Rethinking agriculture

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While global food chains, market competition, industrial processes and increasing productivity have turned agriculture into a profitable economic sector, it is also one of the biggest contributors to environmental and sustainability challenges in Europe and worldwide. In tandem, the COVID-19 pandemic, recent geopolitical developments in Europe and socio-economic trends have driven attention towards agriculture and food systems. Considering these new challenges, it is even more urgent to rethink agriculture and food systems to make them resilient and sustainable. This briefing reflects on what makes agriculture unsustainable today — and the types of agriculture we may want to preserve and support.

Key messages

The European Green Deal and its farm to fork strategy treat agriculture as more than an economic sector: it also contributes to sustainability goals such as social well-being, ecosystem health, and food and nutrition security. Yet despite significant investment in the common agricultural policy and other relevant EU policies, agriculture's contribution to biodiversity loss, water overconsumption and greenhouse gas emissions continues. Moreover, rural abandonment and rural heritage loss are still challenges in Europe.

Looking at agriculture from different angles allows us to explore the root causes of unsustainability and debate possible paths forward. For instance, efficiency and productivity gains in agriculture have increased food production and improved access to it. However, food insecurity is still a major issue worldwide. Even in Europe, currently more than 1 in 12 citizens cannot afford a meal with meat, fish or a vegetarian equivalent every second day.

Coupled with climate change, agriculture's pressure on the environment and natural resources undermines food systems today. Paradoxically, strategies to improve agriculture's sustainability may hinder overall sustainability goals from being met. For example, efficiency gains are effective for reducing crop and nutrient losses — but solely focusing on system optimisation at the farm level may lock agriculture into a cycle of unsustainability. Promoting and reinterpreting traditional practices through agroecology may be the answer to today's sustainability challenges, but many questions remain.

Rather than focusing the discussion on farming practices and technologies, we should be asking broader questions. For example, what roles might agriculture and the food system play in a sustainable future? Which of agriculture's functions should society strive to preserve and support?

This briefing is part of a series called 'Narratives for change', published by the EEA. The series explores the diversity of ideas needed to make our society more sustainable and fulfil the ambitions of the European Green Deal.

Agriculture: where next?

Agriculture plays a central role in human societies — shaping our landscapes, economies, communities and cultures. Over the last 70 years, agriculture has evolved from primarily a local activity to a global industry tasked with feeding a growing global population with globalised tastes (EEA, 2019a). Agriculture's intensification and expansion worldwide has led to widespread pressures on the environment and climate. This poses a threat to the health of people and the planet and to the viability of food systems (EEA, 2019b,c, 2021a). It also bears potentially negative repercussions for

social and political stability.

Numerous, intertwined drivers of change bring about new risks and uncertainties. These drivers include urbanisation, digitalisation, lifestyle shifts in Europe and beyond, climate change, environmental degradation, resource scarcity and geopolitical instability. They also potentially include crop failure, disruptions affecting international supply chains, price shocks (e.g. fuels and fertilisers) (Cagnin et al., 2021) and animal disease outbreaks (e.g. African swine fever, bird flu). However, some of these risks and uncertainties also present new opportunities for reconfiguring agriculture and food systems in Europe and elsewhere (EEA, 2019b, 2020a). For example, the EU is one of the world's main importers and exporters; this means it can play an influential role in setting standards for food and feed production and trade (Bock et al., 2022).

In the EU, agriculture and food systems have been at the core of recent policy developments such as the farm to fork strategy (EC, 2020a), the EU biodiversity strategy for 2030 (EC, 2020b), the common agricultural policy (CAP) 2023-2027 (EC, 2021) and European climate law (EU, 2021).

Agriculture is also closely connected to strategic issues such as food security and safety, and sustainability. Sudden changes in the geopolitical landscape have opened up the debate over food sovereignty and strategic autonomy (Bounds, 2022).

This has become particularly visible in the wake of Russia's invasion of Ukraine. For example, agricultural production in the EU is dependent on 'key imported inputs, including energy, animal feed and feed additives, and also agricultural fertilisers' (EPRS, 2022a). The war could put these supplies at risk. Global commodity prices are surging (Baffel and Macadangdang, 2022; FAO, 2022); consequently, food affordability for low-income households could be further jeopardised — heightening the challenges created by the pandemic (EPRS, 2022a). Agricultural policy has now become 'a crucial security policy' (EPRS, 2022b) and immediate actions have been taken to counter new risks to food security (EC, 2022a).

The EU's ambitions for a sustainable food system are arguably under pressure from a number of challenges. This has delayed proposals for the sustainable use of pesticides and nature restoration (EPRS, 2022b).

Governments, scientists, farmers and non-governmental organisations worldwide have been working together for years to devise and act upon new ideas, policies, blueprints and narratives for transforming agriculture and food systems (EEA, 2017; 2019b; EC, 2020c; SAPEA, 2020). Against this backdrop, and considering the rising challenges associated with recent geopolitical developments in Europe, it has become even more important to 'rethink agriculture and food systems' and push them towards resilience and sustainability (EC, 2022a).

Multiple framings for 'agriculture'

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Agriculture is the activity of governing and managing ecosystems so that they deliver food products that meet our nutritional needs. Agriculture is an integral part of the food system (EEA, 2017) and can be framed in various, legitimate ways. Reflecting on these framings unearths opportunities to explore the root causes of unsustainability and debate possible routes forward.

For example, agriculture can be seen as an **economic sector** contributing to economic growth (Johnston and Mellor, 1961; Mundlak, 2000) and poverty alleviation (Timmer, 2002). From this perspective, the market is the best tool to govern the agricultural sector. Competition will drive each region and producer to specialise in what they can produce most efficiently and cheaply.

Agriculture is also the **means to feed a growing world population**. The global population is projected to reach 9.7 billion in 2050 (FAO et al., 2021). Meeting the global demand for food will require increased productivity (FAO, 2018a) in combination with dietary changes and food waste reductions. This is a complex challenge involving issues related to agricultural production (e.g. yield increases), distribution, inequality and access to food (SAPEA, 2020). Agriculture can also be framed as an **enabler of basic human rights**: it can contribute to ensuring food democracy and food sovereignty, e.g. through community-supported agriculture (Wittman, 2011; Claeys, 2015; SAPEA, 2020).

Agriculture as an **agroecological system** is a holistic approach that promotes diversifying farms and reducing chemical inputs. It also seeks to enhance biodiversity and stimulate interactions between different species to build long-term soil fertility, healthy agroecosystems, and secure livelihoods (IPES-Food, 2016; FAO, 2018b). It is based on knowledge sharing and co-creation — and the premise that increasing production and efficiency is not enough to reconcile human and ecosystem health with social welfare (HLPE, 2019).

Agriculture can also be considered a **frontier of high-tech applications.** Challenges around productivity and sustainability are interpreted as issues that can be solved through technology. Precision agriculture — increasingly dubbed the 'third agricultural revolution' — uses technological innovation, global positioning system (GPS) technology and big data to accomplish two tasks. First, it is used to make the application of fertilisers, pesticides and irrigation more efficient; second, it is leveraged to manage inter- and intra-field variability (EY Global, 2017).

Farmers can be seen as **guardians of rural heritage and cultural landscapes**. Farming is not simply a 'job' done by people in rural areas. It represents a way of living and knowing and creates a territory that is distinct from urban spaces; it has its own identity. Farmers are seen as knowledge-holders and guardians of traditional practices.

Agriculture is also increasingly considered part of the **'solution' to climate and environmental challenges**. Agriculture, forestry and other forms of land use are expected to play an important role in carbon sequestration (EEA, 2021b,c) and biomass production for bioenergy and bio-based products (EEA, 2018). At the farm level, nature-based solutions [1] — such as integrated crop-livestock systems, soil organic matter management, mixed cropping, crop rotations, biological pest

control and agroforestry — can improve soil and water management and promote biodiversity. These solutions also contribute to climate change adaptation and mitigation (EEA, 2021c) and to nature conservation and restoration (EEA, 2019d).

These different perspectives reveal complexity and tensions that may not be easily resolved. Such tensions create fundamental paradoxes in agriculture and food systems.

Paradoxes at the heart of unsustainability in agriculture and food systems

Agriculture is highly interconnected with a broad set of activities, economic sectors, societal actors, regulations and policies. Considered together, these are often referred to as a food system. Such systems operate across multiple regional scales and are interconnected through international supply chains, financial markets, technologies, flows of resources, information and ideas. How agriculture is framed and its functions are prioritised may have important direct and indirect effects on other food system components and overall sustainability outcomes. These effects — especially the indirect ones — may be counterintuitive. If they are not acknowledged and addressed, they may lead to undesirable consequences. Three important examples are illustrated below.

Despite the focus on producing more, we are still far from achieving healthy diets for all — globally or in Europe

Today's food and farming systems have succeeded in supplying large volumes of food to global markets feeding an ever-growing human population. This is because of increasing yields and efficiency and falling food prices over the last 60 years (IPES-Food, 2016; Benton and Bailey, 2019). Despite these achievements, food security [2] is still a major issue worldwide. It is estimated that between 720 and 811 million people in the world faced hunger in 2020 (FAO et al., 2021), a figure that has been increasing since 2015. In recent years, more food has not equated to less hunger. More wealth has not meant better health: obesity and diet-related diseases are on the rise globally (WHO, 2018; Willett et al., 2019; UN Environment, 2020). The prospects of a growing global population and a rising global middle class, which is increasingly adopting western lifestyles and consumption levels, are likely to heighten these challenges (EEA, 2020a).

In the EU, food security is still an issue. Although trends indicate that the issue has become less problematic since 2011, in 2020, over 1 in 12 EU citizens could not afford a meal with meat, fish or a vegetarian equivalent every second day (Eurostat, 2022). At the same time, EU citizens are increasingly affected by non-communicable diseases associated with dietary choices. For example,

the number of people who are overweight or obese is rapidly increasing among EU Member States (Eurostat, 2021a). Obesity alone is estimated to have caused about 2.8 million deaths per year and absorbed 7% of the EU's health budget in 2017 (FAO et al., 2017).

Inequality is a major driver of food insecurity in Europe and globally. Hence, efforts to increase food production may not hit the mark if barriers impeding access to food and adequate nutrition remain.

Efficiency gains have not halted environmental degradation in Europe or globally

Agriculture contributes to severe environmental and sustainability impacts such as 'widespread degradation of land, water and ecosystems; high [greenhouse gas] emissions; biodiversity losses; and livelihood stresses for farmers around the world' (IPES-Food, 2016). Recent findings confirm the major roles that climate change and intensive agriculture play in driving the decline of insect biodiversity worldwide (Outhwaite et al., 2022). There are even warnings of a potential global collapse of insect life, pointing to potentially catastrophic effects on food production worldwide (Hallmann et al., 2017; Sánchez-Bayo and Wyckhuys, 2019).

These impacts are still very significant, despite the fact that since 1960, food production and land use have been decoupled thanks to increases in yield (OECD, 2021). The impacts remain because global competition generally incentivised those who could produce the most and at a cheaper cost, even if the environment was damaged in the process (Benton and Bailey, 2019). Many of the environmental problems associated with agriculture 'are linked specifically to "industrial agriculture": the input-intensive crop monocultures and industrial-scale feedlots that now dominate farming landscapes' (IPES-Food, 2016).

In Europe, policies have ensured that the agricultural sector remains competitive. At the same time, efficiency-driven approaches, focusing on short-term productivity and profitability, are paradoxically associated with increased resource use (Vivanco et al., 2018; Paul et al., 2019). For example, 'where lower (production) costs result in lower prices, consumers are likely to react with increased consumption of the more efficient product' (Paul et al., 2019). Moreover, as higher efficiencies mean lower production costs and higher income, producers are motivated to expand (specialised) production (Paul et al., 2019).

In Europe, 'while intensification has enabled the production of food for a growing population, intensive agriculture is also putting pressure on the very resource that sustains it: healthy and productive soil' (EEA, 2019a). Overall, the intensification of agriculture has resulted in (EEA, 2019a,b):

- excess nutrients in water bodies and water overabstraction
- chemical pollution
- loss of landscape diversity and features (e.g. ponds and hedgerows)

- loss of soil health and fertility
- biodiversity loss, including pollinator decline (Figure 1).

Soil health and biodiversity are particularly critical to agricultural production. Despite this, an average of 2.5 tonnes per hectare of soil are lost every year across the EU — a value considerably higher than the average annual rate of soil formation (around 1.4 tonnes per hectare) (Panagos et al. 2015). High erosion levels lead to a loss of agricultural productivity and significant economic costs (Panagos et al., 2018). Soil loss alongside major changes in agricultural practices led to food production in Europe becoming reliant on high inputs of chemical fertilisers, pesticides and on the preventive use of antibiotics (EEA, 2017), although recent trends point to a reduction in antibiotic use (ECDC, 2021). However, the short-term profitability of input-intensive agriculture is likely to come at the expense of long-term soil health and viability.

Agriculture also significantly contributes to climate change by accounting for nearly 10% of the EU's total greenhouse gas emissions (EEA, 2021g). In turn, climate change affects agriculture in several ways. Changes in temperature and precipitation, as well as weather and climate extremes, are already influencing crop yields and livestock productivity in Europe. These changes also affect water availability for irrigation, livestock watering and food processing (EEA, 2019c, 2021d). Agriculture is dependent on soil characteristics, weather patterns and biodiversity — which makes it one of the socio-economic sectors most sensitive to climate change (EEA, 2021a).

Globally, several, combined factors undermine agriculture's ability to maintain productivity, ensure resilience and feed a growing global population (Bullock et al., 2017; FAO, 2017; Oliver et al., 2018; EEA, 2020a). These factors include climate change, soil loss and degradation, pollinator decline and multiple environmental pressures. The situation is expected to get worse in the future (UNCCD, 2017).

Figure 1. Decline in grassland butterflies (population index) in Europe between 1991 and 2018

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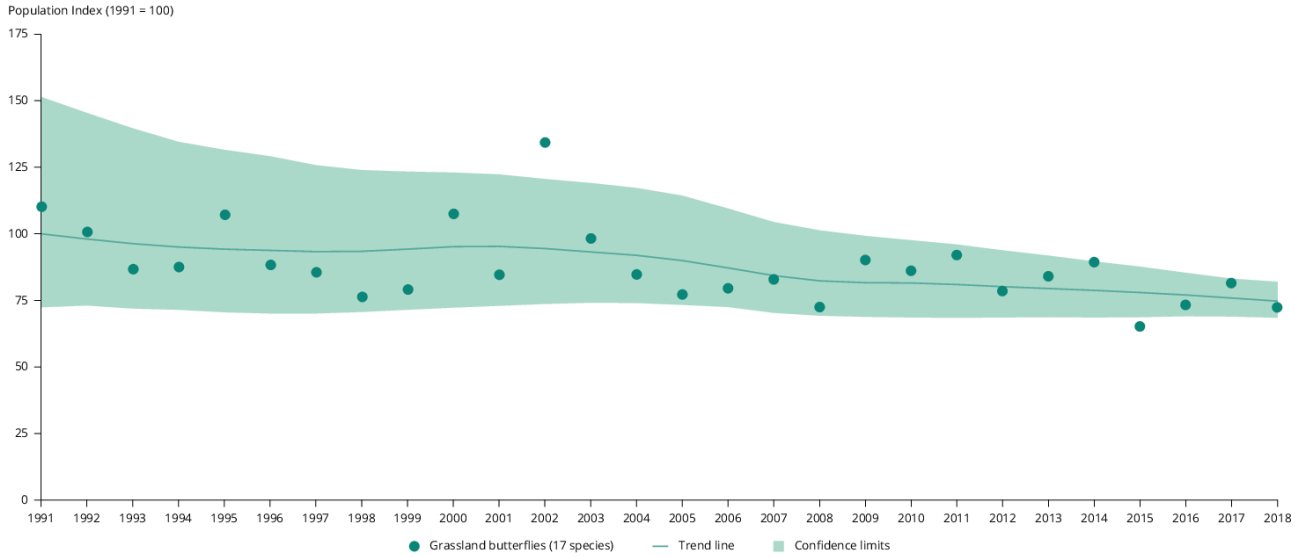


Note: The shaded area represents the confidence limits. Geographical coverage: Austria, Belgium, Czechia, Estonia, Finland, France, Germany, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Netherlands, Romania, Spain, Slovenia, Sweden.
Sources: EEA (2021e); Butterfly Conservation Europe; European Butterfly Monitoring Scheme Partnership; Assessing Butterflies in Europe (ABILE).
Click here for different chart formats and data

A growing sector, a disappearing heritage in Europe

Europe has made its agricultural sector competitive and is a significant exporter of value-added products, such as processed food, meat and dairy products (OECD and FAO, 2020). Although the gross value of the sector is growing (Eurostat, 2021b), the labour input is shrinking (Eurostat, 2021c). This points to decreasing opportunities for small producers.

Between 2005 and 2016, the number of farms in Europe decreased by about one quarter. In other words, nearly 4.2 million farms were lost — the vast majority of which were small farms (Eurostat, 2018). Small-scale farming in Europe is also threatened by land grabbing, a process involving ‘large-scale purchase or leasing of agricultural land by companies, governments and private individuals’

(EESC, 2015). In land grabbing, land ownership becomes increasingly concentrated in the hands of a few landowners and foreign capital, with a 'detrimental effect on rural life, with jobs disappearing in the regions affected' (EESC, 2015).

Between 2012 and 2018, the extent of total arable land and permanent crops did not change significantly (EEA, 2019b). However, several regions in Europe have been subject to 'land abandonment' — a process 'driven by a combination of socio-economic, political and environmental factors by which formerly cultivated fields are no longer economically viable under existing land use and socio-economic conditions' (Ustaoglu and Collier, 2018). Land abandonment particularly affects rural communities in remote regions, and generally 'where local economies rely mainly on small farm holdings with limited economic prospects and low productivity, with younger generations tending to move to urban areas' (EEA, 2019a). Recent estimates indicated that around 30% of agricultural areas in the EU are under at least a moderate risk of land abandonment by 2030 (European Parliament, 2021).

The CAP's subsidies for rural development have had significant, positive spill-over effects on the wider rural economy and have significantly reduced poverty in rural areas (EC, 2022b). While 'CAP support can help slow down the rate of depopulation and land abandonment in the EU' (EC, 2022b), it could not stop land abandonment and loss of rural heritage. This is because those dynamics are connected to broader urbanisation and migration trends — from rural areas to cities for better paid jobs — as well as shrinking and ageing populations (EEA, 2019a, 2020a). Low farm income (EC, 2018), poor working and living conditions for migrant seasonal workers or even modern forms of slavery (EPRS, 2021) are problematic social issues often associated with the same dynamics driving heritage loss.

Agriculture is more than an economic sector

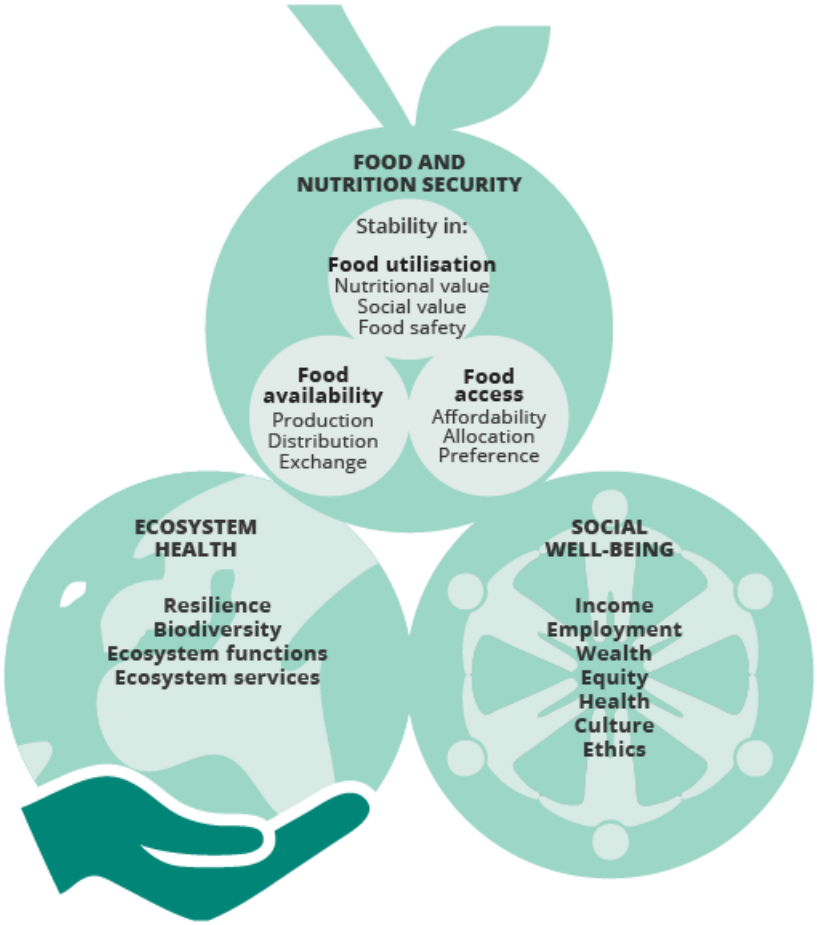
Agriculture is essential to human society and plays a fundamental role in the transition towards sustainability (EC, 2020c). Therefore, there is value in seeing agriculture as a caretaker of rural communities, the environment and our food — rather than simply an economic sector. Agriculture can be an enabler of food system-related sustainability outcomes (EEA, 2017; see also Figure 2):

(1) **Social well-being:** taking care of rural heritage, including the landscape, farmers, rural society and livelihoods. Farmers are seen as experts, empowered to make their own choices.

(2) **Ecosystem health**: managing societies' interface with the natural environment. Agriculture directly depends on and affects ecosystem health and biodiversity. Production systems are adapted to respect soil regeneration, aquifer recharge rates, and ecosystems and biodiversity.

(3) **Food and nutrition security:** contributing to food security by producing safe, nutritious and affordable food — and incorporating a long-term perspective.

Figure 2. Agriculture can help a food system reach sustainable outcomes



Source: EEA (2017)

These enabling functions have been at the core of the CAP since its reform in 2003 (EC, 2003). As much as 37% of the EU's budget for 2014-2020 went into the CAP (Moës, 2018) — primarily to support farmers and the rural economy, and improve agricultural productivity to ensure a stable supply of affordable food. The secondary aim of the CAP 2014-2020 was to maintain rural areas and help tackle environmental issues.

Despite an effort to 'green' the CAP during its 2013 reform, the 'greening' measures introduced during 2014-2020 had limited impacts. This is probably because they were introduced in addition to the CAP's core aim of making agriculture more competitive. These are two different sets of goals that turned out to be in opposition (Matthews et al., 2018).

According to the European Commission, the CAP 2014-2020 had ‘economic, environmental, social and political benefit across the EU’, while ‘results in enhancing environmental protection and climate action by raising standards and encouraging change were mixed’ (EC, 2022b). The way in which CAP tools have been deployed across EU countries has indicated that ‘not all the opportunities to improve the environmental sustainability of farming and to step up climate action were seized’ (EC, 2022b).

The European Court of Auditors suggests that the CAP 2014-2020:

- failed to contribute to halting biodiversity decline (ECA, 2020)
- possibly increased rather than reduced water demand (ECA, 2021a)
- did not significantly reduce greenhouse gas emissions — despite the fact that a quarter of all 2014-2020 EU agriculture spending, amounting to over EUR100 billion, was earmarked for tackling climate change (ECA, 2021b).

Moreover, CAP support for 2014-2020 was not fairly distributed: 20% of the beneficiaries received 80% of CAP direct payments (EC, 2022b). Farmers were not fully recognised for their roles in providing public goods outside of the market (Buckwell et al., 2017) and their share of financial benefits was low.

Recent policies developed under the European Green Deal, such as the farm to fork strategy (EC, 2020a) and the EU biodiversity strategy for 2030 (EC, 2020b), have raised sustainability ambitions for agriculture and food systems. Given the mixed results obtained by the CAP 2014-2020 regarding sustainability in agriculture (EC, 2022b), the newly-approved CAP 2023-2027 (EC, 2021) is expected to be ‘fairer, greener and more performance-based’ (Council of the EU, 2021). 40% of its total expenditure (about EUR154.6 billion) is earmarked for climate action (EC, 2022c).

However, the CAP 2023-2027’s effectiveness will largely depend on its implementation at Member State level through national strategic plans. Moreover, despite the CAP 2023-2027’s heightened level of ambition, civil society organisations (e.g. EEB, 2021, EEB and BirdLife International, 2022) have raised concerns over its design and ability to achieve its goals.

What kind of agriculture do we want to support?

In Europe alone, agriculture is highly diverse — so what may be a solution in one place may create a problem elsewhere. Some strategies may also have unintended consequences. For example, efficiency gains are clearly a sensible strategy to reduce losses along the food production and distribution chain. However, solely relying on strategies targeting system optimisation at the farm level may lock agriculture into the usual, unsustainable cycle (Benton and Bailey, 2019).

Traditional agricultural practices promoted and reinterpreted through agroecology (Altieri, 2002), coupled with change across the whole food system may offer important insights. For example,

leveraging dietary change, agroecology and the integration of crop and livestock production could reinforce Europe's autonomy, resilience and productivity. At the same time, it could reduce pressure on the environment and help cut greenhouse gas emissions (Billen et al., 2021).

A recent analysis of contrasting scenarios for the future of European agriculture in 2040 indicates that in a 'scenario characterised by environmental-friendly practices, multifunctional landscapes and localism, significant decreases in the environmental pressure of agriculture can be achieved with minimum decrease in agricultural output' (Rega et al., 2019). This scenario outperforms 'neo-liberal', 'protectionist' and 'sovereigntist' scenarios and suggests that policies targeting multifunctionality and diversified agricultural landscapes could effectively protect biodiversity and ensure food security in Europe (Rega et al., 2019). Similarly, the European Committee of the Regions (2021) suggests that agroecology should be pursued further, as it 'increases the economic and social resilience of farms with healthy and accessible food' and reduces some environmental pressures. Nevertheless, concerns have been raised that scenarios with high climate ambitions could negatively impact agricultural productivity and prices (Barreiro Hurle et al., 2021).

According to other studies (e.g. WRI, 2018), the key to sustainability in agriculture lies in increasing efficiency and productivity — coupled with sparing land, managing demand and innovating. Sparing land from agriculture would allow it to be allocated to nature conservation; meanwhile, a high-tech production system would increase the remaining land's productivity. At the global scale, this could prevent further deforestation and increase carbon sequestration — which would contribute to achieving global climate goals (WRI, 2018). However, intensifying agricultural production requires high inputs of agrochemicals to boost production, with consequent impacts on biodiversity, soil health and food safety. This may also reinforce some of the dynamics which lie at the core of the paradoxes.

Although 'land-sparing is needed to preserve the last of Europe's wilderness' (Grass et al., 2021), this approach alone is not particularly fit for conserving traditional agroecosystems in Europe — where many rare habitats and species have co-evolved with farming over thousands of years (Halada et al., 2011; Grass et al., 2021). Instead, 'land-sharing practices needed for the preservation of low-intensity agroecosystems, including high nature value farmland' (Paracchini et al., 2008) should be combined with land-sparing approaches (Grass et al., 2021).

> We need to accept that business as usual is no longer a safe course of action. The world needs more nature, not less – and it needs it now if we are to prevent the next big crisis from which we might never recover.
>
> Janez Potočnik, Co-chair UNEP International Resource Panel, and former European Commissioner (Potočnik, 2022)

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While technological innovation can contribute to sustainability, traditional knowledge and behavioural change are vital to solving the current food system crisis(Nature Food, 2021). It is important to remind ourselves that we passed the point of business as usual (Potočnik, 2022) and that prioritising 'short-term security to a subset of vested interests can undermine the resilience of longer-term beneficial outcomes for society' (Oliver et al., 2018). If we are truly to transform agriculture and the food system, we need to reflect on and debate why and for whom agricultural innovations are created (EEA, 2013, 2021f).

An absolute reduction in environmental pressures and impacts requires fundamental transformation, which cannot be achieved through incremental efficiency gains (EEA, 2021b). Instead, values, worldviews and system goals are potentially the most influential levers for change, but also the most difficult ones to transform.

The European Green Deal and its farm to fork strategy represent a fundamental step towards achieving agriculture and food system sustainability. These commitments should not be undermined by short-sighted responses to rising food prices and fears of global food shortages resulting from the invasion of Ukraine (IPES-Food, 2022).

This is particularly true in the current context, which is characterised by multiple and interconnected crises (EEA, 2020b). Achieving systemic change in agriculture requires moving beyond questions of 'how' to farm. Rather than pursuing change simply by improving practices, technologies and processes, fundamental change means asking broader questions, such as:

- What roles can we imagine for agriculture and the broader food system in a sustainable future?
- Which of its multiple functions do we want to preserve, grow and support?

Designing practices within the new paradigm may include keeping old practices that are still relevant and making space for creativity. For example, efficiency could play a role in more collaborative ways of producing and consuming. Goals such as **ecosystem health** and **human health and well-being** could be better defined to become mutually-reinforcing.

The broader questions that need to be asked include reflecting on the trade-offs that may emerge when the futures we imagine are realised. Can better quality food and production processes be provided for everyone? Is there a risk that these would only be accessible to an elite few? How can quality be ensured while upholding fairness? There are also many actors who need to contribute to making agriculture more sustainable. Some have much more power than others to influence activities and choices (EEA, 2017; Bock et al., 2022). This influence should come with responsibility. How can less influential actors be empowered to contribute to more sustainable agriculture?

European citizens and institutions certainly do not lack knowledge (e.g. EEA, 2017, 2019a,b,c, 2021a,b,c,d) or ideas about possible future avenues. However, there is no obvious solution to these questions or blueprints — particularly at a time of heightened challenges and uncertainty. The

suitability of one particular solution is often dependent on the perspective of the observer, as scientific findings and insights alone cannot resolve ethical questions surrounding sustainability issues (EEA, 2020a; Benton and Harwatt, 2022). These are questions that can only be addressed based on people's worldviews, values and beliefs (Vries, 2013). Hence, to realise systemic change, we need actionable knowledge — co-produced by citizens and communities. The possibilities for such change are ready to be explored.

Footnotes

[1] Nature-based solutions are actions that are inspired by, supported by or copied from nature. They use the features and complex system processes of nature, such as its ability to store carbon and regulate water flows, to achieve societal outcomes in a sustainable way (EC, 2015).

[2] Food security is defined as 'the right of every individual to have access to safe and nutritious food, consistent with the right to adequate food and the fundamental right of everyone to be free from hunger' (FAO, 1996).

References

Altieri, M. A., 2002, 'Agroecology: the science of natural resource management for poor farmers in marginal environments', Agriculture, Ecosystems & Environment 93 (1-3), pp. 1-24.

Baffel, J. and Macadangdang, M. H., 2022, 'Commodity prices soared further in March—Pink Sheet', World Bank blogs, 6 April (https://blogs.worldbank.org/opendata/commodity-prices-soared-further-march-pink-sheet) accessed 17 May 2022.

Barreiro Hurle, J., et al., 2021, Modelling environmental and climate ambition in the agricultural sector with the CAPRI model, Publications Office of the European Union, Luxembourg (https://doi.org/10.2760/98160).

Benton, T. G. and Bailey, R., 2019, 'The paradox of productivity: agricultural productivity promotes food system inefficiency', Global Sustainability2(e6), pp. 1-8 (https://doi.org/10.1017/sus.2019.3).

Publications

Benton, T. G. and Harwatt, H., 2022, Sustainable agriculture and food systems: comparing contrasting and contested versions, Research Paper, Royal Institute of International Affairs, London (https://doi.org/10.55317/9781784135263).

Billen, G., et al., 2021, 'Reshaping the European agro-food system and closing its nitrogen cycle: the potential of combining dietary change, agroecology, and circularity', One Earth 4 (6), pp. 839-850.

Bock, A. K., et al., 2022, Concepts for a sustainable EU food system, Publications Office of the European Union, Luxembourg (https://publications.jrc.ec.europa.eu/repository/handle/JRC126575) accessed 21 March 2022.

Bounds, A., 2022, 'EU reviews sustainable food plans as Ukraine war disrupts imports', Financial Times (https://www.ft.com/content/f99d784c-0448-4552-ab8b-e77ed68ea173) accessed 22 March 2022.

Buckwell, A., et al., 2017, CAP — Thinking out of the box: further modernisation of the CAP — why, what and how?, RISE Foundation (https://risefoundation.eu/wp-content/uploads/2020/07/2017_RISE_CAP_Full_Report.pdf) accessed 8 December 2021.

Bullock, J. M., et al., 2017, 'Resilience and food security: rethinking an ecological concept' Journal of Ecology 105, pp. 880-884.

Cagnin, C., et al., 2021, Shaping and securing the EU's open strategic autonomy by 2040 and beyond, Publications Office of the European Union, Luxembourg (https://doi.org/10.2760/414963).

Claeys, P., 2015, 'Food sovereignty and the recognition of new rights for peasants at the UN: a critical overview of la via campesina's rights claims over the last 20 years', Globalizations 12 (4), pp. 452-465 (https://doi.org/10.1080/14747731.2014.957929).

Council of the EU, 2021, 'Council adopts fairer, greener and more performance-based farming policy for 2023-2027', Council of the European Union (https://www.consilium.europa.eu/en/press/press-releases/2021/12/02/council-adopts-fairer-greener-and-more-performance-based-farming-policy-for-2023-2027/) accessed 8 December 2021.

de Vries, B. J. M., 2013, Sustainability science, Cambridge University Press, Cambridge, UK.

EC, 2003, 'CAP reform summary', DG AGRI Newsletter, special edition, July 2003 (https://op.europa.eu/en/publication-detail/-/publication/2f85b2b5-4f8b-4787-9cdb-f5f44d95f89f/language-en/format-PDF/source-search) accessed 8 December 2021.

EC, 2015, Towards an EU research and innovation policy agenda for nature-based solutions & re-naturing cities — Final Report of the Horizon 2020 Expert Group on 'Nature-Based Solutions and Re-Naturing Cities, Directorate-General for Research and Innovation (https://ec.europa.eu/newsroom/horizon2020/document.cfm?doc_id=10195) accessed 12 May 2022.

EC, 2018, CAP Specific objectives… explained – Ensuring viable farm income, Brief No 1, (https://agriculture.ec.europa.eu/system/files/2021-01/cap_specific_objectives_-_brief_1_-

Publications

_ensuring_viable_farm_income_0.pdf accessed 12 August 2022.

EC, 2020a, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'A farm to fork strategy for a fair, healthy and environmentally-friendly food system' (COM(2020) 381 final of 20 May 2020).

EC, 2020b, Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions 'EU Biodiversity Strategy for 2030 — Bringing nature back into our lives' (COM(2020)380 final of 20 May 2020).

EC, 2020c, Towards a sustainable food system—moving from food as a commodity to food as more of a common good, Group of Chief Scientific Advisors, Scientific Opinion No 8, March 2020.

EC, 2021, 'The new common agricultural policy: 2023-27', European Commission (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/new-cap-2023-27_en#documents) accessed 11 January 2022.

EC, 2022a, 'Commission acts for global food security and for supporting EU farmers and consumers', Press release, 23 March, European Commission (https://ec.europa.eu/commission/presscorner/detail/en/IP_22_1963) accessed 17 May 2022.

EC, 2022b, 'CAP performance: 2014-20. A summary of CAP performance and impact across the EU' (https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cmef/cap-performance-2014-20_en) accessed 22 March 2022.

EC, 2022c, 'Common agricultural policy funds'(https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/financing-cap/cap-funds_en) accessed 20 May 2022.

ECA, 2020, Biodiversity on farmland: CAP contribution has not halted the decline, Special Report 13/2020, European Court of Auditors (https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=53892) accessed 11 January 2022.

ECA, 2021a, Sustainable water use in agriculture: CAP funds more likely to promote greater rather than more efficient water use, Special Report 20/2021, European Court of Auditors (https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=59355) accessed 11 January 2022.

ECA, 2021b, Common agricultural policy and climate: half of EU climate spending but farm emissions are not decreasing, Special Report 16/2021, European Court of Auditors (https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=58913) accessed 11 January 2022.

ECDC, 2021, 'Use of antibiotics in animals is decreasing', Press release, 30 June, European Centre for Disease Prevention and Control (https://www.ecdc.europa.eu/en/news-events/press-release-use-of-antibiotics-in-animals-decreasing) accessed 19 May 2022.

EEA, 2013, Late lessons from early warnings: science, precaution, innovation, EEA Report No 1/2013, European Environment Agency (https://www.eea.europa.eu/publications/late-lessons-2) accessed 5 October 2021.

Publications

EEA, 2017, Food in a green light: a systems approach to sustainable food, EEA Report No 16/2017, European Environment Agency.

EEA, 2018, The circular economy and the bioeconomy — partners in sustainability, EEA Report No 8/2018, European Environment Agency (https://www.eea.europa.eu/publications/circular-economy-and-bioeconomy) accessed 20 March 2022.

EEA, 2019a, Land and soil in Europe — why we need to use these vital and finite resources sustainably, EEA Signals, European Environment Agency (https://www.eea.europa.eu/publications/eea-signals-2019-land) accessed 15 November 2021.

EEA, 2019b,The European environment — state and outlook 2020, European Environment Agency.

EEA, 2019c, Climate change adaptation in the agriculture sector in Europe, EEA Report No 4/2019, European Environment Agency (https://www.eea.europa.eu/publications/cc-adaptation-agriculture) accessed 11 January 2022.

EEA, 2019d, Tools to support green infrastructure planning and ecosystem restoration, EEA Briefing No 1/2019, European Environment Agency (https://www.eea.europa.eu/themes/biodiversity/green-infrastructure/tools-to-support-green-infrastructure) accessed 30 March 2022.

EEA, 2020a, Drivers of change of relevance for Europe's environment and sustainability, EEA Report No 25/2019, European Environment Agency.

EEA, 2020b, Living in a state of multiple crises: health, nature, climate, economy, or simply systemic unsustainability?, European Environment Agency.

EEA, 2021a, Global climate change impacts and the supply of agricultural commodities to Europe, EEA Briefing No 27/2020, European Environment Agency (https://www.eea.europa.eu/publications/global-climate-change-impacts-and) accessed 11 January 2022.

EEA, 2021b, Knowledge for action — empowering the transition to a sustainable Europe, EEA Report No 10/2021, European Environment Agency (https://www.eea.europa.eu/publications/knowledge-for-action) accessed 11 January 2022.

EEA, 2021c, Nature-based solutions in Europe: policy, knowledge and practice for climate change adaptation and disaster risk reduction, EEA Report No 1/2021, European Environment Agency (https://www.eea.europa.eu/publications/nature-based-solutions-in-europe) accessed 22 March 2022.

EEA, 2021d, Water and agriculture: towards sustainable solutions, EEA Report No 17/2020, European Environment Agency (https://www.eea.europa.eu/publications/water-and-agriculture-towards-sustainable-solutions) accessed 12 May 2022.

EEA, 2021e, 'Grassland butterflies — population index, 1991-2018' European Environment Agency (https://www.eea.europa.eu/data-and-maps/daviz/european-grassland-butterfly-indicator-4#tab-

chart_6) accessed 11 January 2022.

EEA, 2021f, With people and for people: innovating for sustainability, EEA Briefing No 9/2021, European Environment Agency (https://www.eea.europa.eu/publications/with-people-and-for-people) accessed 10 December 2021.

EEA, 2021g, 'EEA greenhouse gases — data viewer' European Environment Agency (https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer) accessed 22 March 2022.

EEB, 2021, 'New EU farm policy will worsen environmental crises for years', Press release, 25 June, European Environmental Bureau (https://eeb.org/major-new-eu-farm-policy-will-worsen-environmental-crises/) accessed 3 December 2021.

EEB and BirdLife International, CAP strategic plans — are they likely to deliver on given promises? (https://eeb.org/wp-content/uploads/2022/02/CAP-Strategic-Plans-are-they-likely-to-deliver-on-given-promises.pdf) accessed 25 July 2022.

EESC, 2015, 'Land grabbing in Europe/family farming', Opinion of the European Economic and Social Committee, NAT/632 (https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/land-grabbing-europefamily-farming) accessed 22 March 2022.

European Parliament, 2021, The future of the European farming model: socio-economic and territorial implications of the decline in the number of farms and farmers in the EU, Policy Department for Structural and Cohesion Policies (https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/699621/IPOL_ATA(2022)699621_EN.p accessed 18 May 2022.

EPRS, 2021, Migrant seasonal workers in the European agricultural sector, Briefing, February 2021, European Parliamentary Research Service (https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/689347/EPRS_BRI(2021)689347_EN.pc accessed 11 January 2022.

EPRS, 2022a, Russia's war on Ukraine: impact on food security and EU response, European Parliamentary Research Service (https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2022)729367) accessed 17 May 2022.

EPRS, 2022b, Russia's war on Ukraine: EU food policy implications, European Parliamentary Research Service (https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729368/EPRS_ATA(2022)729368_EN.p accessed 17 May 2022.

EU, 2021, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') (OJ L 243, 9.7.2021, p. 1-17).

Publications

European Committee of the Regions, 2021, 'Agroecology: the answer to Europe's agricultural, social and environmental challenges', Press release, 4 February (https://cor.europa.eu/en/news/Pages/answer-to-agricultural-social-environmental-challenges.aspx) accessed 11 January 2020.

Eurostat, 2018, 'Farms and farmland in the European Union — statistics — The evolution of farms and farmland from 2005 to 2016' (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farms_and_farmland_in_the_European_Union_-_statistics#The_evolution_of_farms_and_farmland_from_2005_to_2016) accessed 17 May 2022.

Eurostat, 2021a, 'Overweight and obesity — BMI statistics', Eurostat — Statistics Explained (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Overweight_and_obesity_-_BMI_statistics) accessed 12 May 2022.

Eurostat, 2021b, 'Performance of the agricultural sector — value of agricultural output' (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Performance_of_the_agricultural_sector#Value_of_agricultural_output) accessed 24 November 2021.

Eurostat, 2021c, 'Agricultural labour input statistics: indices (AACT_ALI02)' (https://ec.europa.eu/eurostat/databrowser/view/AACT_ALI02__custom_1642913/default/line?lang=en) accessed 24 November 2021.

Eurostat, 2022, 'Inability to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day by level of activity limitation, sex and age (HLTH_DM030)' (https://ec.europa.eu/eurostat/databrowser/view/hlth_dm030/default/line?lang=en) accessed 17 May 2022.

EY Global, 2017, 'How digital agriculture and big data will help to feed a growing world', Ernst & Young Global (https://www.ey.com/en_lu/consulting/how-digital-agriculture-and-big-data-will-help-to-feed-a-growing-world) accessed 17 October 2021.

FAO, 1996, Rome Declaration on World Food Security, World Food Summit 1996, Food and Agriculture Organization of the United Nations (https://www.fao.org/3/w3613e/w3613e00.htm) accessed 22 March 2022.

FAO, 2017, The future of food and agriculture — trends and challenges, Food and Agriculture Organization of the United Nations, Rome.

FAO, 2018a, The future of food and agriculture — alternative pathways to 2050, Food and Agriculture Organization of the United Nations (https://www.fao.org/3/CA1553EN/ca1553en.pdf) accessed 11 January 2022.

FAO, 2018b, The 10 elements of agroecology — guiding the transition to sustainable food and agricultural systems, Food and Agriculture Organization of the United Nations (https://www.fao.org/documents/card/en/c/I9037EN/) accessed 11 January 2022.

Publications

FAO, 2022, ‘FAO Food Price Index’, Food and Agriculture Organization of the United Nations (https://www.fao.org/worldfoodsituation/foodpricesindex/en/) accessed 17 May 2022.

FAO, et al., 2017, The state of food security and nutrition in the world — building resilience for peace and food security, Food and Agriculture Organization of the United Nations, Rome (https://www.fao.org/3/I7695e/I7695e.pdf) accessed 17 May 2022.

FAO, et al., 2021, The state of food security and nutrition in the world 2021 —transforming food systems for food security, improved nutrition and affordable healthy diets for all, Food and Agriculture Organization of the United Nations (https://www.fao.org/documents/card/en/c/cb4474en) accessed 11 January 2022.

Grass, I., et al., 2021, ‘Combining land-sparing and land-sharing in European landscapes’,Advances in Ecological Research64, pp. 251-303.

Halada, L., et al., 2011, ‘Which habitats of European importance depend on agricultural practices?’,Biodiversity and Conservation20(11), pp. 2365-2378.

Hallmann, C. A., et al., 2017, ‘More than 75 percent decline over 27 years in total flying insect biomass in protected areas’,PLoS ONE12(10), e0185809 (https://doi.org/10.1371/journal.pone.0185809).

HLPE, 2019, Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition, Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome (https://www.fao.org/3/ca5602en/ca5602en.pdf) accessed 11 January 2022.

IPES-Food, 2016, From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems, International Panel of Experts on Sustainable Food Systems (http://www.ipes-food.org/_img/upload/files/UniformityToDiversity_FULL.pdf) accessed 11 January 2022.

IPES-Food, 2022, ‘Another perfect storm?’ A special report by the International Panel of Experts on Sustainable Food Systems, May 2022 (http://www.ipes-food.org/pages/foodpricecrisis) accessed 31 May 2022.

Johnston, B. F. and Mellor, J. W., 1961, ‘The role of agriculture in economic development’, The American Economic Review51(4), pp. 566-593.

Matthews, K. B., et al., 2018, Report on the quality check of the robustness of the narrative behind the common agricultural policy (CAP), Project Deliverable 5.5, MAGIC (H2020-GA 689669) (http://magic-nexus.eu/sites/default/files/files_documents_repository/magic_deliverable_5.5_cap_report.pdf) accessed 11 January 2022.

Moës, N., 2018, ‘EU budget, common agricultural policy and regional policy — en route to reform?’, Bruegel, 22 February (https://www.bruegel.org/2018/02/eu-budget-common-agricultural-policy-and-

regional-policy-en-route-to-reform/) accessed 11 January 2022.

Mundlak, Y., 2000, Agriculture and economic growth: theory and measurement, Harvard University Press, Harvard, MA.

Nature Food, 2021, 'The limits of a technological fix', Editorial, Nature Food2, p. 211 (https://doi.org/10.1038/s43016-021-00275-z).

OECD, 2021, Making better policies for food systems, Organisation for Economic Co-operation and Development, Paris (https://doi.org/10.1787/ddfba4de-en).

OECD and FAO, 2020,OECD-FAO agricultural outlook 2020-2029, Organisation for Economic Co-operation and Development, Paris, and Food and Agriculture Organization of the United Nations, Rome.

Oliver, T. H., et al., 2018, 'Overcoming undesirable resilience in the global food system',Global Sustainability1, pp. 1-9.

Outhwaite, C. L., et al., 2022, 'Agriculture and climate change are reshaping insect biodiversity worldwide', Nature 605, pp. 97-102.

Panagos, P., et al., 2015, 'The new assessment of soil loss by water erosion in Europe', Environmental Science & Policy 54, pp. 438-447.

Panagos, P., et al. 2018, 'Cost of agricultural productivity loss due to soil erosion in the European Union: from direct cost evaluation approaches to the use of macroeconomic models', Land Degradation & Development 29 (3), pp. 471-484.

Paracchini, M., et al., 2008, High nature value farmland in Europe — an estimate of the distribution patterns on the basis of land cover and biodiversity data, Joint Research Centre of the European Commission, Ispra, Italy.

Paul, C., et al., 2019, 'Rebound effects in agricultural land and soil management: review and analytical framework', Journal of Cleaner Production227, pp. 1054-1067.

Potočnik, J., 2022, 'Europe needs more, not less, nature to overcome the looming food crisis', Euractiv (https://www.euractiv.com/section/agriculture-food/opinion/europe-needs-more-not-less-nature-to-overcome-the-looming-food-crisis/) accessed 18 May 2022.

Rega, C., et al., 2019, 'Environmentalism and localism in agricultural and land-use policies can maintain food production while supporting biodiversity — findings from simulations of contrasting scenarios in the EU', Land Use Policy 87, 103986.

Sánchez-Bayo, F. and Wyckhuys, K.A.G., 2019, 'Worldwide decline of the entomofauna: a review of its drivers', Biological Conservation 232, pp. 8-27.

SAPEA, 2020, A sustainable food system for the European Union, Science Advice for Policy by European Academies, Berlin (https://doi.org/10.26356/sustainablefood).

Timmer, C. P., 2002, 'Agriculture and economic development', in: Handbook of agricultural economics, Volume 2, Elsevier, Amsterdam, pp. 1487-1546.

UNCCD, 2017, Global land outlook, United Nations Convention to Combat Desertification, Bonn, Germany (https://knowledge.unccd.int/glo) accessed 3 September 2018.

UN Environment, 2020, 'How to feed 10 billion people' (https://www.unep.org/news-and-stories/story/how-feed-10-billion-people) accessed 1 November 2021.

Ustaoglu, E. and Collier, M.J., 2018, 'Farmland abandonment in Europe: an overview of drivers, consequences, and assessment of the sustainability implications', Environmental Reviews 26(4), pp. 396-416.

Vivanco, D.F., et al., 2018, 'Roadmap to rebound: how to address rebound effects from resource efficiency policy, Sustainability 10, 2009 (https://doi.org/10.3390/su10062009).

WHO, 2018, 'Global hunger continues to rise', News release, 11 September, World Health Organization (https://www.who.int/news/item/11-09-2018-global-hunger-continues-to-rise---new-un-report-says) accessed 14 January 2022.

Willett, W., et al., 2019, 'Food in the Anthropocene: the EAT–LancetCommission on healthy diets from sustainable food systems', The Lancet 393 (10170), pp. 447-492 (https://doi.org/10.1016/S0140-6736(18)31788-4).

Wittman, H., 2011, 'Food sovereignty: a new rights framework for food and nature?' Environment and Society: Advances in Research 2 (1), pp. 87-105 (https://doi.org/10.3167/ares.2011.020106).

WRI, 2018, Creating a sustainable food future — a menu of solutions to feed nearly 10 billion people by 2050, Synthesis Report, World Resources Institute (https://www.wri.org/research/creating-sustainable-food-future) accessed 11 January 2022.

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