BRIEFING

European Parliament

EU feed autonomy

Closing the gaps in European food security

SUMMARY

People in the EU consume millions of tonnes of meat, fish, eggs, and dairy products every year. Animal products, which many consider essential for a balanced and nutritious diet, account for more than a third of the EU's total agricultural output, and are an integral part of Europe's rich and diverse gastronomic culture. Meeting the high demand for nutritious and affordable products of animal origin is a key task of the EU's agricultural sector, which employs millions across all Member States. However, the challenges posed by the COVID-19 pandemic, climate change, and Russia's war on Ukraine mean that feeding Europe's livestock is becoming increasingly difficult.

Thanks to the common agricultural policy, the EU is not facing a food availability crisis. Nevertheless, with feedstuffs already now the highest producer input, rising costs for farmers translate into higher prices for basic commodities such as meat, eggs and milk. Inflation rates for food – the highest after those for energy – reached 13.8 % in December 2022 and remain the main concern for EU citizens, particularly lower-income households.

The European Parliament has repeatedly called for the sources of animal feed to be diversified. EU leaders have expressed their commitment to ensuring the EU's food security and tackling rising food prices by reducing the EU's dependency on key imported agricultural products and inputs, in particular vegetal proteins for animal feed.

The need for greater autonomy and diversification of animal feed sources, and the growing emphasis on the agricultural supply chains' sustainability and circularity, is encouraging innovation in animal nutrition. Boosting the EU's domestic production of feedstuffs, in particular of plant-based proteins, will increase the EU's competitiveness and resilience against future supply disruptions.

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Facts and figures on the livestock supply chain

EU livestock sector

In 2021, the EU agricultural industry's output had a gross value of €449.9 billion, 36.2 % of which was represented by animal output (including the dairy and egg industries), for a value of €163 billion.[1] In 2020, there were 9.1 million farms in the EU: 21.6 % of these were specialised in raising livestock, and 19.3 % were 'mixed farms' growing crops and raising animals. Of the remaining 58.3 % of crop specialist farms, many contribute to meeting the EU's demand for animal feeding stuffs.

The number of animals reared in farms across the EU is substantial. In 2021, the EU's livestock population counted 142 million pigs, 76 million bovine heads (for meat and dairy production), 62 million sheep, and 12 million goats. After pig meat, poultry is the second most consumed meat in the EU, with 891.4 million broilers raised in 2013, and 376 million laying hens in 2021.

Among EU Member States, Spain and Germany led in the production of pigs in 2021, with 24.3 % and 16.8 % of all heads respectively. France dominated the bovine sector with 22.8 % of heads, followed by Germany with 14.5 %. Spain also produces the highest number of sheep, with nearly a quarter of the EU's total, followed by Romania with 12.1 %. Greece was first in goat production at 23.3 %, followed by Spain with 21.7 %. Poland is the EU's top producer of poultry (mainly chicken) with 19 % of the output, ahead of France, Spain, Germany and Italy (with 13 %, 12 %, 12 % and 10 % in 2021 respectively).

Livestock sector: 'Food versus feed' competition?

One of the most controversial debates surrounding the livestock sector is the alleged competition between animal and human nutrition. According to this view, farm animals are fed a disproportionate amount of all calories produced (requiring over 70 % of the EU's farmland), on top of their notable contribution to air and water pollution. A dramatic reduction of the EU's livestock sector would therefore free these calories for human consumption and mitigate the industry's environmental footprint, so the view goes.

This position has been disputed by the agricultural industry, which argues that only a quarter of the grains and grasslands produced are fit for human consumption, and that animals help transform the remaining 75 % into edible food. This view is supported by a study from the United Nations Food and Agriculture Organization (FAO), which claims that 86 % of livestock feed (such as pastures) is unfit for human nutrition, while acknowledging the need to reduce the livestock's impact on the environment.

The millions of animals reared across the EU provide consumers with large quantities of meat, eggs and dairy products. In 2021, the livestock sector produced 23.4 million tonnes of pig meat, 6.8 million tonnes of bovine meat, and a combined 459.4 thousand tonnes of sheep and goat meat. The EU is also one of the world's largest producers of poultry: EU farms' estimated output in 2021 was 13.3 million tonnes of poultry meat, of which 82.6 % was represented by chicken, followed by turkey (13.7 %) and duck (3.3 %). Moreover, in the same year, 376 million hens produced 7 million tons of eggs (for consumption and hatching). Lastly, the bloc's production of raw milk in 2021 reached 161 million tonnes, of which 155.2 million tonnes was collected from cows, 3 million tonnes from sheep, and 2.5 million tons from goats.

The EU is a significant exporter of animal products. In 2021, agricultural commodities represented 8.1 % of all EU exports, of which 22 % were products of animal origin, contributing to an agricultural trade surplus of €47 billion.

The livestock sector is also an important employer. According to European Commission estimates, roughly 5 million farmers work in animal farms. However, the importance of associated industries in the agri-food sector (such as transportation or food processing) points to higher employment figures. Since most agricultural activities take place in rural areas, the livestock sector also contributes to regional cohesion and the EU's efforts to prevent depopulation.

Aquafarming

The past two decades have seen a dramatic 41 % increase in the world's fisheries production, reaching 178 million tonnes in 2019, with a first sale value of US$406 billion. This was mostly due to the steady expansion of aquaculture (at a yearly average of 5.2 %), which reached a total output of 85.3 million tonnes in 2019.

Aquaculture employs a wide variety of production methods: from traditional techniques, usually to complement a farmer's income, to large-scale industrial aquatic farms, both performed offshore and/or inland. The range of species harvested is equally diverse, from marine and freshwater fish, to molluscs and crustaceans. Algae (including seaweed and microalgae) are becoming an important share of the global aquaculture output, as well, with 35.8 million tonnes harvested in 2019, although production is confined almost entirely to Asia (99.1 % in 2019).

In the EU, aquaculture is responsible for 20 % of the overall fish and shellfish production, with an estimated output of 1.1 million tonnes in 2020 (totalling €3.5 billion in value) and 70 000 direct jobs in the sector. The most harvested species in 2020 were molluscs (around 48 % of the total aquaculture production), in particular mussels in Spain and oysters in France. Among marine and freshwater fish, trout represented 17 % of the production volume, followed by gilthead seabream and European seabass (9 % and 7 % respectively). Salmon from aquaculture represented only 2 % of the total volume, 75 % of it produced in Ireland.

Animal feed industry

Providing the millions of animals in the EU's livestock sector with a healthy and nutritious diet requires an estimated 450 million tonnes of feedstuffs per year. Animal feed is not only crucial to the quality and productivity of the EU's livestock sector; it also represents the highest production cost for farmers. According to the European Feed Manufacturers' Federation (FEFAC), in 2020, feeding costs accounted for up to 55 % of the farm gate value of poultry, 32 % for pig and 14 % for cattle. These costs ultimately affect the availability and affordability of meat, eggs and dairy products for EU consumers.

According to industry estimates, in 2019, nearly two thirds of animal feed consumed in the EU came from farm roughages (i.e. plants or parts of plants eaten by livestock), with an additional 9 % of cereals grown in the farm of origin. The remaining feedstuffs required to meet the demand were either industrial compound feed (21 %) or feed materials bought to complement the farm's own production (see text box).

The growing global demand for cost-efficient animal products, together with the livestock sector's efforts to reduce its environmental footprint, has led to an increased industry focus on optimisation and sustainability through new types of feed and greater nutrient recovery.

What is 'feed'?

Feed refers to food products – of vegetable or animal origin – destined for animal consumption in the livestock sector. These include products fit for human consumption, such as wheat or corn, co-products of the agri-food industry, and crops and forage plants grown specifically for animal consumption, such as hay.

Like humans, animals require a balanced and diverse diet to ensure their healthy development. Several elements affect the quality of the feed and its suitability for each animal species; these include the product's digestibility and palatability, its content of fibre, protein, vitamins and minerals, and the absence of anti-nutritious factors.

An integral part of the agri-food chain, safety is also a key concern in animal nutrition and a priority for the EU. Member States are responsible for ensuring that only livestock products complying with EU rules reach consumers. The European Commission's Directorate-General for Health and Food Safety monitors the implementation and enforcement of EU feed safety legislation through its Health and Food Audits and Analysis division.

Source: FAO.

Compound feed

Farm animals' nutrition needs vary across species and development stages. As the name indicates, 'compound' feed results from the combination of different products and additives to achieve the required balance of nutrients. Cereals (mostly wheat and maize) represent around half of the products used in compound feed, followed by cakes and meals (resulting from oilseed crushing) at 24 %. Co-products, which cover 12 % of the industry's needs, play an increasingly important role thanks to their potential to reduce emissions and waste, increase the circularity of the economy, and contribute to the agri-food industry's overall sustainability.

The compound feed industry plays an important role in the livestock sector, since farmers often need to purchase manufactured mixtures and additives (such as vitamins) to complement the forages and grains grown in the farm.

The International Feed Industry Federation (IFIF) estimates that 1 billion tonnes of compound feed are produced globally each year, with an approximate US$400 billion in turnover. China and the United States (US) are the world's foremost producers of compound feed, with a 20.5 % and 18.4 % share respectively in 2020. In that same year, FEFAC estimated an annual turnover of €50 billion and more than 100 000 workers employed in the industry. EU Member States produced 150.2 million tonnes of compound feed (12.8 % of global output). Spain and Germany are the largest producers, with 17 % and 16 % of all production, followed by France with 13.8 %.

Co-products in animal feed

Co-products are generally the result of industrial processes such as the production of foods and beverages, textiles or biofuels. While unfit for human consumption, these materials still retain nutritional value for the livestock sector. They are an important element of feed mixes, in particular those for ruminants, owing to these animals' digestive capacities. The compound feed industry uses many co-products, including:

- **Milled grains**. One of the oldest types of feed. Resulting from the grinding of wheat and rice to produce flour or white rice, these materials are high in fibres, proteins, vitamins and minerals.
- **Brewery by-products**. In 2021, the estimated 8 500 breweries across the EU used millions of tonnes of grains to produce 33.1 billion litres of beer. The discarded grains and yeast from the brewing process have a rich protein, vitamin and amino acid content, making them well suited for animal nutrition, particularly for cattle and poultry.
- **Citrus pulp**. The residue obtained after squeezing oranges, lemons and grapefruits for juice (peel, seeds and tissues) represents more than 50 % of the fruit's original weight. This pulp is fibre-rich and highly digestible, and makes compound feed more palatable for animals.
- **Sugar processing by-products**. Sugar cane, and in particular sugar beet (of which the EU is the world's top producer), has a high value for the livestock and dairy sectors, thanks to the energy and fibre content of their pulp, and their contribution to increased yield and fat content of milk.
- **Oilseeds meals**. Once their oil extracted, soya beans, rapeseeds, and sunflower and linen seeds are rich sources of vegetable protein for the livestock and aquaculture industries. Soya bean, most of which is imported, is the main source of vegetable proteins for the feed sector, making its home-grown alternative, rapeseed, highly important for the EU's feed autonomy.
- **Animal-origin feeds**. Certain animal by-products not intended for human consumption are important ingredients for the feed industry. Fat, milk by-products, crushed bones, broken eggs, and spray-dried blood plasma are rich in nutrients and increase the sector's circularity.

EU policy and legislative framework

Food and feed security as a political priority

Since its inception in 1962, the scope of the EU's common agricultural policy (CAP) has been to ensure a stable and affordable food supply for all. Article 39 of the Treaty on the Functioning of the European Union (TFEU) defines two explicit objectives of the CAP: 'to assure the availability of supplies', and 'to ensure that supplies reach consumers at reasonable prices'. As the EU agricultural policy evolved, a greater emphasis was given to the sustainability and safety of the agri-food chain. These priorities were reflected in successive EU political and legislative texts, setting the framework for the livestock sector and associated industries.

The recent disruptions in the agri-food chain, caused by the COVID-19 pandemic, climate change and the Russian invasion of Ukraine, have turned the spotlight back on food security (of which feed autonomy is a crucial element) – following years in which the topic has not been salient on the EU political agenda. Moreover, these disruptions have led to skyrocketing food prices, already now the main concern for EU citizens (93 %).

These factors combined have put food and feed security at the centre of the EU's political priorities, and in a recent analysis on the drivers of food inflation, the Commission pointed to the role of animal nutrition in achieving a sustainable and resilient agri-food system.

Feed legislation

Alongside the overall objectives of sustainability and security of supply, safety is a key legislative principle regulating the livestock sector in the EU. Following the health concerns that arose in the early 2000s, most notably after the bovine spongiform encephalopathy (BSE, or 'mad cow disease') outbreak, Member States and EU institutions paid greater attention to sanitary controls in the livestock sector, resulting in extensive legislation to ensure the safety of animal products. The relevant updated rules include:[2]

- Regulation (EC) No 183/2005 laying down requirements for feed hygiene. Its subject matter includes the conditions and arrangements ensuring traceability of feed, and the conditions and arrangements for registration and approval of establishments;
- Regulation (EC) No 178/2002 setting the general principles and requirements of food law, establishing the European Food Safety Authority, and laying down procedures in matters of food safety that apply to all stages of production, processing and distribution of food and feed;
- Regulation (EC) No 1831/2003 on additives for use in animal nutrition;
- Regulation (EC) No 767/2009 on the placing on the market and use of feed. This regulation applies to both food-producing and non-food producing animals, and includes requirements for labelling, packaging and presentation;
- Regulation (EC) No 1069/2009 laying down health rules as regards animal by-products and derived products not intended for human consumption. This law aims to prevent and minimise risks to public and animal health and, in particular, protect the safety of the food and feed chain;
- Regulation (EC) No 1829/2003 on genetically modified food and feed;
- Regulation (EU) 2017/625 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products;
- Regulation (EU) 2017/1017 on the catalogue of feed materials, a voluntary list for feed business operators;
- Directive 2002/32/EC on undesirable substances in animal feed. Annex I to the directive includes a list of these substances (such as lead, mercury and mycotoxins), and the maximum levels fixed.

Challenges to the EU's feed autonomy

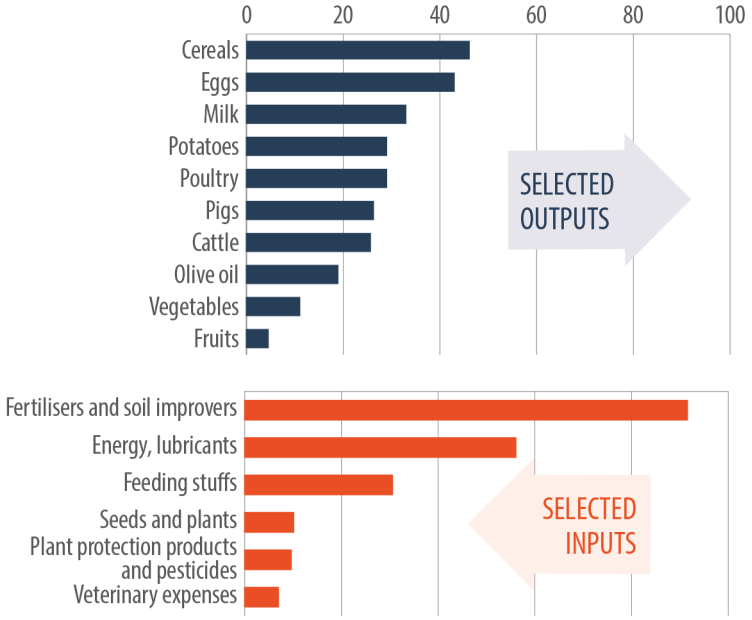
In recent years, a series of crises has affected the availability of animal feedstuffs, putting additional pressure on a sector in which production costs have risen faster than producer prices during the past two decades. While some challenges for the feed sector are structural (such as the EU's deficit in plant-based protein), others are a direct consequence of the COVID-19 pandemic, global disruptions caused by weather extremes, and the war in Ukraine.

The cumulative effect of these factors has also had negative repercussions on EU consumers, in particular lower-income households. In December 2022, inflation for food (including tobacco and alcohol) in the euro area reached 13.8 %, up from 3.2 % in the same period of the previous year, and surpassed energy as the main driver of inflation.

According to the latest European Parliament Eurobarometer survey, the dramatic rise in the cost of living is the biggest concern for people in the EU (93 % of respondents), followed by 'poverty and social exclusion' (82 %). Basic staples such as bread, meat, cooking oils and dairy products are the most affected by inflationary pressures (see Figure 1). Addressing the challenges to feed supply would help ensure availability and affordability of animal products, thus mitigating inflation.

Figure 1 – Annual price changes (in %) for agricultural outputs and inputs

% change, 2012-2022, EU estimates



Data source: Agricultural annual prices in 2022 – first estimates, Eurostat, 2023.

Weather extremes and climate change

The agri-food industry has a well-documented environmental impact. Agriculture is responsible for 10.3 % of greenhouse gas emissions in the EU, of which nearly 70 % come from the livestock sector, particularly from feed digestion. At the same time, agriculture is one of the human activities most affected by weather extremes and the risks associated with climate change, and tackling their effects is a key element in the EU's sustainability efforts.

Climate volatility and extreme weather have a direct and severe impact on crops yields, which are highly sensitive to environmental factors such as humidity, sunlight, heat, and soil quality. Expected weather conditions, or uncertainty about them, also influence farmers' decisions on which crops to

sow. Ultimately, the quality and quantity of harvested crops affect the availability of animal feed directly, and fluctuations in both greatly impact feedstuff prices.

The interlinkages between weather conditions and feed security became very clear in 2022. The severe drought across Europe that year resulted in an estimated reduction of maize, soya bean and sunflower crops of 16 %, 15 % and 12 % respectively. Overall, the EU's 2022 cereal output was expected to decrease by nearly 8 % year-on-year.[3] Moreover, the unusually dry and hot weather affected pastures (the main source of animal feed), increasing farmers' demands for alternative sources of feedstuffs during a time of lower production, leading to an increase in prices.

Generally, higher input prices and a diminished yield of crops used in compound feeds such as maize were expected to result in a 3.5 % reduction in animal feed production for 2022, compared with 2021 levels. The impact varied across Member States, with some keeping production levels stable, and others facing up to an 8.8 % decrease. Pig and poultry sectors are the most affected, taking also into account the spread of avian influenza and African swine fever. A similar reduction in output for cattle feed (despite growing demand following failing pastures during summer) points to the impact that higher production costs are having across the livestock sector.

Geopolitical disruptions

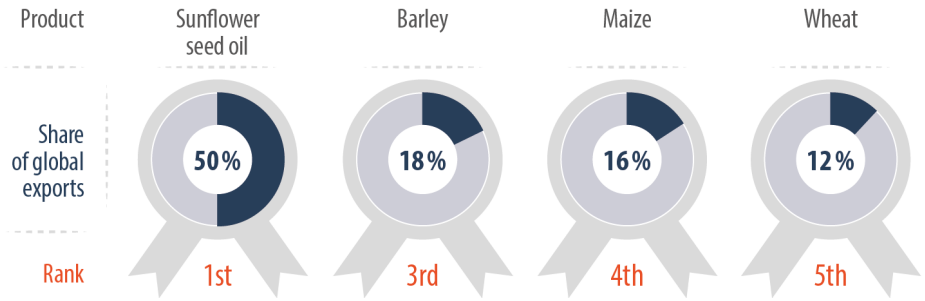
Extreme weather events and rising temperatures are the main long-term threats to feed security in the EU, which still covers most of its needs domestically. However, external disruptions have proven recently that the interlinkages of a globalised market can disrupt the supply of animal feed to EU farmers, as well.

Russia's war of aggression against Ukraine

In addition to the human tragedy and the grave violation of international norms brought about by the Russian invasion of Ukraine, Moscow's war has created new challenges for the global food chains, and aggravated existing ones.

Prior to the February 2022 Russian invasion, Ukraine and Russia combined represented 34 % of the global exports for wheat, 27 % for barley, and 56 % for sunflower oil. More crucially for the feed sector, Ukraine exported 16 % of all maize (11 million tonnes annually to the EU, accounting for 52 % of the EU's maize imports) and 61 % of sunflower cake. Russia and Belarus were among the world's top exporters of fertilisers, which is an important input cost in the production of maize and other feed crops.

Figure 2 – Ukraine's share of global agricultural exports and rank in the world before the Russian invasion



Source: Infographic – How the Russian invasion of Ukraine has further aggravated the global food crisis, Council of the EU, 2022.

The ongoing hostilities have affected both the production and export of Ukrainian agricultural commodities (see Figure 2), including those used in animal feedstuffs such as cereals and oilseeds (mainly sunflower seeds) of which the EU is a leading importer. The Russian military has deliberately

targeted Ukrainian farming facilities, as well as storage and exporting sites, resulting in a substantial fall in agricultural output and a 22 % reduction of the cultivated land, compromising future harvests. The Russian occupation of Ukrainian ports in the Sea of Azov, and the months-long military blockade of Black Sea routes, virtually halted Ukraine's agricultural exports (about 80 % of the country's grain exports were seaborne) until the United Nations-brokered Black Sea Grain initiative and EU solidarity lanes allowed for the safe transport of agricultural commodities.

The EU and its international partners have avoided targeting the Russian and Belarussian agricultural sectors with sanctions so as to minimise disruptions on global food markets – with the exception of potash (used in fertiliser production), given its importance for the Belarussian economy. Despite efforts to shield the already strained food markets from sanctions fallout, Russia's own export restrictions of grain, oilseeds and fertilisers have put additional strain on world supplies, leading to higher prices.

The combination of lower yields in the EU because of extreme weather conditions, and reduced availability of commodities as a result of the war in Ukraine have contributed to higher prices for animal feedstuffs, affecting consumer prices. Moreover, Europe's dependence on Russian oil and gas imports aggravated the energy crisis following Moscow's weaponisation of energy supplies, resulting in higher prices along the entire agri-food chain, including the industrial production of compound feed and fertilisers (natural gas being a key driver of nitrogen fertiliser prices).[4]

Ongoing combat operations, diminished arable surface, and the human, economic and material losses incurred will continue to affect the country's production and exports – despite the international support for Ukraine's agricultural sector. Combined with Russia's instrumentalisation of its food and fertiliser production, the availability and affordability of animal feedstuffs will continue to be affected by the war in Ukraine during 2023.

Fallout from the COVID-19 pandemic

The COVID-19 pandemic has had repercussions on both the animal feed sector and the supply chain, with disruptions following the outbreak still felt across the world. The initial lockdowns, and travel restrictions, limited the available workforce in agricultural and feed processing facilities and their dependant logistic chains, both inside and outside the EU. Concerns over food availability also led to export restrictions in several food-producing countries, limiting the availability of feed materials such as soya bean, and further aggravating market disruptions.

The supply limitations continued despite easing of restrictions and the recovery of agricultural production and exports. Container and truck driver shortages, and international ports' inability to process the recovering shipping traffic, worsened logistic bottlenecks, resulting in higher freight prices. Moreover, as the world started re-emerging from the pandemic crisis, global demand for energy experienced a sudden surge, creating a mismatch between supply and demand that sent energy prices soaring in 2021, particularly for natural gas. In addition to labour shortages, transport disruptions and higher prices for raw materials, feed manufacturers and agricultural facilities were facing increased input costs from energy consumption months before Russia's invasion of Ukraine exacerbated some of these issues. Since new disease outbreaks with pandemic potential remain a possibility, future health risks (and their associated disruptions) could again pose a challenge to the EU's feed security.

EU protein deficit

Like humans, animals require a balanced diet to ensure their healthy development. Farmers often have to purchase compound mixes and additives to ensure that their livestock receive the necessary nutrients. These nutritional requirements vary across species and at different stages of the animal's development, with some species such as poultry and pig heavily dependent on compound feed.

Plant-based proteins, rich in amino acids, represent a crucial element in animal nutrition, since meat and bone meals are limited in EU livestock feed. Of all crops used in compound feed, soya bean has

the highest protein content with over 40 %. While other products such as legumes and oilseeds are also important sources of plant-based protein, they lack the nutrition profile that makes soya bean so important for the feed industry.

The EU's self-sufficiency does not extend to proteins of vegetable origin, to which Member States only devote 3 % of their agricultural land. This is due to several factors, notably lower production costs in third countries, sometimes at the environment's expense. Because of this deficit, in 2018, more than 75 % of the EU's plant-based proteins had to be imported from third countries, particularly Argentina, Brazil and the US.

Rapeseed constitutes the EU's main domestic alternative to soya, and is also used by the biofuels industry. Rapeseed cultivation has increased substantially in recent years thanks to the incentives offered by the 2009 Renewable Energy Directive, allowing rapeseed co-products to have a larger share in EU feed mixes. Despite its potential to close the current deficit, rapeseed's lower protein content compared with soya bean, and the presence of certain anti-nutritious elements, have contributed to the EU's continuing dependence on soya bean imports.

Ultimately, the EU's plant-protein deficit and the higher input costs resulting from external imports, affects consumer prices, thereby harming the long-term competitiveness of the EU's livestock market and the affordability of animal products for low-income households.

Ensuring feed security: Proposed EU action and solutions

Feedstuffs are the highest input cost for European farmers and a key determinant of consumer prices. EU institutions have therefore placed ensuring a constant and affordable supply of nutritious animal feed high on the agenda, adopting several measures in recent years to guarantee food security in the EU.

Increasing EU protein production

Forages and roughages[5] cover the majority of livestock feed consumption in the EU, with compound mixes covering the remaining 20 % of demand, but providing many of the dietary requirements absent in forages. The current protein deficit in the EU has led feed manufacturers to resort to imports, in particular of soya bean, to cover the needs for their mixes.

Encouraging the EU's domestic production of plant-based proteins could reduce the dependence from imports, contribute to the EU livestock sector's competitiveness and sustainability, and increase the EU's resilience against future disruptions.

How to tackle the protein deficit has long been the object of political debate. In February 2018, the Commission launched a survey with stakeholders and Member State representatives on how to foster domestic production of plant-based proteins. Two months later, the European Parliament, in its resolution on a European strategy for the promotion of protein crops, called for implementing 'a major strategic European vegetable protein production and supply plan'.

The proposed European protein plan was widely welcomed by stakeholders. FEFAC pointed to protein's growing role as the 'limiting factor' for global agricultural markets, while environmental and animal rights groups warned about the links between soya bean imports and deforestation in third countries.

A return to animal proteins in livestock feed?

After the BSE crisis of the 1990s was linked to the use of meat and bone in cattle feed, the EU banned the use of animal proteins in most animal nutrition in 2001. Two decades later, scientific evidence pointed to the safety of using low-risk processed animal protein (PAP) for certain species, which led to its partial re-authorisation by the EU. Avian and porcine PAP and insect PAP were allowed for aquaculture in 2013 and 2017 respectively.

The most recent re-authorisation of PAP in animal feed came in 2021, with the EU allowing its use in poultry and porcine feed (since these species do not develop BSE) while maintaining the ban on PAP for ruminants and intra-species feeding.

This partial reintroduction was the result of a positive European Food Safety Authority opinion; competition from international producers that only banned ruminant-to-ruminant feed; and the EU's efforts to increase circularity in the agri-food chain and reduce the EU's protein deficit. Despite the reintroduction of PAP, the strict requirements imposed on PAP feed usage led to a mixed reception by industry stakeholders.

The Commission published its final report in November 2018. Although an EU strategy on proteins did not materialise, the report included several recommendations, including encouraging farmers to grow more protein crops through national strategic plans as part of the new CAP legal framework (in force as of 1 January 2023). According to the choices detailed in the national CAP strategic plans approved by Commission services in the course of 2022, sector-specific farm payments supporting cultivation of protein crops and legumes are expected to increase compared with the past, thus helping reduce the EU's dependency on imports of plant protein for feed.

In their informal meeting in Versailles of March 2022 following the Russian invasion of Ukraine, EU leaders identified 'increasing the EU production of plant-based proteins' as means to improve the EU's food security and reducing food prices. Equally, the European Parliament's resolution of 24 March 2022 called for a reinforcement of Europe's strategic autonomy on feed.

The Commission subsequently adopted a series of short and medium-term measures designed to mitigate the impacts on food and feed security, including:

- a support package of €500 million and a temporary crisis framework allowing State aid measures for producers affected by increased input costs;
- exceptional and temporary derogation allowing the use of fallow land to increase production for feed purposes;
- temporary easing of import requirements for animal feed.

Diversifying feed sources

The EU livestock sector's sensitivity to price shocks is caused not only by its reliance on imports but also by its dependence of a limited number of crops for animal feed. Rising global demand for animal products has encouraged research into new types of feedstuffs capable of meeting the nutrition and health requirements of the livestock and aquaculture sectors. The EU devoted substantial funding under the Horizon 2020 programme to research projects identifying alternative sources of protein (such as insects, algae or microbes), and has placed innovation in the sustainability of food systems among the key priorities for current Horizon Europe funding.

Traditionally, the agricultural sectors has regarded **insects** more as a pest than a valuable resource, although a better understanding of their crucial role in nature has led to greater conservation efforts.[6] While the importance of insects for human consumption is growing, it remains limited in Europe for cultural reasons. Animal nutrition offers the greatest potential for insect meals, which could improve the sustainability of the agri-food sector thanks to their reduced land and water usage. More importantly, insects can transform biomass (such as food waste) into high-value protein and other nutrients well suited for feeding fish, poultry and pigs, and could help reduce the EU's protein deficit and increase the agricultural industry's circularity. Recognising this potential to bridge the protein gap, the Commission authorised the use of insect processed proteins in fishmeal

in 2017 and in poultry and pig feed in 2021. The farm to fork strategy committed to fostering the use of insects as alternative feed materials. Despite the sector's currently limited market share, the insect feed industry expects to generate 25 000 direct jobs and €2 billion in annual revenue by 2030.

Seaweed and microalgae are another promising feed source identified in the farm to fork strategy. These aquatic organisms are not only crucial for marine ecosystems and CO_2 capture, but also play an increasingly important role in human nutrition and the blue economy. The value of algae extends to many sectors, from biofuels production to the pharmaceutical industry. Algae also offer great potential for animal nutrition. Rich in protein and bioactive compounds beneficial to fish healthy development, they are particularly relevant for aquaculture. Algae production is largely confined to Asia; however, the growing global demand and algae's potential as an alternative source of protein could foster European domestic production, potentially able to cover 30 % of the continent's demand by the end of the decade. To encourage Europe's domestic production, the Commission launched, in February 2022, the EU4Algae platform with stakeholders, and in November of that year, adopted a communication outlining 23 initiatives to boost the sector.

Microbes such as bacteria, yeast, and fungi have always played a crucial role in human nutrition, as they are responsible for the fermentation processes involved in the production of bread, yogurt, cheese and beer. Microbial protein is already in commercial use as animal feed. Its significant protein content, high growth rate, and reduced land and water use (around 10 % of the water needed for soya bean crops) mean that it holds great potential for ensuring the agricultural sector's sustainability. Despite the growing importance of microbial protein in human and animal nutrition, its industrial production remains limited by high energy requirements and strict toxicological testing (to ensure that microbes are not harmful to humans or animals); however, optimisation of production and the positive environmental effects of microbial protein could offset the costs. The EU has supported research on how microbial fermentation could turn forest biomass into single-cell protein meal as part of the Horizon 2020 programme.

Changing consumption patterns

The livestock industry's environmental impact, pressure from animal rights groups, and concerns over a possible 'food-feed' competition (arable land and edible crops devoted to animal rather than direct human nutrition) have led to calls for a general change in dietary choices, reducing the presence of animal products in people's diets or eliminating it entirely.

Some polls point to the increasing popularity of vegan, vegetarian or flexitarian diets (prioritising plant-based over animal products) among EU citizens. Together with an overall decrease in people's consumption of animal products, some organisations have also advocated dietary changes for livestock, prioritising 'low opportunity cost' feeds (products unfit for human nutrition such as grass) and thereby reducing the sector's land use and environmental footprint. However, although this proposal would have a positive environmental impact and reduce the EU's dependence on third-country feed imports, it is incompatible with the present demand for animal products and the current production system (particularly for intensive livestock farming). It could only be achieved through a substantial change in EU consumers' dietary decisions, and in a broader transition towards more sustainability for the whole agri-food system.

Increasing feed efficiency

In addition to diversification and increased domestic production of feed sources, the EU livestock sector can also achieve greater feed autonomy by optimising available resources, assisted by digital technologies. Recent innovations in animal nutrition science and formulation software are providing farmers and feed manufacturers with a better understanding of livestock animals' nutrition requirements, allowing for a more efficient use of feedstuffs and optimised compound feed manufacturing. These technologies can help lower input costs for farmers while preserving the health and productivity of their livestock. Moreover, they can contribute to better use of available resources, and the sustainability of the agri-food chain, through a better insight into the negative

externalities resulting from animal nutrition, such as emissions from digestion. The EU has financed feed optimisation projects through Horizon 2020, and continues funding them in the current Horizon Europe programme.

MAIN REFERENCES

Caprile A. and Pichon E., Russia's war on Ukraine: Impact on global food security and EU response, EPRS, European Parliament, September 2022.

Drivers of food security, SWD(2023) 4, European Commission, January 2023.

Laaninen T., Russia's war on Ukraine: EU food policy implications, EPRS, European Parliament, April 2022.

Feed & Food, FEFAC, November 2021.

Report on the development of plant proteins in the European Union, COM(2018) 757, European Commission, November 2018.

Special report 16/2021: Common Agricultural Policy and climate, European Court of Auditors, 2021.

Vinci C., EU-Russia trade in agri-food products, EPRS, European Parliament, March 2022.

World Food and Agriculture – Statistical Yearbook 2021, FAO, 2021.

ENDNOTES

1 Animal output is valued at basic prices, defined as the price received by the producer, after deduction of all taxes on products but including all subsidies on products.

2 For more detailed information on legislation concerning animal feed see: FASFC

3 The latest available Eurostat data confirm the overall decrease in EU crop output. Future updates will help determine the exact figures.

4 On the importance of fertilisers for the agri-food sector, and what the EU is doing to increase the availability and affordability of fertilisers, see: Ensuring availability and affordability of fertilisers, COM(2022) 590, European Commission, 2022.

5 Forages and roughages are edible plant materials used in animal nutrition, although roughages have higher fibre contents. Both terms are often used interchangeably.

6 On the importance of pollinators for EU agriculture, see Protecting pollinators in the EU, EPRS, European Parliament, July 2021.

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