one way forward for Europe to connect diet-related heath to environmental goals [63,112,113]. However, even this has proved more complex than first thought. For example, modelling has highlighted how healthy diets can have "high environmental impacts if rich in dairy, lean meats, and fresh produce grown under protected conditions or transported by air" [106].

Fish is another point of tension: nutrition advice to eat fish, "an important source of omega 3 fatty acids, iodine and vitamins A&D, as per dietary guidelines", may conflict with addressing declining fish stocks [43,63]. There are also economic implications of managing the environmental aspects of fish production. According to EU data, "fishing and fish processing provide jobs for over 350,000 people" [114]. This has led DG MARE, the maritime affairs and fisheries directorate, to highlight how "the EU makes every effort to ensure fishing is sustainable – both economically and environmentally – while protecting consumers' interests and taking fishermen's needs into account" [114].

The presence of these conflicts between goals indicates that converting connections into co-benefits rather than conflicts requires deeper change in which the entire system is reoriented towards meeting health, environmental and economic goals together. This process of designing and managing food systems differently must recognize that making changes in one part of the system will not necessarily have the intended outcome for diet-related health or other goals unless complementary changes are made in other parts of the system (Box 1). For example, while it has been argued that on-farm production should be aligned with food-based dietary guidelines, transformations between farm and fork mean that even "healthy" crops can become "unhealthy", or not reach people who need them most (see below on the CAP for more detail). So what would food systems look like that could deliver these co-benefits?

What could be? A vision of food systems with co-benefits

What would it take to deliver these co-benefits? Based on analysis of the connections presented, we now define a vision of what food systems would look like if they were to deliver. The basic aspects of food systems functioning needed to deliver this vision are threefold:

- Nutritious foods that promote health and align with food-based dietary guidelines as the core focus of production, distribution, trade, processing, marketing, retailing and catering throughout the system (**health**).
- Methods and processes throughout the food supply chain that support environmental sustainability (**environment**).
- A private sector, including farmers, entrepreneurs, SMEs and big business that creates jobs and generates wealth equitably shared with the workforce and national and local economies (**economy**).

Deeper food systems change would involve connecting these three aspects: health (nutritious foods) with positive aspects of the economy (generating jobs and wealth in an equitable manner) with environmental sustainability (methods to reduce environmental impact).

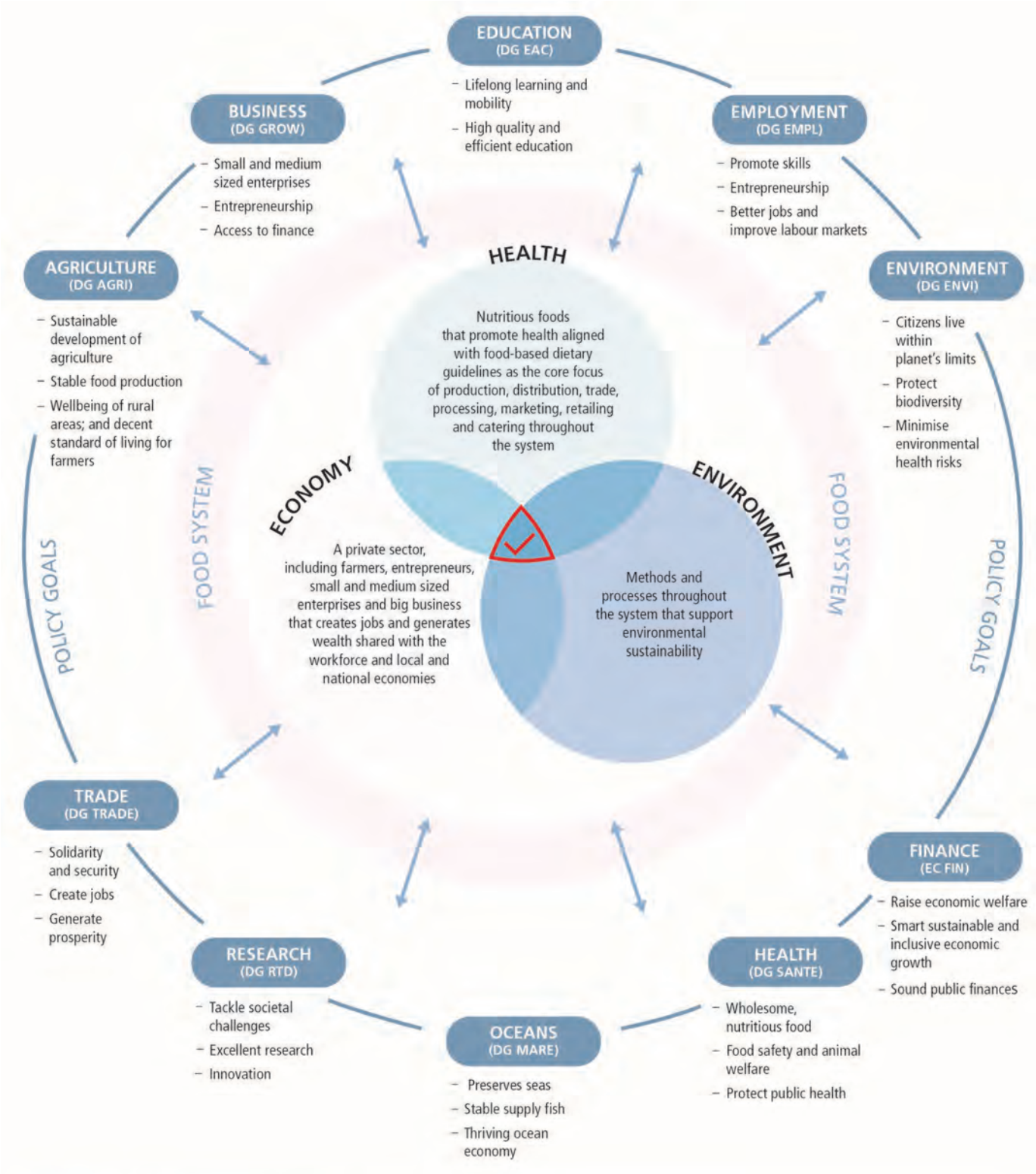
The first aspect is foods that promote health. In line with food-based dietary guidelines, foods which are here termed "nutritious foods" would be the core focus of not just production, but processing, distribution, trade, marketing, retail and catering (i.e. extending beyond agricultural production all the way through the food supply chain). These foods would also be safe. The vision is that this would enable citizens to have greater access to a diversity of nutritious, affordable and safe foods, and less exposure to the availability and marketing of foods high in fats, sugars and salt. Adequate fish would be available and affordable for consumption, and animal source foods would be consumed at levels aligned with dietary guidelines. The reduced burden of diet-related ill-health would lead to healthier citizens, lower healthcare costs and a more economically productive workforce, thus benefiting economic prosperity.

Second, an economy would be created around nutritious foods, which would directly generate decent jobs and equitably shared economic wealth, in turn supporting rural development, urban livelihoods and economic competitiveness. New businesses would be established through entrepreneurship and workers would have the skills needed to operate in such an economy and attain a decent standard of living.

Third, the production, processing, distribution, trade, marketing, retail and catering of nutritious foods would use methods and processes that support environmental sustainability and animal welfare, so reducing greenhouse gas emissions, maintaining and restoring biodiversity, and supporting healthy soils, clean water and sustainably managed fisheries, with less food waste and high standards of animal welfare.

Food systems would thus involve farmers, entrepreneurs, SMEs and big businesses generating jobs and equitably shared wealth for themselves and local and national economies, by producing, trading and selling a diversity of nutritious foods to European citizens at affordable prices with a skilled and decently paid workforce, using environmentally-sustainable production methods that protect biodiversity, water, soils and air, and minimize

Figure 2: A vision for food systems with co-benefits



The Food Systems Sweetspot
Food systems that balance these three aspects would involve farmers, entrepreneurs, SMEs and big businesses generating jobs and wealth for themselves and local and national economies by producing, trading and selling a diversity of nutritious foods to European citizens at affordable prices with a skilled and decently-paid workforce, using environmentally-sustainable production methods that protect biodiversity, water, soils and air and minimise environmental health risks, food waste and greenhouse gas emissions, with high standards of animal welfare.

Source: Authors' own compilation with Emily Kerr.

environmental health risks, food waste and greenhouse gas emissions, with high standards of animal welfare (Figure 2).

Specific examples of how the vision for food systems would benefit multiple policy goals could be:

- Farmers benefiting from new markets and a higher share of value by providing nutritious fresh produce to schools, meaning children are well fed (so achieve their educational potential). Workers in food systems have the skills and ongoing training needed to support the production and provision of a diversity of nutritious and sustainably-produced foods (supporting the goals of DGs EAC; AGRI; SANTE; EMPL and ENVI).
- Fisheries are well managed by economically-vibrant fishing communities, enabling adequate consumption as well as robust stocks (supporting the goals of DGs MARE, ENVI and SANTE).
- Economic growth is generated by businesses and entrepreneurs, including SMEs, to enhance access to nutritious foods in deprived neighbourhoods, produced in environmentally friendly ways, with low impact and waste (supporting the goals of DGs GROW, ENVI and SANTE).
- Children in schools are well fed (therefore achieving their educational potential) on nutritious fresh produce bought direct from farmers who are benefiting from new markets and a higher share of value. Workers in food systems have skills and ongoing training needed to support production and provision of a diversity of nutritious and sustainably produced foods (supporting the goals of DGs EAC, AGRI, SANTE, EMPL and ENVI).

Given the current conflicts in the system, enabling food systems to combine such co-benefits is inherently challenging. A pragmatic way forward is to start by identifying specific opportunities which already in some way include the three basic aspects, and thus where specific actions could be implemented to connect them. We now suggest some of these potential 'opportunity spaces' as initial options where governments and others can start a conversation about how the production, distribution, processing, marketing and sale of nutritious foods can also lead to economic and environmental benefits.

Policy implications

Opportunity spaces for the EU and its Member States

In this final section we present some ideas for potential 'opportunity spaces' as specific places to test out how the connections needed between diet-related heath, environment and economy could work. These are not necessarily spaces where there is direct evidence of impact on health, or any other outcome, at this point in time. Rather, they are spaces that already have the potential to include all three aspects, which could be connected to achieve multiple goals. Table 4 sets out in brief the elements that could be connected in six such opportunity spaces. Four are then discussed in detail: the Common Agricultural Policy, public procurement, short supply chains and building skills.

Table 4: Six potential opportunity spaces for producing co-benefits for health, environment and economy

Opportunity space	Elements to connect
School fruit and vegetable schemes	• **Health.** Fruits and vegetables are nutritious. • **Economy.** Economic opportunity to increase markets for fruit and vegetable producers. • **Environment.** Opportunity to consider environmental sustainability of production, transport and waste.
Investing in SMEs and entrepreneurs to bring nutritious, sustainably produced foods into deprived neighbourhoods	• **Health.** Opportunity to focus on nutritious foods. • **Economy.** Entrepreneurs are concerned with generating profitability in new markets. • **Environment.** There has been a significant growth in businesses concerned with 'sustainable food'.
Common Agricultural Policy	• **Health.** Aims to ensure consumers have a stable supply of affordable food; opportunity to be reoriented around production of nutritious foods. • **Economy.** Aims to support farmers to produce food while making a reasonable living, and keep the rural economy alive. • **Environment.** The CAP already includes requirements for sustainable production.
Public procurement	• **Health.** Nutritional standards can be included in procurement specifications. • **Economy.** Countries spend considerable amounts on procuring food; potential to improve livelihoods for farmers through providing markets. • **Environment.** Sustainability criteria can be included in procurement specifications.
Short supply chains	• **Health.** Opportunity to focus on nutritious foods. • **Economy.** An economic opportunity for selling food direct to consumers, and increasing value taken by producers. • **Environment.** Many farmers involved already prioritize sustainable production methods.
Building skills	• **Economy.** Productivity in the food production sector is low, suggesting economic potential. • **Health.** Opportunity to improve knowledge on nutrition. • **Environment.** Opportunity to improve knowledge on sustainability.

Source: Authors' own compilation.

The Common Agricultural Policy

The CAP presents a unique opportunity space in Europe given its aims to: "support farmers and improve agricultural productivity, so that consumers have a stable supply of affordable food; ensure that European Union (EU) farmers can make a reasonable living; help tackling climate change and the sustainable management of natural resources; maintain rural areas and landscapes across the EU; and keep the rural economy alive promoting jobs in farming, agri-foods industries and associated sectors" [115]. It includes provisions on all the elements needed to create co-benefits: food production; environmental impact of production; and economic impacts for farmers and rural development.

The CAP is already used to encourage more environmentally sustainable production methods [115]. Proposals to also use the CAP to advance diet-related health objectives have existed for many years, as indicated in the section above on 'Conflicts'. This approach appears to be gaining currency within the EU. For example, the *Communication on the Future of Food and Farming* highlights CAP's contribution to the SDGs and makes links to 16 of the 17 goals [66]. The latest CAP reform proposal acknowledges: "consumption patterns have an influence on public health. Via its link to food and sometimes also the ways food is produced agricultural policies are linked to health policies. The proposals reinforce the links to health policy, in particular as regards healthy diets and the decrease of the use of anti-microbials" [116]. The 2017 *Reflection paper on the future of EU finances* also noted growing calls for the CAP to "focus further on the provision of public goods, such as safe and healthy food, nutrient management, response to climate change, protection of the environment and its contribution to the circular economy" [18].

This statement chimes with stakeholder proposals to align the CAP with wider goals beyond production, including the need to "include health objectives in the CAP, such as those related to antibiotics use reduction, air quality, nutrition (in particular relating to fruit and vegetables) and pesticide use reduction"; obliging Member States "to set national antibiotics use reduction targets"; and promoting diversity of production [7]. The CAP already features diversity in that one of the three basic greening measures is crop diversification (farmers must cultivate at least two crops when their arable land exceeds 10 hectares and at least three crops when the arable area exceeds 30 hectares) [93]. But it could go further. Options proposed by the draft proposal on a Common Food Policy for the EU by the iPES-Food include CAP payments targeted towards "ambitious crop rotations with a minimum share of legumes"; promotion of extensive livestock systems; and more promotion budget for fruits and vegetables [7]. Other possible measures include reducing tariffs on imported fruits and vegetables, and reducing direct and indirect support to sugar, animal fat and red meat production**.** Such proposals envisage the CAP as evolving into a policy to "help integrate farm and fisheries policies with diverse measures that are needed to reduce food's impact on health, environment and social inequalities" [93]. Research has also highlighted how the CAP is a clear example of where different bodies of knowledge and expertise within the EU (for example, on agriculture and nutrition) could be better aligned [94].

However, examining the potential for connection through a food systems framing also indicates the challenges of engaging with the CAP as an opportunity space. For example, as highlighted above, a food systems framing allows us to see that just because food is produced in a nutritious state does not mean it stays in the same state, e.g. eating boiled potatoes is more aligned with dietary guidelines than potato crisps or French fries [117]. Moreover, it brings in distribution and trade, indicating that just because fewer foods (for example, meat) are produced in European countries does not mean there will be fewer available since imports could simply increase. Taking a food systems approach thus means the CAP would either need to be designed in conjunction with further measures to ensure any changes at the production level would be accompanied by changes to the availability, affordability and appeal of food to European citizens.

Public procurement

Public procurement represents a powerful opportunity space to connect the three aspects: it is a single process which explicitly includes taking foods from point of production to specific food environments (e.g. schools), which is economically a very significant cost to governments, and which presents an opportunity to set nutritional and environmental standards.

Improving public procurement is already very much on the agenda for the European Commission and represents 17% of the GDP of EU Member States [118]. Yet, while food procurement work has been taking place for many years, experts have argued that it remains a "tale of untapped potential" [119]. Currently, the EU policy approach focuses on environmental goals (along with the inherent economic goal of keeping costs to a minimum) under DG ENVI and, to a lesser extent, social issues under DG GROW, which appear to be addressed separately. Health is not currently a strong focus but is increasingly being taken forward [120]. The main tool for addressing food goals via procurement is the voluntary EU Green Public Procurement (GPP) scheme, which recommends the purchasing of organic and some higher animal welfare food, plus fairly-traded items [121,133]. However, the current scope of the GPP is quite narrow. Options to align procurement policy with food systems could include focusing more on the nutritional component (including criteria to exclude those that cannot deliver) and on wider social considerations, including around reskilling and improved working conditions, as well as better links between smaller producers and buyers.

Short supply chains

Short supply chains emerge as an opportunity space since they are explicitly concerned with ensuring that a greater share of value from farms goes to producers (economy); often concern nutritious foods (health) and sustainable production methods (environment); and can be designed to specifically reach target groups (e.g. urban agriculture, direct farm-to-school programmes and markets in low-income neighbourhoods).

The identification of short supply chains as an opportunity space is against a backdrop of significant consolidation in

the farming sector during the past 50 years [60]. In spite of this, short supply chains (where farmers sell directly to consumers or with a minimum of intermediaries) have grown both in number and support in recent years. Fresh fruits and vegetables are some of the main products traded in short supply chains, followed by animal products – fresh and prepared (mainly meat) and dairy products [62]. Plus, "most short food supply chains are characterised by full or partial organic farming methods", although not always certified [62], and the farms involved are likely to involve a greater labour force than farms in long chains [122].

With direct sales representing such a small part of the market, there is potential for further policy support to make them a more established feature in food environments and to capitalize on the potential both for improving availability of healthy food and for farmers to increase their share of value. One option proposed is to "upgrade health, phytosanitary and quality legislation to cater for the specific constraints of small producers and agroecological production" [7]. Another might be exploring the wider potential of the Ici.C.Local trademark, which is funded by the French National Institute for Agricultural Research (INRA) in France and uses coloured labels to highlight foods from short food chains; this can be tailored to local food system contexts as regards what is considered 'local' and 'sustainable' [122]. However, the implications of this for internal market rules will require further exploration. Improvements to the physical infrastructure (such as mobile slaughter units and knowledge-sharing platforms) are other ways in which policy can better support short supply chains [7]. Another key action could be to explore how these short chains might play a more proactive role in supporting diet-related health in deprived communities where the problems are greatest, by bringing fresh food to those that most need access to it.

Investing in skills

Investing in skills emerges as a space of opportunity given the economic imperative of a skilled workforce and the recruitment challenges in the food system, which suggest the potential for improved economic performance if addressed. The skill of incorporating nutrition and sustainability in decisions and practices is arguably required to advance improvements in food systems outcomes.

Underinvestment in skills and recruitment is a major challenge in farming and beyond the farm gate. For example, "30% of employees in the food and drink industry have a low level of qualifications (vs 21% in the overall economy)", and "labour productivity is lower than in most manufacturing sectors" [61]. Similarly, figures suggest that "only 8.5% of the present generation of European farmers have received full agricultural training, and 70% have only practical experience", and "the traditional subjects in agricultural teaching are disappearing from curricula" [123]. The challenge of generational renewal in farming is well rehearsed, and yet with food systems challenges ahead, there is a need to attract new entrants and to ensure they have the skills to meet them.

Improved skills and training could better focus on the current and future needs of food systems – whether in nutrition and sustainability in food preparation, or farming techniques with reduced environmental impact. By including training on how to produce, procure, prepare and serve better quality diverse food offerings, health and sustainability goals would also be supported. An additional health benefit from better wages for more skilled work would be that the workers themselves would be better able to afford healthier food.

More work is needed to explore the best focus and approaches, which could include: partnerships between practitioners/farming communities and research/educational organizations [7]; apprenticeship schemes [7]; advisory systems; and training schemes.

Cross-sector collaboration

The opportunity spaces identified above indicate some ideas for places to build on previous work to connect the different aspects of food systems. Starting, or building on existing discussions about how to create co-benefits, will clearly take conversations across sectors. Here we propose three specific steps that could be taken to enable those conversations: food systems policy audits; cross-government coordination mechanisms; and food systems policy roundtables. These would be in addition to existing proposals to create integrated food policy frameworks as described in the 'Introduction', which would enable connections to be made across food systems.

Food systems policy audits

A food systems approach is gaining currency within Europe and there is a need to track and link various food systems activities and ensure collaboration, as well as to better understand the relevance of food systems to national departments. A food systems policy audit could: bring together all work currently directed at food systems; evaluate commonalities and potential synergies; and allow a more informed consideration of policy and governance options. For example, at EU level, there are several projects which the literature suggests could be linked, including the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) [51]; the Joint Research Centre and Directorate-General for International Cooperation and Development (DEVCO)'s "vision-building exercise to provide a holistic and future-proof EU position on sustainable food systems in the context of the SDGs"; the Standing Committee on Agricultural Research (SCAR) foresight work on development of the food system [124]; DG AGRI's new approach to EU agricultural research and innovation, which "aims to support transition pathways towards resilient, sustainable and climate-friendly farming systems and value chains to secure the long-term supply of healthy and nutritious food"; and DG RTD's Food 2030 initiative, which explores food systems from a research and innovation perspective [6].

Along with collating current food systems work across the EU or national government, the audit could require each government department to assess its links to food systems, taking inspiration from the suggestions in this Policy Brief. This approach would also build on work being done in the EU which acknowledges connections between specific policy areas and broader policy goals.

Many DGs specify which of the current top 10 political priorities (2015–19) they contribute to, as presented in Table 3. This approach could be replicated across the relevant DGs or national government departments regarding their contributions to food systems priorities, in turn contributing to broader political priorities.

An important consideration is ensuring that this exercise is not viewed as another level of bureaucracy – and the experience with Member State health impact assessments suggests it may be difficult to implement.

Cross-government coordination mechanism

There is wide agreement on the need for a cross-sector mechanism to facilitate more coordinated governance of food [22], but little detail on what this should look like. Issues of policy fragmentation in the EU are mirrored at a national level, with limited exceptions such as Finland's project linking production to consumption in North Karelia [125], and outside Europe the governance of food and nutrition security in Brazil [126]. Attempts to bring food issues together into an integrated strategy or plan at a national level have not been successful in achieving their aims [127,128].

An analysis which draws on the results of a food systems policy audit, plus evaluation of national-level coordination structures in other sectors or covering other policy themes, could explore the most appropriate ways to support oversight of policy on food. The merits of a separate agency, or department or DG, with policy responsibility for food in a broader sense than any existing entities, could be part of the discussion [128].

Food systems policy roundtables

This Brief has identified the need for links between policy objectives to be made more explicit, and for the creation of a shared understanding of mutual objectives. Both are needed to examine possible policy options which have multiple benefits. A series of roundtables focused on specific selected opportunity spaces, which would include representatives from government departments or DGs with identified mutual interests and be based on interdisciplinary collaboration, could initiate a new cross-cutting approach to food. These could borrow from the UK Institute for Government's method of conducting "policy reunions" to analyse with stakeholders why particular policies were successful [129], along with workshops, for example at the European level, held as part of current attempts to modernize the CAP and the Food 2030 initiative policy labs on food and nutrition security research and innovation [130]. Those with experience of a particular policy tool (such as the Common Agricultural Policy discussed above), or a particular theme which has the potential to benefit multiple departments or DGs, would be brought together with representatives of new disciplines, such as nutrition, with the explicit aim of addressing the *policy* required for a food systems approach [131]. An explicit focus on *policy* in these roundtables would distinguish them from projects such as the Food Systems Dialogues, which address the system more broadly [132].

Conclusion

The evidence presented here shows that food systems could combine diet-related health with environmental and economic policy goals if they were designed and managed differently. While creating such co-benefits presents its own challenges, and will require a new approach to food systems, the severity of the food systems challenges outlined here, in terms of both health and environmental consequences, and the economic costs of these, underline the need to think and act differently.

This policy brief also shows that food systems present not just challenges, but huge opportunities as well. Redesigning food systems may be a large ask, but there are specific spaces of opportunity for change. Greater cross-government and cross-sector collaboration will be crucial to this process, as well as an enabling food policy framework. Connecting food systems for co-benefits will require active and concerted efforts to identify and drive forward opportunities for the production, distribution, trade, processing, marketing and sale of nutritious foods to create shared economic prosperity while also bringing benefits for environmental sustainability.

Annex

Policy goals of the 19 Directorate Generals of the European Commission

DG	Core policy goals
Health and Food Safety – DG SANTE	• Protect and improve public health • Ensure safe food • Safe animal food • Ensure wholesome food • Nutritious food • Protect health and welfare of farm animals • Protect health of crops and forests • Clear information
Agriculture and Rural Development – DG AGRI	• Promote sustainable development of Europe's agriculture • Well-being of rural areas • Stable food supply • Sustainable production • Affordable food • Decent standard of living for farmers • Requirements for animal health and welfare • Environmental protection • Food safety • Sustainable rural development
Climate Action – DG CLIMA	• Formulate and implement cost-effective policies for the EU to meet its climate targets on: – greenhouse gas emissions – Ozone Layer • Ensure climate change taken into account in all other EU policies • Ensure adaptation measures reduce EU's vulnerability to impacts of climate change
Competition – DG COMP	• Consumer welfare • Protect competition • Smart, sustainable inclusive growth • Competition culture
Communications Networks, Content and Technology – DG CONNECT	• Open up digital opportunities • Excellent research • Innovation • Growth • Jobs • Competitiveness • Better jobs • Tackle societal challenges
International Cooperation and Development – DG DEVCO	• Reduce poverty • Sustainable development • Promote democracy, peace, security
Education, Youth, Sport and Culture – DG EAC	• Lifelong learning and mobility • Quality and efficiency of education • Quality • Innovation

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DG	Core policy goals
Economic and Financial Affairs – DG ECFIN	• Raise economic welfare of citizens • Competitive economies • Smart, sustainable and inclusive economic growth • Preserve macroeconomic and financial stability • Sound public finances • Investment in productive and human capital
Employment, Social Affairs and Inclusion – DG EMPL	• Better jobs • Promote skills • Entrepreneurship • Improve functioning of labour markets • Confront poverty and social exclusion • Modernize social protection systems including pensions, health, long-term care • Free movement of workers • Workers' rights • Health and Safety at work • Rights of disabled
Energy – DG ENER	• Affordable energy • Sustainable energy production • Sustainable energy transport • Sustainable energy consumption • Decarbonization • Safe and secure energy supply
Environment – DG ENVI	• Citizens live well within planet's ecological limits • Innovative circular economy • Protect, value and restore biodiversity • Minimize environmental health risks • Resilient society • Growth decoupled from resource use
Internal Market, Industry, Entrepreneurship and SMEs – DG GROW	• Entrepreneurship • Growth • Reducing administrative burden • Access to funding for SMEs
Migration and Home Affairs – DG HOME	• Economic growth • Cultural growth • Social growth • Stable, lawful and secure environment • Open and safe Europe
Justice and Consumers – DG JUST	• Consumer safety • Consumer rights

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DG	Core policy goals
Maritime and Fisheries – DG MARE	• Thriving ocean economy • Preserve seas and oceans • Safe and stable supply of seafood • Sustainable fisheries • Healthy seas • Prosperous coastal communities
Mobility and Transport – DG MOVE	• Efficient, safe and environmentally friendly mobility solutions • Competitive industry • Growth and jobs • Reduce traffic congestion • Innovation • Passenger rights • Funding for infrastructure • Reduce transport-related greenhouse gas emissions • Remove conventionally fuelled cars in cities • Sustainable low carbon fuels in aviation • Shift freight journeys from road or rail to waterborne • Increased rail travel
Regional and Urban Policy – DG REGIO	• People can realize their full potential • Improvement in economy • Improvement in quality of life
Research and Innovation – DG RTD	• Excellent research • Innovation • Growth • Jobs • Competitiveness • Tackle societal challenges
DG TRADE	• Prosperity • Solidarity • Security • Growth • Jobs • Investment • Improve conditions for citizens, consumers, workers, self-employed • Improve conditions for small, medium and large enterprises • Improve conditions for poorest in developing countries • More modern, sustainable and viable economy • Competitive European Union

Notes:

The following DGs were not included as they were not deemed relevant or focus on support services: BUDG; COMM; ECHO; EUROSTAT; FISMA; NEAR; HR; DIGIT; SCIC; JRC; TAXUD; DGT.

Source: Authors' own compilation.

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