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Towards nature-friendly consumption

Biodiversity impacts and policy options for shrimp, soy, and palm oil

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Fig. 1: Intact forests are vital for biodiversity and ecosystem health. (Photo: Mariquita vector/Adobe Stock)

Executive summary

Key messages

- **Consumption in the European Union (EU) significantly contributes to global biodiversity loss**, primarily through changes in land use and habitat degradation. This study highlights the severe impacts of EU demand for shrimp, soy, and palm oil on ecosystems in the Global South.
- **A coherent EU policy mix is required** to align consumption with biodiversity objectives, integrating voluntary, market-based, fiscal, regulatory, and trade instruments.
- **Sufficiency-oriented strategies should complement efficiency and substitution approaches**, including targeted reductions in demand for high-impact products.
- **Greater policy coherence and effectiveness can be achieved** by systematically addressing spill-over effects, such as the shifting of environmental impacts between commodity supply chains or the displacement of pressures onto other ecosystems, as well as structural drivers such as overconsumption and rising resource demand.
- **Future policy design should embed global equity and procedural fairness** to ensure inclusive implementation and co-development of standards with producer countries.

Biodiversity forms the foundation of life on Earth. It protects our food and water supplies, contributes to human and ecosystem health, and helps stabilise the climate. However, **biodiversity is declining at an alarming rate**, affecting all regions worldwide and posing severe risks to society, economies, and human well-being. Biodiversity loss, climate change, and pollution are now widely recognised as interconnected dimensions of a broader 'triple planetary crisis', with compounding and mutually reinforcing effects. **Key sectors including agriculture, livestock, fisheries, and forestry are among the primary drivers of biodiversity loss.** Their activities drive large-scale deforestation, overfishing, degradation of terrestrial and marine ecosystems, and the release of harmful pollutants. As home to some of the world's most biodiverse ecosystems and a significant share of global raw materials, the Global South is disproportionately affected. At the same time,

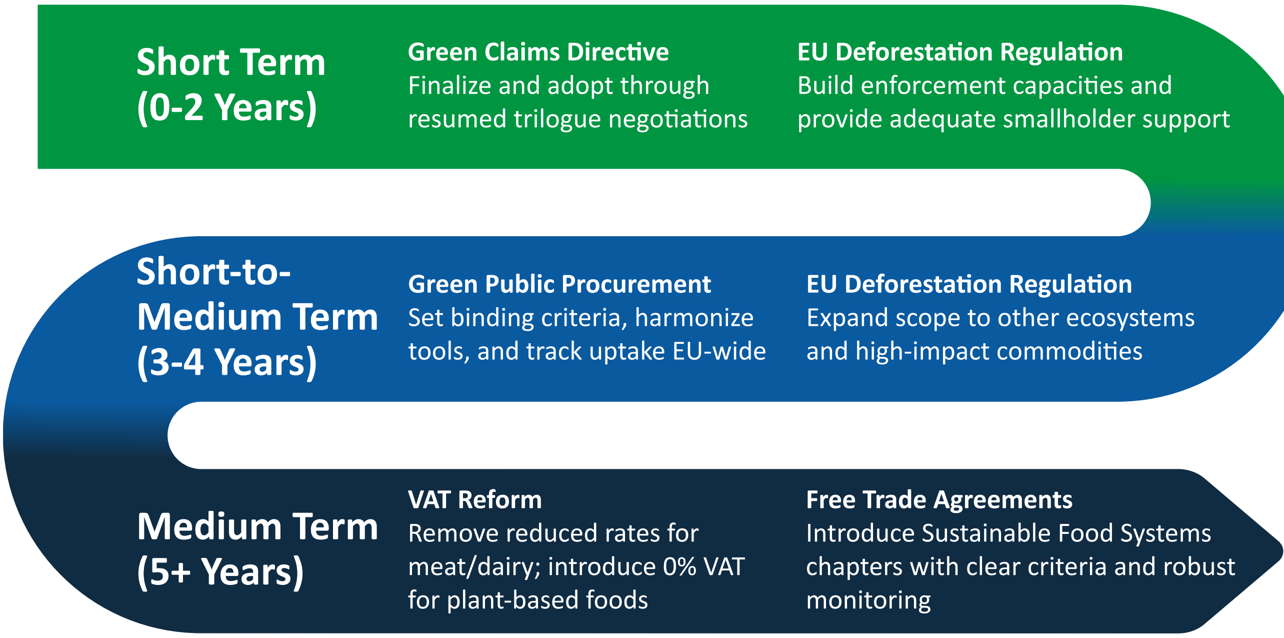

Fig. 2: Overarching recommendations – selected future milestones for EU policies

industrialised nations in the Global North remain strongly dependent on resources produced and extracted in these ecologically vulnerable areas. This creates an **ecologically unequal exchange** through which high-income countries externalise environmental and social costs, exacerbating biodiversity loss and reinforcing global inequalities.[1]

The EU plays a central role in this dynamic of externalisation. With a material footprint of 14 tonnes per capita in 2023 – far above ecologically sustainable levels – EU consumption places a substantial strain on both European and global ecosystems, contributing to biodiversity degradation in some of the world's most fragile ecosystems. A shift in consumption patterns is necessary to halt biodiversity loss. Against this backdrop, this study pursues three key aims:

- Develop a **scientifically grounded evidence base on the EU's consumption-related biodiversity impacts in the Global South**, focusing on shrimp, soy, and palm oil as three high-impact commodities.
- Propose **concrete policy recommendations for EU policymakers** to promote nature-friendly consumption of these commodities.
- Identify key differences and similarities between the three cases and pinpoint **overarching political levers that can support nature-friendly consumption**.

Methodologically, the study combines quantitative assessments of biodiversity impacts with qualitative policy analysis to bridge disciplinary perspectives and support science-based policy advice. The methodological design involved two key steps:

- **Biodiversity impact assessment**: To estimate the EU's biodiversity impacts, import data from Eurostat Comext (adjusted for re-exports) were used to calculate how much land is required for the imported products, based on yield figures from FAOSTAT. These land use estimates were then linked to different ecosystems (biomes) and compared with deforestation information from the Trase database.
- **Policy instrument evaluation**: For each commodity, a broad set of potential policy instruments was identified and categorised (regulatory, informational, financial), aligned with sustainability strategies (sufficiency, efficien-

[1] This externalisation means that the environmental destruction and social burdens linked to resource extraction are primarily borne by producer countries, while consumer countries benefit from the resulting economic gains.

cy, consistency), and refined through expert workshops.

The case of shrimp

Shrimp is the EU's third most widely consumed type of seafood. **Imports have risen by 60% over the past decade, reaching 404,000 tonnes in 2023.** This increase is linked to declining prices, shifting dietary trends, and changing consumption patterns. Around half of EU shrimp imports now stem from aquaculture systems, which pose a significant threat to biodiversity. The expansion of shrimp ponds – especially in tropical regions – has contributed to the **deforestation of biodiversity-rich mangrove forests**. These ecosystems support over 1,500 species, 15% of which are threatened with extinction. They also provide vital ecosystem services, including storm protection, food security, and carbon sequestration. While Ecuador – Europe's top shrimp supplier – has made notable progress in halting mangrove conversion since the 1990s, aquaculture-linked deforestation remains widespread in Southeast Asia, which supplies about 32% of the EU shrimp market. **The land footprint of European shrimp consumption is considerable: in 2018 alone, it was estimated at 463,000 hectares – nearly twice the size of Luxembourg – when accounting for ponds, infrastructure, and feed-related cropland.** Shrimp farms also discharge wastewater containing nutrients, chemicals, and antibiotics into surrounding ecosystems, contributing to eutrophication, habitat degradation, and potentially antibiotic resistance. Feed inputs – especially soy and fishmeal – generate further indirect biodiversity impacts by driving agricultural land conversion and marine resource extraction.

Policy recommendations at a glance

To reduce these impacts, three policy priorities emerge:

- First, **reducing demand is critical**. While shrimp offers some nutritional benefits, most of its nutrients can be sourced from more sustainable, plant-based foods. Educational campaigns should move beyond generic sustainability messaging and tailor their communication to specific consumer segments, such as environmentalists, animal welfare advocates, health-conscious buyers, and regional food supporters. Highlighting the ecological value of mangroves, the animal welfare concerns in shrimp farming, and the potential contamination risks from antibiotics can encourage more sustainable choices.
- Second, **the sustainability of farmed shrimp needs to improve**. Although eco-labels and certifications have potential, they currently suffer from low coverage (14% of global shrimp production), high costs for smallholders, and inconsistent credibility. Strengthening certification systems requires lowering certification costs, expanding technical support, and improving transparency, particularly in areas such as biodiversity criteria, including mangrove protection, effluent management, and species escapes.
- Third, **trade policy should reinforce sustainability**. Biodiversity-related clauses in EU Free Trade Agreements remain vague and unenforceable. Future trade agreements should incorporate aquaculture-specific safeguards into Sustainable Food Systems chapters and establish clear performance metrics. Where possible, Contingent Trade Agreements should be explored to tie tariff benefits directly to measurable conservation outcomes, such as reduced habitat conversion.

The case of soy

Although largely invisible to EU consumers, soy is a central component in the production of meat and other animal-based foods. Most EU-imported soy is processed into soybean meal for animal feed, accounting for roughly 29% of EU animal feed protein. The EU imports approximately 17 million tonnes annually from the Global South, primarily from Brazil and Argentina, which requires **around 4.8 million hectares of farmland in these highly biodiverse regions**. Soy is mostly cultivated in monocultures with intensive input of agrochemicals – particularly glyphosate-based herbicides linked to genetically modified soy, which comprises over 90% of EU imports. Although no-till farming has reduced soil erosion and increased carbon storage, it has also intensified reliance on herbicides, exacerbating biodiversity pressures. Moreover, the expansion of soy cultivation drives land use change in ecologically sensitive biomes, such as the Cerrado and the Pampas. In 2022, **EU soy imports triggered the estimated conversion of 125,000 hectares of land in Brazil alone, nearly half the size of Luxembourg**. In the Amazon rainforest, deforestation slowed down due to zero-deforestation commitments, including the Amazon Soy Moratorium in Brazil.[2] In other biomes, such regulations are weaker or absent, leading to leakage effects. The Cerrado – home to 4,200 endemic plant species and crucial water systems – is currently Brazil's most threatened biome, with only 37% of its original area remaining intact.

Policy recommendations at a glance

To reduce these impacts, the EU needs to confront its own structural drivers, especially high levels of livestock production and meat consumption. Three main insights emerge:

- First, **reforming the Common Agriculture Policy (CAP) is crucial**. The CAP currently allocates around 80% of its subsidies directly or indirectly to livestock farming, thereby reinforcing unsustainable production and consumption patterns. Direct payments, Voluntary Coupled Support, and tariff exemptions on feed imports all incentivise soy-intensive meat production. Reforming these instruments – by redefining CAP objectives, reducing livestock numbers, and redirecting subsidies toward organic farming and domestic protein crops – can reduce EU demand for imported soy and promote biodiversity-friendly agriculture.
- Second, **fiscal policy tools – particularly value-added tax (VAT) reform – offer a complementary route**. At present, in most EU countries, both animal products and plant-based foods benefit from reduced VAT rates. Aligning tax rates with environmental objectives – by removing VAT reductions for animal products and setting the VAT rate at 0% for plant-based foods – would help internalise biodiversity and climate externalities, while raising revenues for just transition measures. A well-designed VAT reform could reduce environmental impacts by ~6% and save €5.3 billion in climate costs in Germany alone.
- Third, **promoting behavioural change remains vital**. Given that the public's understanding of the link between soy, meat, and biodiversity loss remains limited, tailored, target-group-specific campaigns that combine health and environmental messaging are necessary to shift social norms, help promote plant-based diets, and strengthen support for complementary policies. Additionally, public procurement in places such as canteens and schools can help create environments that actively support plant-based diets.

Fig. 3: Food environments can foster nature friendly diets. (Photo: _jure/iStock)

The case of palm oil

Palm oil is the most widely used vegetable oil in the world. It is prized for its yield efficiency, supplying 36% of global output on less than 9% of cropland. Nonetheless, palm oil cultivation – concentrated in Southeast Asia – has been a major driver of tropical deforestation, particularly in Indonesia and Malaysia. Between 2001 and 2019, around 3 million hectares of Indonesian forest were converted into oil palm plantations.

[2] In the light of recent moves to suspend the Amazon Soy Moratorium after nineteen years of implementation, future trends seem uncertain (Reuters, 2025a).

Fig. 4: Palm oil is one of the most widely produced vegetable oils worldwide. (Photo: Photoongraphy/ Shutterstock.com)

Although deforestation linked to EU-bound exports has significantly declined since 2018 – falling from 75,000 to 30,500 hectares per year – new threats are emerging. Moist peat swamp forests – which are globally important for carbon storage and rich in biodiversity – are increasingly being drained and converted for palm oil production. These areas – home to endemic species like orangutans and hosting rich assemblages of birds, fish, and mammals – are being destroyed at an alarming rate. Peatland emissions are particularly severe: despite accounting for only 14% of plantations, they contribute 92% of greenhouse gas emissions from Indonesia's palm oil sector, the equivalent of one-fifth of the country's total emissions. Fires worsen emissions by burning surface vegetation and peat, releasing considerably more CO_2 than forest fires on mineral soils. Palm oil cultivation for the EU market requires around 1.5 million hectares in highly biodiverse regions. In biodiversity terms, oil palm plantations are structurally poor monocultures that support only a fraction of the species found in intact tropical forests, thereby accelerating the decline of forest-specialist species.

Policy recommendations at a glance

To reduce these impacts, four policy priorities emerge:

- First, **recognising that substitution strategies – such as removing palm oil from products – are often counterproductive**. Promoting substitution with lower-yield crops such as coconut or soybeans can lead to increased land use pressures and potentially exacerbate biodiversity loss. Policy efforts should therefore focus on improving the sustainability of existing supply chains.
- Second, **continuing and further strengthening regulatory instruments such as the EU's Renewable Energy Directive (RED).** The classification of palm oil as a high-ILUC-risk biofuel and its phase-out by 2030 have contributed to declining deforestation rates. To maintain this success, the phase-out of such high-ILUC-risk biofuels should be continued. Furthermore, indirect risks need to be addressed, including rising demand for used cooking oil, potential fraud, and substitution with soy, another high-risk crop.
- Third, **improving the credibility of certification schemes and leveraging public procurement to drive change.** Criticism focuses on poor enforcement, limited transparency, and weak accountability. Certification needs to be strengthened, especially for palm kernel oil. Public procurement can play a leading role

by requiring credible certification in relevant product categories.

- Fourth, **enhancing consumer awareness with more targeted and nuanced communication. Consumer awareness is already high, but often lacks nuance.** Campaigns should clarify the complex trade-offs of palm oil use, debunk substitution myths – such as the belief that replacing palm oil with other vegetable oils is more sustainable – and link reduced palm oil consumption with health benefits through diet shifts away from processed foods.

Lessons learned and general observations

Based on these case study-specific findings, the study identifies five core lessons that challenge conventional approaches to environmental sustainability:

- First, **leveraging nature-friendly production and consumption holds strong synergy potential for biodiversity, climate, and other sustainability objectives**. Across the three studied commodities, prevailing unsustainable practices drive not only biodiversity decline but also pollution, land degradation, and greenhouse gas emissions. Effective policies promoting a shift towards nature-friendly practices can deliver tangible co-benefits for climate change mitigation, local resilience, and sustainable livelihoods.
- Second, **while ecosystem- or product-specific protection frameworks remain essential, they often struggle to address the displacement dynamics that define global commodity markets**. Measures targeting a single forest type or product can inadvertently shift environmental pressure elsewhere. To prevent such leakage effects, these frameworks should be complemented by integrative policy approaches that span ecosystems, commodities, and the functional drivers of consumption.
- Third, **policy should confront the structural inequalities embedded in global trade**. Europe's commodity imports externalise ecological harm to producer regions in the Global South, where biodiversity-rich ecosystems are degraded to supply low-cost inputs. Even worse, governance solutions such as certification schemes or due diligence laws often replicate these asymmetries by placing compliance burdens on smallholders while ignoring local rights. Biodiversity protection needs to be designed with and for the communities that are affected.

Fig. 5: Overconsumption within the EU is a structural driver of biodiversity loss. (Photo: Ljupco Smokovski/Shutterstock.com)

- Fourth, **technological fixes have limited potential to resolve systemic overconsumption**. The intensification of shrimp aquaculture, improvements in soy yield, or the substitution of palm oil may mitigate some local impacts but often generate new pressures elsewhere. Sufficiency – reducing overall demand for high-impact products – emerges as a necessary yet politically sensitive strategy.
- Finally, **informational tools can support this shift, albeit only when targeted and context-sensitive**. Generic sustainability messaging is ineffective. Instead, campaigns should appeal to diverse consumer motivations – such as health, ethics, and taste – and tailor their framing to specific audiences. Dual-framing (health and biodiversity) is particularly promising.

Policy recommendations: A comprehensive toolbox for biodiversity-friendly consumption

This study proposes a **multi-level policy framework spanning voluntary, market-based, fiscal, regulatory, and trade instruments** to align EU consumption with global biodiversity goals. Rather than privileging one approach, it outlines a toolbox of mutually reinforcing interventions that target different leverage points in the system, including consumer behaviour, market dynamics, production practices, and global governance structures.

Voluntary and informational instruments are foundational tools that shape norms, guide choices, and prepare the ground for more binding interventions. Strengthening the credibility of eco-labels is key. The proposed EU Green Claims Directive – if robustly enforced – can curb greenwashing by requiring verifiable, science-based environmental claims, although transparency alone is insufficient. A dedicated EU Ecolabel for food and feed is necessary to offer a harmonised benchmark across the Single Market. This label should build on advances in biodiversity footprinting and recognise high-performing systems beyond organic farming, such as regenerative agriculture. Informational efforts need to be complemented by targeted communication strategies.

Market-based instruments – especially green public procurement (GPP) – remain underutilised levers for systemic change. Given that public procurement accounts for 14% of EU GDP, redirecting institutional food procurement – e.g., in schools, hospitals, and military facilities – can drive demand for biodiversity-friendly products. Nonetheless, uptake remains limited due to legal uncertainty, fragmented tools, and weak incentives. This study recommends increasing transparency and benchmarking across Member States, harmonising tools and capacities, and ultimately making GPP mandatory in the food sector. EU institutions should lead by example, linking GPP to funding eligibility and adopting biodiversity criteria in their own procurement.

Fiscal instruments are essential for internalising the ecological costs of consumption. Reforming VAT to favour plant-forward diets – by removing tax breaks on animal products and reducing VAT on plant-based foods – would realign price signals with biodiversity and climate objectives. Revenue generated by these measures should be reinvested to support small-scale producers and ecosystem restoration, particularly in producer countries that are affected by EU demand. To ensure public support, fiscal reforms should be coupled with awareness campaigns and measures that safeguard affordability and equity.

Regulatory instruments offer the most direct route to structural change. The EU Deforestation Regulation (EUDR) is a landmark policy that should be expanded to cover other vital ecosystems, such as peatlands, grasslands, and wetlands, as well as additional high-risk commodities such as maize and shrimp. Implementation should be fair and inclusive, with support mechanisms for smallholders and Indigenous communities, including technical assistance and digital traceability tools.

Finally, **trade and external policies** should be aligned with environmental goals. Future Free Trade Agreements should include enforceable chapters on Sustainable Food Systems, with clear biodiversity targets and monitoring provisions. Equally important is embedding procedural fairness, whereby standards should be co-developed with producer countries to avoid reproducing North–South asymmetries. Internally, the EU needs to ensure policy coherence; for instance, that liberalisation under deals such as the EU-Mercosur Agreement does not undercut regulatory advances like the EUDR.

Put simply, biodiversity loss is not an inevitable consequence of consumption but rather a result of political and economic decisions. This study demonstrates that with coordinated, equity-focused policies, the EU can meaningfully reduce its global biodiversity footprint and contribute to fairer, more sustainable lifestyles.

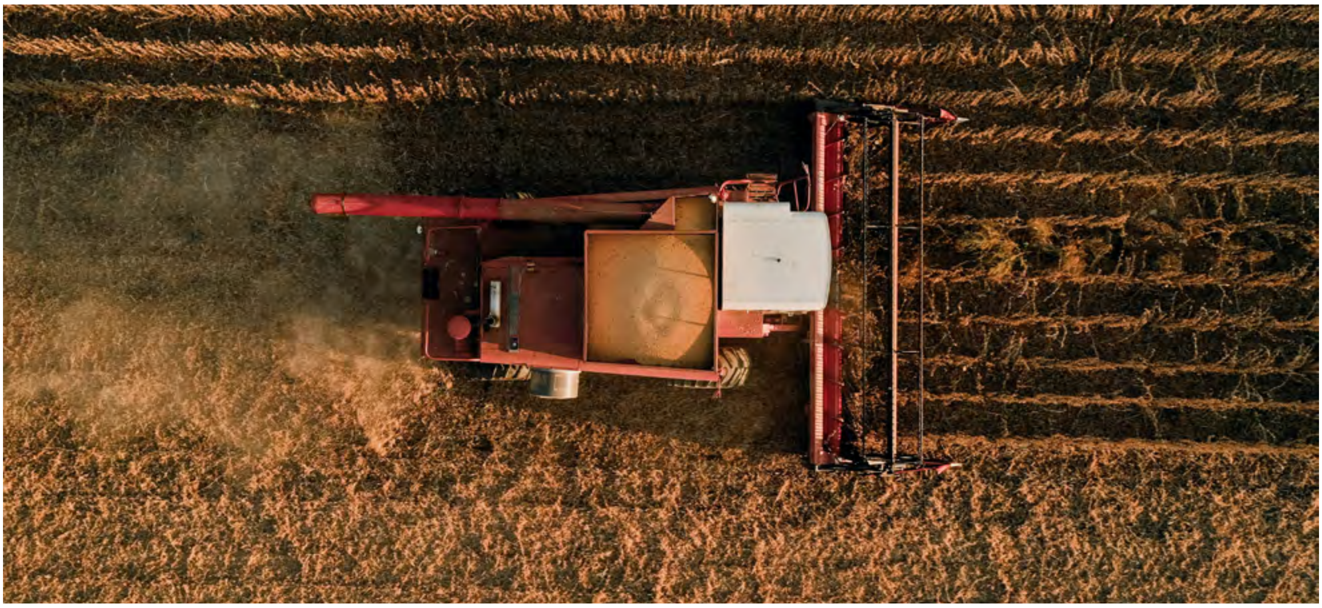

Fig. 6: Global food systems drive 80% of deforestation worldwide. (Photo: Donnie Rosie/Unsplash)

1 Introduction

1.1 Global trends: Biodiversity at risk

Biodiversity forms the foundation of life on Earth, as it safeguards food and water supplies, contributes to human and ecosystem health, and helps stabilise the climate system. Nonetheless, biodiversity loss – driven by changes in land and sea use, overexploitation of organisms, climate change, pollution, and invasive species – is accelerating worldwide, disrupting ecological processes, weakening natural buffers against climate impacts, and threatening essential resources such as clean water and food (IPBES, 2019). Globally, the biomass of wild mammals has declined by 82%, largely due to habitat destruction, and approximately 25% of known animal and plant groups face the risk of extinction (ibid., p. XXIX). According to the United Nations Environment Programme (UNEP), biodiversity loss, climate change, and pollution represent interconnected dimensions of a so-called 'triple planetary crisis,' whose impacts often compound one another (UNEP & IRP, 2024). Reflecting their significance for global stability, the Global Risks Report by the World Economic Forum (2024) ranks biodiversity loss and ecosystem collapse as the second most severe risk for the coming decade.

The Global South is disproportionately affected by these pressures. Home to some of the most biodiverse ecosystems and large shares of global raw materials – such as soy, palm oil and timber – the region bears the ecological brunt of global demand. Meanwhile, consumers in industrialised nations in the Global North remain strongly dependent on resources that are produced, extracted, and processed in these ecologically vulnerable areas. This dynamic creates a direct link between environmental degradation in the Global South and unsustainable consumption patterns in the Global North (Hellmann, 2013; Kliem et al., 2019) and an ecologically unequal exchange, whereby high-income countries derive significant material and economic benefits from trade with low-income countries without providing adequate compensation, effectively outsourcing environmental and social costs. This global 'telecoupling' (J. Liu et al., 2019) not only exacerbates biodiversity loss in producer regions but also entrenches global inequalities and hampers the transition towards sustainable and just development (O'Brien et al., 2025).

Fig. 7: Unsustainable consumption patterns in the Global North are directly linked to environmental degradation in the Global South. (Photo: Fred Meyer/Unsplash)

What is biodiversity?

Biodiversity refers to the variety of life on Earth, encompassing the diversity of species, ecosystems, and genetic differences within species. It is essential for maintaining the stability and resilience of ecosystems, as it supports vital processes such as pollination, nutrient cycling, and climate regulation.

Food consumption is a leading driver of biodiversity loss, surpassing the impacts of other consumption domains in many regions (Wilting et al., 2017). Global food systems[3] are responsible for 80% of deforestation, 70% of biodiversity loss on land, and 50% of biodiversity loss in freshwater ecosystems (WWF, 2020, p. 61). Agriculture alone occupies about half of the Earth's habitable land, with livestock farming and its associated feed production accounting for 83% of this land use, despite providing less than 20% of the world's calorie supply (Poore & Nemecek, 2018, p. 4). Global food production accelerates biodiversity loss due to unsustainable agricultural practices, excessive water use, and widespread pollution. Moreover, the dependence on a narrow range of crop species exacerbates the decline in agrobiodiversity and undermines the resilience of food systems (IPBES, 2019). The environmental toll of food production is poised to intensify as global demand continues to rise. Under a business-as-usual scenario, meeting future food needs would require a 67% increase in cropland use, a 65% rise in water consumption, and a 54% and 51% increase in phosphorus and nitrogen application, respectively, dramatically escalating pressure on ecosystems and threatening critical planetary processes (Springmann et al., 2018).

How EU consumption contributes to biodiversity loss

The European Union (EU) plays a disproportionate role in global resource consumption and its associated impacts on biodiversity. In 2023, its material footprint was 14 tonnes per capita (Eurostat,

[3] These systems encompass all actors and interconnected value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal (including loss and waste) of food. They span agriculture, livestock, forestry, fisheries, and food industries, and are embedded within broader economic, societal, and ecological contexts. Food systems function as tightly interwoven networks, where changes in one domain can trigger cascading effects across others. For instance, rising demand for biofuels can reduce food availability and drive up prices (Riemer et al., 2023; von Braun et al., 2021).

2024), which is estimated to be 40-70% higher than what would be environmentally sustainable within planetary boundaries, the safe operating limits for Earth's ecosystems and resources (Meysner & Gore, 2022). This excessive consumption places a substantial strain on both European and global ecosystems, further intensifying the ongoing biodiversity crisis.

Food consumption is central to this footprint. The globalisation of food systems has made diets in the EU more diverse and – in some cases – healthier (Dokova et al., 2022), although this shift comes at a steep ecological cost. The EU's demand for agricultural products extends well beyond its borders, exerting pressure on ecosystems in other parts of the world. Food consumption alone accounts for nearly one-third of the EU-27's ecological footprint, with over half of its biocapacity demand met through imports from non-EU countries (Galli et al., 2023). This strong reliance on external land resources contributes directly to biodiversity degradation in some of the world's most fragile ecosystems.

The negative effects of the EU's food systems on biodiversity can largely be traced to two key factors (Köppen et al., 2024). First, the intensification of agricultural practices has led to the decline of structurally diverse, extensive landscapes that once supported rich ecosystems. This shift has also reduced genetic diversity while increasing water use and pollution. Second, shifting consumption patterns and dietary habits continue to drive land use changes that directly contribute to the destruction of natural ecosystems. A central concern is the high and persistent consumption of animal-based products. In the EU, per capita meat consumption increased from around 50 kg per year in 1961 to a peak of 86 kg in 1990, before slightly declining to 78 kg in 2022 (Our World in Data, 2024).

The urgent need for a shift in consumption patterns

Scholars and policymakers are increasingly emphasising that halting biodiversity loss requires a fundamental transformation of consumption patterns, particularly in the food and agriculture sectors (O'Neill et al., 2018; Wiedmann et al., 2020). In the Global North, transitioning toward more sustainable and biodiversity-friendly diets is now widely seen as essential. While supply-side interventions such as improved agricultural practices can reduce some pressures, they are insufficient on their own (Köppen et al., 2024). Poore and Nemeck (2018) argue that changing dietary patterns could offer environmental benefits that producers alone cannot achieve, as the efficiency potential in agricultural production – especially for animal products – is limited. As a result, policy interventions should focus on systemic change, addressing not only production but also consumption and waste generation (Köppen et al., 2024). A transition toward plant-forward diets combined with efforts to reduce food waste and improve trade policies could significantly reduce the EU's global biodiversity impact.

Fig. 8: Vast trade flows connect resource use in the Global South to Northern lifestyles. (Photo: GreenOak/Shutterstock.com)

A key concept for achieving sustainable food systems is the planetary health diet (EAT-Lancet Commission, 2019). Developed by the international EAT-Lancet Commission – comprising 37 scientists from sixteen countries – this framework is designed to enable the growing global population to eat healthily while remaining within the planet's ecological boundaries. Realising this vision requires more environmentally friendly production practices, a substantial reduction in meat and animal product consumption, and a halving of food loss and waste. Celebrated as a groundbreaking approach, the planetary health diet not only guides the creation of healthy and sustainable dietary patterns but also has the potential to inform policy measures ranging from agricultural subsidies and food taxation to public procurement guidelines.

1.2 International and European policy efforts for nature-friendly consumption

Tackling the negative impacts of consumption on biodiversity and climate has been on the international political agenda for many years. In 2012, the Ten-Year Framework of Programmes (10YFP)[4] was launched to promote sustainable economic practices, later becoming part of the One Planet Network (OPN). Adopted in 2015, the Sustainable Development Goals (SDGs) established sustainability as a global priority. SDG 12, which focuses on sustainable consumption and production, including targets that emphasise resource efficiency (12.2) and the role of education in fostering informed consumer choices for biodiversity conservation (12.8).

More recent developments under the Convention on Biological Diversity (CBD)[5] – especially the Kunming-Montreal Global Biodiversity Framework (GBF)[6] adopted in 2022 – have set new standards for biodiversity governance. Referred to as the 'Paris agreement for nature' (Willige, 2021), it encompasses four global goals for 2050 and 23 targets for 2030, among them a commitment by the various parties to reduce subsidies that are harmful to biodiversity and restore 30% of degraded ecosystems. Target 15 requires governments to encourage and enable businesses, including large corporations, to disclose biodiversity risks, dependencies, and impacts. This includes reporting on supply and value chains and operations, with the goal of progressively reducing negative impacts and increasing positive impacts on biodiversity. In the context of food systems, this implies that agribusinesses, retailers, and producers have a crucial role to play in ensuring biodiversity-friendly sourcing and preventing habitat destruction. In addition, GBF target 16 requires governments to encourage sustainable consumption through consumer information, education, and supportive policy frameworks, aiming to reduce food waste by half, tackle overconsumption, and promote responsible choices. The success of these targets depends on their integration into national policies and private sector commitments.

A further notable development is the EU Green Deal,[7] a comprehensive strategy aimed at making the EU climate-neutral by 2050. Within this framework, several key initiatives address sustainability challenges related to food systems and beyond, including the Farm to Fork Strategy and the EU Deforestation Regulation (EUDR). The former aims to make food systems fair, healthy, and environmentally friendly, outlining a comprehensive vision for transforming food production and consumption across the EU to achieve sustainability goals by 2030. By contrast, the EUDR represents the EU's most ambitious effort to address its role in global deforestation to date. To reduce the EU's global deforestation footprint, it imposes legally binding market access conditions, whereby relevant products can only be placed on or exported from the EU market if they are 'deforestation-free,' legally produced in accordance with the laws of the country of origin, and covered by a due diligence statement. The regulation applies to products derived from or containing seven high-risk commodities: cattle, cocoa, coffee, oil palm, rubber, soy, and wood.

However, current political momentum remains far below what is needed to effectively curb global ecosystem destruction (Teufel et al., 2021). International negotiations continue to lag, slowed by diverging interests among actors and compound-

[4] Ten-Year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP), adopted by the United Nations Conference on Sustainable Development (Rio+20), 20–22 June 2012, A/CONF.216/5, endorsed by UN General Assembly resolution 66/288, The Future We Want, 27 July 2012.

[5] Convention on Biological Diversity (CBD), United Nations, adopted at the Rio Earth Summit on 5 June 1992, entered into force 29 December 1993, 1760 UNTS 79.

[6] Kunming–Montreal Global Biodiversity Framework (GBF), adopted by the Conference of the Parties to the Convention on Biological Diversity at its fifteenth meeting (COP 15), Montreal, 19 December 2022, CBD/COP/DEC/15/4.

[7] Communication from the Commission: The European Green Deal, COM(2019) 640 final, dated 11 December 2019.

ed by pressing global challenges such as armed conflicts and mounting backlash against environmental and sustainability agendas (Bocquillon, 2024). At the same time, political resistance to sustainability initiatives is intensifying, fostering a broader shift toward deregulation that threatens progress toward nature-friendly production and consumption. The European Commission's recently launched Competitive Compass prioritises economic strength and resilience (2025), placing key environmental gains at risk. Proposed 'Omnibus' legislation could further weaken corporate regulations, potentially rolling back key climate- and biodiversity-related measures, including the Supply Chain Due Diligence Directive (CSDDD)[8] and the Corporate Sustainability Reporting Directive (CSRD)[9] (Directive (EU) 2022/2464, CSRD) (DNR, 2025). Similarly, in June 2025, negotiations on the Green Claims Directive[10] were suspended due to concerns from some EU Member States about excessive bureaucracy and the directive's potential burden on businesses (Euraktiv, 2025; Reuters, 2025b). Even the EUDR – which already entered into force in June 2023 – saw its full application delayed by one year, whereby it will now apply from December 2025 for medium and large operators, and from June 2026 for micro and small enterprises.

These political setbacks occur within a broader context of institutional fragmentation. A recent European Commission analysis highlights a patchwork of environmental policies across Member States (Sanyé-Mengual et al., 2024), which further impedes the transformative governance of food systems and systemic change. Scholars argue that addressing these challenges requires moving beyond isolated interventions toward integrated policy mixes (Kern et al., 2019; Kliem et al., 2019). It is argued that these mixes should jointly address climate and biodiversity impacts, raise awareness of consumption-driven biodiversity loss, shape individual consumption choices, incorporate regulatory and fiscal tools, and phase out environmentally harmful subsidies, while seeking synergies across these strategies (O'Brien et al., 2025). Delivering on this ambitious agenda requires a strong scientific foundation that provides policymakers with robust data and facilitates evidence-based policymaking.

1.3 Aims of the study

The rollback of sustainability policies and the fragmentation of governance underline the urgent need for coherent and ambitious action on biodiversity. This study provides scientific evidence that such political action is indispensable, offering guidance on how robust and integrated approaches can be advanced in the governance of food systems. It examines three commodities – shrimp, soy, and palm oil – that exemplify global supply chains with significant environmental footprints. Through detailed case studies, the report analyses the biodiversity impacts associated with their production and explores strategies to mitigate these effects. While the EU serves as the primary reference point, the findings are relevant to other industrialised economies and – in some cases – directly transferable. The study pursues three objectives. First, it seeks to develop a scientifically grounded information base on the EU's consumption-related biodiversity impacts associated with these three commodities. Second, based on this knowledge, the study proposes concrete policy recommendations for EU policymakers to promote nature-friendly consumption of shrimp, soy, and palm oil. Third, by identifying key differences and similarities between the three cases, the study aims to pinpoint overarching political levers

8 Directive (EU) 2024/1760 of the European Parliament and of the Council of 13 June 2024 on corporate sustainability due diligence and amending Directive (EU) 2019/1937 and Regulation (EU) 2023/2859, OJ L, 5.7.2024, p. 1-58.

9 Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting, OJ L 322, 16.12.2022, p. 15-80.

10 Proposal for a Directive (EU) 2023/0085/COD of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive), COM(2023) 166 final, proposed 22 March 2023.

at the EU level that can support nature-friendly consumption.

While the study initially adopts a food systems perspective, it draws connections to other sectors, such as transportation. In assessing the biodiversity impacts of each product, it considers the various ecosystems that are affected to provide an integrated perspective on the biodiversity impacts of the three cases. Through this systemic perspective and the methodological and disciplinary mix of quantitative assessments of biodiversity impacts and qualitative policy analysis, this approach bridges the gap between different scientific communities to provide scientifically supported policy advice.

1.4 Methodological approach

Case study selection

The study follows a three-step methodological design. The first step involved selecting relevant commodities. The primary selection criterion was that each case must exert significant pressure on biodiversity. An initial overview of the main drivers of biodiversity loss was developed through extensive desk research, followed by expert consultations in the field of biodiversity governance. Second, to capture displacement effects from the EUDR – which focuses primarily on forests – the study also aimed to include ecosystems beyond forested areas. Other considerations included the direct link between each commodity and individual consumption, as well as the availability of reliable data.

Based on this process, shrimp, soy, and palm oil were selected. Shrimp was chosen as a commodity from marine ecosystems, which the EUDR does not cover. Moreover, with the EU among the world's largest seafood markets and shrimp gaining popularity, there is substantial leverage for biodiversity protection. In terms of scope, the study focused on farmed shrimp only, which accounts for about half of the shrimp consumed in the EU (European Commission Directorate General for Maritime Affairs and Fisheries & EUMOFA, 2024). This focus is justified by the scale of aquaculture's market share and the particular environmental challenges it poses, including land conversion with impacts on both biodiversity and carbon emissions, as well as water pollution from shrimp farms. Soy was chosen due to its high demand in the EU, particularly for animal feed, which drives significant deforestation and land use change in its countries of origin. The EUDR targets deforestation of forests but overlooks biodiversity risks in ecosystems like savannahs, grasslands, and other wooded areas, which are also affected by soy production. Through embedded soy in meat and animal products, the biodiversity impacts of soy are directly linked to individual consumption. Finally, palm oil is associated with the highest deforestation risks worldwide, particularly in biodiversity-rich regions such as tropical rainforests and peatlands.[11] At present, peatland areas are not covered by the EUDR and remain unprotected. Palm oil's impact is directly tied to individual consumption, affecting sectors such as food, cosmetics, detergents, and biofuels.

Evaluating biodiversity impacts

The second methodological step involved evaluating biodiversity impacts associated with EU consumption of shrimp, soy, and palm oil. Biodiversity impacts were evaluated along two dimensions: land conversions, i.e., the conversion of natural, biodiversity-rich ecosystems into aquaculture systems or farmland, and the biodiversity value of the production systems themselves.

To assess these impacts, in a first step, the volume flows of imports into the EU (EU27) from countries in the Global South for each product were derived using statistical data from the Eurostat Comext database. For soy and palm oil, the study focused solely on direct imports. Various sub-products (e.g., soybean oil, soybean meal, palm kernel oil) were converted into their primary product equivalents following the methodology

[11] Tropical peatlands are wetland ecosystems found in warm regions where waterlogged conditions allow thick layers of partially decomposed plant material – called peat – to build up over thousands of years (International Peatland Society, n.d.).

Fig. 9: Global resource demand drives deforestation, accelerating biodiversity loss and climate change. (Photo: _jure/iStock)

of De Laurentiis et al. (2024). For shrimp, additional steps were required. Specifically, we identified the share of farmed shrimp in exporting countries, determined the specific aquaculture species involved, and assigned the corresponding HS codes from Comext. This was supported by data from FAOSTAT and EUMOFA. For the purpose of this study, we did not consider the impacts of total imports into the EU27 but focused on the part that remains within the EU, i.e., net imports. This share presumably represents the share actually consumed within the EU. For doing so, re-exports were subtracted from the imports. Due to a lack of data, we assumed the export country mix to be the same as the import country mix.

The second step involved converting import volumes into estimated land use requirements. For palm oil and soy, this was achieved using average yield data from FAOSTAT, calculated over a five-year period. In the case of shrimp, due to the lack of consistent yield data in FAOSTAT, we used findings from Boyd et al. (2021) instead.

As a final step, the estimated land use requirements were mapped onto the predominant biomes in the respective producing countries. For palm oil and shrimp, this was relatively straightforward, as production is concentrated in specific ecosystems, namely tropical rainforests and mangroves, respectively. In contrast, soy is cultivated

The Trase Database and deforestation

Trase is a partnership established by the Stockholm Environment Institute and Global Canopy that links supply chain information of agricultural commodity imports in consumer countries with the resulting tropical deforestation in producer countries. The data covers more than 60% of global trade in forest-risk commodities, including soy, beef, and palm oil. Trase's deforestation indicator captures the primary loss of native vegetation, i.e., how much of a defined area used to produce a particular commodity overlaps with areas that have been recently deforested or converted into agricultural land. It combines remote sensing data with additional validation from other sources, such as official government data, mapping initiatives, and non-governmental organisation (NGO) datasets. These datasets generally encompass all native vegetation types, ranging from natural grasslands, wetlands, and savannahs to dry and moist forests. A so-called 'allocation period' is applied that accounts for the period of time over which deforestation is likely to have been caused by the target commodity.

across a wider range of ecosystems. Its allocation was based on Trase ratios, which reflect the distribution of soy cultivation across different biomes. Beyond biome classification, assessing biodiversity impacts also required incorporating data on actual deforestation and land conversions linked to the production of each commodity. For the main producing countries, these deforestation estimates were similarly drawn from the Trase database.

It should be noted that the Trase database also includes trade flows for imports of individual commodities into Europe. However, since the database does not account for all countries relevant to European shrimp imports, we used the Comext databases for the sake of consistency. Consequently, due to differing assumptions and methodologies, there are discrepancies in the trade flows reported in this study compared to those published by Trase. While Trase also utilises Comext data, it combines these with national data sources, such as production statistics and company information.

Identifying policy measures for nature-friendly consumption

The third and final methodological step involved evaluating policy instruments for reducing the biodiversity impacts associated with the consumption of soy, palm oil, and shrimp. To achieve this, the relevant policy context for each commodity was described, and key stakeholders were identified in a first step. Next, a broad set of potential measures to support nature-friendly consumption and production practices was compiled, drawing on scientific literature, expert panels, policy analyses, and publications from NGOs and think tanks. These measures were categorised by type – regulatory, informational, cooperative, and financial instruments – and subsequently evaluated in terms of the overarching sustainability strategies that each measure aligned with, namely sufficiency, efficiency, consistency, and substitution. Based on insights from the earlier analysis of biodiversity impacts and policy contexts, the most relevant sustainability strategies were identified for each case. From there, the most suitable policy measures were selected, with a focus on those that directly addressed the core challenges of the respective commodity. These measures were then further elaborated into concrete policy recommendations. The resulting recommendations were presented and discussed in a workshop with international experts, including policymakers, researchers, and practitioners from the fields of biodiversity conservation, consumer policy, and strategic communication. Based on the feedback received, the recommendations were refined and further developed to enhance their relevance and effectiveness.

Fig. 10: Shrimp is the EU's third most consumed seafood. (Photo: Wilfried Strang/Pixabay)

2 The case of shrimp

Once considered a luxury item, shrimp is now the third most consumed seafood in the EU, accounting for 10% of the total volume of all fish imports (European Commission Directorate General for Maritime Affairs and Fisheries & EUMOFA, 2024, p. 17). Between 2012 and 2023, EU shrimp imports rose by approximately 60%, driven by advances in aquaculture significantly reducing prices and growing awareness of its health benefits – low in fat, high in protein – boosting its appeal as a sustainable and nutritious part of a balanced diet. Together, these dynamics have transformed shrimp from an occasional indulgence into one of the fastest-growing protein sources in the European market, raising questions about the sustainability of this expanding appetite.

2.1 Mass flows and environmental impacts

2.1.1 The global perspective

Shrimp is produced through two fundamentally different methods: wild capture and aquaculture. Wild-caught shrimp is harvested from marine and coastal ecosystems – such as oceans, bays, and estuaries – using fishing techniques such as bottom trawling. By contrast, farmed shrimp is cultivated in controlled environments, including ponds, tanks, and raceways. We focus on aquaculture shrimp, which accounts for approximately half of the shrimp consumed in the EU (European Commission Directorate General for Maritime Affairs and Fisheries & EUMOFA, 2024, p. 43).

Global shrimp production from aquaculture has more than doubled over the past two decades, rising from 2.8 million tonnes in 2010 to 6 million tonnes in 2023 (FAO, 2024b) (see also Fig. 11). However, this expansion has been uneven: after a sharp increase starting in 2013, production stagnated in 2020, primarily due to the impacts of the COVID-19 pandemic (FAO, 2021). In 2023, global inflation and declining disposable incomes in key consumer markets such as North America and Europe contributed to a period of slight decline (FAO, 2024b). Preliminary data from 2024 indicate a continued downturn (FAO, 2024a). Five countries – China, Ecuador, India, Vietnam, and Indonesia – now account for roughly 74% of global output (Global Seafood Alliance, 2023).

Global aquaculture shrimp production is dominated by the pacific white shrimp (Litopenaeus vannamei) and the black tiger shrimp (Penaeus monodon). While the former still dominates global production (Global Seafood Alliance, 2023), breeding advancements and the black tiger shrimp's resistance to certain diseases have contributed to a recent resurgence in its production, particularly in Southeast Asia (Aqua Culture,

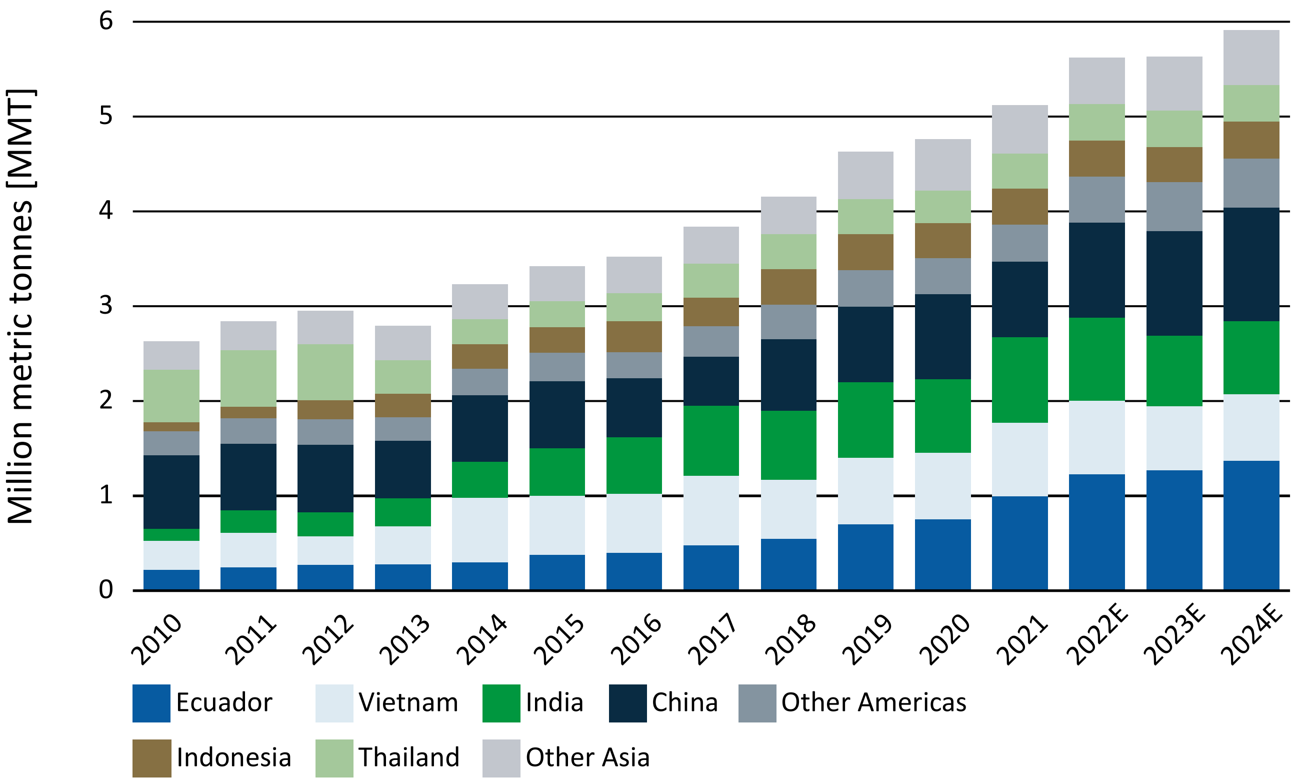

Fig. 12: Global aquaculture shrimp production 2010–2024 (Global Seafood Alliance 2023)

2023). In 2023, black tiger shrimp accounted for 10% of shrimp production in Southeast Asia, with a total of over 500,000 tonnes (FAO, 2024b, p. 63).

Global shrimp consumption is growing across both industrialised and emerging economies. China is not only the world's largest producer of shrimp but also the largest importer globally. Despite a significant domestic aquaculture industry, imports of frozen and high-quality shrimp are increasing due to urbanisation and rising disposable incomes (Renub Research, 2025). The US ranks second in imports, and together with China it accounted for 48% of global shrimp imports in the first half of 2024 (0.86 million tonnes in 2023). Other important consumers include Japan, Spain, and France, whose combined imports totalled 501,000 tonnes in 2023 (FAO, 2024b). In 2023, the global shrimp market was valued at approximately USD 40.35 billion. Projections indicate that it could grow to USD 74.24 billion by 2032, with an average annual growth rate of around 7.1% between 2024 and 2032 (Fortune Business Insights, 2025).

Fig. 11: Shrimp contain substantial levels of protein, omega-3 fatty acids, and essential micronutrients such as iodine and vitamin B12. (Photo: Artem Stepanov/Shutterstock.com)

2.1.2 European imports and consumption

Shrimp production within the EU is limited. The EU's self-sufficiency rate stands at just 12% on average between 2013 and 2022 (European Commission Directorate General for Maritime Affairs and Fisheries & EUMOFA, 2024, p. 37), underscoring its structural reliance on imports. As a result, most shrimp consumed in the EU originates from countries with established fishery and aquaculture industries. In 2022, shrimp accounted for 10% of the total volume and 13% of the value of fish imports into the EU (ibid.). With an import value of €532 million – 7% of total fish import

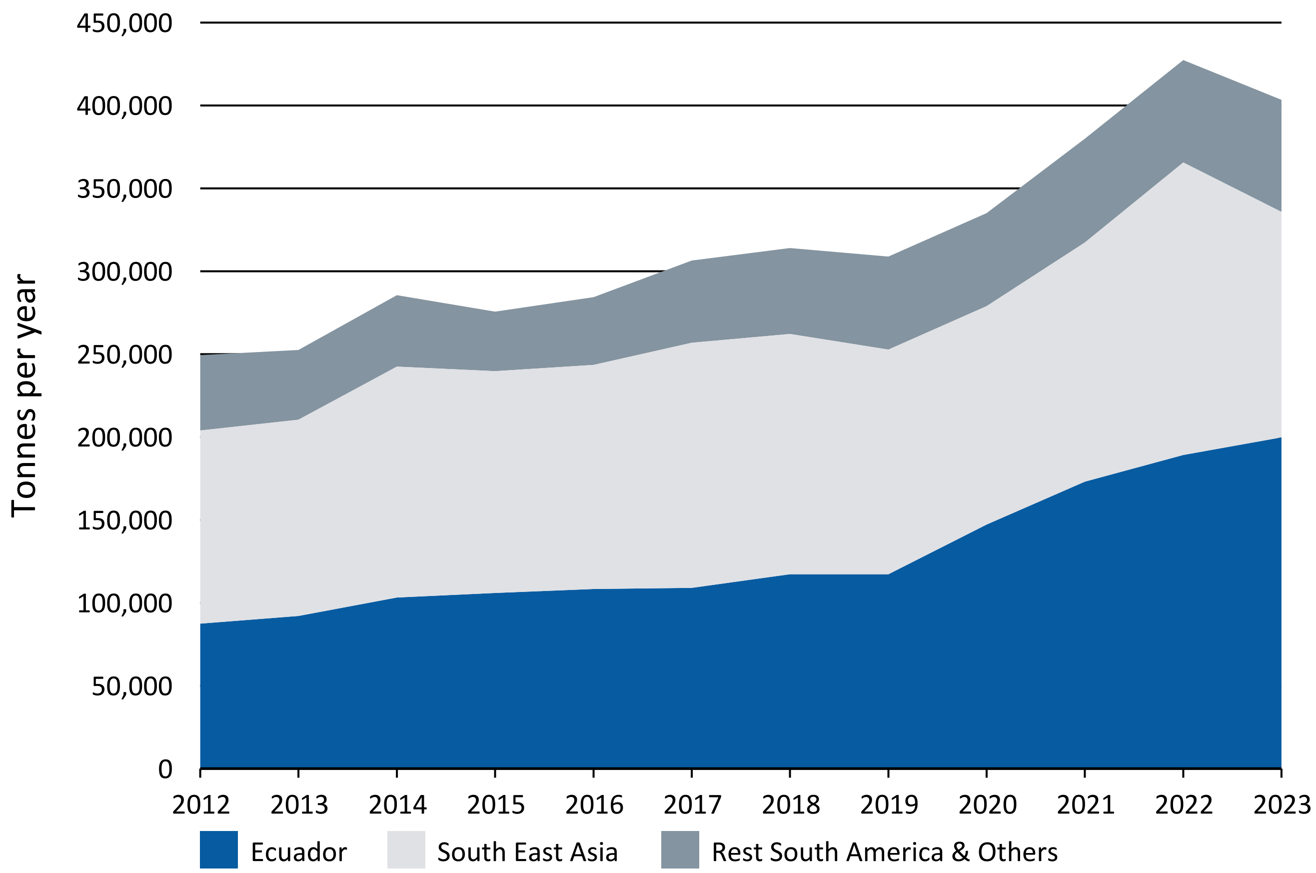

Fig. 13: Aquaculture shrimp imports into the EU (own compilation; for references see Section 1.4)

value – shrimp ranked among the top three fish species by import value.

Fig. 13 illustrates the trend and the countries of origin of aquaculture shrimp imports into the EU, adjusted for re-exports (for methodological details, see Section 1.4). The trend in shrimp imports to Europe depicted in the figure reflects global developments, showing an overall upward trend between 2012 and 2023. In 2023, a total of 404,000 tonnes of farmed shrimp were imported, marking a 60% increase since 2012 (252,000 tonnes). A notable surge occurred after 2019, largely driven by the COVID-19 pandemic, which shifted consumption toward home-prepared meals during quarantine measures (ibid.). Imports peaked in 2022 at nearly 428,000 tonnes, reflecting the highest volume in the past decade. However, in 2023, imports declined by 5.5% compared to the previous year, reflecting the broader stagnation in global shrimp production. This downturn was primarily driven by inflation and reduced consumer purchasing power (FAO, 2024b).

EU shrimp import patterns have shifted markedly in recent years. While imports from Vietnam declined, Ecuador's share has risen steadily – reaching 49% of total EU imports in 2023 – driven primarily by its lower price point (FAO, 2024b). Vietnam, Venezuela, and India follow as the next most important suppliers. By contrast, imports from China play only a minor role in the European market – counter to global trends – accounting

Fig. 14: Mangroves are vital coastal ecosystems and provide habitat for many species. (Photo: Galeh Kholis/Shutterstock.com)

for just 1.7% of total imports in 2023 (own compilation; for references see Section 1.4).

Shrimp consumption in the EU is evenly split between wild-caught and farmed products. After peaking at 1.60 kg per capita in 2018, shrimp consumption in the EU dropped below 1.50 kg per capita in 2019 and 2020. In 2021, shrimp consumption began to rise again, reaching a new peak of 1.68 kg per capita by 2023 (ibid.).

2.1.3 Biodiversity impacts

Shrimp production – whether wild-caught or farmed – entails significant biodiversity impacts. In wild capture fisheries, methods such as bottom trawling, skimmer trawling, and gillnetting often unintentionally capture other marine life, known as bycatch. With trawling, boats drag large nets along the seabed, catching almost everything in their path, such as marine turtles. Gillnets similarly cause large amounts of bycatch, trapping everything larger than the mesh, including juvenile fish, sharks, seabirds, sea turtles, and cetaceans (members of the whale family, including dolphins and porpoises). Moreover, lost gillnets are rarely recovered and can continue capturing marine animals for many years (Seafood Watch, n.d.; WWF, n.d.). Bycatch remains one of the leading global threats to marine biodiversity, with an estimated 9.1 million tonnes of unwanted catch

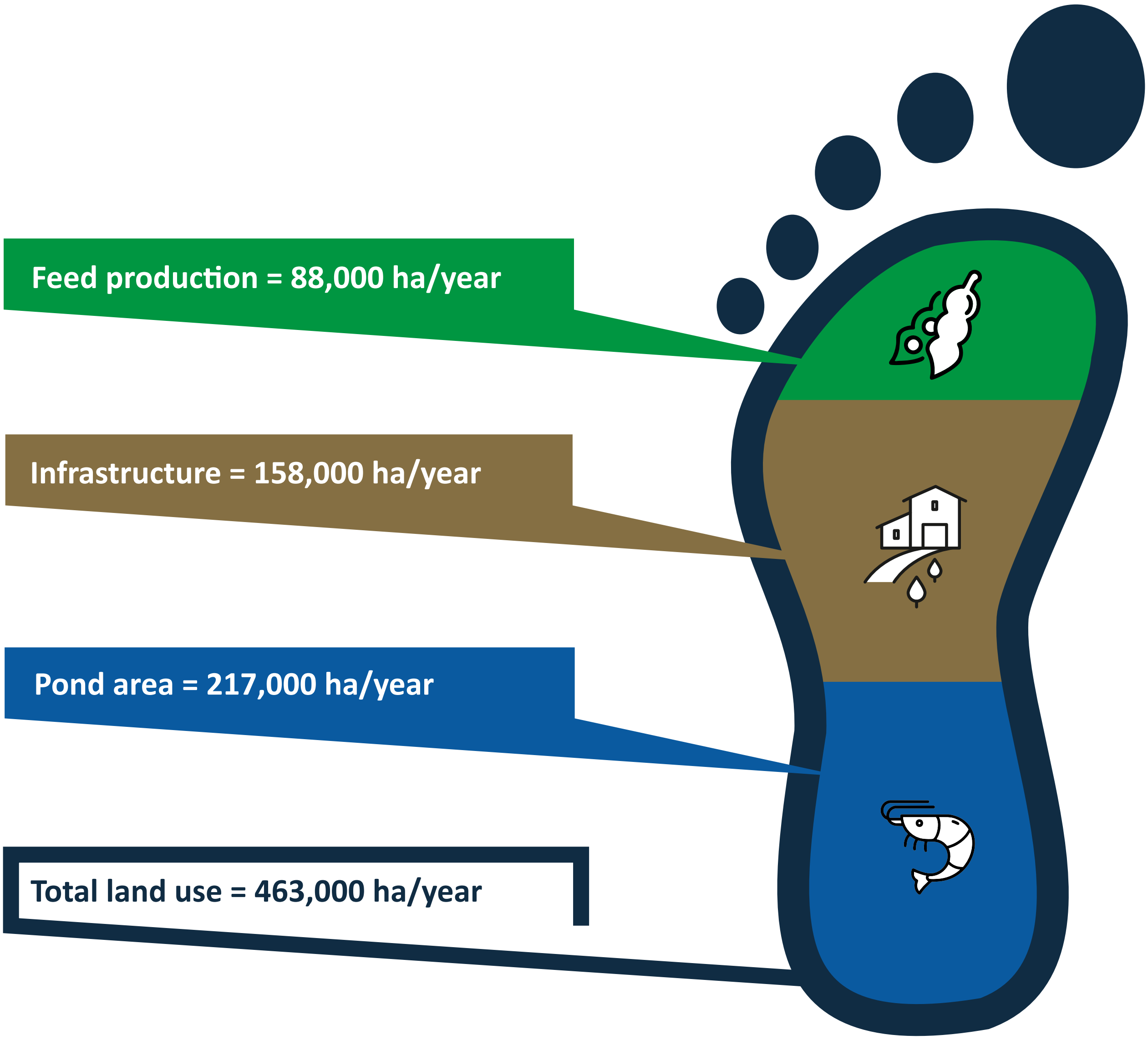

Fig. 15: Land footprint of shrimp production for European consumption in 2018, broken down into pond area, farm area, and cropland for feed production (compilation based on Boyd et al., 2021)

Fig. 16: Shrimp farms typically use flow-through systems that discharge nutrient- and chemical-rich effluents, polluting and degrading nearby ecosystems. (Photo: BorneoRimbawan/Shutterstock.com)

discarded annually (Pérez Roda et al., 2019, p. 10). In farmed shrimp production, biodiversity impacts arise through the expansion of shrimp farms is associated with land use changes – i.e., conversion and degradation of biodiversity-rich ecosystems – and harmful environmental effects such as water pollution and high water needs. Both effects are analysed in further depth in the following.

Land footprint of European shrimp consumption

Quantifying the land area required to produce shrimp consumed in Europe is challenging due to wide variability in yields across production systems, from extensive systems yielding roughly 0.5 t/ha to hyper-intensive systems exceeding 20 t/ha (Boyd et al., 2021). Using national average yields from Boyd et al. (2021) and EU import volumes (as shown in Fig. 13), the direct pond area required to produce shrimp imported to Europe in 2018 is estimated at 217,000 hectares. However, shrimp farming also involves supporting infrastructure, including hatcheries and nurseries. Adjusting for this, total land use expands to approximately 375,000 hectares, based on country-specific correction factors (1.48 to 1.79 times pond area). An additional, indirect land demand arises from the feed requirements of shrimp farming, which strongly relies on agricultural commodities such as soy[12], rice bran, wheat flour and on fishmeal or wild-caught fish (Ashton, 2008). Shrimp require two to three times their body weight in fishmeal or wild-caught fish (ibid.). According to Boyd et al. (2021), about 86% of farmed shrimp production is feed-based, which means that an additional 88,000 ha would be required for European shrimp consumption. Overall, the footprint of European aquaculture shrimp consumption in 2018 amounted to 463,000 hectares, roughly 1.9 times the size of Luxembourg (see Fig. 15). While intensification offers potential to reduce per-unit land use, its benefits are limited. More intensive systems typically require more feed inputs, thereby increasing the demand for cropland and marine resources (Boyd et al., 2021).

Mangrove deforestation driven by aquaculture expansion

Beyond its land use implications, the expansion of shrimp aquaculture poses serious risks to coastal ecosystems, most notably mangrove forests. Globally, mangroves cover about 147,256 km^2 (Global Mangrove Alliance, 2024), primarily in the

[12] The environmental implications of soy cultivation are discussed in detail in Section 3.1.3 of this study.

intertidal zones of tropical and subtropical coastlines, where land meets the sea. From a sustainability perspective, mangrove forests hold critical importance as they support high levels of biodiversity, sequester carbon, protect coastlines from erosion, and sustain local livelihoods. Mangrove ecosystems are biodiversity hotspots, shaped by the diversity of living conditions in the intertidal zone. They encompass a variety of habitats: the canopy provides nesting sites for numerous bird species, the middle intertidal zone – shaped by the ebb and flow of tides – hosts specialised organisms adapted to its fluctuating conditions, and the lower zones are home to a wide array of marine species, including nursery habitats for fish and larger animals such as manatees. Moreover, mangroves also provide essential resources such as food, breeding grounds, and nursery habitats for both aquatic and terrestrial species (Global Mangrove Alliance, 2024; Kathiresan & Bingham, 2001). Overall, more than 1,500 species are associated with mangroves, 15% of which are threatened with extinction. These include a wide range of marine vertebrates – such as various fish species and mangrove crabs – as well as particular bird species and larger animals such as sea turtles, manatees, and proboscis monkeys. In addition, countless plant species are also affected, including some species of mangrove trees themselves (United Nations Environment Programme, 2023). Moreover, mangroves areas are closely intertwined with adjacent ecosystems such as tidal marshes, seagrass meadows, tidal flats, and coral reefs. Impacts on mangroves thus drive wider changes in these ecosystems.

In addition to supporting biodiversity, mangroves provide a wide range of vital ecosystem services. They act as natural buffers against storm surges, sea level rise, and shoreline erosion, while also regulating coastal water quality and nutrient cycles (Howard et al., 2014). For many coastal communities, mangroves are crucial to local livelihoods, providing food, materials, and income. They serve as nurseries for fish and shellfish, which are crucial for both subsistence and commercial fisheries, and they also supply additional food products such as honey, fruits, and edible leaves. Additionally, mangroves provide valuable materials such as timber for firewood and construction, and create employment opportunities in fisheries, aquaculture, and ecotourism, thereby underpinning both food security and economic stability for local populations (Leal & Spalding, 2024). Mangrove forests are also among the most effective natural carbon sinks on the planet. Coastal ecosystems – including mangroves – sequester carbon at exceptionally high rates and can store it for centuries to millennia (Atwood et al., 2017; Bertram et al., 2021; Howard et al., 2014; Spivak et al., 2019). Although mangroves only account for 3% of the world's forest cover, their deforestation could account for up to 10% of global carbon emissions (Donato et al., 2011, p. 293). The destruction of mangrove ecosystems not only lowers their capacity to absorb carbon but also releases vast amounts of previously stored carbon from soils (Spivak et al., 2019), adding to an increase in greenhouse gas concentration in the atmosphere (Atwood et al., 2017; Spivak et al., 2019).

Mangrove forests have experienced decades of deforestation, with an estimated 35% lost globally between 1980 and 2000 (Valiela et al., 2001, p. 809). Shrimp farming has been a major driver of this decline (Global Mangrove Alliance, 2024). More than half of all deforested mangrove areas – around 1.89 million hectares – have been converted into coastal aquaculture farms. Of this total, about 1.4 million hectares were used for shrimp farming, while the remaining 490,000 hectares were used for other types of aquaculture (Ahmed et al., 2017, p. 442). However, patterns of mangrove loss – and efforts to curb or reverse them – have significantly varied across regions, resulting in a highly uneven global landscape. For instance, while the conversion of mangroves into shrimp farms appears to have been largely contained in Ecuador – the EU's largest supplier of farmed shrimp (see the following Box) – mangrove loss due to the establishment of new shrimp farms continues to occur in Southeast Asia, which is providing around 32% of European shrimp imports. The region – home to nearly half of the world's mangrove forests – lost an estimated 360,000 hectares (7.4%) between

2001 and 2022, primarily driven by aquaculture expansion and demand for wood products (Sasmito et al., 2025, p. 3). This area equals around fourteen times the area of Luxembourg. According to the Global Mangrove Alliance (2024, p. 21), aquaculture in Asia was responsible for over one-third of the documented mangrove deforestation between 2000 and 2020.

Combatting mangrove deforestation: The case of Ecuador

Industrial shrimp farming in Ecuador began in earnest in the 1970s and rapidly expanded during the 1980s. Favourable coastal conditions, government incentives, and growing international demand fuelled the conversion of vast mangrove areas into shrimp ponds, particularly in the Gulf of Guayaquil. By the mid-1980s, Ecuador had become one of the world's leading shrimp exporters, with significant environmental consequences. While the exact deforestation rates are not known, a 2007 study estimated a 27.6% loss of mangrove forests during the 1969-2006 period (Bravo, M., 2013, cited after IUCN & CI Ecuador, 2016), with the peak of shrimp farming-driven deforestation occurring in the 1980s. This situation began to shift in the early 1990s, following increasing international pressure to address environmental degradation. In 1994, Ecuador introduced a ban on mangrove felling and the construction of new shrimp farms in mangrove areas (López-Angarita et al., 2016). Under current regulations, only recreational use is permitted within mangrove zones, while concessional use for cultivating native aquatic species is limited to legally recognised, non-profit organisations or local ancestral communities (D'Andrea, 2025). While historical damage remains extensive, these reforms – which were accompanied by a rise in voluntary certification schemes and community-based restoration efforts – have contributed to a notable decline in new mangrove deforestation in recent years (Goldberg et al., 2020). Despite this decline, the increase in shrimp imports to Europe can be attributed to the substantial yield improvements achieved on existing aquaculture farms in recent years. The reforms have also led the country's aquaculture industry to adopt more sustainable practices. As a result, Ecuador is today often regarded as having one of the more sustainable shrimp industries, partly due to higher certification rates compared to its Asian counterparts (Asche et al., 2021). However, there is also evidence indicating that illegal deforestation of mangrove forests has continued in Ecuador even after the ban (Cabello, 2021).

Overall, mangrove deforestation has slowed compared to the late 20th century, due to stronger legal protection and the declining availability of viable areas for conversion (Goldberg et al., 2020). Restoration efforts – through both reforestation and afforestation – are underway in many regions, supported by international initiatives such as the Global Mangrove Alliance and the Bonn Challenge. Frameworks such as the Ramsar Convention on Wetlands and the CBD have also contributed to promoting the protection, restoration, and sustainable use of mangrove habitats. However, restoration outcomes remain mixed as studies report seedling survival rates of just 51% on average (Bayraktarov et al., 2016, p. 1060), and many replanting efforts have failed to produce lasting results (Leal & Spalding, 2024). These failures are often linked to challenges such as inappropriate site selection, the planting of unsuitable species, limited and short-term funding, weak institutional coordination, and a lack of long-term monitoring (Leal & Spalding, 2024; Lovelock et al., 2022). In addition, restoration projects frequently overlook the root causes of degradation and are further hindered by pollution, climate impacts, and competing land uses (Lovelock et al., 2022; Pham et al., 2022).

Environmental impacts of aquaculture pond operations

Beyond deforestation, shrimp farms themselves pose significant environmental challenges. Most shrimp ponds operate as flow-through systems, where water is continuously exchanged to maintain optimal growing conditions. These systems

Fig. 17: Mangroves provide natural protection against storm surges and rising seas. (Photo: GarryKillian/Shutterstock.com)

discharge effluents containing chemicals, antibiotics, nutrients, organic matter, and suspended solids into surrounding water bodies, leading to pollution and eutrophication in adjacent ecosystems (Avnimelech & Ritvo, 2003; Molnar et al., 2013; Monsalve & Quiroga, 2022). Management systems are typically classified as extensive, semi-intensive, or intensive, with environmental impacts rising along this gradient (Ashton, 2008). Intensive systems – characterised by high stocking densities – require larger inputs of feed, chemical additives, and energy for aeration and water exchange (Pazmiño et al., 2024). They are associated with a higher risk of environmental degradation, including nutrient loading, chemical pollution, and the accumulation of organic waste. Discharges from intensive farms can contribute to eutrophication in nearby water bodies, trigger algal blooms, and reduce oxygen levels, harming aquatic ecosystems. The use of antibiotics, disinfectants, and other chemicals further exacerbates pollution risks and poses serious health risks to humans by leaving residues in food, causing allergic and toxic reactions in consumers and workers, and may foster antibiotic resistance in local environments (Cherian et al., 2023; Leal & Spalding, 2024). By contrast, extensive systems generally have a lower environmental impact, as they use no artificial feed, rely on tidal water exchange, and maintain lower population densities (Boyd et al., 2021; Pazmiño et al., 2024).

2.1.4 Key takeaways

Shrimp production within the EU remains limited, with an average self-sufficiency rate of only 12% between 2013 and 2022. Consequently, the EU strongly relies on imports, primarily from Ecuador, which supplied 49% of total shrimp imports in 2023. The land footprint of aquaculture shrimp production for the EU market is considerable. In 2018, the estimated area required – including shrimp ponds, infrastructure, and feed production – amounted to approximately 463,000 hectares, or about 1.9 times the size of Luxembourg. Shrimp aquaculture has been a primary driver of mangrove deforestation, with significant consequences for biodiversity and climate change. Mangroves provide habitat for numerous endangered species and act as highly effective carbon sinks. Their clearance not only reduces carbon sequestration capacity but also releases large quantities of stored carbon. Although progress has been made in protecting mangroves in many regions, Southeast Asia remains a hotspot for mangrove loss, driven by both the continued expansion of shrimp aquaculture and the increasing demand for wood products. Despite global restoration efforts, the success of reforestation remains mixed.

Beyond deforestation, shrimp farming systems themselves pose significant environmental risks. Most ponds operate as flow-through systems, where water is continuously exchanged. These systems discharge wastewater containing chemicals, antibiotics, nutrients, organic matter, and suspended solids into surrounding waters, leading to pollution and eutrophication of adjacent ecosystems. Indirect environmental impacts arise from the use of feed, as shrimp aquaculture strongly relies on agricultural feedstocks such as soy and fishmeal. Tab. 1 summarizes the biodiversity impacts of aquaculture shrimp production.

Tab. 1: Biodiversity impacts of aquaculture shrimp production

Main ecosystem affected	Impacted through	Effects on biodiversity	Quantitative data/ impact ranking
Mangroves	Land conversion for pond construction	Loss of a highly biodiverse natural ecosystem, habitat degradation, and species extinction Globally, over 1,500 species depend on mangroves, 15% of which are threatened with extinction	Land footprint of entire aquaculture shrimp production for the European market: 375,000 ha. In Ecuador, approximately 25% of mangroves lost, primarily due to shrimp farming (pond area 2020: 20,600 ha)
Adjacent ecosystems	Aquaculture pond operations	Eutrophication and water pollution from effluent discharge (impact results from nutrient loading, chemical runoff, and sedimentation from shrimp pond discharge)	Significant, no exact overall quantification possible
Global ecosystems	Feed-related resource extraction (agricultural commodities (mainly soy), fishmeal)	Indirect biodiversity loss due to impacts from intensive agriculture and pressure on marine food webs	Arable land footprint for feed production: 89,000 ha Environmental impacts (e.g., land conversion, intensive agriculture) in soy-exporting countries and overfishing

2.2 Mitigating the impact of shrimp consumption: Options for action

As one of the world's largest seafood consumers, the EU is uniquely positioned to leverage its economic influence to shape the sustainability of global shrimp production and thus help mitigate biodiversity impacts. This section explores three key instruments at the EU level to promote more sustainable production and consumption patterns. First, targeted awareness campaigns can help reduce overall demand by informing consumers about the environmental and social costs of shrimp farming. Second, the sustainability of the shrimp market itself can be improved by strengthening aquaculture certifications and eco-labels. Third, sustainability criteria can be embedded into trade policy to create market incentives for environmentally responsible production. Together, these instruments provide a multifaceted approach to reducing the EU's environmental footprint while facilitating a transition to more sustainable seafood systems.

2.2.1 From everyday staple to occasional treat: Reducing consumption through information campaigns

The most effective way to reduce the ecological pressures caused by shrimp production is to reduce overall consumption rates in the EU and globally. While shrimp contain substantial levels of protein, omega-3 fatty acids, and essential micronutrients such as iodine and vitamin B12 (Mishyna & Glumac, 2021), virtually all of these nutrients can also be obtained from plant-based, nutrient-rich foods, including lentils, chickpeas, tempeh, and quinoa. Since shrimp are therefore

Fig. 18: To be truly effective, consumer education campaigns need to target specific consumer motivations. (Photo: Tempura/iStock)

not essential for meeting nutritional needs, they should ideally remain a luxury product that – if consumed at all – complements more environmentally friendly alternatives. Consumers play a crucial role in shaping demand and preventing shrimp from becoming a routine dietary staple. However, environmental concerns remain a relatively weak influence on seafood purchasing decisions (Pieniak et al., 2013; Zander et al., 2018). According to a recent Eurobarometer survey, only 10% of Europeans report avoiding fisheries and aquaculture products due to environmental concerns (European Commission Directorate General for Maritime Affairs and Fisheries, 2021, p. 78). By contrast, the primary driver behind the recent rise in shrimp consumption in the EU has been health considerations (see Section 2.1) (Dewals & Daures, 2023). Shrimp in particular is increasingly perceived as a lean, high-protein food, reinforcing its image as a healthy dietary choice among European consumers (Dayal et al., 2013).

Designing targeted information campaigns

One major reason environmental considerations have little influence on fisheries and aquaculture consumption is the widespread lack of awareness of their ecological impacts (Kaimakoudi, 2024). Rather than questioning the sustainability of these products per se, consumers tend to focus on the differences between wild-caught and farmed varieties (Bronnmann & Asche, 2017; Pieniak et al., 2013). For instance, one-third of EU consumers prefer wild products (European Commission Directorate General for Maritime Affairs and Fisheries, 2021, p. 73), often – incorrectly – perceived as the more sustainable option (Bronnmann & Asche, 2017). In this context, targeted educational campaigns on production methods could help consumers better understand the ecological implications of their choices, enabling them to make more informed purchasing decisions.

Good practice: Consumer guidelines

A good practice example is the Marine Conservation Society Good Fish Guide, which categorises seafood into 'best', 'OK', and 'to avoid' choices, incorporating location, production method, and certification details while also suggesting more sustainable alternatives. The guide is available both online and as a mobile app, enhancing accessibility. Similarly, the WWF's Seafood Guide provides country-specific recommendations across Europe, offering detailed background information on species and production methods. These resources – alongside others – can support consumers in making more informed and sustainable seafood choices.

For sustainability campaigns to be effective, they need to be tailored to the motivations and values of specific consumer groups. Four key consumer groups can be differentiated:

Environmentally conscious consumers: Although they currently constitute a minority within the shrimp market (see above), consumers with a strong 'affinity toward nature' are more likely to act on ecological concerns, particularly when campaigns resonate with their values and emotional attachments (White et al., 2019, p. 29). Many EU consumers already feel a strong emotional connection to mangrove ecosystems. Information campaigns can leverage this connection by making the ecological consequences of shrimp consumption more visible and personally resonant. Tools such as before-and-after imagery, testimonials from affected communities, and success stories from conservation projects can help bridge the gap between emotional engagement, awareness of consumption impacts, and behavioural change. For instance, campaigns might emphasise how shrimp farming threatens entire food webs, including species that many consumers already care about, such as migratory birds and sea turtles. They could also spotlight the ecological importance of mangrove crab populations, which play a crucial role in aerating soils and distributing nutrients. As mangrove forests are converted into shrimp ponds, these populations decline, accelerating soil erosion, reducing biodiversity, and ultimately undermining ecosystem resilience. These emotional appeals can be complemented by practical tools such as eco-guides or apps to facilitate more sustainable choices.

Animal welfare advocates: Scientific evidence increasingly suggests that crustaceans such as shrimp are capable of experiencing pain, stress, and distress (Birch et al., 2021). Despite this growing awareness, shrimp aquaculture continues to raise serious animal welfare concerns. These include overcrowded rearing conditions and procedures such as eyestalk ablation, a technique in which a female prawn's eyestalks are removed to induce egg production (ibid.). Yet even consumers who avoid meat for animal welfare reasons frequently continue to consume seafood (Cullen et al., 2025). This inconsistency presents an opportunity for targeted awareness campaigns, which could highlight the animal welfare implications of shrimp farming and encourage a more consistent application of ethical principles across food choices. Integrating such arguments alongside environmental ones would broaden the motivational reach of information campaigns and offer multiple emotional and ethical entry points for promoting more sustainable dietary choices.

Addressing health-conscious consumers: Besides vitamin B12, which requires supplementation in a plant-based diet, most nutrients found in shrimp – protein, omega-3s, iodine, and selenium – can be adequately substituted with plant-based alternatives (Bryant, 2022). Switching from seafood to plant-based options may even offer additional health benefits, such as lower cholesterol levels and improved gut health due to higher fibre intake (Mariotti, 2025). Moreover, shrimp is frequently flagged during border inspections for excessive antibiotic residues, raising concerns about contamination and food safety (Piglowski, 2023; Southern Shrimp Alliance, 2024). Given these risks, educational campaigns that highlight antibiotic use, unsanitary farming conditions, and heavy chemical inputs in shrimp production could help shift consumer preferences toward more sustainable choices (Carassón et al., 2021; European Commission Directorate General for Maritime Affairs and Fisheries, 2021; Pieniak et al., 2013).

Heritage food consumers: Promoting the consumption of regionally available seafood alternatives – such as mussels – might appeal to so-called heritage food consumers, who prioritise culinary traditions, regional identity, and quality over novelty and convenience (Almansouri et al., 2022; Mohammad et al., 2022). This strategy might be particularly effective in coastal communities, where seafood is already a dietary staple and traditional food cultures have a strong influence on purchasing behaviours. By highlighting both the cultural significance and environmental benefits of local seafood options, such campaigns can help counter the growing consumption of imported, non-local species such as shrimp (Almeida et al., 2015).

Taken together, to be truly effective, consumer education campaigns need to extend beyond generic sustainability messaging and target specific consumer motivations (see also Section 5.1.5). By leveraging personal experiences, cultural values, and health concerns, campaigns can drive more meaningful behavioural shifts and encourage nature-friendly shrimp consumption patterns.

2.2.2 Raising the bar: Strengthening aquaculture labels and certifications to green the shrimp market

While awareness raising through educational campaigns is essential for reducing overall shrimp consumption, it is equally important to make the shrimp market itself more sustainable, as a complete reversal of current consumption trends is unlikely. For consumers who continue to purchase shrimp, awareness of and access to credible, high-standard eco-labels and certifications can help ensure that their purchasing decisions support more responsible organic production practices (see also Section 2.1). Against this backdrop, strengthening aquaculture certification schemes can serve as a crucial pathway to improving environmental and social standards within the shrimp industry, mitigating its most harmful impacts while providing consumers with comparatively more sustainable options.

Coverage of established labels and certifications remains limited

Our 2024 scoping analysis identified 30 active aquaculture certification labels, of which five hold pronounced significance in the global shrimp sector.[13] Mangrove protection measures feature prominently across all five, with some schemes applying cut-off dates to prevent the certification of farms established through mangrove deforestation after a designated baseline year. Similarly, all major standards address the issue of farmed species escapes, namely the release of shrimp or other aquatic organisms into surrounding marine or freshwater ecosystems. From a biodiversity perspective, escapes can pose serious ecological risks as escaped species might become invasive, outcompete native fauna, or disrupt local food webs. Beyond mangrove protection and escape management, the depth and specificity of biodiversity criteria vary considerably across certification schemes. Some – such as the Aquaculture Stewardship Council (ASC) – explicitly integrate biodiversity into the environmental impact assessment process to ensure that biodiversity is treated as a discrete and assessable factor. Among other stipulations, the ASC prohibits the use of fresh groundwater in ponds, mandates minimum permanent barriers between farm and marine environments, and requires protection measures for critical habitats supporting species at risk. By contrast, other standards are often broader and less detailed in their treatment of biodiversity-related risks.

While the share of farmed fish certified by these eco-labels has increased in recent decades (Potts et al., 2016), overall certification coverage remains low. In 2012, 36 certifications collectively covered only 2.58% of global aquaculture production (Boyd & McNevin, 2012, p. A-46). By 2024, this share had risen only marginally, reaching 3.3% of total production (see Fig. 19) (Seafood Certification & Ratings Collaboration, 2024). For shrimp specifically, recent estimates indicate that approximately 14% of global farmed shrimp is now certified, significantly lower than for salmon, where certification covers around 50% of production (ibid.). However, certification rates vary widely by country: while around 40% of shrimp production in Ecuador is certified, the figure is only about 13% in Vietnam and 5% in Indonesia (ibid.).

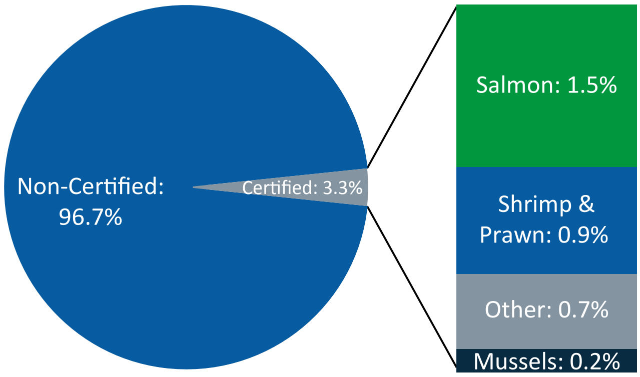

Fig. 19: Certification rate in the aquaculture sector (based on data from the Seafood Certification & Ratings Collaboration, 2024)

The limited reach of voluntary certification schemes and their associated eco-labels reflects a broader failure to catalyse systemic change across the industry. This failure can be traced to the following three key barriers, which should be addressed to enhance the sustainability of shrimp aquaculture.

Overcoming fragmentation and cost barriers

The shrimp farming sector is fragmented and dominated by small-scale operations, making certification uptake more difficult (Bush, 2018; McSherry et al., 2023; Virat, 2019). Certified shrimp farms

[13] These include Global Good Agricultural Practice (Global G.A.P.), Friends of the Sea, the Global Aquaculture Alliance's Best Aquaculture Practices (GAA BAP), the Aquaculture Stewardship Council (ASC), and further organic aquaculture labels (such as Naturland and the EU Organic standard).

tend to be larger in scale than non-certified ones (Davis & Boyd, 2021), indicating that certification is comparatively less accessible for smallholders (Macusi et al., 2022; McSherry et al., 2023; Villarreal, 2023). The costs of certification also disproportionally affect small-scale farmers (Virat, 2019), as large-scale farms can spread certification costs over a higher production volume. While some funds support smallholders in achieving certifications, the overall success and scope of these efforts have been limited (Potts et al., 2016), leading to a bias toward large-scale farms in the certified shrimp market. Against this backdrop, the key challenge is to reduce certification costs without compromising sustainability standards. Tiered or subsidised models could scale fees to farm size, while financial support mechanisms – such as grants or low-interest loans – would help farmers cover necessary infrastructure improvements. Streamlining audits through remote verification and digital tools can further lower costs, and group certification models could allow smallholders to share expenses, making participation more financially viable. Nonetheless, cost is not the only barrier as small-scale farmers also need technical knowledge and logistical support. Governments, NGOs, and research institutions should therefore expand training and assistance programmes, including local extension services and partnerships with cooperatives.

Increasing transparency and addressing credibility issues

A second key barrier is the lack of transparency in aquaculture certification. Basic data on farm and pond sizes as well as shrimp survival rates are often unpublished, making it difficult for researchers and regulators alike to compare and benchmark certification schemes (Bacher, 2015; Davis & Boyd, 2021). This opacity persists because certification remains largely voluntary, with schemes often funded by producers and retailers, creating weak incentives for full disclosure. As a result, the credibility of eco-labels is undermined, and doubts remain about whether they genuinely reflect sustainable practices. This problem extends beyond environmental indicators. Recent investigations into India's shrimp supply chain have revealed severe human rights violations, even in certified processing plants (Global Seafood Alliance, 2024; Urbina, 2024). In light of these challenges, increasing data transparency is essential. Addressing these shortcomings requires a multi-actor approach. Certification bodies should enhance their auditing procedures and data disclosure practices; for instance, by making audit reports, supply chain information, and environmental and social impact assessments publicly accessible. This would not only facilitate independent evaluation but also enable researchers, policymakers, and civil society actors to identify and promote the most effective labels. At the same time, EU policymakers have an important role to play in strengthening the credibility of certification schemes by establishing clear rules for how companies substantiate environmental claims. The proposed Green Claims Directive – which seeks to harmonise the substantiation of green claims across the EU – represents a modest but meaningful step in this direction. However, without further regulatory advances, such as mandatory due diligence for seafood imports and stricter traceability requirements, the potential of certification schemes to contribute meaningfully to biodiversity protection will remain limited.

Increasing market demand for sustainable shrimp alternatives

As the economic viability of certified small-scale farmers remains uncertain without a stable demand base, a key challenge for European policymakers is to expand the regional market for sustainably produced shrimp. One major obstacle is low consumer awareness of aquaculture eco-labels (Zander et al., 2018). Moreover, recent studies show that consumers quickly feel overwhelmed by the abundance of labels and sustainability claims in the market for fisheries and aquaculture products (Bogliacino et al., 2023). Nonetheless, recent data suggest that awareness-building can positively influence purchasing behaviour (Aquaculture Stewardship Council (ASC), 2023). This suggests that targeted efforts to improve label recognition – by making eco-labels more visible in everyday contexts and connecting them to consumer values (see also Section 2.2.1)

– could boost demand for certified aquaculture products, including sustainably farmed shrimp. In addition to the retail sector and household consumption, it is also essential to target the on-trade distribution channel, including public canteens, restaurants, hotels, and other foodservice establishments. Although exact figures on shrimp consumption across distribution channels are limited, estimates indicate that the on-trade channel accounts for approximately 58% of the total seafood market value in the EU (Mordor Intelligence, 2025). This highlights the pivotal role of restaurants and other food service actors in expanding the market for sustainable alternatives.

2.2.3 Making trade work for nature: Mainstreaming sustainability criteria into trade policy

Lacking a competitive domestic aquaculture sector, the EU relies almost entirely on imports to meet shrimp demand. To keep prices low, it utilises free trade agreements (FTAs) that reduce tariffs from the standard 12% to 0%. At the same time, FTAs have become a key instrument for advancing normative, non-trade policy objectives (Ferrari et al., 2021). For instance, leveraging its status as the world's largest single market, the EU has increasingly used trade policy to promote environmental standards across global value chains, reflected in initiatives such as the European Green Deal[14] and the EUDR (Preamble (18)).

By integrating stringent sustainability criteria into FTAs, the EU aims to mitigate environmental spillover effects, where pollution and resource exploitation are outsourced to countries with weaker environmental regulations (S. J. Liu & Xu, 2021). In practice, biodiversity-related commitments are typically included in the Trade and Sustainable Development (TSD) chapters of EU FTAs. These chapters require parties to implement multilateral environmental agreements (such as the CBD), promote the sustainable use of biological resources (including fisheries and forests), combat illegal trade in wildlife and flora, and cooperate on the

Fig. 20: A key challenge for EU policymakers is to expand demand for sustainably produced shrimp to ensure the viability of certified small-scale farmers. (Photo: Steve Barze/ Shutterstock.com)

conservation of biodiversity-rich ecosystems such as mangroves and coral reefs. However, the effectiveness of non-trade objectives in FTAs remains a contested issue. A recent study found no consistent improvement in non-trade outcomes among EU partner countries. It concluded that these objectives often require complementary 'flanking measures' such as technical assistance and financial support to become impactful (Ferrari et al., 2021, p. 13). In other words, while biodiversity-specific commitments in FTAs represent a positive step, several structural shortcomings limit their real-world effectiveness.

One major issue is the vague, non-committal, and non-binding language used in TSD chapters, reflecting a persistent weakness across nearly all agreements (Blot et al., 2022). Even binding terms such as 'shall' are often followed by broad and ambiguous objectives – such as 'promoting sustainable aquaculture' – that lack operational clarity. This largely leaves implementation at the discretion of the parties involved, making it difficult to hold signatories accountable when biodiversity loss results from irresponsible aquaculture practices. Furthermore, the dispute settlement mechanisms for TSD chapters are often weaker and structurally separate from the core enforcement provisions (Bronckers & Gruni, 2021). In addition, competing trade agreements without

[14] See Footnote 5, p. 16.

environmental safeguards can undercut the EU's efforts to promote sustainability through trade. For instance, the China–Ecuador FTA eliminates tariffs on shrimp without including environmental conditions (Godfrey, 2024), thereby reducing the EU's leverage to incentivise more sustainable production practices.

Biodiversity provisions in current free trade agreements with shrimp-producing countries

As the exclusive negotiator of FTAs for its Member States, the EU has established multiple agreements with key shrimp-producing countries in recent years. Vietnam, one of the world's leading shrimp exporters, entered into an FTA with the European Union in 2019 – the EU–Vietnam Free Trade Agreement (EVFTA)[15]. The EU has widely presented the agreement as a model for integrating environmental objectives into trade policy, particularly through its TSD chapter (Blot et al., 2022). The FTA commits both parties to promote trade in products that support the conservation and sustainable use of biodiversity (Art. 13.7) and to encourage sustainable aquaculture, considering environmental, social, and economic aspects (Art. 13.9). While these provisions reflect a clear rhetorical commitment to biodiversity protection, their practical impact remains limited. The agreement lacks a robust monitoring framework and does not establish concrete performance indicators to track implementation progress, which makes it difficult to evaluate whether the sustainability objectives are being met in practice (ibid.). Moreover, as of the time of writing, no ex-post assessment has been conducted to measure the EVFTA's environmental outcomes. In the absence of such evaluations, the effectiveness of the EVFTA's biodiversity provisions remains largely speculative.

Ecuador – Europe's largest shrimp supplier – joined the previously negotiated Andean-EU FTA[16] in 2017. While the agreement incorporates provisions on sustainable development, environmental protection, and biodiversity conservation as part of Title IX, it lacks the comparatively firmer legal language and the more detailed commitments found in the EVFTA. Overall, the agreement's environmental impact has been mixed. Tariff elimination accelerated Ecuador's already expanding shrimp exports, which grew by 69.5% between 2019 and 2023, from 99.3 million kg to 168 million kg (European Commission BKP Economic Advisors and Directorate General for Trade and Economic Security, 2022, p. 99; World Integrated Trade Solution, n.d.). Although Ecuador is often regarded as having one of the more sustainable shrimp industries (Asche et al., 2021), this rapid growth has nevertheless raised environmental concerns, particularly regarding river pollution, land conversion for aquaculture, and water resource constraints for adjacent communities (European Commission, 2022). Notably, the EU's ex-post assessment concluded that rising exports might be exacerbating pre-existing biodiversity and climate pressures associated with shrimp farming (ibid., 2022, 148).

Beyond Ecuador and Vietnam, the EU is currently also negotiating FTAs with India (the world's largest shrimp producer), Indonesia, and Thailand. While shrimp exports from these countries to the EU are comparatively lower than those of Vietnam and Ecuador, these agreements are nevertheless noteworthy as they are expected to include a dedicated Sustainable Food Systems chapter. Draft provisions indicate that these chapters will feature annual action plans to monitor concrete impacts and outcomes. While aquaculture is not explicitly mentioned, the chapters address related issues such as animal welfare, food-chain fraud, pollution, and antibiotic use, which are highly relevant to the sustainability of shrimp farming. Such clear and measurable goals would already mark an improvement over current TSD

[15] Free Trade Agreement between the European Union and the Socialist Republic of Viet Nam, signed 30 June 2019, OJ L 186, 12.6.2020, p. 3–1400.

[16] Trade Agreement between the European Union and its Member States, of the one part, and Colombia and Peru, of the other part, signed 26 June 2012, OJ L 354, 21.12.2012, p. 3–2607. Ecuador acceded via a Protocol, OJ L 356, 24.12.2016.

frameworks, where – based on meeting records of TSD Chapter committees – discussions remain rather vague.[17]

Good practice:
The 2009 US-Peru free trade agreement

The Annex on Forest Sector Governance of the 2009 US-Peru FTA offers a compelling example of tailored sustainability enforcement. The annex contained highly specific, one-sided, non-reciprocal provisions, requiring Peru to strengthen its forest protection measures (Velut et al., 2022). These included expanding forest management staff, implementing anti-corruption programmes, and introducing penalties to deter violations. This unprecedented level of detail led to significant reforms in Peru (ibid.), illustrating that when negotiating parties consider an issue sufficiently urgent, FTAs can include stricter and more enforceable sustainability provisions than usual.

Recommendations for a more sustainable shrimp trade

In line with target 14 of the Global Biodiversity Framework – which calls for the integration of biodiversity considerations into decision-making at all levels – the EU's approach to embedding sustainability in trade agreements could be strengthened through a more comprehensive and enforceable framework. First, advocating for the explicit inclusion of provisions relating to fisheries and aquaculture in FTAs would ensure that biodiversity concerns in these sectors are directly addressed, rather than treated as peripheral issues. Second, the introduction of dedicated Sustainable Food Systems chapters, with clear and measurable criteria for reducing biodiversity loss, would provide a structured approach to promoting environmental and social responsibility in agrifood trade. Third, continuous compliance is resource-intensive but essential for upholding commitments over time (Henriot & Van den Berghe, 2021). To address this, systematic impact assessments – both ex ante and ex post – should be contractually mandated and conducted regularly to track the actual environmental and social effects of trade liberalisation, ensuring that agreements contribute to biodiversity conservation rather than exacerbate ecological degradation. Finally, the EU could explore more dynamic and incentive-compatible instruments such as Contingent Trade Agreements (CTAs) (Harstad, 2024). CTAs explicitly tie tariff reductions to verifiable conservation outcomes using clear, measurable indicators and pre-agreed benchmarks. By conditioning trade benefits on environmental performance, CTAs might offer a credible, renegotiation-proof mechanism to align economic incentives with biodiversity protection.

2.2.4 Key takeaways

Ensuring a more sustainable shrimp trade requires a multifaceted policy approach that aligns consumer behaviour, certification mechanisms, and trade policy with environmental and social sustainability goals. The three key policy instruments explored in this chapter – consumer education campaigns, strengthened aquaculture certifications, and the integration of sustainability criteria into trade policy – provide complementary pathways to achieving this goal (see also Tab. 2).

First, consumer education campaigns can help reduce overall shrimp consumption, particularly by targeting specific consumer groups based on their values and motivations. Raising awareness about mangrove deforestation, habitat loss, and the environmental costs of shrimp farming can encourage nature-friendly choices, while promoting local seafood traditions and potentially healthier plant-based alternatives can further shift demand away from unsustainable shrimp products. Second, eco-labels and certification schemes should be strengthened in terms of how biodiversity impacts are assessed, made more transparent and

[17] Meeting notes of the TSD Subcommittees for the Andean and EU-Vietnam FTAs are available here and here. These committees convene annually and aim to foster dialogue, provide updates on domestic legislation, and strengthen cooperation between the parties.

accessible to small-scale farmers. While voluntary certifications provide an important market-based governance tool, their current low adoption rates, high costs, and credibility concerns limit their effectiveness. Reducing certification costs, introducing tiered or subsidised models, improving supply chain transparency, and ensuring better oversight of social and environmental standards – including biodiversity-specific criteria – can enhance their impact. Third, mainstreaming sustainability criteria into trade policy is essential to extend environmental standards beyond EU borders. While the TSD Chapters in FTAs acknowledge biodiversity concerns, they often lack enforceable commitments. Stronger monitoring mechanisms and binding environmental clauses – including explicit biodiversity safeguards – could provide stronger incentives for shrimp-producing countries to uphold environmental and social standards. Additionally, integrating aquaculture-specific sustainability criteria into ongoing trade negotiations and ensuring that ex-post assessments are conducted could help mitigate environmental harm linked to EU shrimp imports.

Tab. 2: Policy recommendations for nature-friendly shrimp consumption

Policy recommendations		
Reduce overall demand for shrimp through **awareness raising and education**	Make shrimp production more nature-friendly by strengthening **eco-labels and certification schemes**	Create financial incentives for more sustainable production by mainstreaming biodiversity-specific criteria into **trade policy**
• Inform consumers about mangrove deforestation, habitat loss, and environmental costs of shrimp farming through targeted information campaigns • Promote local seafood traditions and healthier alternatives	• Make eco-labels and certification schemes more accessible to smallholders by reducing certification costs, e.g., through tiered or subsidised models • Ensure better oversight of biodiversity-related claims through regulatory advancements	• Include provisions related to fisheries and aquaculture in Sustainable Food Systems chapters • Introduce clear and measurable sustainability criteria including on biodiversity

Fig. 21: Soybeans: a major global source of protein and oil (Photo: nnattalli/Shutterstock.com)

3 The case of soy

Soy is the world's most important source of plant-based protein and oil. Every day, large quantities of soy are consumed, often without consumers even realising it, as it is frequently hidden or 'embedded' in products where people would not typically expect to find it. Most of global soy production is used as animal feed – primarily for livestock (cattle, pigs, and poultry) and aquaculture (fish, shrimp) – making it a staple input in the production of meat, dairy, and farmed seafood (WWF, 2014). As a result, soy is indirectly present in virtually all animal-derived products. In addition to feed, soy is also a constituent of many processed foods. For instance, soybean oil is a common ingredient in packaged snacks, margarine, baked goods, and dressings. Lecithin – a fatty substance derived from soybeans – is commonly used as an emulsifier in various food products to blend ingredients that would otherwise separate. With 6%, only a small fraction of soy is consumed directly by humans, typically in the form of soy milk, tofu, tempeh, soy sauce, and – more recently – plant-based meat alternatives. While the popularity of these alternatives has increased in recent years, they still account for only a small portion of overall soy use.

3.1 Mass flows and environmental impacts

3.1.1 The global perspective

Global meat production – which strongly relies on soy as animal feed – has more than quadrupled over the past 50 years and continues to grow (Ritchie et al., 2023). This rise is driven not only by the increase in the world's population but also by higher per capita meat consumption, with production outpacing population growth, albeit unevenly across countries (ibid.). Global soybean production has soared in parallel, reaching 371 million tonnes in 2023 (Our World in Data, 2025) (see Fig. 22). The main producing countries are Brazil, the US, and Argentina, which together account for 80% of the global supply. On the demand side, China is the leading importer, accounting for nearly 42% of all soy products traded globally.

3.1.2 European imports and consumption

International soy trade revolves around three main products: whole soybeans, soybean oil, and soybean meal (the byproduct remaining after the oil is pressed). To quantify total EU imports, the imported quantities of these products were converted into soybean equivalents. For the purpose of this study, these imports included only those

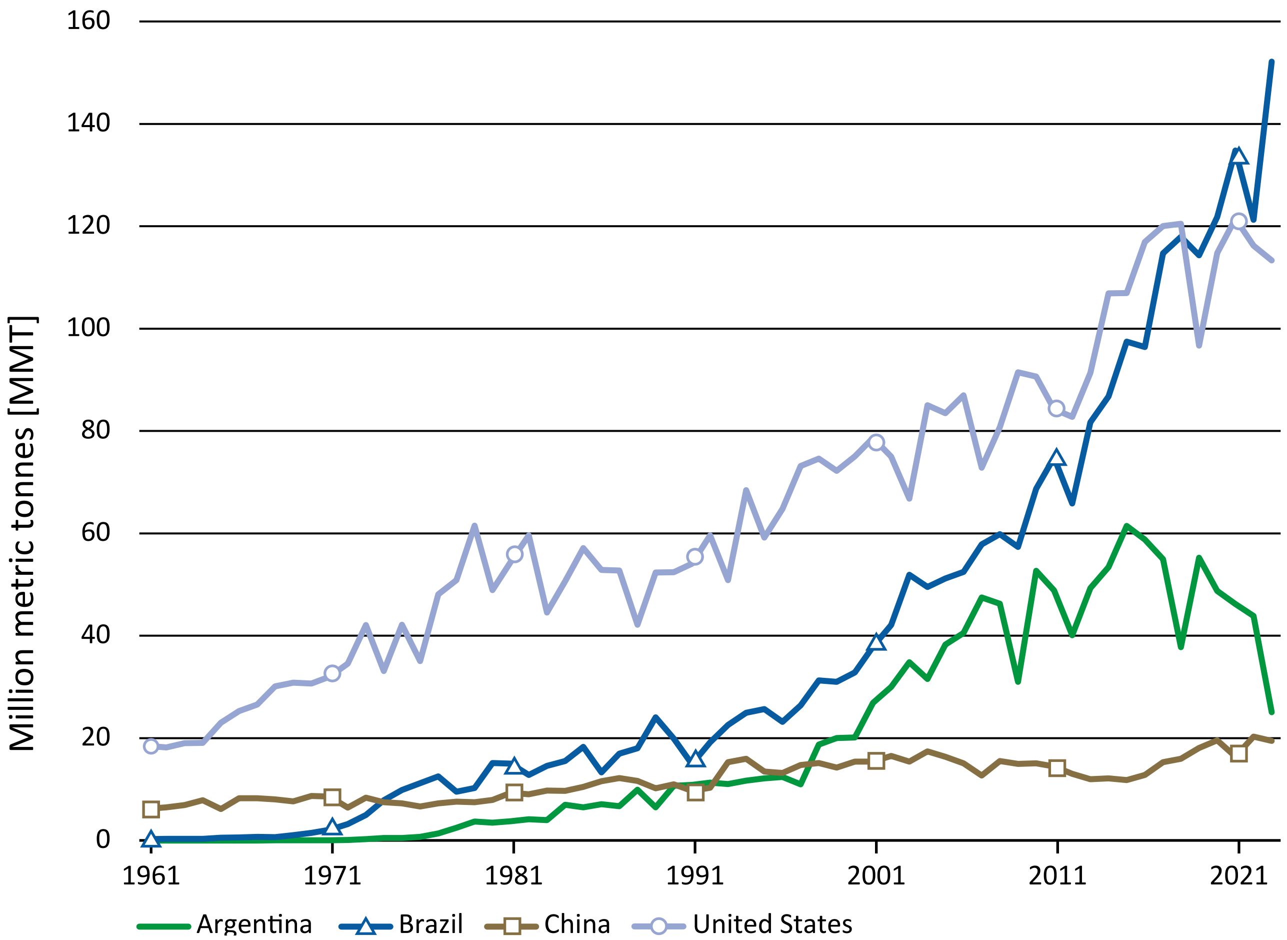

Fig. 22: Global soybean production in tonnes (Our World in Data, 2025)

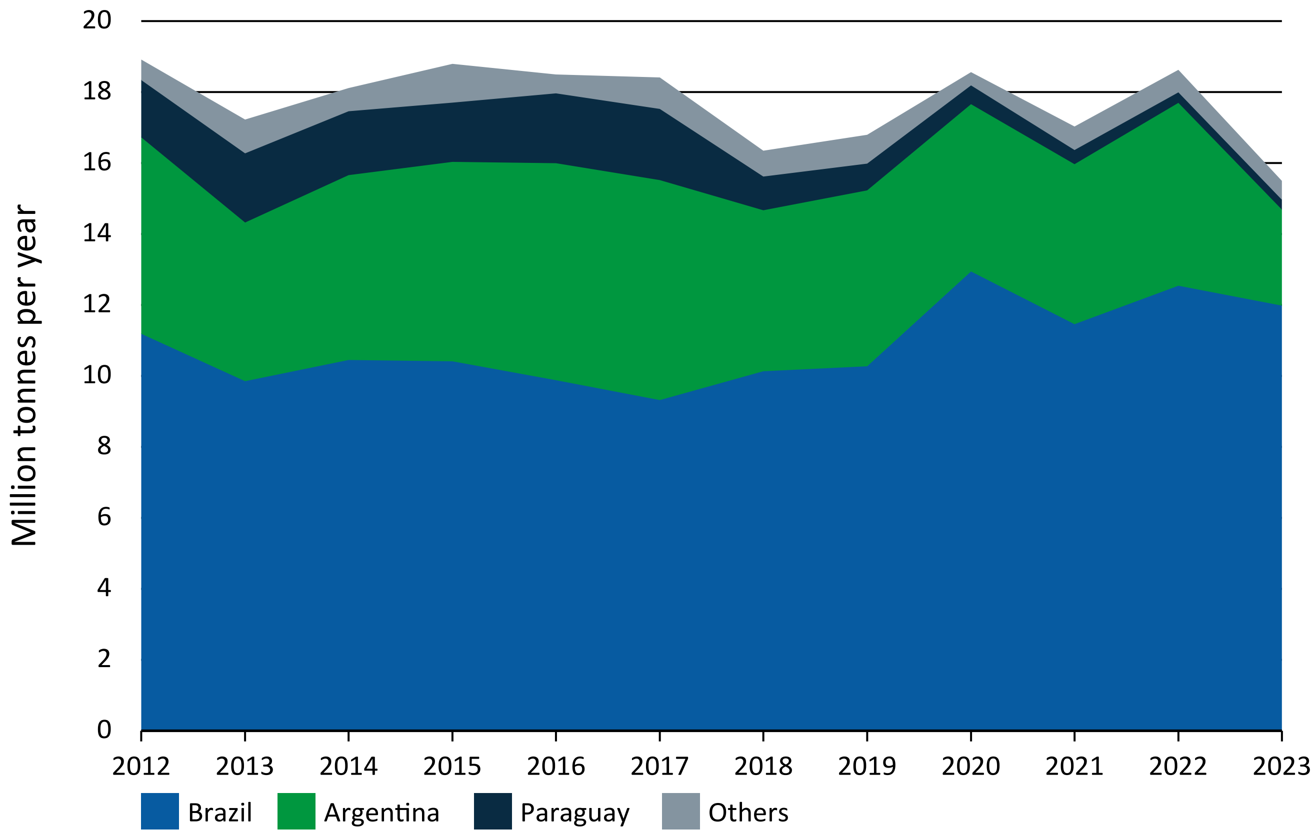

Fig. 23: Soy imports from the Global South to EU27 (own compilation; for references see Section 1.4)

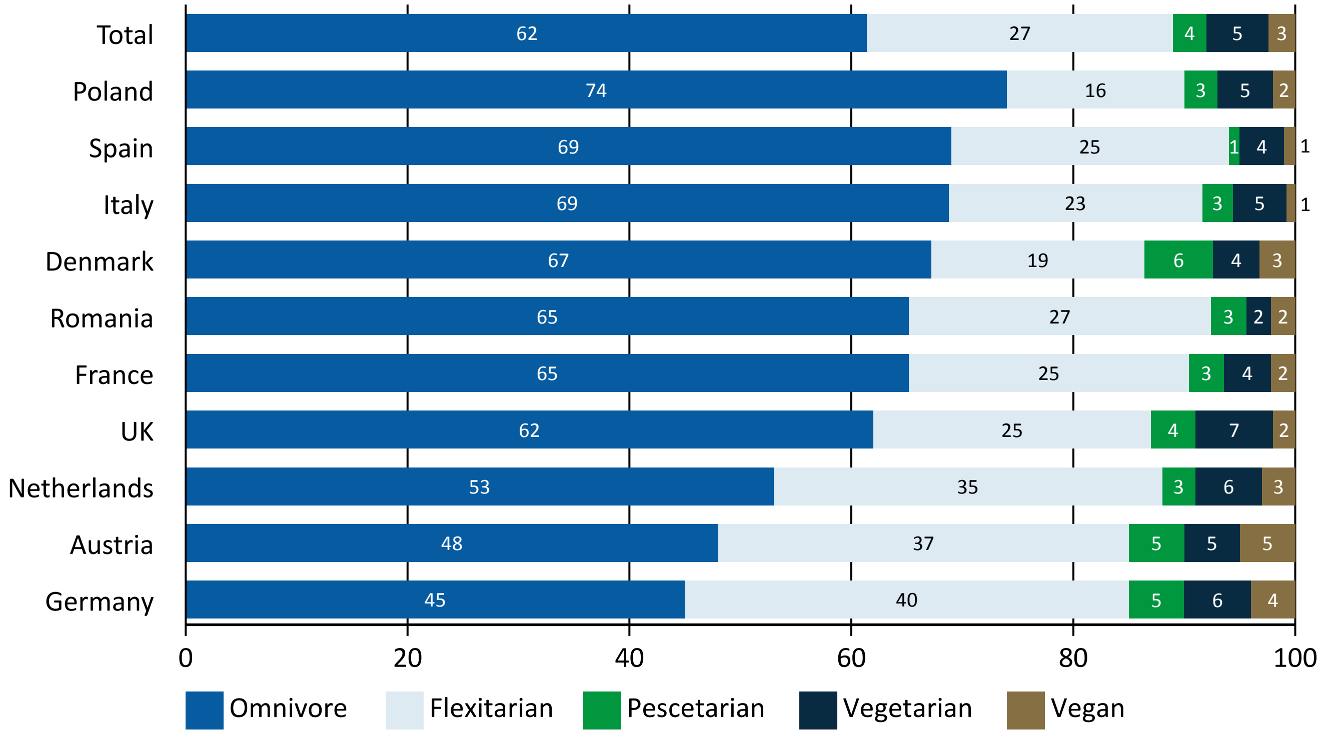

Fig. 24: Dietary lifestyles by country (based on ProVeg International & Smart Protein Project, 2023)

from countries in the Global South.[18] We took into account solely direct soybean imports and did not account for indirectly imported – or 'embedded' – soy, which is hidden in meat or other animal products.

The quantity of soy imported into the EU from the Global South (see Fig. 23) has remained relatively stable since 2012. Between 2021 and 2023, the EU imported an average of approximately 17 million tonnes of soy annually from the Global South. In 2023, volumes dropped to 15.5 million tonnes, largely due to drought-induced crop failures in Argentina. The share of source countries from the Global South is dominated by Brazil, which accounted for 67% of the imports in 2022. Argentina ranks second, with 5.2 million tonnes, or 28% of the imports from the Global South. By contrast, EU domestic soybean production remains marginal. Despite increasing from 7.5 million tonnes in 2014 to 12.1 million tonnes in 2023, it still represents less than 1% of global output (Donau Soja, 2024).

As is the case globally, the vast majority of soybean imports into the EU are directed toward animal feed production. Soybean meal constitutes the largest share – about 17.5 million tonnes – and accounts for an estimated 29% of the protein used in EU livestock feed (Kuepper & Stravens, 2022, p. 25). EU meat consumption has significantly increased from around 50 kg per capita in 1961 to 78 kg in 2022, marking a 64% increase (Our World in Data, 2024). The average daily protein intake is 82 grams per capita, with 49 grams coming from animal products and 33 grams from plant-based sources (Simon et al., 2024, p. 402). The share of people following vegan or vegetarian diets varies acryoss Europe but remains low (see Fig. 24). While studies show a positive trend, with 51% of European meat consumers reporting that they have reduced their intake (ProVeg International & Smart Protein Project, 2023), the EU's demand for soybeans continues to be a major driver of global production, whether directly for animal feed or indirectly through animal-based products.

[18] Another relevant country of origin for soybean imports is the US. In 2020, the US ranked third after Argentina and Brazil, accounting for approximately 16% of European soybean imports (Kuepper & Stravens, 2022).

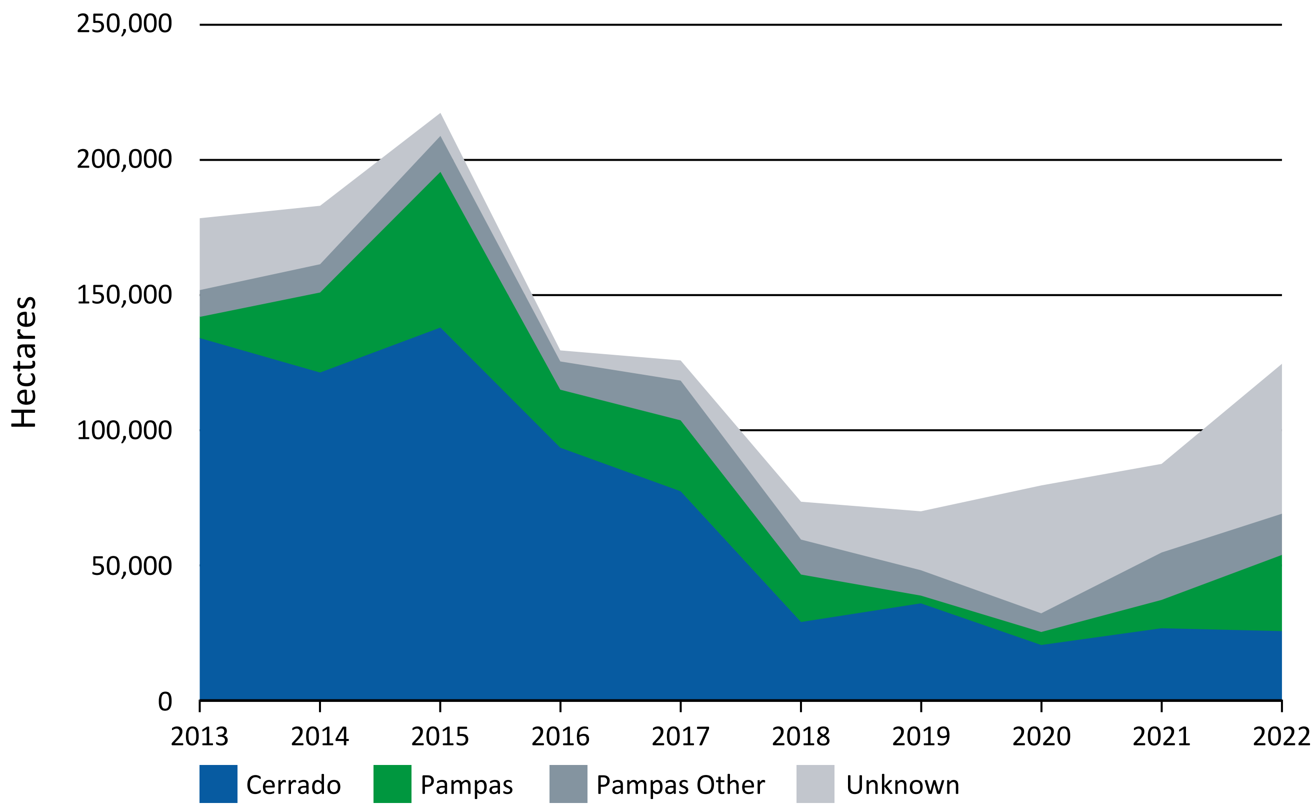

Fig. 25: Land conversion in Brazil induced by soy exports to EU27 (based on data from Trase, 2025)

3.1.3 Biodiversity impacts

The environmental impacts of European soy consumption unfold through two main pathways. First, the expansion of soy cultivation drives large-scale land use change in producing countries, often leading to the destruction of forests and other biodiversity-rich ecosystems. Second, soy is typically grown in vast monocultures that simplify landscapes, degrade ecological resilience, and threaten local biodiversity by reducing habitat diversity and increasing reliance on chemical inputs.

Biodiversity and land conversions in biomes affected by EU soy imports

The soybean flows imported into Europe originate from a wide range of ecosystems and biomes.[19] To estimate the biodiversity impacts of soybean cultivation, we first allocated import mass flows to the biomes in Brazil, Argentina, and Paraguay, the primary production countries in the Global South for the European market (for a detailed description of the data sources and methodological approach used, see Section 1.4). The resulting distribution for the year 2023 is shown in Fig. 30. The largest share – at 37% (1.7 million hectares) – can be attributed to the Cerrado, followed by the Atlantic Forest (24%), the Amazon (16%), the Pampas (12%), and the Chaco (10%). The share of ecosystems remained relatively stable between 2012 and 2023.

Overall, EU soy imports from the Global South as a whole (see Fig. 26) resulted in a total land footprint of 4.8 million hectares in the year 2023, roughly equivalent to the size of Slovakia. As discussed in Section 3.1.1, the vast majority of this soy is not consumed directly but embedded in animal products. The scale of this indirect footprint is stark as producing beef requires up to 32 times more land than consuming the same amount of protein from soy directly (Machovina et al., 2015).

A biome-based analysis does not yet permit direct conclusions about the impacts on biodiversi-

[19] Biomes are defined as large-scale, ecologically distinct regions characterised by specific climatic, geological, and biological conditions (e.g., tropical rainforest, savanna, Cerrado, Pampas).

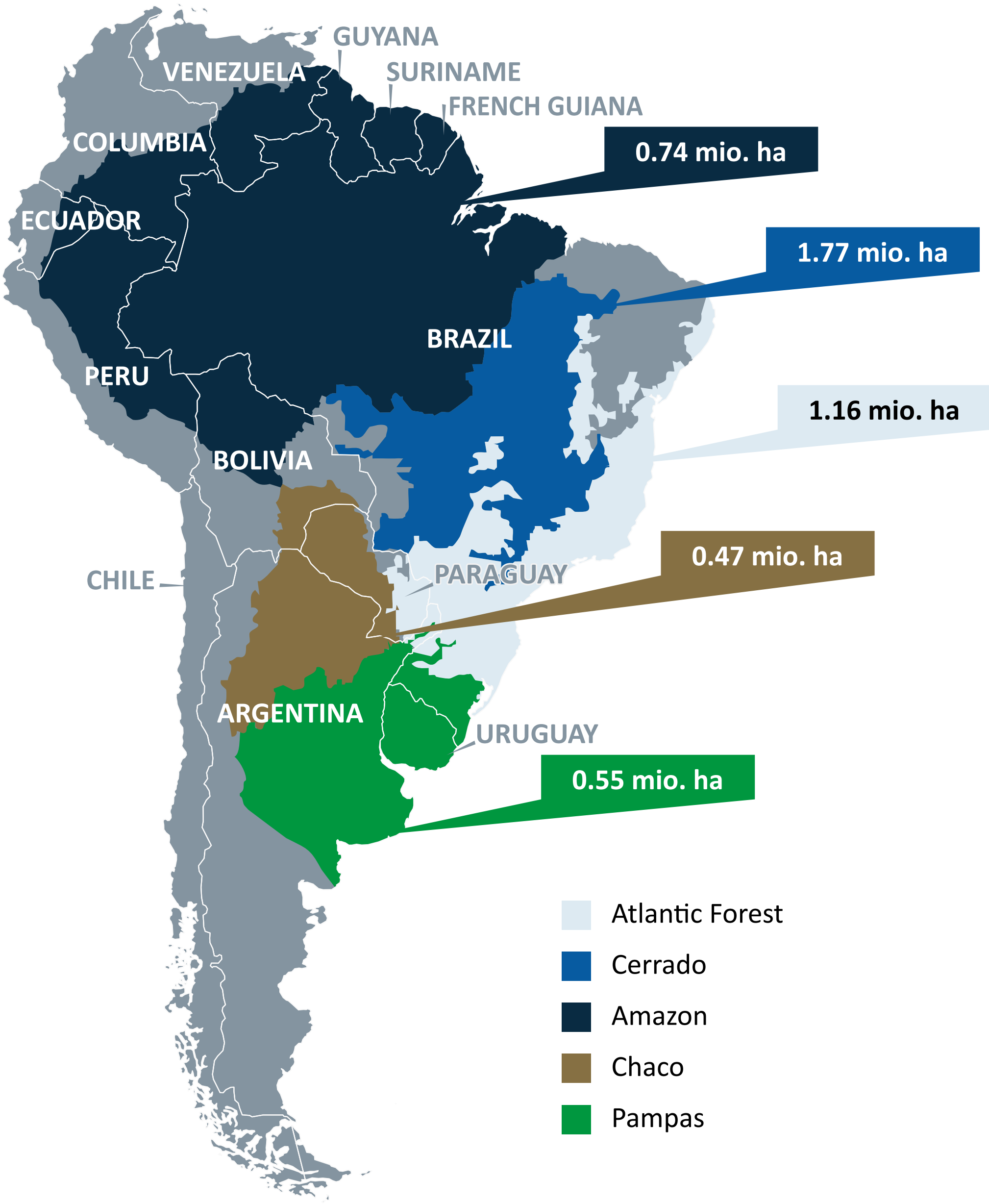

Fig. 26: Spatial distribution of land use of soy production for European imports in 2023, broken down by biomes (biome classification and visualization based on WWF International, 2014 in million hectares)

ty. For assessing biodiversity loss, the key variable is land conversion, namely the transformation of natural vegetation into agricultural land. For the purpose of this study, we focused on direct land conversion for soybean cultivation. However, indirect pathways are also critical: in South America, land is often initially cleared for cattle grazing and subsequently converted to soybean cropland (Baumann et al., 2022; Vasconcelos, 2022). According to the Trase (2025) database, Brazil overwhelmingly dominates direct soy-related land conversion linked to the European market. Fig. 25 presents the land conversions in the main biomes affected. While soybean cultivation was a major driver for land use change in the past, land conversions declined after 2015, before rising again from 2018/2019 onward.

The initial decrease can be attributed to the spread of zero-deforestation commitments (ZDCs) in Brazil since the 2000s. One well-known exam-

Fig. 27: The Cerrado is known as the most species-rich savanna in the world. (Photo: JudsonCastro/iStock)

ple is the Amazon Soy Moratorium.[20] Although there are other private sector ZDCs outside the Amazon, they have proven less effective. As a result, from 2019 onwards, the combination of increased demand for soy feed in China and Russia's war in Ukraine led to a rise in soy prices, which in turn incentivised further soy expansion and deforestation (Pereira & Bernasconi, 2025).

In recent years, land conversion has predominantly occurred in the Cerrado and the Brazilian Pampas regions.[21] Spanning 2 million km², the Brazilian Cerrado is the second-largest ecosystem in South America, after the Amazon rainforest. While the ecological importance of the Amazon and its threatened status are well-known – and recent developments regarding the suspension of the Soy Moratorium have once again placed the Amazon at heightened risk – the Cerrado receives comparatively less attention. It is a mosaic landscape comprising a variety of ecosystems, ranging from tall, closed forests to marshlands and open grasslands. This variety of habitats creates different niches for a wide array of species. Known as a biodiversity hotspot and as the most species-rich savanna in the world, the Cerrado has the richest vascular plant flora and is home to around 4,200 species of vertebrates, many of which are found only in this particular ecosystem (Giroldo & Scariot, 2015; Wedeux & Schulmeister-Oklenhove, 2021; WWF Brazil, 2024). Beyond biodiversity, the Cerrado is also vital for water security, serving as the source region for eight of Brazil's twelve river basins (WWF Brazil, 2024). Deforestation and conversion to agricultural land lead to reduced infiltration, increased surface runoff, and declining groundwater levels, which endanger water availability in rivers and for the population (Salmona et al., 2023). Nonetheless, the biome remains poorly protected as only 8.9% of its area has formal conservation status (Ministério do Meio Ambiente (MMA), 2025), and just 21% – roughly 440,000 km² – of its original vegetation remains intact (Hance, 2020). In essence, extensive conversion to cropland, pasture, and forest planta-

[20] This private-sector ZDC, established voluntarily in 2006 through cooperation between NGOs and business, aims to protect the Amazon rainforest and is monitored by government authorities. It requires industry not to trade, buy, or finance soy from Amazon areas deforested after 2008 (Ziegert & Sotirov, 2024). Nonetheless, after nineteen years in force, the future of the Amazon Soy Moratorium is now uncertain, as Brazil's federal antitrust agency called for its suspension in August 2025 (Mano & Andreoni, 2025).

[21] Other biomes affected by soybean-induced land conversion – albeit to a much lesser extent than the Cerrado and the Pampas – include the Chaco, the Atlantic Forest (Mata Atlântica), and parts of the Amazon region.

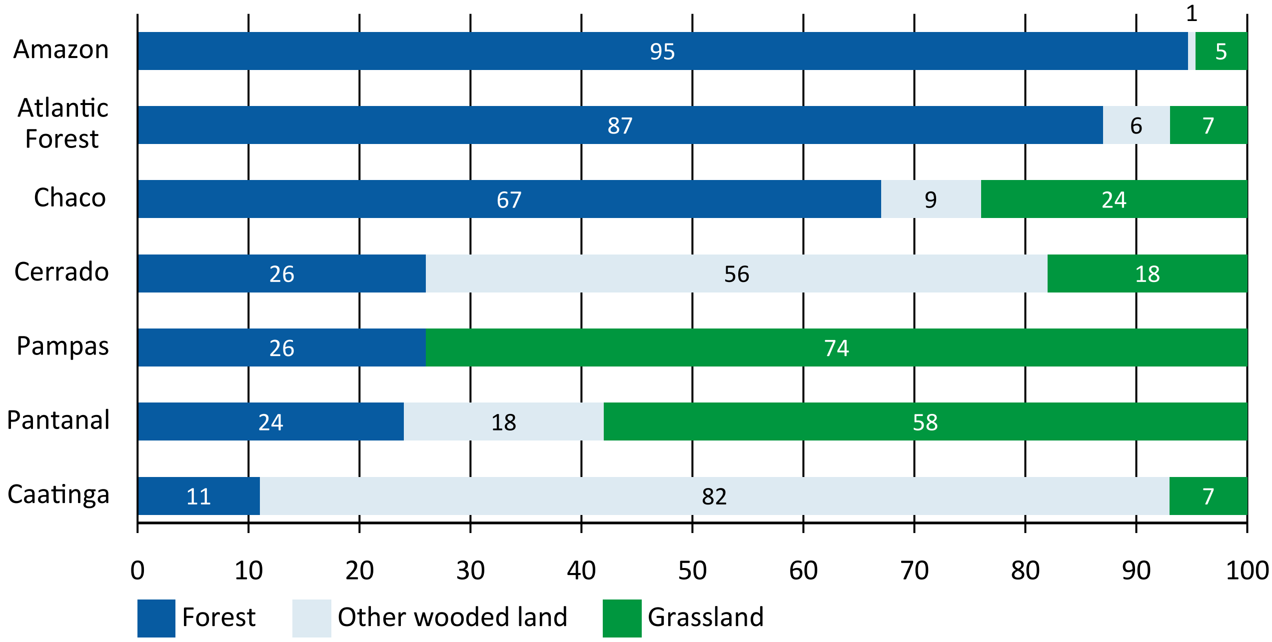

Fig. 28: Ecosystem coverage of the EUDR (based on Richens, 2022) in per cent

tions has made the Cerrado the most threatened ecosystem in Brazil (Salmona et al., 2023).

The Pampas region is a semi-arid, grassland-dominated biome that spans over 1 million km², primarily across Argentina, with smaller portions in Brazil and Uruguay. It is ecologically significant, hosting high levels of biodiversity despite its relatively limited extent. In Brazil, the Pampas covers just 2% of national territory but contains roughly 9% of the country's biodiversity (Andrade et al., 2023, p. 10). Soybean cultivation for European consumption has become a key driver of land conversion in the Brazilian portion of the Pampas, with substantial impacts on local ecosystems (Trase, 2025). In Brazil, approximately 35% of the original Pampas area has been converted (MapBiomas, 2024).

In 2022, land conversion in Brazil linked to EU-bound soy exports totalled approximately 125,000 ha, nearly half the size of Luxembourg. This makes EU consumption the third-largest driver of soy-related land conversion, following exports to China (260,000 ha) and domestic soy use (144,000 ha) (Trase, 2025).

Beyond its impacts on biodiversity, soy-driven deforestation is also a significant contributor to climate change. The ecosystems mentioned above store substantial amounts of carbon, both in biomass and soils. Converting these landscapes into agricultural land releases stored carbon, not only from carbon-rich forests but also from tropical savannas, which can sequester substantial amounts of carbon (Zhou et al., 2023). In 2022, land conversions in Brazil – driven by soy exports to the European market – resulted in approximately 19 million tonnes of CO_{2eq} emissions (Trase, 2025).

Beyond forests: Gaps in EUDR coverage of soybean-affected ecosystems

The mosaic of ecosystems within the biomes affected by soybean cultivation highlights both the opportunities and limitations of the EU Deforestation Regulation (EUDR, see Section 1.2). While the regulation aims to prevent deforestation and forest degradation, its effectiveness is challenged by the ecological diversity and complex land use dynamics beyond forests, such as savannas and grasslands, which are not fully addressed. As a result, only the Amazon and the Atlantic Forest are significantly protected from further deforestation. In the Chaco, around 60% of the area is still protected, while in the remaining ecosystems, forests account for only a quarter or less of the total area (see Figure 10), leaving them unprotected by the EUDR and thereby posing the risk of leakage effects of soy cultivation to other ecosystems.

Fig. 29: Extensive soybean monocultures in South America drive deforestation, biodiversity loss, and environmental degradation. (Photo: Mato Grosso/dreamstime.com)

Biodiversity on soy farms

Beyond the risks associated with land conversion, soybean cultivation itself poses significant risks to biodiversity. The crop is typically grown in large-scale, high-intensity monocultures, which offer little habitat diversity and inhibit the survival of other plants, animals, and insect species that would improve diversity. These risks are further amplified by the environmentally harmful use of pesticides, which are increasingly applied in the cultivation of genetically modified soybean varieties (Ofterdinger & Granzow, 2022). In recent years, almost all soy grown in Brazil has been genetically modified (Transparenz Gentechnik, 2018), and over 90% of soy imported into the EU from Argentina, Brazil, and Paraguay is genetically modified (ProTerra Foundation, 2023; Smith & Katovich, 2017; Stern, 2014). Of particular concern is Roundup Ready soy, engineered to tolerate glyphosate, a broad-spectrum herbicide whose usage has surged as a result (Bøhn & Millstone, 2019). Glyphosate indiscriminately kills non-target vegetation, reducing food and habitat availability for insects, birds, and other wildlife, thereby contributing to declining species diversity (El Jaouhari et al., 2023).

At the same time, Brazil – along with Argentina and Paraguay – has become a global leader in implementing and improving no-till practices. In no-till systems, the soil remains undisturbed, and crops are sown without ploughing or tilling. According to Kassam et al. (2015, p. 5), over 70% of the total cultivated crop area in the Mercosur (Mercado Común del Sur) countries (Argentina, Brazil, Paraguay, and Uruguay) is farmed using no-till methods, two-thirds of which are under permanent no-till cultivation. On the one hand, no-till soybean farming offers clear environmental benefits as it reduces soil erosion and increases soil organic matter, thereby enhancing the soil's capacity to store carbon, making an important contribution to climate change mitigation (Bolliger et al., 2006; Maia et al., 2022). On the other hand, the lack of mechanical weed control in no-till systems results in a strong reliance on chemical herbicides, particularly glyphosate, as previously discussed.

3.1.4 Key takeaways

The expansion of soybean cultivation remains one of the main drivers of land conversion and therefore biodiversity loss in Brazil and Argentina, as the two primary suppliers for the European market. Especially in combination with cattle ranching, soybean cultivation significantly contributes to the large-scale conversion of forests, savannas, and grasslands into agricultural land. While land conversion initially declined after 2015, this trend has reversed since 2019, with increasing losses in the Cerrado and the Brazilian part of the Pampas region. In Brazil, soy production for the European market still drives annual land use changes of native vegetation equivalent to about half the area of Luxembourg. The EU plays a major role in these changes, alongside China and domestic demand. Beyond its impact from land conversion, soybean cultivation itself poses biodiversity concerns, as it is largely carried out in intensive monocultures with low structural diversity and a strong reliance on fertilisers, pesticides, and genetically modified crops. Tab. 3 summarizes the most relevant impacts of soybean production for the European market.

Tab. 3: Biodiversity impacts of soy production

Main ecosystem affected	Impacted through	Effects on biodiversity	Quantitative data / impact ranking
Cerrado, Pampas	Deforestation and land conversion for soy cultivation	Loss of highly biodiverse natural ecosystems, habitat degradation, and species extinction	Land conversions linked to soy exports to Europe: Brazil (mainly Cerrado and Pampas): 179,000 ha (2013) – 125,500 ha (2022); Argentina (mainly Chaco): 3,900 ha (2015) – 2,500 ha (2019)
Agricultural landscapes (soybean plantations)	Cultivation in large-scale monocultures	Reduction of agrobiodiversity through monocultures, pesticides (especially glyphosate), use of GMO	Almost the total quantity of soy for the European market (4.8 million hectares) is produced in highly intensive monocultures

3.2 Mitigating the impact of soy production: Options for action

As a major importer of soy linked to deforestation, especially in Latin America, the EU bears a responsibility to restructure market demand in ways that reduce its global biodiversity footprint. Nonetheless, current EU policies continue to subsidise livestock production, making animal products artificially affordable and reinforcing harmful consumption patterns. Reducing the consumption of meat and dairy is therefore critical not only for biodiversity protection but also for public health, with proven co-benefits including lower risks of cardiovascular disease, high blood pressure, type 2 diabetes, and certain cancers (Global Nutrition Report, 2021). This section outlines three strategies to reduce production and demand, with the goal of promoting more sustainable soy use. First, policymakers can strengthen the role of the EU's Common Agricultural Policy (CAP)[22] as a lever for sustainability by phasing out harmful incentives and subsidies, in an approach aligned with Target 18 of the Global Biodiversity Framework. Second, they can support shifts in consumer behaviour by implementing price incentives that encourage plant-based alternatives and discourage excessive meat consumption. Third, they can conduct awareness campaigns to increase public visibility and understanding, highlighting the benefits of plant-forward diets and providing essential knowledge to facilitate their adoption.

[22] Common Agricultural Policy (CAP), established under various Regulations of the European Parliament and of the Council since 1962 (e.g., Regulation (EU) 2020/2220, OJ L 437, 28.12.2020, p. 1–29).

3.2.1 Reforming the CAP: Reducing soy imports and the biodiversity impact of livestock

Established in 1962, the CAP is one of the EU's longest-standing and most influential instruments, particularly shaping agriculture but also affecting rural development and the environment. By providing subsidies to farmers, the CAP has historically aimed to ensure food security, stabilise agricultural markets, and promote rural development (European Commission, n.d.b; Khatun, 2012). Recent reforms have added ecological goals, such as halting biodiversity loss, reducing carbon emissions, and improving animal welfare; however, core elements still prioritise the competitiveness of the livestock sector (European Commission, 2023b).[23] The ongoing support from the CAP contributes to maintaining the current structure of livestock production, which tends to inhibit significant change in consumption patterns (Buckwell & Nadeu, 2018). At the same time, there is growing recognition of the CAP's potential to foster biodiversity protection and climate resilience if better aligned with ecological goals (European Network of Heads of Nature Conservation Agencies (ENCA), 2024). Reforming the CAP to phase out environmentally harmful subsidies would therefore be a key step toward reducing the EU's soy-related biodiversity footprint.

The two pillars of the EU's Common Agricultural Policy

The CAP has a budget of approximately €387 billion for the 2021-2027 period, accounting for around a third of the EU's total budget (European Commission, o. J.). It is divided into two pillars:

Pillar I – Direct Payments are distributed based on the amount of land farmed. This mechanism constitutes 72% of the CAP budget. Direct payments include – among others – a new eco-scheme mechanism that allocates 25% of Pillar I funds to incentivise environmentally friendly farming practices. Voluntary Coupled Support (VCS) – allocated to specific sectors in difficulty – receives 10% of direct CAP funds. In addition, farmers must comply with Good Agricultural and Environmental Conditions (GAECs) to qualify for direct payments, which are mandatory standards to ensure sustainable farming.

Pillar II – Rural Development Programmes focus on long-term rural development and offer financial support for environmental practices, such as organic farming and various agri-environmental schemes. Since 2013, this pillar has included sustainability measures. During the CAP 2023–2027 period, at least 35% of Pillar II funds will be allocated to measures supporting climate, biodiversity, the environment, and animal welfare.

Member States have a significant role in implementing CAP measures, especially under Pillar II. While the EU sets the overall framework and goals, each member state is responsible for designing and managing the specific programmes that address these goals.

How is the CAP linked to deforestation?

Livestock farming is one of the main beneficiaries of agricultural subsidies within the EU and globally (FAO et al., 2021; Kortleve et al., 2024). In the EU, it benefits from both direct payments for domestic protein feed production and for livestock production itself (Kortleve et al., 2024). Approximately 80% of CAP subsidies directly or indirectly support animal farming, thereby increasing profitability and encouraging high meat consumption

[23] In parallel, the Farm-to-Fork Strategy, as a part of the Green Deal, sets out a broader vision for sustainable food systems beyond the CAP. Nevertheless the implementation of the Farm-to-Fork Strategy has faced significant delays due to institutional fragmentation within the Commission, polarised political debates around agricultural models, and insufficient attention to the economic implications for farmers, consumers, and trade (Aubert, 2023)

while overlooking externalities (Kortleve et al., 2024, p. 288). Voluntary Coupled Support payments further bolster livestock farming, with 74% allocated to this sector (European Court of Auditors, 2021, p. 25). The EU's exemption of animal feed from import tariffs further compounds the issue and has boosted cheap soy imports (Muller & Bautze, 2017)[24] – and encourages these countries to expand soy production at the expense of forests and biodiversity-rich savannahs, exacerbating deforestation rates (see Section 3.1.3). The CAP is not the only instrument shaping EU agricultural policy and influencing imports of soy as animal feed. Another significant factor is the EU-Mercosur Free Trade Agreement. Current developments suggest that the pressure on ecosystems resulting from soy imports could intensify in the future under the agreement.

The EU-Mercosur agreement

The EU-Mercosur Trade Agreement is a proposed free trade deal aimed at reducing trade barriers while addressing labour and environmental concerns. Negotiations began in 1999, paused for eleven years, and concluded in 2019. A revised agreement with enhanced sustainability aspects was reached on December 6, 2024, with implementation expected by 2026. It includes commitments to sustainable fisheries, forest management, and combatting illegal logging. On the one hand, some studies (e.g. Campos et al., 2022) argue that the agreement could set a new global sustainability standard and could decrease greenhouse gas emissions in the Mercosur states. Evidence from previous trade agreements suggests that environmental provisions can strengthen regulations in partner countries (ibid.). However, on the other hand, critics contend that the agreement could harm biodiversity in Mercosur states by increasing imports of deforestation-linked goods such as soy and beef into the EU, undermining the EU's deforestation reduction goals outlined in the EUDR (Fuchs et al., 2024). They highlight the structural contradiction between the Mercosur Agreement and the EUDR, which could worsen the exploitation of known loopholes (ibid.) (see Section 3.1.3). Some models (Buczinski et al., 2023) estimate that the EU-Mercosur agreement could lead to an additional deforestation of between 620,000 and 1,350,000 ha (in the worst-case scenario) over five years, corresponding to a 5-25% annual increase in deforestation during the first six years (Greens/EFA in the European Parliament, 2024). The agreement remains contested, with sustainability being a key issue. Critics argue it must strengthen indigenous rights, supply chain traceability, and legal enforcement of sustainability measures (Kehoe et al., 2020). Meanwhile, organisations such as the Greens/EFA demand stricter tariff conditions tied to sustainability, better alignment with the Paris Agreement, and safeguards against environmental externalisation. Improved labelling of Mercosur soy could enhance transparency. Nonetheless, if well-regulated, the agreement could set a precedent for balancing trade and sustainability in future deals (Cesar De Oliveira et al., 2024).

To address the CAP's role in driving deforestation, reforms need to confront its structural support for intensive livestock farming, which requires limiting livestock numbers, mitigating ecological harm, and reducing reliance on imported soy. Three key pathways are redefining CAP objectives, increasing domestic legume production and reducing livestock, and providing stronger sustainability-specific subsidies.

Redefining the CAP objectives

The CAP must fundamentally shift its priorities, placing sustainability at the core, with a stronger

[24] Tariff measures on soybeans and related trade policies have frequently changed in recent months, largely due to the nature of US tariff policies and ongoing negotiations with the EU and other partners. For example, proposed EU tariffs on US soybeans in 2025 were later suspended, illustrating this shifting dynamic (de la Hamade & Hogan, 2025; Reuters, 2025c).

focus on protecting biodiversity both within the EU and in feed-exporting countries, as well as reducing greenhouse gas emissions. A key objective should be to scale down excessive livestock production, thereby reducing the demand for imported soy. Achieving this requires accounting for livestock-related emissions – both domestic and embedded in imports – and setting binding reduction targets. Such a shift could deliver important co-benefits, including the prevention of further ecosystem destruction in soy-producing regions (European Court of Auditors, 2021).

Reducing soy imports through local feed production and reduced livestock numbers

The CAP should further incentivise local protein crop cultivation, as already encouraged by initiatives such as the European Soya Declaration (2017). This would not only contribute to reducing soy imports but also improve domestic soil fertility through nitrogen fixation (Debaeke et al., 2022; Kliem et al., 2019; Muller & Bautze, 2017). As shifting to local feed production would increase pressure on cropland within the EU, it is also essential to reduce livestock production (Agora Agriculture, 2024; Karlsson et al., 2020).

To reach this goal, the CAP's market support for animal products needs an overhaul. Intensive livestock farming significantly contributes to the demand for soy-based animal feed, particularly due to the high number of animals kept in the EU. For example, pig farming is a major driver of soy imports. A central strategy to reduce livestock numbers is the phase-out of basic income support and coupled income support under the first pillar of the CAP, as proposed by Agora Agriculture (2024). These payments are linked to the agricultural area of farms but are criticised as ineffective in achieving environmental objectives and in distributing CAP funds efficiently (Agora Agriculture, 2024; Pe'er et al., 2020). Phasing out direct payments would make large-scale livestock farms, in particular, less profitable, allowing for the reallocation of funds to eco-schemes and second-pillar measures (Agora Agriculture, 2024). Eliminating payments – such as those for ruminants under the Voluntary Coupled Support – would further lower livestock production and reduce feed imports

How to determine the true cost of meat

Efforts to calculate the 'true' cost of food often include CO2 emissions and direct pollution (Funke et al., 2022), although accurately pricing negative externalities beyond greenhouse gas emissions remains difficult (Hamm et al., 2021; Pechanec et al., 2017). An approach that is gaining increasing attention is true cost accounting (TCA), as a financial method that extends beyond direct monetary costs to consider the social, environmental, and long-term economic impacts of business activities, many of which are typically externalised (Baker et al., 2020; Decker et al., 2022; Gemmill-Herren et al., 2021). It encompasses four types of capital: natural, human, social, and produced (Hamm et al., 2021). The goal is to provide a comprehensive picture of both the positive and negative impacts of business practices. In recent years, the potential of TCA in the food sector has received growing attention. In Germany, the interdisciplinary Commission on the Future of Agriculture (Zukunftskommission Landwirtschaft) has advocated for agricultural and environmental policies that "make avoiding current negative externalities and achieving positive effects economically attractive [for producers]" (Zukunftskommission Landwirtschaft, 2021, pp. 53–54, own translation). While several organisations have developed methodologies to apply TCA to agri-food supply chains, standardised tools for effective implementation and consistent results remain lacking (De Adelhart Toorop et al., 2021). Determining the true cost of meat in particular requires careful analysis. Studies on the true cost of meat yield different conclusions depending on the database and methodology used. Additionally, their scope varies: while most studies account for hidden environmental costs, only a few (such as Azarkamand et al., 2024) also quantify broader human health consequences. Further research is needed to integrate social costs, which remain largely unaddressed due to their complexity and data limitations.

(Jansson et al., 2021). However, without measures addressing imported meat with lower production standards, this could lead to market imbalances, as the CAP measures can only address domestically produced meat, leaving imports with lower standards unregulated (ibid.). Thus, efforts aimed at reducing overall meat consumption need to go hand in hand with the proposed measures.

Providing stronger sustainability-specific subsidies

The reduction of subsidies for the livestock sector should be accompanied by higher subsidies for organic, biodiversity-friendly, and plant-based farming, alongside the simplification of administrative procedures to enable effective implementation. Organic agriculture, already supported by many Member States through the CAP (Haynes, 2023), could play a key role in making EU farming greener and more biodiversity-friendly by supporting up to 30% more species compared to conventional farming, including a significant increase in pollinators and plant diversity (IFOAM, 2022). The European Green Deal – supported by the EU Organic Action Plan – sets the ambitious target that at least 25% of agricultural land should be under organic farming by 2030. However, at present, only 9.1% of land is farmed organically, despite a steady annual growth rate of 5.7% (European Commission, 2023a, p. 5). Organic livestock production, which prohibits the use of GMO feed and relies more on domestically produced fodder, is less directly linked to imported soy and thus less associated with deforestation. Organic farms also have advantages in animal feed production. They account for 20-40% of grain legumes and an even higher share of forage legumes in the EU (Kliem et al., 2019, p. 53; Muller & Bautze, 2017).

3.2.2 Reflecting the true costs of animal-based foods: Towards biodiversity-oriented VAT reform

Although initial declines in meat consumption can be observed, they remain insufficient to significantly reduce overall demand for animal products – and, by extension, for soy used as animal feed – to a level that would meaningfully mitigate their negative biodiversity impacts. One frequently discussed policy tool to influence consumer demand is the taxation of animal products. Specific taxes on animal products can also help ensure that prices better reflect the true environmental impacts of their production, such as deforestation, water usage, and greenhouse gas emissions, which are currently not reflected in the price (Azarkamand et al., 2024; Funke et al., 2022; Leite Pinto, 2021; Springmann et al., 2025). Unlike the CAP, which primarily shapes production through subsidies, pricing measures directly influence consumption and apply equally to both domestic and imported products. Various instruments are under discussion, including the introduction of a dedicated meat tax or the reform of the VAT system to better reflect the environmental costs of animal-based foods.

Meat taxation: internalising environmental and health costs

Although no country has implemented a direct meat tax to date, several European nations have introduced environmental and health-related taxes to encourage more sustainable and healthier choices. For instance, France, Norway, Denmark, and Sweden have imposed taxes on pesticide use to discourage unsustainable farming practices (European Commission Directorate General for Environment et al., 2024). In the realm of health-focused taxation, Denmark briefly introduced a tax on saturated fats in 2011, indirectly impacting meat consumption. However, it was repealed after a year due to insufficient stakeholder involvement and opposition from the industry (Vallgårda et al., 2015). By contrast, the UK's 2018 sugar tax is often cited as a success as it led to a substantial reduction in sugar consumption (Taylor, 2024), illustrating that well-designed and targeted taxes can be effective drivers of behavioural change. Crucially, such instruments require consistent political backing to withstand pressure from vested interests. These examples also highlight the multiple entry points for taxation along the supply chain – from agricultural inputs such as pesticides to consumer-facing products – offering valuable lessons for designing future pricing instruments, including those targeting meat and animal products.

Beyond the current lack of public support for a dedicated meat tax, a key procedural challenge lies in determining an appropriate and effective tax rate that accounts for the varying environmental impacts of different animal products. A common approach is to base the rate on greenhouse gas emissions. However, this method often fails to capture other significant environmental externalities, such as biodiversity loss, land degradation, or water pollution. Incorporating these broader impacts into a comprehensive pricing model remains a challenge.

Reforming value-added tax (VAT)

A more straightforward approach to promoting nature-friendly consumption – one that builds on existing tax infrastructure – is through the VAT system. The EU Member States raise over €1,000 billion in revenue through VAT, which in 2023 represented 7.2% of the EU's GDP (European Council, n.d.). While VAT is primarily administered by Member States, it is harmonised at the EU level through a common framework. The EU sets a framework for VAT rates, including reduced (from 5%) or super-reduced rates (from 0%) and the standard VAT rate from 15%. It additionally lists goods eligible for reduced VAT rates, including foodstuffs, meat, and live animals. At the same time, Member States have the flexibility to set higher rates and to differentiate VAT rates to pursue social or environmental objectives.

At present, meat and animal products benefit from reduced tax rates in many EU countries: on average, meat and dairy products are taxed at 8% while plant-based products are taxed at 9% (Springmann et al., 2025). The European Green Deal (2019) and the Farm to Fork Strategy (2020) both highlight VAT reforms to support sustainable food systems, particularly by promoting organic fruits and vegetables. Equally, the Policy Evaluation Network (PEN) as well as national expert commissions such as the German Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection (WBAE) consider price incentives through VAT reforms as a feasible measure to support healthier and more sustainable diets (Spiller et al., 2020; von Philipsborn et al., 2021). To incentivise healthier and more environmentally friendly diets, the EU could exclude meat and dairy products from the list of goods eligible for VAT reductions, while encouraging Member States to set the VAT rate for plant-based products such as vegetables, fruits, and legumes at 0%.

Modelling by Oebel et al. (2024, p. 1714) confirms that increasing the VAT on meat and fish to 19% and lowering it on organic vegetarian foods to 0% could generate additional tax revenues of €2.04 billion and €5.31 billion in averted external climate costs in Germany. Springmann et al. (2025) showed for the EU and UK that increasing taxes on meat and dairy at the maximum rate on foods in each country and reducing taxes on plant-based foods would result in an average reduction of around -6% across eutrophication potential, land and freshwater use, and GHG emissions. Additionally, the number of diet-related deaths in Europe could be reduced by 330 deaths per million people. Tax revenues across the EU and UK were estimated at 45 billion USD (ibid., 163).

Proposals to increase food prices are often criticised for potentially exacerbating social inequalities. Indeed, a truly sustainable food system should be both environmentally and socially just, particularly considering the needs of low-income groups, who spend a larger share of their income on food (Klenert et al., 2023) and consequently are relatively more affected by a VAT increase. However, despite the common misconception that plant-forward diets are more expensive, research shows they can actually be more affordable than omnivorous diets (Hohoff et al., 2022; Kabisch et al., 2021; Springmann et al., 2021). Springmann et al. (2021) argue that a shift toward predominantly plant-forward diets could lower food costs for consumers, even in the absence of tax reform. Nonetheless, any removal of the reduced VAT rate on animal products needs to be paired with a 0% VAT on plant-based foods to prevent undue financial burdens and support a socially just dietary transition. This dual approach would help make plant-forward diets more financially viable, especially for lower-income households, while still allowing for continued (though likely reduced) meat consumption. To ensure broader equity, ad-

Fig. 30: Plant-forward diets can play a key role in protecting biodiversity. (Photo: vaaseenaa/iStock)

ditional social compensation mechanisms – such as increased social security payments, additional lump sum transfers, or targeted food vouchers – have been recommended (Klenert et al., 2023; Latka et al., 2021; Spiller et al., 2020; The European Environment and Sustainable Development Advisory Councils Network (EEAC), 2022). Beyond consumers, farmers also require targeted support. A promising option is to reinvest revenues from VAT increases to help farmers – particularly small-scale producers – transition to more sustainable practices or adopt higher animal welfare standards (Funke et al., 2022; Spiller et al., 2020; TAPPC, 2020). Funds could also be allocated to third-party countries to offset the damage caused by the European livestock sector (TAPPC, 2020).

A survey commissioned by the True Animal Protein Price Coalition (TAPPC) reveals that 57% of Western Europeans support a meat tax if it is accompanied by a 0% VAT on healthy foods, financial compensation for low-income groups, and subsidies for farmers (TAPPC, 2024). Nevertheless, to achieve the positive environmental, health, and cost benefits of plant-forward diets, consumers must be both willing and able to adopt them. Therefore, effective communication, awareness campaigns, and capacity building are crucial for successfully pursuing this goal. Past failures of consumer taxes have often stemmed not from policy ineffectiveness but from poor communication and strong industry opposition (Vallgårda et al., 2015). Denmark's experience shows that involving a broad range of stakeholders, including consumers, farmers, and environmental groups, can facilitate sectoral changes (ibid.). Moreover, fiscal measures should be complemented by informational campaigns to build support for price signals and to enhance their responsiveness to price changes (Funke et al., 2022). For consumers, the availability of plant-based substitutes will also be important. Satisfaction with options like tofu, seitan, and meat substitutes, as well as emerging products such as cultivated meat and insect-based foods, could also improve the acceptance and effectiveness of the tax.

3.2.3 Raising awareness and building public support for nature-friendly dietary transitions

Continuous education and awareness are essential to reduce meat and dairy consumption and promote healthy diets. Raising awareness about the environmental impact of animal products is key to gaining public support for measures such as price incentives or more plant-based options in public canteens (see box "Good practice: Lessons from France's EGalim implementation"). Studies show that European consumers have limited awareness of the environmental and climate issues associated with animal husbandry and the potential benefits of a vegetarian diet for climate and biodiversity protection (Sanchez-Sabate & Sabaté, 2019). Adverse effects of meat production are generally underestimated and more often attributed to transport and packaging of all foods (Sanchez-Sabate et al., 2019). A key challenge in raising awareness lies in addressing the variability in knowledge about the use of soy in animal feed versus direct human consumption. German consumers, for instance, are largely unaware of the hidden soy in meat products and its environmental consequences (Weinrich & Busch, 2021).

**Good practice:
Lessons from France's EGalim implementation**

Calls to reduce meat consumption can be politically and culturally sensitive, especially when mandated by the state. Such measures are often perceived as paternalistic (Dieterle, 2020) and tend to be unpopular (Ajena et al., 2021; Milford & Kildal, 2019), occasionally triggering backlash, as seen with the German Green Party's 2013 proposal for a weekly vegetarian day (Seha, 2019). France faced similar resistance when the 2019 EGalim[25] law introduced a weekly vegetarian meal in public and private schools, which as later made permanent by the 2021 Climate and Resilience Act. Concerns centred on France's culinary traditions and fears of nutritional deficiencies. However, a two-year evaluation found growing public support (Bardon & Feignier, 2021). The French Ministry of Agriculture emphasised the importance of a structured implementation approach, including chef training, quality ingredient supply, educational outreach, and robust monitoring. These lessons highlight that successful policy requires not only logistics but also cultural sensitivity and effective communication. Framing meat reduction in culturally resonant ways – such as celebrating traditional legume dishes – can help ease resistance (Bègue & Treich, 2019). Public support also depends on addressing concerns about fairness and choice. While initial resistance is common, social norms shift over time, increasing long-term acceptance (Bryant et al., 2024).

General considerations for raising awareness effectively

Overall, research indicates that health-related arguments tend to be more effective than environmental messaging in changing dietary behaviour (Kwasny et al., 2022). Nonetheless, it remains crucial to raise awareness about the environmental impacts of meat consumption, as public understanding of these issues is still relatively limited (Hartmann & Siegrist, 2017; Sanchez-Sabate et al., 2019). Evidence suggests that combining health and environmental messages yields the strongest results in motivating dietary change (Kwasny et al., 2022). Moreover, to maximise impact, information should be tailored to the consumer's stage in the decision-making process, reflecting motivational reasons for those contemplating change, and practical strategies for those already committed (Zur & Klöckner, 2014). Raising awareness of alternative meat substitutes is a further key component of these educational initiatives. The market for plant-based substitutes reached EUR 5.4 billion in 2023 across six European countries,[26] marking an increase of 5.5% compared to

[25] Loi n° 2018-938 du 30 octobre 2018 pour l'équilibre des relations commerciales dans le secteur agricole et alimentaire et une alimentation saine, durable et accessible à tous (EGalim), Journal officiel de la République française No. 0255.

[26] France, Germany, Italy, Netherlands, Spain, United Kingdom

2022 (The Good Food Institute Europe, 2024). In addition to traditional tofu and seitan, innovative products now mimic meat using novel proteins from peas, lupins, and even heme (Ajena et al., 2021; Smart Protein Project, 2021).

Target-group-specific communication strategies for reducing meat consumption

As will be discussed in Section 5.1.5, it is essential to tailor awareness campaigns to specific target groups. To enable a more audience-specific communication strategy, the following three main target groups (simplified according to Grobler & Rückert-John, 2023) can be distinguished.

Health-conscious consumers: To reach individuals focused on well-being, communication should emphasise the health benefits of plant-forward diets, such as reduced risks of strokes, heart attacks, and cancer. Highlighting the naturalness of plant-based options (Seffen & Dohle, 2023), avoiding GMOs, and tracing the origins of animal feed can strengthen the message. Additionally, references to nutrient density, plant-based proteins, and superfoods, along with testimonials from athletes and health experts, can boost credibility.

Holistically minded consumers: Those who consider ethical, environmental, and social aspects in their food choices respond well to messages about the broader impact of meat consumption. Effective strategies include highlighting animal welfare concerns, the carbon footprint of livestock farming, deforestation, the significantly larger land footprints of meat compared to plant protein, and social inequalities in global meat production.

Indulgence-focused consumers: Those who prioritise hearty and satisfying meals without specific concern for health or environmental issues should be engaged by emphasising the enjoyment and richness of plant-based options. Messaging should focus on flavour, texture, and culinary experiences, highlighting high-quality meat alternatives, umami-rich ingredients, and indulgent plant-based dishes. Showcasing well-known chefs and popular comfort food recipes can make plant-based choices more appealing.

3.2.4 Key takeaways

To promote more sustainable soy consumption, the key focus should be placed on meat and animal product consumption in the EU, as the majority of soy imported is used as livestock feed. This section has discussed three policy approaches aimed at reducing the consumption of meat and animal products within the EU, namely the reduction of harmful subsidies within the EU, setting price incentives to steer consumer demand, and consumer awareness raising (see also Tab. 4).

The following recommendations appear most prescient. First, the CAP should be used to reduce livestock production while simultaneously promoting sustainable production methods such as organic farming and the cultivation of domestic protein sources. In this way, EU subsidies can be leveraged to support healthy and sustainable diets within the EU and to reduce biodiversity loss in production countries. Second, a VAT reform can be an effective instrument to internalise the external costs of meat consumption and influence demand. Setting price incentives can make healthy, plant-based options more affordable while increasing the prices of meat to curb consumption. Although the EU cannot directly determine the tax policies of Member States, it can establish regulatory frameworks, such as removing animal products from the list of goods eligible for reduced tax rates. Third, despite ongoing societal debates and positive trends toward plant-forward diets, raising awareness remains a key strategy. A stronger emphasis needs to be placed on communicating the environmental costs of meat consumption and the benefits of plant-forward diets. This is crucial not only to build public acceptance for the previously mentioned measures and increase responsiveness to price adjustments but also to drive a broader, long-term shift in dietary habits.

Tab. 4: Policy recommendations for nature-friendly soy consumption

Policy recommendations		
Reduce demand for soy as animal feed by lowering livestock production within the EU • Make biodiversity protection a key goal of the CAP • Decrease soy imports through local feed production and reduced livestock numbers • Provide stronger sustainability-specific subsidies to support organic agriculture	Reduce demand for animal products by making them less cost-competitive and plant-based options more affordable: • EU level: Reform the EU VAT Directive to remove animal products from the list of goods eligible for a reduced VAT rate • National level: Remove the reduced VAT rate on animal products and set VAT on plant-based foods to 0%.	Reduce demand for animal products through awareness raising and education • Raise consumer awareness through target group-specific information campaigns • Combine environmental and health claims

Fig. 31: Oil palms produce palm oil, palm kernel oil, and palm kernel expeller. (Photo: KYTan/Shutterstock.com)

4 The case of palm oil

From chocolate bars and ready-made meals to cosmetics and cleaning products, palm oil is found in many everyday items. It can also be used as a biofuel or as a base for paints, plastics, and coatings (Nagel et al., 2020). The reason for its popularity is its specific material features, as it is colourless and odourless, it remains semi-solid at room temperature and stable at high temperatures, thus making it the perfect ingredient for many different types of processed foods (Habi Mat Dian, 2018). Additionally, palm oil can be produced very efficiently compared to alternative vegetable oils: it accounts for 36% of global vegetable oil production, while using less than 9% of the total cropland devoted to vegetable oil crops (Ritchie, 2021). Substituting palm oil with rapeseed would require five times more land.

The three primary products derived from oil palms include palm oil, palm kernel oil, and palm kernel expeller. Palm oil, produced by milling the fruits, is used for foods (68% of global palm oil use), detergents (27%), and biofuels (5%). Typical applications of palm kernel oil, produced by crushing the kernel/seed, include oleochemicals, cosmetics (EPOA et al., 2022, p. 5), and processed foods (Meijaard et al., 2018). The co-product of palm kernel oil – palm kernel expeller – is predominantly used as animal feed (EPOA et al., 2022).

4.1 Mass flows and environmental impacts

4.1.1 The global perspective

As the most widely consumed vegetable oil in the world, the cultivation of oil palms has dramatically increased, reaching around 35 times the level seen in the early 1970s (see Fig. 33; (Ritchie, 2021)). The main cultivation areas of palm oil are located in Southeast Asia. Indonesia and Malaysia contribute 85% to global palm oil production. Cul-

Fig. 34: Palm oil is a versatile ingredient used in foods, cosmetics, cleaning products, and biofuels. (Photo: New Africa/Shutterstock.com)

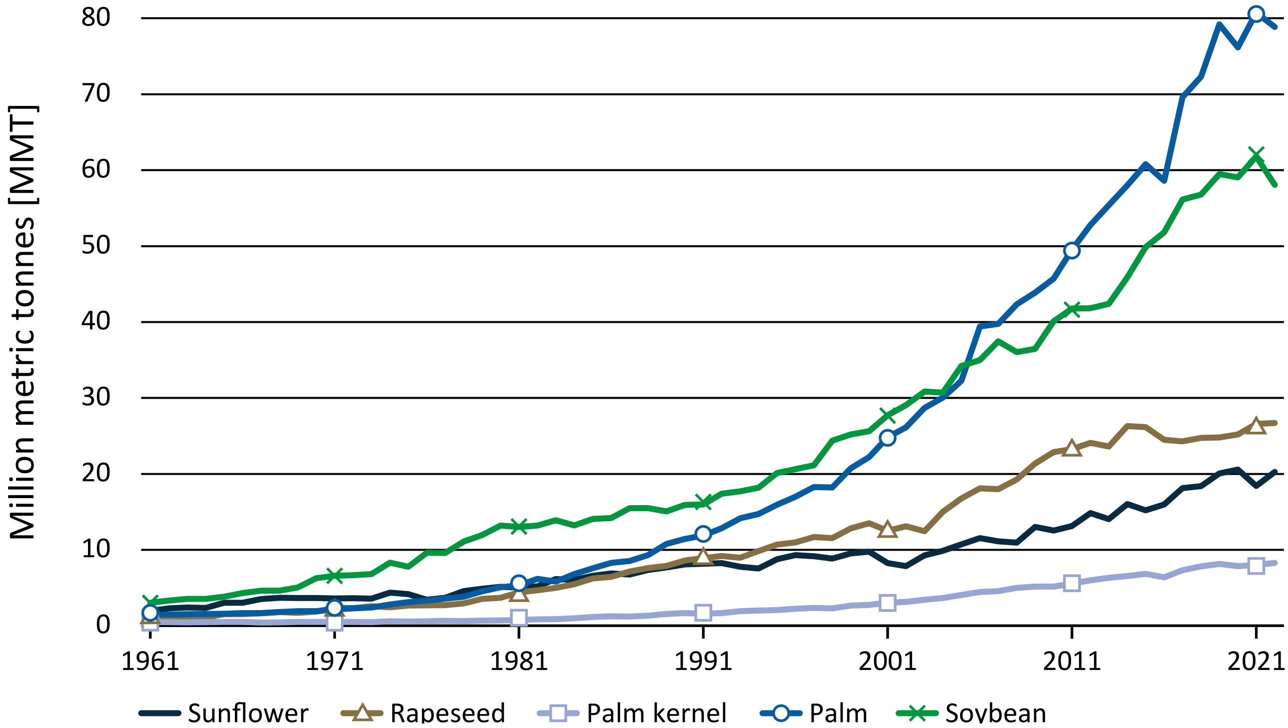

Fig. 32: Trends in global vegetable oil production (based on Ritchie, 2021)

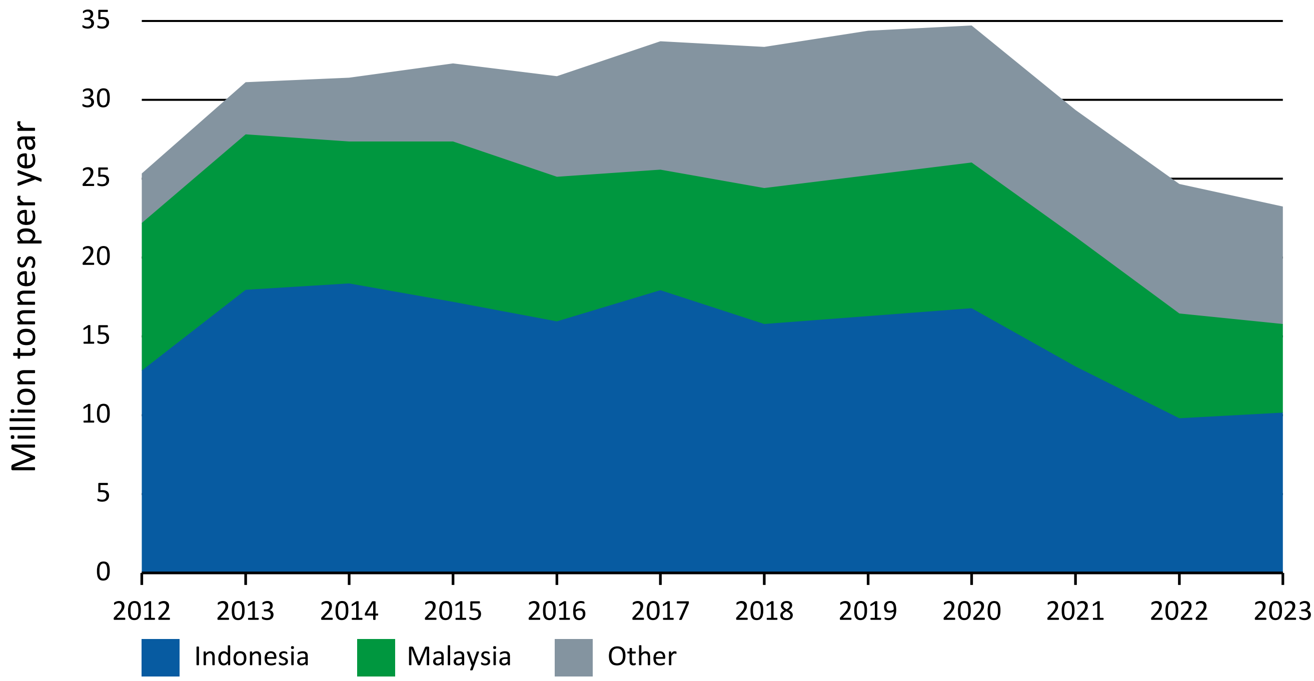

Fig. 33: Palm oil imports from the Global South to EU27 (own compilation; for references see Section 1.4)

tivation is primarily conducted on industrial-scale plantations, 60% of which are situated in Malaysia and 32% in Indonesia. Cultivation by smallholders accounts for 40% of the total planted area in both countries (ibid., p. 13). Indonesia is the world's largest exporter of crude and refined palm oil, exporting over 58% of its production and contributing 59% of total global exports (Heilmayr & Benedict, 2022).

4.1.2 European imports and consumption

To quantify the palm oil imports into the EU, the imported quantities of palm oil, palm kernel oil, and palm kernel expeller were considered and converted into palm oil equivalents. For further details on the methodology, please refer to Section 1.4. The results show that following a period of slightly rising imports between 2012 and 2020, European palm oil imports have been continuously decreasing since 2020 (see Fig. 34). In 2023, imports were significantly lower, amounting to 23.6 million tonnes, compared to 2020, the year with the highest imports at 34.7 million tonnes. The decline can be attributed to the phase-out of palm oil for biofuel production within the EU by 2030, initiated by the Renewable Energy Directive II (RED II)[27] (for more detailed information, see section 4.2.2).

The EU's Renewable Energy Directive (RED)

The Renewable Energy Directive – now in its third version (RED III)[28] – aims to reduce greenhouse gas emissions and promote renewable energy across the transport, electricity, heating, and cooling sectors.

Renewable Energy Target: By 2030, at least **29%** of the energy used in the transport sector must come from renewable sources, or alternatively a **14.5% reduction in greenhouse gas intensity** can be achieved (Art. 25).

Cap on First-Generation Biofuels: The contribution of biofuels produced from food or feed crops remains **capped at 7 %** (or the 2020 national share + 1 percentage point), now applied to the entire transport energy mix, including aviation and maritime fuels (Art. 26b).

High ILUC-Risk Biofuels: Biofuels with a high indirect land use change (ILUC) risk[29] remain **frozen at 2019 levels** and must be **phased out by 2030**.

Consistent with their prominence in global production, imports to the EU are predominantly sourced from Indonesia and Malaysia. In 2023, Indonesia contributed approximately 10.2 million tonnes, accounting for 43% of EU imports, followed by Malaysia with 5.6 million tonnes, or 24%. When examining palm oil production in Indonesia, in 2021, the export share to the EU (7.1%) was comparable to exports to China (around 6.6%), India (5%), and Pakistan (around

[27] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources, OJ L 328, 21.12.2018, p. 82-209.

[28] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652, OJ L, 31.10.2023, p. 1-77.

[29] The ILUC criteria – established by Commission Delegated Regulation (EU) 2019/807 – classify certain biofuels, bioliquids, and biomass fuels as "high ILUC-risk" if their production is likely to cause significant indirect land use changes. These changes occur when the increased demand for bioenergy crops leads to the conversion of carbon-rich land – such as forests, wetlands, or peatlands – into agricultural land elsewhere, thereby releasing substantial greenhouse gas emissions. The regulation sets specific thresholds and lists feedstocks (including palm oil, soybean oil, and certain other vegetable oils) that are subject to phase-out or use limitations in the EU's renewable energy targets to mitigate adverse environmental effects including deforestation and biodiversity loss.

Fig. 35: Oil palm cultivation is primarily conducted on large industrial plantations. (Photo: Naya Nurindra/ Shutterstock.com)

4.4%). The largest share of production, 41%, remained within the country itself (Trase, 2025).

Data on palm oil consumption in the various sectors in the EU is only available up to 2018. While between 2008 and 2018, the use in the food sector decreased (from 3.8 million tonnes to 2.8 million tonnes), there was a significant increase in palm oil usage in the energy sector during the same period, leading to an overall higher consumption. In 2018, approximately 65% of the 7.6 million tonnes was used for energy purposes, mainly in the form of biodiesel for transportation (Gregory, 2022, p. 11). Due to the sharp decline in imports associated with the phase-out initiated under the RED II, food presumably now constitutes the most significant use of palm oil within the EU.

4.1.3 Biodiversity impacts

The most significant biodiversity impacts of palm oil imports stem from land use changes, where highly biodiverse ecosystems are converted into palm oil plantations. Additionally, cultivation itself occurs in large monoculture plantations, which pose further risks to biodiversity.

Biodiversity effects of deforestation and peatland cultivation

Palm oil production is closely linked to a single ecosystem, namely tropical rainforests, as the most biodiverse ecosystems on the planet. Within these rainforests, tropical peatlands represent particularly valuable ecosystems, serving as major carbon sinks while also supporting rich biodiversity. The following sections will examine the impacts on both tropical rainforests and peatlands separately.

Tropical forests are home to more than half of all terrestrial vertebrate species, with 29% found nowhere else on Earth and 20% threatened with extinction (Pillay et al., 2022, p. 12). Indonesia – which contains the world's third-largest expanse of tropical forests – accounts for around half of global palm oil production (Heilmayr & Benedict, 2022; Jong, 2025). The palm oil boom has driven extensive deforestation: between 2001 and 2019, approximately 3 million hectares of Indonesian natural forest were converted into oil palm plantations (Gaveau et al., 2022, p. 1), an area roughly the size of Belgium. Over the past two decades, palm oil production has contributed to the loss of a third of Indonesia's old-growth forests, dealing a severe blow to one of the world's most critical ecosystems. Malaysia has also suffered significant deforestation, losing 2.93 million hectares of natural forest between 2002 and 2024, marking a 19% decline (Global Forest Watch, 2025).

After a sharp rise in deforestation for palm oil plantations until 2013, both Indonesia and Ma-

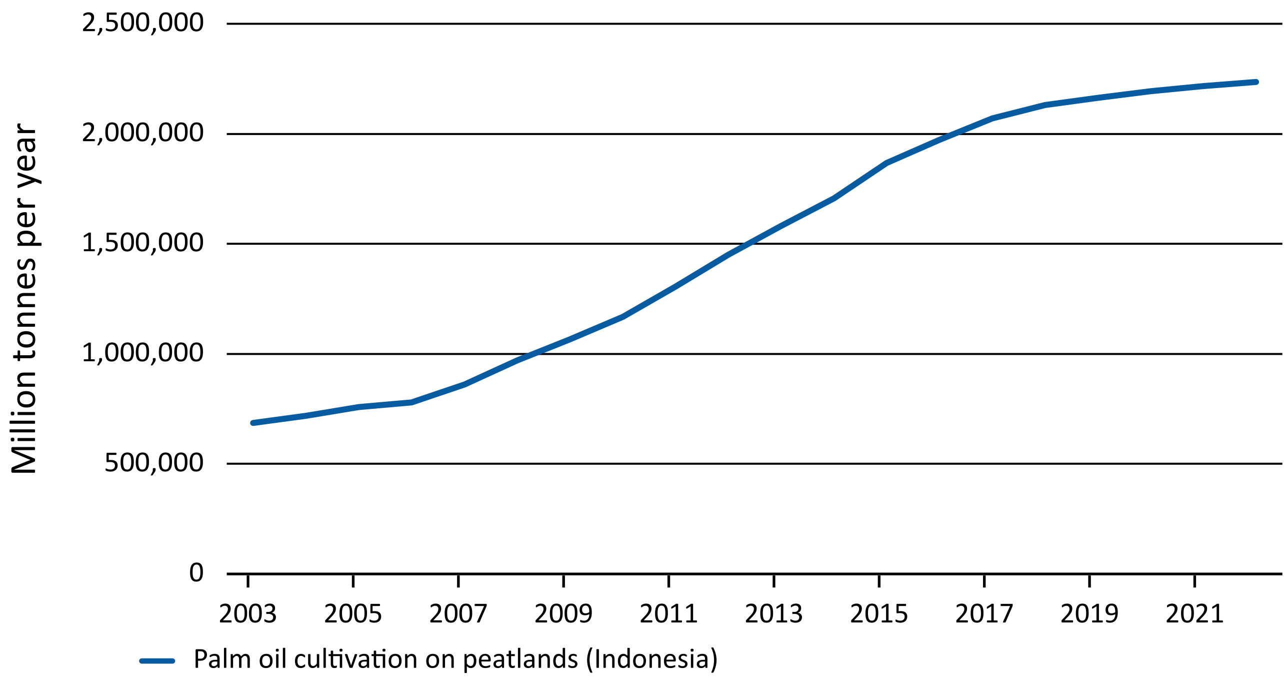

Fig. 36: Palm oil plantations on peatland in Indonesia (based on data from Trase, 2025)

laysia saw a significant decline in deforestation linked to palm oil expansion. As a result, deforestation associated with EU-bound exports also decreased, declining in Indonesia from approximately 75,000 hectares in 2018 to about 30,500 hectares in 2022 (Trase, 2025). Several factors contributed to this decline. Economically, fluctuating palm oil prices played a key role. Gaveau et al. (2022) found a positive correlation between rising palm oil prices and plantation expansion, meaning that when prices fell, expansion slowed and deforestation rates declined. A major price drop occurred between 2011 and 2019, as economic slowdowns in China and India halved palm oil prices, reducing plantation expansion and deforestation. Political regulations also played a crucial role. In 2011, Indonesia introduced a moratorium on new oil palm concessions in peatlands and primary forests, extending it until 2021 (Busch et al., 2015; Christina, 2024). At the EU level, the phase-out initiated under RED II further contributed to the decline in deforestation. Finally, international pressure prompted many of the world's largest palm oil traders and producers to adopt 'No Deforestation' policies (Meijaard et al., 2018). Today, 85% of refined palm oil exports from Indonesia are traded under formal ZDCs (Heilmayr & Benedict, 2022). Despite the overall decline in deforestation linked with Indonesian and Malaysian palm oil production, there are signs of a potential resurgence in deforestation in Indonesia. In 2022, industrial oil palm-driven deforestation rose by 18%. Additionally, 2.4 million hectares of intact rainforest are still within palm oil concessions (Benedict & Heilmayr, 2024).

While the overall loss of tropical rainforests appears to have been somewhat contained, tropical peat swamp forests are increasingly threatened by palm oil production. There has been a steady rise in the conversion of peatlands for palm oil cultivation (see Fig. 36). In 2022, 14% of palm oil plantations in Indonesia were located on peatlands (ibid.).

The impacts of palm oil cultivation on tropical peatlands are devastating, both in terms of biodiversity loss and climate change. While the majority of the world's peatlands are located in boreal and temperate zones, tropical regions account for about 21% of the global peatland area. Around 23.48 million hectares of tropical peatland are found in Indonesia and Malaysia (United Nations Environment Programme, 2022, p. 96). Tropical peat swamp forests have the highest biodiversity globally when compared with other peatland ecosystems, hosting at least 123 mammal species, 268 bird species, and 219 freshwater fish

Fig. 37: Tropical peatland fires release huge carbon stores, driving climate change. (Photo: Joey56/Shutterstock.com)

species, along with a vast number of unreported invertebrates (Rieley, 2016, p. 708). Furthermore, peatlands are home to numerous endemic species that are not found in other types of habitats. One of the most well-known species is the orangutan, with a relatively large population residing in peat swamp forests in Borneo and Aceh in Sumatra (ibid.). In Indonesia, almost 60% of peatlands are drained (United Nations Environment Programme, 2022) and converted into timber or palm oil plantations, used for other agricultural purposes, or degraded by logging, drainage, and fire. Only 4.4% of the total peatland area in Southeast Asia is within protected areas (ASEAN, 2021, p. 81).

Tropical peatland loss fuels climate change

The conversion and degradation of tropical peatlands in Indonesia have significant consequences for climate change. These peatlands store vast amounts of carbon – between 13,600 Mt and 40,500 Mt – which is estimated to be 30% more than the carbon stored in the biomass of all Indonesian forests (Warren et al., 2017, p. 7). When peatlands are drained, the carbon stored in the peat for millennia comes into contact with oxygen and oxidises, releasing large amounts of CO_2 into the atmosphere, along with nitrous oxide (N_2O), which is over 300 times more harmful to the climate than CO_2. Fires further exacerbate emissions, as they impact both the surface vegetation and the underlying peat layer, releasing much larger amounts of CO_2 than forest fires on mineral soils (ibid.). Although only 14% of oil palm plantations are located on peatlands, they account for 92% of the total greenhouse gas emissions from Indonesia's palm oil sector. These annual emissions amount to approximately 220 million tonnes of CO_{2eq}, which is roughly one-fifth of Indonesia's total emissions (Benedict & Heilmayr, 2024).

Biodiversity in palm oil plantations

The greatest threat to biodiversity comes from the expansion of palm oil plantations into biodiversity-rich rainforests and peat swamp forests. The import volume depicted in Fig. 34 resulted in a land footprint of approximately 1.5 million hectares in 2023, about three times the size of Luxembourg. Palm oil cultivation causes a sharp decline in biodiversity, especially when compared to primary tropical forests, which are among the most species-rich ecosystems on Earth. By contrast, monoculture plantations support only a fraction of that diversity. When natural forests are replaced with oil palm, the complex web of plant and animal life is reduced to a simplified system that can sustain far fewer species (Mendes-Oliveira et al., 2017). Many forest specialists disappear entirely, as the uniform structure and limited resources of plantations offer little to no suitable habitat. Moreover, oil palm plantations are associated with changed water availability due to drainage as well as downstream pollution from fertilisers and pesticides (Meijaard et al., 2018), which can negatively affect not only biodiversity but also local communities.

4.1.4 Key takeaways

The expansion of palm oil cultivation continues to be a significant driver of tropical rainforest loss in Southeast Asia, which is the most biodiverse ecosystem on the planet. In Indonesia – the leading production country – deforestation driven by palm oil exports to the EU has been on a sharply declining trend. This can be attributed to better protection through ZDCs and a significant decrease in palm oil imports to the EU, largely due to the phase-out of palm oil in energy use under RED II. While deforestation in rainforests appears to have slowed, a new concern has emerged with the increasing cultivation of palm oil plantations on peat soils. This trend not only threatens the biodiversity of the world's unique peat swamp forests but also leads to significant carbon emissions, through both the drainage and degradation of peat soils and the occurrence of peatland fires. The palm oil plantation systems themselves are also considered harmful from a biodiversity perspective, as they mainly consist of structurally poor monocultures. Tab. 5 summarizes the most relevant biodiversity impacts of palm oil cultivation for the European market.

Tab. 5: Biodiversity impacts of palm oil production

Main ecosystem affected	Impacted through	Effects on biodiversity	Quantitative data/impact ranking
Tropical rainforest	Deforestation of tropical rainforests	Loss of highly biodiverse natural ecosystems; species extinction	Annual deforestation in Indonesia linked to palm oil exports to Europe: 75,000 ha (2018) – 30,500 ha (2022) Overall rainforest loss: Malaysia: 3 million hectares (2002 – 2023) Indonesia: 3 million hectares (2001 – 2019)
Tropical peat swamp forests	Conversion and drainage of tropical peatland swamp forests	Loss of highly biodiverse natural ecosystems; species extinction	Indonesia: drainage of almost 60% of peatlands; 14% of oil palm plantations are located on peatlands
Agricultural landscapes	Cultivation of oil palm in large-scale monocultures	Extremely low agrobiodiversity through monocultures, water pollution, risk of peat fires	Almost the total quantity of palm oil is produced in highly intensified monocultures (1.5 million hectares for exports to the EU)

4.2 Mitigating the impact of palm oil production: Options for action

Palm oil has long been a focal point of environmental criticism due to its significant ecological impacts, although sustained advocacy by environmental organisations, scientific debates, and evolving political frameworks have led to the development of several pathways toward more sustainable palm oil production and consumption. These efforts are reflected in the recent positive trends in deforestation decline, as outlined in the previous section. The complex history of palm oil – and the ongoing debates about how best to mitigate its environmental consequences – offers a compelling case study, illustrating the achievements made possible through coordinated campaigns and regulatory action, as well as the limitations of biodiversity protection within the context of a mass consumption society. The following section examines these successes and setbacks in greater detail, laying the groundwork for a discus-

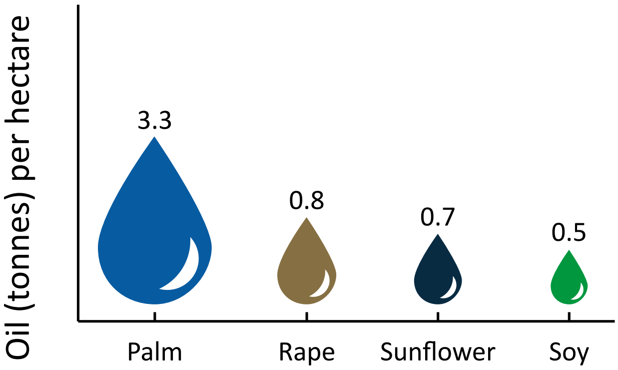

Fig. 38: Yields of oil palms compared to other crops (own graphic based on Noleppa & Cartsburg 2016)

sion of policy options that could facilitate a shift toward nature-friendly palm oil consumption.

To reduce the biodiversity impacts of palm oil, three main policy avenues emerge. First, rather than shifting to other crops, efforts should prioritise lowering overall demand, especially in processed foods and biofuels. Secondly, improving and enforcing certification standards – including through green public procurement – is key to ensuring sustainable supply chains. Third, more nuanced consumer information is needed to move beyond 'palm oil-free' labels and support informed choices. These strategies together promote systemic change over symbolic solutions, aligning markets and consumption with biodiversity goals.

4.2.1 Rethinking palm oil substitution: risks and trade-offs for biodiversity

Due to its well-documented environmental impacts and the influence of past advocacy campaigns, palm oil now carries a largely negative reputation among consumers. Public perceptions are predominantly critical, leading some companies to remove palm oil entirely from their products. In an effort to appeal to environmentally conscious consumers, certain brands have gone a step further by introducing 'palm oil-free' labels (Borrello et al., 2019; Lieke et al., 2024). Some of these labels resemble official eco-labels, potentially giving the misleading impression that palm oil-free products are inherently more sustainable (Lieke et al., 2024).

While substituting a potentially harmful ingredient with an alternative might seem like an obvious solution in the case of palm oil, the effects of this strategy can actually be detrimental to the cause, as palm oil is the most efficient oil crop in terms of oil yield per hectare. On average, palm oil yields around four tonnes per hectare, much higher than other vegetable oils, which yield under 1 tonne per hectare (Meijaard et al. 2024; see Fig. 38). For instance, in the manufacturing of detergents and certain cosmetic products, coconut oil would be the only viable substitute for palm oil. Substituting palm oil with other oils would increase pressure on agricultural land, thereby raising the risk of land use changes, negatively impacting biodiversity, and exacerbating greenhouse gas emissions (Noleppa & Cartsburg, 2016; Parsons et al., 2020). Noleppa and Cartsburg (2016, p. 9) found that replacing Germany's palm oil consumption with alternative oils would free up nearly 400,000 hectares of palm oil cultivation area globally but require approximately 1.85 million hectares of additional agricultural land for alternative oil production. In Indonesia alone, this substitution scenario would reduce the area of palm oil plantations by about 175,000 hectares, but at the same time necessitate the establishment of about 364,000 hectares of new coconut plantations. These figures indicate that substituting palm oil with other vegetable oils – particularly tropical oils such as coconut oil – results in a substantial net increase in land use. Therefore, alternative approaches need to be explored to achieve more sustainable palm oil consumption and mitigate its associated environmental impacts

4.2.2 The Renewable Energy Directive: Progress and challenges in phasing out palm oil

Apart from being an ingredient for many food products, detergents and cosmetics, palm oil is widely used as biofuel. Biofuels are considered a supposedly sustainable alternative to fossil fuels (European Commission, n.d.a; Priya et al., 2022). They are produced from food and feed crops, as well as from wastes such as used cooking oils or animal fats (Priya et al., 2022). Plant oils such as soybean or palm oil are therefore potential raw materials for the production of biofuels. These oils can be used directly as feedstock for biodiesel production, or indirectly through the use of by-products and residues from their processing in food and other industries.

The cultivation of energy crops for biofuel production not only creates competition for land with food production – 'fuelling' the food versus fuel debate – but also leads to an increased demand for oil crops such as soybeans and palm oil, putting pressure on ecosystems in the producing countries, with the associated negative impacts on biodiversity.

The EU regulates biofuel use through the Renewable Energy Directive (RED; see box on page 56), which has been revised as RED II in 2018 and RED III in 2023. These revisions introduced stricter mandates and limits to address the harmful environmental impacts, particularly those related to deforestation and biodiversity loss from palm oil diesel production. To avert deforestation caused by first-generation biofuels, the revised RED II introduced ILUC-risk fuels, aiming to reduce their use in biofuel blends. Palm oil exceeds the set criteria and is therefore currently being phased out (see Section 4.1.2.). There are concerns that phasing out palm oil will drive up demand for used cooking oil (UCO), primarily imported from Asia. The demand for UCO is already rising due to double-counting, which has led to mislabelling and fraud in recent years. Furthermore, the increased demand for UCO could lead to displacement effects in the countries of origin, where other uses may replace UCO with virgin oil, such as palm oil.

Additional concerns relate to the potential unintended consequences of replacing palm oil with other plant oils, particularly in ways that could undermine biodiversity goals. For instance, soy oil – often associated with high deforestation risks – is not currently affected by the renewable energy accounting phase-out, raising fears that substitution could simply shift environmental pressures elsewhere. This remains a contested issue within EU institutions. Although not legally binding, the European Parliament voted in 2022 to lower the threshold for classifying high-ILUC-risk (indirect land use change) biofuels, potentially opening the door for soy oil to be included in the future (Euractiv, 2023).[30] Nonetheless, the RED imposes a cap on the use of food- and feed-based biofuels (Art. 27 RED III). Under current rules, Member States can only increase the share of such fuels in the transport sector (road and rail) by a maximum of one percentage point above their 2020 levels, placing at least some constraint on further expansion.

Economic modelling of a phase-out of palm oil – and an extended phase-out including soy – indicates that both scenarios would lead to a significant increase in oilseed production within the EU, particularly rapeseed. This expansion would place additional pressure on agricultural land needed for food and feed production (Heimann et al., 2024). Rather than shifting from one commodity to another, the focus should be on fundamentally rethinking the production and consumption of oil crops, prioritising their role in feeding people over fuelling the transportation sector. Without a broader sufficiency strategy in transportation – such as promoting public and non-motorised transport in urban areas through measures like free public transit or congestion charges – technological solutions such as biofuels will continue to exert pressure on ecosystems. A true sustainability transition in the transport sector requires not only cleaner fuels but also fewer cars and less resource-intensive mobility overall.[31]

4.2.3 Unlocking the remaining potential of palm oil certification

Certification labels can help consumers make informed decisions and aim to ensure sustainable

[30] The obligation for the European Commission to review and update the ILUC criteria is set out in Article 26(2), paragraphs 4 and 5 of the RED III. This mandates periodic assessment based on the latest scientific evidence and market developments to ensure effective mitigation of indirect land use change impacts.

[31] See case study on biodiversity impacts of lithium in Kliem et al. (2019).

production (see Section 5.2.1). In the palm oil sector, certification is primarily led by the Roundtable on Sustainable Palm Oil (RSPO), founded in 2004 through a collaboration between the World Wide Fund for Nature (WWF), the Malaysian Palm Oil Association (MPOA), consumer goods company Unilever, vegetable oil producer AAK, and Swiss retailer Migros (RSPO, n.d.a). It covers 19% of global palm oil production (WWF Germany, 2022) and 93% of EU palm oil imports in 2021 (EPOA et al., 2022, p. 10). However, certification rates for related products such as palm kernel oil (62%) and palm kernel expeller (5%) in EU imports remain considerably lower (ibid., p. 8). According to RSPO figures from 2023, the certification scheme covers approximately 1.0% of the global palm oil cultivation area and 8.1% of global vegetable oil production (RSPO, 2023, p. 6).

Other players have ceased operations: the Rainforest Alliance – while continuing other forms of engagement within the industry – officially withdrew from palm oil certification in 2021. The decision was based on limited uptake of the certification scheme and the high costs required to continue operating a programme with relatively low market reach and impact (Preferred by Nature, 2021; Rainforest Alliance, 2022). The organisation's influence was relatively limited, covering an area of around 100.000 hectares by 2017 (Newsom & Milder, 2018, p. 23), which was significantly smaller than the area covered by the RSPO (3,2 million hectares of production area in 2017) (RSPO, 2018, p. 4). For the EU market, the EU Ecolabel has incorporated criteria that require the sustainable sourcing of palm oil, palm kernel oil, and their derivatives as an ingredient in cosmetic and animal care products.

Continuously improving certification standards

Key critiques of palm oil certification include weak enforcement of standards and low consumer awareness of certification labels (Greenpeace International, 2021; Ostfeld et al., 2019; Wassmann et al., 2023). As the largest palm oil certification scheme, the RSPO has faced persistent criticism from NGOs for various shortcomings. Key concerns include the inadequate enforcement of certification standards, a weak grievance mechanism, and potential conflicts of interest in the certification process. Certification bodies are paid directly by the companies they audit, raising questions about their independence and objectivity. Additionally, audits of these certification bodies are conducted on a risk-based rather than a routine basis, which may further erode the credibility of the system (Greenpeace International, 2021). Rainforest Rescue (2022) has even accused the RSPO of 'greenwashing' and functioning primarily as a marketing tool. According to the organisation, RSPO-certified palm oil production remains linked to biodiversity loss, land grabbing, and human rights violations, highlighting the gap between certification claims and on-the-ground realities.

Research on the environmental impact of the RSPO yields mixed results. Studies in Thailand indicate that certified producers and mills have a significantly lower environmental footprint compared to non-certified ones (Saswattecha et al., 2015). In Colombia, research has found that RSPO-certified producers use less synthetic fertiliser and set aside larger conservation areas (Furumo et al., 2020). However, a study in Indonesia found no clear evidence that smallholders certified under the RSPO consistently follow sustainable agricultural practices (Kunz et al., 2019).

In 2018, the RSPO standards were tightened, including a ban on establishing new plantations on peatlands (WWF Germany, 2022). Despite these reforms, criticism continued. Reports by Greenpeace International (2021) and Milieudefensie (2021) – along with an open letter signed by numerous NGOs (Rainforest Rescue, 2022) – raised concerns about ongoing environmental and social harms associated with RSPO-certified production. The RSPO undergoes a regular revision cycle every five years, which includes input from its members as well as a broad stakeholder consultation process (RSPO, n.d.a). The most recent revision process took longer than usual due to the complexity of the issues raised. According to experts consulted during this research, the process revealed significant challenges, particularly concerning the discrepancy between the formal (written) standard and its practical enforcement. Experts further expressed concerns that, in the absence of competing certification schemes, there is limited external pressure on the RSPO to raise its standards. Nonetheless, the revision processes signal the organisation's willingness to improve its procedures and address key deficiencies. The RSPO's quasi-monopolistic role in the palm oil certification landscape highlights the urgent need for ongoing improvement. As the dominant scheme in the sector, its ability to evolve and enforce credible, ambitious standards remains essential to ensuring that palm oil production contributes to sustainable agricultural practices.

Mainstreaming certified palm oil in public procurement

Given the high share of RSPO-certified palm oil in the EU, the potential for further expansion regarding palm oil is nearly exhausted. However, there is still room for improvement when it comes to palm kernel oil, which is primarily used in the production of surfactants for detergents and cleaning products. One effective approach for policymakers to increase the share of certified palm kernel oil would be to make sustainability certification a mandatory requirement in public procurement processes, such as for cleaning contracts or public canteens, as part of a broader green public procurement strategy (FONAP, 2021; see section 5.2.2). Legally, this requires allowing recognised and equivalent certification schemes to be treated equally, ensuring fair competition and avoiding the privileging of any single certification standard. Currently, however, alternatives to the RSPO certification are limited, which presents challenges in balancing sustainability ambitions with fair procurement rules and avoiding de facto monopolies in certification standards (EU Public Procurement Directive 2014/24/EU, Article 42).

4.2.4 Nuanced consumer information on sustainable palm oil consumption

As noted earlier, consumers tend to view palm oil critically, often associating it with negative environmental and health impacts and perceiving it as more harmful than alternatives such as butter, coconut oil, or canola oil. Social and health-related issues are mentioned less frequently than environmental concerns, and there are limited positive associations with palm oil (Wassmann et al., 2023). According to Lieke et al. (2024, p. 4) a majority of German consumers believe that reducing palm oil production could "[…] curb deforestation (75.7%), slow species extinction (77.2%) and counteract the effects of climate change (68.4%)".

Studies conducted in Italy and Germany suggest that consumers perceive palm oil-free labelled products as healthier, more sustainable, and eco-friendlier compared to products containing conventional or certified palm oil (Borrello et al., 2019; Lieke et al., 2024). Lieke et al. (2024) also found that more environmentally concerned consumers support the substitution of palm oil. This shows that consumers often lack knowledge about palm oil's relative advantages – particularly its high yield efficiency compared to other vegetable oils – which complicates consumers' ability to assess the complex sustainability trade-offs involved in fat and oil production (Lieke et al., 2023).

While research indicates that some information gaps remain (Lieke et al., 2023), particularly regarding its use in non-food products, the critical stance of consumers toward palm oil can initially be seen as a success example for the campaign and information efforts of environmental organisations. Unlike many other commodities, the environmental impacts of palm oil are widely recognised by the public, and consumers increasingly seek out alternatives. This growing awareness has already influenced industry practices, prompting some manufacturers to reformulate their products, underscoring the powerful role that informed consumer demand can play in driving change.

To further improve consumers' understanding of the issues at hand concerning palm oil, they should be made aware that a blanket boycott of palm oil does not necessarily result in the desired positive environmental effects. Consumers need to be informed about the comparative advantages of palm oil compared to other oil crops and the complex trade-offs involved, particularly the potential negative impacts of substituting palm oil with alternative vegetable oils, which may require more land and resources. Equally important is highlighting the efficiency advantages of palm oil – its high yield per hectare is a key reason for its continued dominance in global supply chains. The goal should be to move beyond overly simplistic narratives and provide consumers with nuanced, evidence-based information. This includes helping them understand when purchasing products containing sustainably sourced palm oil may be appropriate, and when avoidance might be justified (Lieke et al., 2023).

Good practice: WWF's Palm Oil Scorecard

A positive example for a consumer information tool is the WWF's Palm Oil Scorecard. The online tool informs consumers about the environmental impacts of palm oil cultivation and its use in various products. It also evaluates and scores brands based on their commitment to sourcing sustainable palm oil in categories such as purchasing practices, traceability, and suppliers' accountability. By rating companies across various sectors, the scorecard encourages more responsible sourcing and enables consumers to make informed, sustainable choices.

Reducing palm oil demand and promoting healthy diets

Efforts should also be made to promote awareness regarding ways to reduce palm oil consumption as part of a sufficiency strategy. This reduction would not involve substituting palm oil with other oils, but rather a shift in dietary habits. For instance, palm oil is widely used in processed foods such as ready-made meals, pizza, crisps, baked goods, and ice cream due to its affordability and functional properties as a fat and emulsifier. These types of products are often calorie-dense and tend to contain high amounts of refined fats, sugar, and salt while being low in fibre and essential nutrients. Regular consumption of such foods has been linked to obesity and an increased risk of non-communicable diseases, such as cardiovascular disease and type 2 diabetes (Pagliai et al., 2021).

A shift in dietary habits towards more freshly cooked meals would therefore not only address consumers' environmental concerns but might also yield positive health outcomes as a co-benefit. Information campaigns aiming at reducing palm oil consumption should therefore address health concerns alongside environmental issues. Additionally, they should provide practical guidance on how consumers – particularly those who often rely on ready-made meals – can prepare quick, healthy, and accessible alternatives at home. However, as previously noted, palm oil is a basic ingredient in a wide range of everyday products. This means that a complete elimination of palm oil consumption is unrealistic. Nevertheless, even a partial shift in consumer habits – toward more selective consumption and greater awareness – can contribute to reducing the biodiversity impacts associated with palm oil use.

4.2.5 Key takeaways

Palm oil presents an interesting case as it highlights both success stories and the challenges, pitfalls, and impasses of biodiversity protection policies. It serves as evidence that campaigning and education can effectively raise consumer awareness and even influence consumer choices to the extent that companies adjust their product offerings, thereby demonstrating the power of consumer demand. Furthermore, it highlights the complexities of a substitution strategy, which – in the case of palm oil – can result in even greater biodiversity losses. Additionally, using the example of the RED, it highlights the potential adverse side effects that otherwise promising policies may entail.

To ensure sustainable palm oil production and consumption in the future, efforts should be made to reduce palm oil consumption wherever possible. The RED represents an important step in this regard within the biofuels sector. At the same time, the effects of phasing out palm oil as a biofuel show that product-specific measures often lead to a shift from one raw material to another, highlighting the need for systemic transformation – as is the case with biofuels – in the transportation sector. In the context of food, efforts should focus on reducing the consumption of ready-made and highly processed foods, which often contain palm oil. This approach not only contributes to sustainability but also offers significant health benefits, which can be effectively addressed in awareness campaigns. For the remaining unavoidable demand for palm oil, it is crucial to maintain the EU's already high share of certified palm oil. Additionally, efforts should be made to further increase the share of certified palm kernel oil. The EU Green Public Procurement Guidelines can play a key role in this process by providing stronger incentives through the measures proposed in Section 5.2.2. Finally, as the only globally recognised certification body for sustainable palm oil, the RSPO bears the responsibility to continuously improve its certification standards, particularly regarding peatlands, which are currently under significant threat. It should ensure strict enforcement and compliance, thereby enhancing transparency and trust in the certification system. At the same time, policymakers and NGOs need to constantly push for regular evaluation and improvement of the RSPO standard.

Tab. 6: Policy recommendations for nature-friendly palm oil consumption

Policy recommendations		
Reduce demand for oil crops to avoid pressure on other ecosystems through shift effects • Prioritise palm oil and other oil crops for food rather than animal feed or other uses. • Promote a mobility shift towards a reduction of motorised individual transport	Ensure sustainable production of palm oil through certification • Continuously further develop the RSPO by improving certification standards, strengthening enforcement and compliance mechanisms, and enhancing transparency. • Make sustainability certification a mandatory requirement in public procurement processes	Reduce consumer demand for palm oil where possible and avoid well-intentioned but counterproductive substitution • Encourage consumers to limit their consumption of highly processed foods • Educate consumers about the adverse effects of purchasing products made with palm oil substitutes

Fig. 39: Eating healthily within planetary boundaries requires more environmentally friendly production practices, major cuts in meat and animal product consumption, and halving food loss and waste. (Photo: Bigc Studio/Shutterstock.com)

5 Conclusion and recommendations

Global consumption and production patterns are major drivers of biodiversity loss worldwide (IPBES, 2019; WWF, 2024). Food systems in particular are responsible for 80% of deforestation, 70% of terrestrial biodiversity loss, and 50% of biodiversity decline in freshwater ecosystems (Crippa et al., 2021; WWF, 2020), while they also account for roughly one-third of global greenhouse gas emissions (WWF, 2020, p. 94). High-consumption regions such as the EU play a disproportionately large role in these impacts, with current consumption levels exceeding planetary boundary limits by 40-70% (Meysner & Gore, 2022). To explore how consumption patterns can be transformed to protect biodiversity worldwide, this study has pursued three objectives: (a) assess the biodiversity impacts associated with the EU consumption of shrimp, soy, and palm oil; (b) identify key differences and similarities between the three cases; and (c) sketch out measures that can promote more nature-friendly consumption patterns. This concluding section synthesises the findings from the three case studies to draw broader lessons. It begins by identifying cross-cutting patterns and divergences (Section 5.1) and then sets out actionable policy recommendations at the EU level (Section 5.2).

5.1 Lessons learned and general observations

The analysis of the EU's consumption-driven biodiversity impacts yields several overarching insights that underscore the need for a fundamental shift in how the environmental consequences of food consumption are understood and addressed. Across all cases, it becomes clear that incremental reforms, while necessary, are often insufficient. Instead, meaningful change requires moving beyond conventional approaches, beyond parallel crises narratives, narrow protection lenses, green colonialism, technical fixes, and generic messaging. The following sections unpack these five lessons in turn.

5.1.1 Beyond parallel crises narratives: Integrating biodiversity and climate policy

A first key insight of the study – building on the findings of the initial report in this series (Kliem et al., 2019) – is that the twin crises of biodiversity loss and climate change are not merely parallel but also profoundly interconnected. Across all three case studies, we observe how land use change simultaneously undermines ecosystems and accelerates greenhouse gas emissions. The ongoing expansion of shrimp farming in countries such as Indonesia and Malaysia results in widespread mangrove destruction, eliminating highly efficient carbon sinks and releasing centuries of stored carbon. A similar trend is observed in soy production, where deforestation in Brazil threatens biodiversity and climate stability by releasing vast amounts of carbon from vegetation and soil. Palm oil plantations follow the same pattern, often replacing tropical peatlands, as millennia-old carbon reservoirs. Draining these lands releases massive CO_2 and nitrous oxide emissions, with fires used for clearing further accelerating climate pollution. The destruction of carbon-rich ecosystems should therefore not only be tackled as a leading cause of biodiversity loss but also as a major driver of greenhouse gas emissions. Yet these twin crises also suggest an opportunity: protecting or restoring these ecosystems can support both biodiversity and climate goals by reinforcing natural carbon sinks. Put simply, climate policy needs biodiversity protection, and vice versa.

5.1.2 Beyond narrow protection lenses: Tackling displacement across ecosystems and commodities

A second key insight is that policy frameworks that focus narrowly on either ecosystems – such as rainforests or mangroves – or products – such as palm oil or shrimp – often fail to account for displacement dynamics. While such measures might succeed in reducing environmental harm in targeted areas or concerning specific products, they risk shifting pressures elsewhere.

The problems of an ecosystem-centric lens are illustrated in the case of soy. Early concern focused on deforestation in the Amazon, leading to initiatives such as the Amazon Soy Moratorium and, more recently, the EUDR. However, policies targeting a single ecosystem – such as the EUDR's narrow forest focus – risk driving land use leakage. As this study has shown, the Cerrado – rather than the Amazon – is now the primary frontier for soy expansion. A similar displacement dynamic is evident in shrimp aquaculture. Initial concern focused on the clearing of mangroves, prompting stricter conservation efforts that helped slow deforestation. Today, one of the key ecological consequences of shrimp farming is not deforestation, but pollution and salinisation of coastal water bodies, along with the degradation of surrounding aquatic ecosystems. These impacts are more diffuse and more complicated to regulate yet no less damaging to biodiversity. Similarly, in the case of palm oil, increasing restrictions on deforestation have encouraged plantation expansion into peatlands and secondary forests, which are highly biodiverse yet often not explicitly covered by regulatory frameworks. Thus, while the visible clearing of primary rainforest might decline, equally harmful forms of ecological degradation continue.

In tandem, these case studies thus illustrate the broader lesson that ecosystem-specific protection approaches – while important – are insufficient when used in isolation. They tend to miss the broader systemic dynamics through which environmental pressures shift across ecosystems and jurisdictions. In contrast, product-specific assessments – such as those undertaken in this study – offer a more granular lens. By tracing the material flows and production logics of individual commodities, they help reveal such patterns of leakage, substitution, and displacement. At the same time, a strictly product-specific lens also has its limitations as it can obscure substitution effects that occur across commodities within the same consumption domain. The case of palm oil illustrates this: successful campaigns against its environmental impacts have led consumers to favour alternatives, such as coconut oil. But these alternatives are less land-efficient, shifting environmental pressure to other producing regions. A similar pattern may emerge under the revised Renewable Energy Directive (RED). The phase-out of palm oil-based biofuels – due to their deforestation risk – could increase reliance on other oil crops such as rapeseed or soybeans. This substitution risks generating new pressures, especially in temperate regions, underscoring how displacement can also occur within a single sector.

Hence, to fully grasp the systemic nature of these dynamics, conservation and sustainability policy should adopt a more integrative framework that combines ecosystem-specific and product-specific perspectives with a broader understanding of consumption fields such as food, mobility, or energy. Only by examining how demand for certain functions – such as protein intake or fuel use – drives commodity production can we anticipate and mitigate unintended consequences. Put simply, a truly effective conservation strategy needs to extend beyond protecting individual ecosystems and tracking individual commodities by addressing the underlying societal drivers of commodity expansion. Only then can we move from managing symptoms to transforming systems.

5.1.3 Beyond green colonialism: Subverting power dynamics in global trade systems

A third cross-cutting insight concerns the externalisation of harm and power asymmetries that structure global trade systems. Through the trade of agricultural commodities, environmental pressures are systematically displaced from consumer markets in the Global North to biodiversity-rich producer regions in the Global South. The case of soy exemplifies this dynamic. European livestock systems strongly rely on soy-based feed from Brazil, Paraguay, and Argentina, driving land use change and biodiversity loss, especially in the Cerrado. EU trade policies – such as tariff exemptions for feed imports – reinforce this pattern by encouraging large-scale imports of cheap soybeans (Muller & Bautze, 2017). The proposed EU-Mercosur agreement could further intensify these pressures by lowering trade barriers without adequate environmental safeguards. Crucially, this externalisation extends beyond environmental degradation, as it also affects local communities. Shrimp aquaculture in Latin America and Asia – promoted as a sustainable development tool since the 1980s (Agarwal et al., 2019; FAO, 2022) – has driven mangrove loss, pollution, and declining fisheries, undermining coastal livelihoods. When environmental harm coincides with the erosion of livelihoods and local autonomy, it reflects a broader pattern of extractivism that prioritises global supply chain efficiency over community sustainability and rights.

While much of the debate in recent years has focused on this ‘telecoupled’ (J. Liu et al., 2019)

Fig. 40: Forests are vital to the livelihoods of smallholders. (Photo: Miguel Pinheiro/CIFOR)

externalisation of harms, this study has also revealed a second, less examined dynamic: that even governance mechanisms intended to mitigate these harms can reinforce North–South power imbalances, particularly if they are not designed in a participatory, inclusive way. Certification schemes illustrate this paradox: while these mechanisms are often – at least formally – developed and governed jointly by actors in the Global North and Global South, they have an inbuilt power hierarchy due to market dynamics. Smallholder producers must invest heavily to obtain certification, while consumers in the North can opt out at any time (Hatanaka, 2010). Additionally, many smallholders lack both an understanding of certification requirements and the capacity to implement ecosystem protection measures (Davis & Boyd, 2021; Virat, 2019).

Legislation such as the EUDR poses similar challenges. On the surface, the regulation represents a significant step toward curbing the import of commodities linked to deforestation, such as soy, palm oil, and cocoa. However, as Aty-Biyo has argued succinctly (2024), the regulation focuses almost exclusively on environmental compliance – particularly the protection of forest areas as defined by the FAO – while largely neglecting the social dimensions of sustainability. The problem: smallholders in the Global South often lack the resources to meet due diligence requirements, leading to added costs and exclusion from markets. Moreover, the regulation fails to meaningfully address the rights of local and Indigenous communities, who often depend on forested areas for their livelihoods (ibid.), thereby reinforcing the very inequalities that sustainability policies aim to address.

These dynamics suggest that even well-intentioned sustainability efforts can reinforce global imbalances. As critics warn, European environmental policies risk becoming 'green colonialism' (Bassey et al., 2023; Reyes, 2024), perpetuating inequality under the guise of progress. To prevent this, cooperation needs to move toward more horizontal forms, with standards co-developed with producer countries. In this broader sense, biodiversity protection should address who sets the rules and who bears the costs (Vela Almeida et al., 2023), ensuring sustainability does not come at the expense of those least responsible for harm.

5.1.4 Beyond technical fixes: Centering sufficiency in sustainability transitions

A fourth cross-cutting insight is that the traditional sustainability strategies of efficiency, consistency, and substitution each face evident limitations in addressing the structural drivers of biodiversity loss driven by European food systems. These limitations underscore the need to take sufficiency more seriously as a sustainability strategy, focusing not only on how food is produced but also on how much is consumed and why.

The limitations of efficiency strategies have become most visible in the case of shrimp aquaculture, where intensifying production through improved feed and farming systems often increases ecological and health risks while sidelining small-scale, ecologically integrated practices. Similarly, in soy production, yield improvements and feed conversion gains often reinforce input-intensive monocultures, rather than addressing the underlying driver, namely the expansion of industrial animal agriculture.

Consistency strategies face parallel constraints. In soy cultivation, the integration of agroecological practices and the limitation of expansion to degraded lands remain rare due to economic incentives for monocultures and weak policy support. In palm oil, mixed agroforestry promises ecological benefits but suffers from lower short-term yields and limited certification systems. In shrimp farming, silvofisheries offer a more sustainable model but lack profitability and institutional backing. Across all cases, consistency strategies clash with the short-term logic of capitalist markets.

Finally, the limitations of substitution strategies were most visible in the case of palm oil. Palm oil, the most land-efficient vegetable oil, yields nearly four tonnes per hectare, considerably surpassing alternatives (Meijaard et al., 2024). A similar dynamic is visible in the case of soy, where feed alternatives – such as insect protein or microalgae – show promise but cannot yet match soy's protein density, scalability, and price point (Sogari et al., 2023). In both cases, substitution can shift or maybe even delay the problem, although it does little to reduce overall pressure on ecosystems.

Against this backdrop, reducing overall consumption emerges as the most effective way to protect biodiversity and relieve pressure on ecosystems. Nutritionally, there are no barriers to reducing consumption of shrimp, soy, and palm oil. While shrimp have health benefits (Mishyna & Glumac, 2021), all of these can be obtained from plant-based alternatives. In the case of soy, shifting away from meat not only reduces environmental impacts but also lowers the risk of cardiovascular disease, type 2 diabetes, and certain cancers. As for palm oil, a sufficiency-oriented approach would involve reducing the consumption of processed foods, which are strongly linked to obesity and metabolic disorders.

Equally important is reducing food waste, which represents one of the clearest 'no-regret' options for advancing sufficiency. It avoids unnecessary production, conserves natural resources, and can generate both economic and environmental co-benefits. From a sufficiency perspective, targeting food waste is thus an essential complement to reducing overconsumption.

Taken together, from both a public health and biodiversity perspective, sufficiency-oriented lifestyles need be taken seriously and actively supported by policymakers. There are, however, certain limits to sufficiency-based strategies that should be considered. First, such strategies

Fig. 41: Emotionally powerful visuals and testimonials can make biodiversity loss tangible for environmentally conscious consumers. (Photo: Alfredo Maiquez/Shutterstock.com)

need to recognise the cultural value of food and avoid imposing new dietary patterns. Instead, they should offer appealing alternatives that respect cultural preferences, making a dietary shift an attractive choice. Moreover, sufficiency strategies ought to be implemented with global justice in mind. Reducing overconsumption in the Global North is crucial, albeit not at the expense of smallholder livelihoods in the Global South. Many small-scale producers already face barriers to market access, especially with tightening sustainability regulations. Without addressing these disparities, sufficiency at a macro scale risks worsening economic vulnerabilities rather than enabling transformation.

5.1.5 Beyond generic messaging: Targeting consumer motivations for biodiversity-friendly consumption

The fifth and final insight is that information campaigns remain essential, given persistently low consumer awareness in the EU. Campaigns can correct misconceptions and encourage behavioural change, albeit only under specific conditions. Most importantly, they need to be tailored to specific consumer groups. Designing effective campaigns requires careful attention to the attitudes, values, and behavioural tendencies of distinct consumer segments. Moreover, how the message is conveyed matters. Altruistic messages are generally perceived as more informative than egoistic appeals (Phua et al., 2020). Additionally, positively framed messages tend to be more effective than negative ones, and those delivered by trusted, prosocial messengers are especially impactful. Research further indicates that effectiveness varies by gender (Dowsett et al., 2018) and is influenced by cultural factors (Zickfeld et al., 2018), underscoring the importance of socio-demographic sensitivity.

In the case of shrimp, emotionally resonant visuals and testimonials can engage environmentally conscious consumers by making mangrove loss more tangible. Animal welfare advocates may respond to messages highlighting threats to food webs, as well as concerns for the welfare of charismatic species like migratory birds, and for the welfare of fish and shrimp as sentient beings. Health-conscious consumers can be reached through messaging on plant-based alternatives and food safety risks. Promoting local options such as mussels can appeal to those who value culinary tradition, regional identity, and quality. Similarly, soy-focused messaging that encourages reduced meat consumption can be tailored to distinct consumer groups. Health-conscious individuals may respond to appeals to naturalness and expert endorsements, while holistically minded consumers are more receptive to arguments about animal welfare, deforestation, and global inequality. For indulgence-oriented consumers, campaigns that emphasise taste, texture, and culinary enjoyment – through chef-driven promotions and umami-rich recipes – can help normalise plant-based choices.

The case of palm oil presents a noteworthy outlier. Here, consumer awareness is already relatively high, due to decades of advocacy campaigns linking palm oil to deforestation and species loss (Wassmann et al., 2023). This demonstrates that sustained campaigning can indeed influence consumer perceptions and even prompt companies to reformulate their products. However, it also demonstrates the complexity of blanket product boycotts. Given that palm oil is the world's most land-efficient oil crop, replacing it with alternatives may lead to even greater land use pressures. Rather than simply raising awareness, campaigns should now focus on differentiating between unavoidable and avoidable uses, emphasising where palm oil consumption is most harmful and where it might be more sustainable.

A further complexity arises from the interaction of different motivational framings. Across all three case studies, the evidence suggests that health-related arguments are often more effective than environmental messaging (Kwasny et al., 2022). However, biodiversity messaging should not be subsumed under health appeals alone. Instead, dual-framing approaches – combining health and environmental arguments – have been shown to be more persuasive than single-issue messaging.

Taken together, these findings suggest that for awareness campaigns to be truly effective, they must extend beyond generic sustainability messaging by targeting specific consumer motivations, addressing the complexities inherent in global value chains, and engaging in dual-framing. When these conditions are met, informational campaigns can play a meaningful role in supporting the shift toward more biodiversity-friendly consumption.

5.2 Actionable policy measures for nature-friendly consumption

This chapter translates general observations into actionable policy recommendations for nature-friendly consumption patterns. It presents a spectrum of policy instruments from voluntary and informational approaches to market-based, fiscal, regulatory, and trade instruments. Moving from softer to more binding interventions, it offers a comprehensive and pragmatic toolbox for strengthening biodiversity-focused consumption policy at the EU level.

5.2.1 Voluntary and informational instruments: Improving the information base on which consumers make their purchasing decisions

Voluntary and informational instruments form a key pillar of biodiversity-focused consumption policy. While not legally binding, they help shape norms and build legitimacy for more ambitious interventions. Eco-labels – voluntary standards that verify whether products meet specific environmental or social criteria – are central in this regard as they offer consumers a trusted signal of sustainability (De Melo et al., 2024), as well as an opportunity to influence production practices at the point of sale (Mol & Oosterveer, 2015). Producers gain access to price premiums and new markets (Cooper et al., 2007). As market-based governance tools, eco-labels complement – or, where public oversight is weak – even substitute for state-led enforcement (Bush, 2018). However, the proliferation of inconsistent or opaque labels often undermines trust, while poor communication limits their behavioural impact. To address these shortcomings, we recommend the following measures:

Aim: Build trust in eco-labels and certification schemes

- Resume negotiations to implement and enforce the Green Claims Directive
- Reopen development of an EU Ecolabel for food and feed products

Resume negotiations to implement and enforce the Green Claims Directive: A first key step to strengthen the credibility of eco-labels is the adoption and strict enforcement of the proposed Green Claims Directive (GCD).[32] Introduced in 2023, the proposed directive aims to combat greenwashing by requiring that environmental claims be scientifically substantiated, verifiable, and transparent. The commission proposal of the directive mandates a standardised method for assessing environmental performance, stricter rules for aggregating sustainability scores, and clear guidelines for consumer communication. For instance, Article 5 requires that supporting information be accessible via packaging, websites, or QR codes, making it easier for consumers to evaluate the credibility of such claims. Negotiations on the directive were suspended in June 2025 (see chap-

[32] See Footnote 13, p. 32.

ter 1.2). Nevertheless, the directive is urgently needed, as its robust implementation could serve as a cornerstone for restoring consumer trust and raising the standard of voluntary environmental communication.

Combatting market fragmentation through an EU ecolabel for food and feed: While the GCD marks a crucial step toward improving transparency, important limitations remain. By relying on the regulation of private certification schemes, it risks reinforcing corporate-driven sustainability governance with limited democratic accountability. Moreover, the GCD does not provide the structural coordination or public oversight needed to steer systemic change in production and consumption. Critically, it also fails to address the fragmentation caused by a proliferation of eco-labels with varying standards and ambitions. A promising solution is the creation of a dedicated EU Ecolabel for food. While the EU Ecolabel currently certifies a wide range of products, food is explicitly excluded. The idea of expanding the EU ecolabel accordingly has been under discussion for over a decade. A 2011 feasibility study led the Commission to pause development, citing consumer confusion with the existing organic label, the legal protection of terms like 'eco' and 'bio,' and the complexity of creating comprehensive environmental criteria across diverse food categories (Sengstschmid et al., 2011). However, this idea was never ruled out entirely; for instance, the EU Ecolabelling Board recommended revisiting the idea once more research and policy development had occurred (EU Ecolabelling Board, 2011).

Since then, both the scientific tools for evaluating biodiversity footprints and the EU's regulatory capacity have considerably advanced. New assessment initiatives aim to refine traditional Life Cycle Assessment[33] (LCA) methods by incorporating biodiversity-specific indicators to address prior knowledge gaps (Institute for European & Environmental Policy (IEEP), 2021). However, no scientific consensus has yet emerged on how best to integrate biodiversity considerations into LCA frameworks. By contrast, alternative methods such as biodiversity footprinting include qualitative dimensions and can capture impacts for which indicators or data remain unavailable within current LCA approaches. For instance, the Product Biodiversity Footprint (PBF) combines quantitative and semi-quantitative indicators and covers all five direct drivers of biodiversity loss[34] (Asselin et al., 2020). Similarly, the Global Biodiversity Score (GBS) proposes a hybrid method grounded in life cycle thinking but extends beyond LCA by adopting the Mean Species Abundance (MSA) metric to capture impacts on ecosystem functionality and global species loss (Damiani et al., 2023). On the governance side, institutional experience has also evolved. The EU Organic Label – in place since 2010 – provides a precedent for certifying sustainable food production. Building on this, a public EU ecolabel for food could counter fragmented private labels with one harmonised benchmark, reducing consumer confusion, simplifying compliance, and raising standards. However, unlike the Organic Label, it should also recognise high-performing systems beyond organic certification such as regenerative farming (Sher et al., 2024) and be directly informed by the latest science on biodiversity footprint assessment (Iraldo et al., 2020; Tiboni-Oschilewski et al., 2024).

The GCD and an EU Ecolabel for food are best seen as complementary. While the former weeds out misleading claims, the latter sets a positive benchmark for what credible sustainability should look like. Nonetheless, even the most robust certification schemes will fail to drive change if consumers do not understand or recognise them. To ensure these initiatives are effective, they should be supported by targeted awareness campaigns, as argued in Section 5.1.5. While policymakers should lead, successful outreach requires collaboration with actors who meet consumers 'where

[33] Life cycle assessment (LCA) is a scientific method used to evaluate the environmental impacts of a product, process, or service throughout its entire life cycle from raw material extraction to disposal.

[34] As discussed in the introduction, these drivers are (1) land- and sea-use change, (2) overexploitation of organisms, (3) climate change, (4) pollution, and (5) invasive alien species (IPBES, 2019).

they are.' In retail, recipe cards, QR codes on products, and promotional materials can help encourage more sustainable choices (Gravely & Fraser, 2018). Social media also plays a powerful role in influencing perceptions, especially among younger users (Pilař et al., 2021). Schools are also crucial, as early education fosters long-term dietary changes and sustainability awareness (McInnes et al., 2023), particularly given the growing trend of vegetarian and vegan diets among younger generations (Ajena et al., 2021; Van Den Berg et al., 2022).

5.2.2 Market-based instruments: Unlocking the potential of green public procurement

Market-based instruments play a pivotal role in shaping the incentives that govern production and consumption. Rather than mandating specific behaviours, they influence market dynamics by altering cost-benefit structures and rewarding more sustainable practices. Among these tools, public procurement stands out as a powerful yet underutilised lever. Public authorities spend approximately 14% of EU GDP – or €2 trillion – per year, making it one of the largest market forces in the EU (European Commission, 2019b). In the food sector, procurement plays a central role across educational, healthcare, and administrative institutions (Neto & Gama Caldas, 2018). Although data is scarce, estimates suggest that over half of all meals served by catering companies are provided in public institutions, representing a turnover of €24.6 billion. By directing this purchasing power toward biodiversity-friendly products, governments could shift market norms. Nonetheless, EU-level efforts to strengthen green public procurement (GPP) face significant hurdles. Governance remains fragmented, with rules varying across Member States, regions, and institutions (Neto & Gama Caldas, 2018). Only a few countries have adopted national GPP policies, and environmental criteria are rarely included in public tenders (Mélon, 2020). Moreover, most public buyers still prioritise the lowest price, despite Directive 2014/24/EU permitting a broader range of evaluation criteria (European Court of Auditors, 2023).

Fig. 42: Public procurement can align with the Planetary Health Diet to promote biodiversity-friendly nutrition. (Photo: Ekaterina Naumova/iStock)

The European Commission has taken several steps to promote GPP in the food sector, including the publication of the practical Buying Green Handbook, the launch of the European Innovation Procurement Award, and the establishment of minimum criteria for sustainable food procurement as one of the 27 flagship measures of the Farm to Fork Strategy. Most significantly, it has developed voluntary GPP Criteria, including a dedicated section on food and catering services, which public authorities can directly integrate into their tendering processes (European Commission, 2019a). These criteria include concrete recommendations; for instance, sourcing certified vegetable oils or preferring aquaculture products that are certified (ibid.). Despite this progress, the uptake of these criteria remains unclear. To date, no comprehensive study has assessed how widely they are used. Given their voluntary nature, adoption appears limited, and public buyers often worry that prioritising greener tenders over the lowest-price offers could be challenged as discriminatory or even illegal (Mélon, 2020). To overcome these barriers, we recommend taking the following measures:

Aim: Unlock the potential of green public procurement

- Increase transparency and benchmarking
- Harmonise tools and capacities
- Make GPP criteria mandatory
- Lead by example at the EU level

Increase transparency and benchmarking: The EU already tracks key indicators of public procurement, although it does not currently include any metric to monitor the uptake of GPP criteria. Adding such an indicator – e.g., the share of public tenders incorporating biodiversity- or sustainability-related criteria – would enable benchmarking across Member States, foster transparency, and create soft incentives through reputational pressure. Importantly, such a step would remain voluntary, avoiding pushback while increasing visibility and accountability.

Harmonise tools and capacities: EU Member States have developed a wide array of GPP tools, ranging from lifecycle costing calculators to environmental footprint databases; yet, this knowledge remains fragmented and unevenly distributed (OECD, 2024). The European Commission should facilitate capacity sharing through common toolkits, multi-language resources, and cross-border learning workshops (Mélon, 2020). A harmonised EU-level GPP platform – building on existing initiatives – could drastically reduce administrative burdens and support public buyers across Europe, particularly at the local level.

Make GPP criteria mandatory: To move beyond voluntary uptake, the EU could introduce minimum binding targets for sustainable public procurement in the food sector. These targets could be phased in over time, ensuring feasibility while setting clear expectations. This could be achieved by amending Directive 2014/24/EU, allowing Member States to define context-sensitive implementation pathways, while requiring measurable outcomes (ibid.). For instance, procurement could be aligned with the Planetary Health Diet to encourage biodiversity-friendly nutrition (EAT-Lancet Commission, 2019; The European Environment and Sustainable Development Advisory Councils Network (EEAC), 2022). Contrary to common assumptions, certified products are not always more expensive – certified palm oil, for instance, differs only minimally in price (Eppler et al., 2023) – and savings from increased plant-based offerings could offset additional costs.

Lead by example at the EU level: EU institutions themselves should adopt mandatory GPP criteria for their own procurement, demonstrating leadership and sending a clear political signal. Additionally, the use of GPP could be made a requirement for accessing EU funding; for example, for municipalities applying for EU grants in the education or healthcare sector. This would create strong incentives for local authorities to prioritise sustainability in their purchasing decisions.

5.2.3 Fiscal instruments: Internalising the ecological costs of consumption

Fiscal instruments – such as taxes or subsidies – are powerful tools for reshaping market behaviour and addressing the ecological costs of consumption. Unlike informational or voluntary measures, they directly influence consumer and producer decisions by altering the relative prices of sustainable and unsustainable products. Accordingly, they can correct market failures, internalise environmental externalities, and make biodiversity-friendly choices more economically attractive. Nonetheless, in the EU, such instruments remain underused in the context of food systems, despite growing evidence of their effectiveness. Against this backdrop, we recommend the following measures:

Aim: Internalise the ecological costs of consumption

- Reform VAT to encourage plant-forward diets
- Reinvest revenues to support producers and ecosystems
- Complement fiscal policies with information and awareness campaigns

Fig. 43: A systemic approach requires embedding the EUDR in a broader policy framework tackling the full range of deforestation drivers. (Photo: Rudy and Peter Skitterians/Pixabay)

Reform VAT to encourage plant-forward diets: As shown in Section 3.2.2, most EU Member States currently apply reduced VAT rates to animal products, creating price incentives. Reversing this trend by removing VAT reductions for meat and animal products – while lowering VAT on plant-based foods to 0% – could send strong market signals in favour of biodiversity-friendly diets. Modelling studies suggest that such reforms can reduce environmental pressures while generating public revenue and improving public health. To ensure fairness, such changes should be accompanied by targeted support for low-income households and small-scale farmers; for example, through direct transfers, food vouchers, or subsidies for sustainable practices.

Reinvest revenues to support producers and ecosystems: In line with the considerations developed in Section 5.1.3, revenues from fiscal measures should not only compensate consumers but also support producers in transitioning to more sustainable production systems. Funds could be earmarked to help farmers adopt biodiversity-friendly farming practices, improve animal welfare, implement regenerative practices, or diversify away from intensive livestock farming. Additionally, a share of the revenue could be allocated to restore ecosystems affected by commodity production or to support climate and biodiversity efforts in third countries linked to EU consumption patterns.

Complement fiscal policies with information and awareness campaigns: Public acceptance is critical for the success of any tax reform. Past failures – such as Denmark's short-lived fat tax – underscore the importance of transparent communication and stakeholder engagement. Fiscal instruments should therefore be accompanied by educational initiatives that explain their purpose and benefits. Consumer uptake will also depend on the availability and desirability of affordable, plant-based alternatives. Policymakers need to collaborate with industry and civil society to ensure that dietary shifts are supported by market access, culinary expertise, and cultural relevance.

5.2.4 Regulatory instruments: Strengthening and ambitiously implementing the EU Deforestation Regulation for greater impact

Regulatory instruments form a core pillar of biodiversity-related consumption policy. Unlike voluntary or market-based approaches, they impose binding obligations that directly restrict harmful practices or mandate sustainability standards. When well-designed and enforced, tools such as due diligence laws or import restrictions can drive structural shifts in supply chains and set clear limits on environmental destruction. The EUDR – adopted in 2023 and entering into application in 2025 – illustrates this potential. Although its primary objective is to curb the EU's contribution to global deforestation (see also Section 1.2), its relevance to biodiversity protection is immediate, as deforestation and forest degradation are among the leading drivers of terrestrial biodiversity loss (IPBES, 2019). Forests host more than 80% of all animal, plant, and insect species, as their clearance for commodity production not only reduces carbon sinks but also results in the irreversible loss of biodiversity (FAO & UNEP, 2020).

By tying market access to strict environmental criteria and requiring full traceability down to plot-level geolocation, the EUDR marks a landmark shift in how the EU governs sustainability in global supply chains. Unlike previous rules focused on legality, it bans products linked to deforestation or forest degradation, even when such practices are legal under national law. Combined with the EU's global market influence, these provisions are expected to alter production patterns and influence sustainability practices worldwide. The European Commission projects that the EUDR could prevent 29% of deforestation linked to EU consumption by 2030, saving over 71,000 hectares of forest annually and avoiding nearly 32 million metric tonnes of carbon emissions (European Commission, 2021, p. 51). Whether or not these gains are realised depends on how ambitiously the regulation is implemented. Without sustained political commitment and targeted improvements, the regulation risks falling short (see Pentzien & Fülling, 2025, for a more detailed discussion). To ensure just and effective implementation, we recommend the following actions:

Aim: Strengthen and ambitiously implement the EUDR

- Build enforcement capacity
- Ensure inclusive and fair implementation
- Strengthen the EUDR for greater impact
- Embed the EUDR in a broader policy architecture

Build enforcement capacity: The effectiveness of the EUDR will ultimately hinge on whether it is enforced with sufficient rigour across Member States. Although the regulation introduces robust legal obligations, experience with its predecessor – the EU Timber Regulation (EUTR) – demonstrates that ambitious rules alone are not enough. By 2019, most national authorities still operated with fewer than twenty staff members, and at least ten lacked a dedicated enforcement budget. This resulted in minimal oversight and significant variation in enforcement between countries (ClientEarth, 2021). To avoid repeating these shortcomings, Member States should invest in adequate staff, training, and resources to conduct risk-based inspections, assess due diligence statements, and, where necessary, perform on-the-ground checks. Cross-agency and cross-border coordination is equally vital, as improved collaboration between customs, environmental, and enforcement bodies as well as harmonised implementation across Member States can help close regulatory gaps.

Ensure inclusive and fair implementation: For the EUDR to be both effective and legitimate, it needs to address not only environmental goals but also the distributional impacts of its implementation. Although the regulation imposes legal obligations on EU-based operators, it indirectly places demands on stakeholders in producing countries – especially smallholders – who must supply precise geolocation data and evidence that their production is deforestation-free. These actors, while not formally regulated, face real costs and risks. In the long term, participation in traceability systems may improve smallholders' bargaining power and access to high-value markets (European Commission Directorate General for Environment, 2023). However, in the short term, the burden of compliance might exclude those with limited financial and technical resources, and could even exacerbate land conflicts (Zhunusova et al., 2022) or divert trade toward less regulated markets (Brandt et al., 2024). To mitigate these risks, the EU should complement strict compliance obligations with a partnership-based approach that supports equitable transitions in producer countries (Verhaeghe & Ramcilovic-Suominen, 2024). Article 30 of the EUDR mandates a cooperation framework with producer countries, particularly those classified as high-risk. This needs to be operationalised through long-term funding, including continued support for initiatives like the Team Europe Initiative on Deforestation-Free Value Chains. Targeted technical and financial assistance for smallholders is essential, particularly for digital traceability tools, local training, and inclusive implementation processes. Finally, the 2028 impact assessment should include disaggregated indicators on smallholder outcomes to inform future regulatory adjustments.

Strengthen the EUDR for greater impact: To maximise its impact, policymakers should address gaps in the EUDR's current scope. As it stands, the regulation focuses on forests, neglecting other ecologically vital systems such as other wooded land, peatlands, wetlands, savannahs, and grasslands. Excluding them creates leakage risks, as land use pressures may simply shift to non-forest areas, thereby undermining overall ecological protection. Similarly, the regulation currently covers seven commodities, excluding others – such as maize and shrimp – that contribute significantly to deforestation and forest degradation. Moreover, the current country benchmarking system relies heavily on forest loss data and EU sanctions, while under-emphasising governance factors such as illegality, corruption, and weak enforcement (Canby & Walkins, 2025). This risks misclassifying high-risk countries as low or standard risk. Fortunately, the EUDR includes built-in review mechanisms. Article 34 mandates the European Commission to assess, and where appropriate propose, extending the regulation's scope to other wooded land within one year and to other natural ecosystems such as peatlands, wetlands, grasslands, and savannahs within two years of its entry into force. These reviews should be viewed as strategic opportunities to align the regulation with scientific evidence and real-world risks, ensuring that the EUDR evolves as an adaptive, rather than static, governance framework (Trio & Mühlenhoff, 2025).

Embed the EUDR in a broader policy architecture: The EUDR's focus on agriculture-driven deforestation is justified, as agricultural expansion accounts for approximately 80% of global forest loss (FAO, 2020). Nonetheless, it is not the only driver, as infrastructure projects such as roads, dams, and pipelines and extractive industries – including mining and fossil fuel development – often open access to remote forest areas, triggering both direct clearance and indirect land conversion (Kliem et al., 2019; Klimke, 2023). These drivers fall outside the EUDR's scope but also need to be addressed to tackle deforestation at its systemic roots. A genuinely systemic approach requires embedding the EUDR within a broader policy architecture that addresses the full spectrum of drivers of deforestation. This means complementing the EUDR with regulatory action on upstream financial flows, non-agricultural land use pressures, and demand-side dynamics within the EU.

5.2.5 Trade and external policy instruments: Leveraging economic power alongside distributive justice

Trade policy is a powerful – yet underutilised – instrument in the EU's sustainability toolbox. As the world's largest single market, the EU wields significant influence over global production patterns through its trade agreements. These agreements increasingly incorporate environmental goals, aiming to curb the outsourcing of biodiversity loss and pollution to producer countries (Rampa et al., 2020). Nonetheless, as this study has highlighted, the effectiveness of such efforts remains constrained by vague language, weak enforcement mechanisms, and a lack of sector-specific commitments, especially in biodiversity-critical sectors such as aquaculture, livestock, and feed production. To address this, we recommend taking the following actions:

Aim: Align trade liberalisation with biodiversity and climate goals

- Introduce Sustainable Food Systems chapters with clear criteria and robust monitoring mechanisms
- Embed distributive justice and equity into trade governance
- Lead by example through internal policy coherence

Introduce Sustainable Food Systems chapters with clear criteria: Future FTAs should include dedicated chapters on sustainable food systems that extend beyond voluntary commitments. These chapters should define measurable targets (e.g., reduced deforestation risk, pollution control, and antibiotic reduction), annual monitoring plans, and reporting requirements. Making these provisions enforceable would strengthen accountability. Moreover, to avoid biodiversity blind spots, trade agreements should mandate both ex ante and ex post environmental impact assessments, carried out by independent bodies. These assessments should become a contractual obligation, enabling a transparent evaluation of whether trade growth is aligned with sustainability goals.

Embed distributive justice and equity into trade governance: To avoid reinforcing global power asymmetries, trade sustainability ought to go beyond technical criteria – it should also be procedurally fair and socially just. If sustainability standards are imposed unilaterally, transferring compliance burdens to producers in the Global South without adequate support, European trade policy runs the risk of manifesting as a form of 'green colonialism,' as argued in Section 5.1.3. A just trade agenda should prioritise horizontal cooperation, meaning that sustainability frameworks, standards, and certification schemes are co-developed with producer countries and communities. This includes ensuring meaningful participation in rule-setting processes and providing technical and financial assistance to small-scale producers.

Lead by example through internal policy coherence: The EU needs to ensure that its trade objectives do not contradict its environmental regulations. For example, efforts to regulate deforestation-linked imports (e.g., through the EUDR) should be reinforced, not undermined, by trade liberalisation. The proposed EU-Mercosur Agreement exemplifies this danger. By facilitating increased imports of commodities like soy and beef that are linked to deforestation in the Mer-

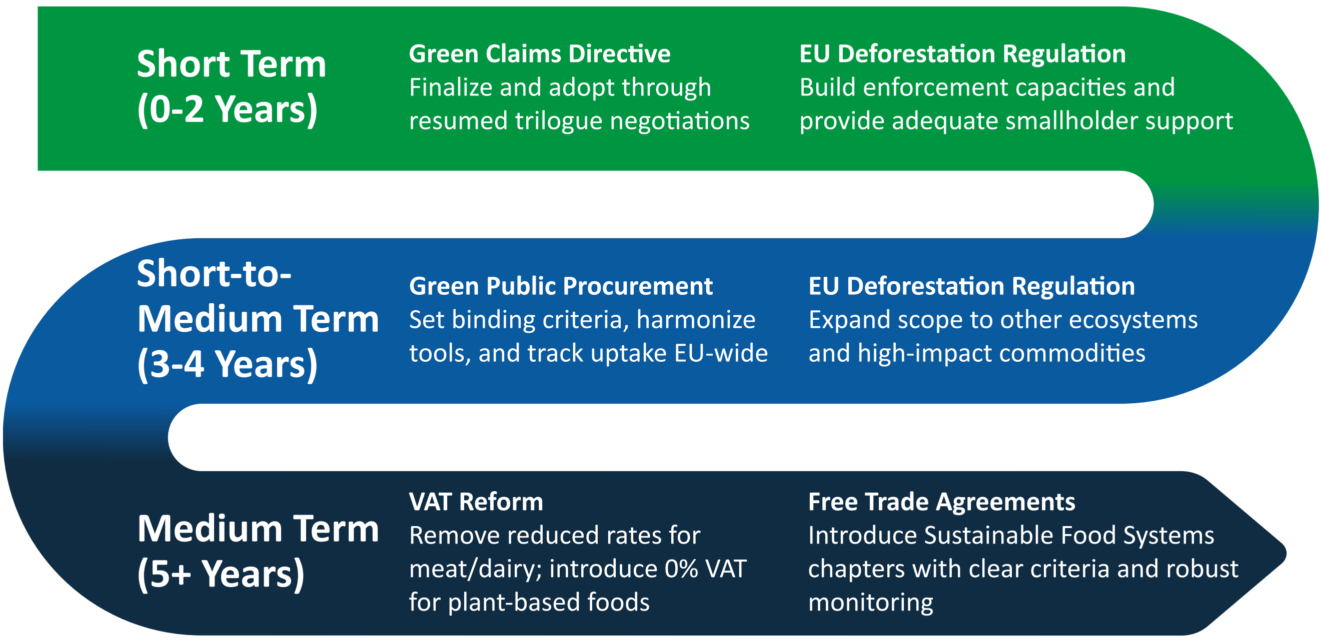

Fig. 44: Overarching recommendations – selected future milestones for EU policies

cosur states, the agreement, in its current form, could undermine the EU's own environmental goals, effectively exploiting the known loopholes of the EUDR (see Section 3.2.1). As a result, the agreement risks becoming structurally contradictory: while one EU policy seeks to prevent deforestation, another could stimulate it. To avoid this, sustainability should be treated as a core, not conditional, pillar of trade negotiations.

To complement the typology of measures outlined above, this section concludes with a time-based perspective on implementation. While grouping actionable measures by type clarifies their function within a policy mix, policymakers also need guidance on sequencing and prioritisation. While some recommendations – such as adopting the Green Claims Directive – could be rapidly implemented, others – including fiscal reforms or major regulatory extensions – require medium-term planning, stakeholder negotiation, and institutional capacity building. Presenting the measures on a timeline helps distinguish between quick wins, transitional steps, and structural reforms, providing a roadmap for scaling ambition over time. This approach underscores that effective transformation will not come from isolated interventions but rather from a coordinated sequence of actions, whereby early initiatives can build momentum, lay groundwork, and reduce political resistance for more ambitious measures. Fig. 44 illustrates this temporal dimension, organising the recommended measures into short-term (0-2 years), short-to-medium-term (3-4 years), and medium-term (5+ years) priorities for achieving nature-friendly consumption.

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Biodiversity Communication Toolkit of the Working Group 4 (“Biodiversity and Consumption”) of the Consumer Information for SCP Programme of the One planet network

All publications can be found in the One Planet Network Resources Data Base.

List of Acronyms

Abbreviation	Explanation
10YFP	Ten-Year Framework of Programmes on Sustainable Consumption and Production Patterns
ASC	Aquaculture Stewardship Council
BfN	German Federal Agency for Nature Conservation
CAP	Common Agricultural Policy
CBD	Convention on Biological Diversity
EEC	European Economic Community
EFA	European Free Alliance Group in the European Parliament
EGalim	French Law n° 2018-938 of October 30, 2018 for the balance of trade relations in the agricultural and food sector and healthy, sustainable and accessible food for all.
EU	European Union
EUDR	European Deforestation Regulation
EUMOFA	European Market Observatory for Fisheries and Aquaculture products
EUTR	European Timber Regulation
EVFTA	EU-Vietnam Free Trade Agreement
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistics
FONAP	Forum Sustainable Palm Oil
FTA	Free Trade Agreements
GAECs	Good Agricultural and Environmental Conditions
GBF	Kunming-Montreal Global Biodiversity Framework
GDP	Gross Domestic Product
GCD	Green Claims Directive
GMO	Genetically Modified Organisms
GPP	Green Public Procurement

ILUC	Indirect Land Use Change
IRP	International Resource Panel
IUCN	International Union for the Conservation of Nature
MERCOSUR	Southern Common Market (Mercado Común del Sur)
MPOA	Malaysian Palm Oil Association
NGO	Non-Governmental Organization
OPN	One Planet Network
RED	Renewable Energy Directive
RSPO	Roundtable on Sustainable Palm Oil
SDGs	Sustainable Development Goals
SPOC	Sustainable Palm-Oil Choice
T&E	Transport and Environment
TAPPC	True Animal Protein Price Coalition
TCA	True Cost Accounting
TSD	Trade and Sustainable Development
UCO	Used Cooking Oil
UNEP	United Nations Environment Programme
USD	US Dollar
VAT	Value-Added Tax
VCS	Voluntary Coupled Support
WBAE	German Scientific Advisory Board on Agricultural Policy, Food and Consumer Health Protection
WWF	World Wide Fund for Nature
ZDC	Zero Deforestation Commitment
ZKL	Interdisciplinary Commission on the Future of Agriculture (Zukunftskommission Landwirtschaft)

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This study addresses how EU consumption impacts global biodiversity, focusing on three high-impact commodities: shrimp, soy, and palm oil. It highlights the intertwined crises of biodiversity loss and climate change, systemic displacement of environmental pressures, global trade power imbalances, the limits of technical fixes, and the need to center sufficiency and equity. The study also presents policy options, calling for integrated strategies that transform consumption patterns to protect biodiversity, uphold fairness for producer countries, and promote global sustainability.

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