March 2026

Report

Protein diversification: Closing the Economic Confidence Gap

Strengthening Supply-Chain Structures for Food-Grade Legume Production in Europe

Institute for European Environmental Policy

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Szewczyk, O. and Nadeu, E. (2026) 'Protein Diversification: Closing the Economic Confidence Gap. Strengthening Supply Chain Structures for Food-Grade Legume Production in Europe. Report, Institute for European Environmental Policy, Brussels.

CORRESPONDING AUTHORS

Olga Szewczyk (oszewczyk@ieep.eu) and Elisabet Nadeu (enadeu@ieep.eu)

ACKNOWLEDGEMENTS

This report benefited from the insights of many people we engaged with throughout the research project. We extend our gratitude to IEEP colleagues Isabella Wedl and Melanie Muro for their helpful comments, and to the School for Moral Ambition for its support.

Cover image by Betty Subrizi from Unsplash

This work has been produced with the financial support of the LIFE Programme of the European Union. The paper reflects only the views of its authors and not the donors.

IEEP AISBL office
IEEP - Norrsken House Brussels
72 Rue du Commerce
1040 Bruxelles

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ABBREVIATIONS AND DEFINITIONS

The following instruments and the prospect of their extension to legume crops are central to the policy recommendations developed in this report:

CAP	Common Agricultural Policy
CMO	Common Market Organisation – EU regulatory framework governing how agricultural markets are managed.
IBOs	Interbranch Organisations – bring together actors from different stages of the supply chain to coordinate on quality standards, market information and research priorities.
POs	Producer Organisations – formal groupings of agricultural producers, recognised under EU law, that can collectively market products, negotiate contracts and access certain CAP support instruments.

EXECUTIVE SUMMARY

The production of legume crops such as peas, faba beans, lentils and chickpeas is increasingly acknowledged as a strategic policy priority in the European Union (EU), driven by the need to reduce import dependency, deliver environmental benefits through diversified crop rotations, strengthen the resilience of food and feed supply chains and overall contribute to a more sustainable food system. Yet, despite growing policy attention, including Common Agricultural Policy (CAP) coupled support, eco-schemes and a proposed Common Market Organisation (CMO) protein sector, domestic food-grade legume production remains marginal. The EU continues to import approximately 19 million tonnes of plant protein annually, predominantly from Brazil, Argentina and the United States.

This report examines why food-grade legume supply chains in Europe remain underdeveloped, **and what supply-chain interventions could close the economic confidence gap that prevents farmers from diversifying**. Drawing on desk-based research, four comparative case studies (Germany, France, the Danube region and Canada) and stakeholder interviews, it maps the structural and organisational barriers along the value chain from breeding and seed supply to market access and price formation.

The analysis confirms that the core constraint is not agronomic potential alone, but structural weaknesses across the supply chain. The hesitation of European farmers to adopt food-grade legume production is a rational economic response to supply chains that have been shaped by decades of policy, infrastructure and practices prioritising other crops. The sector is caught in a vicious cycle: processors will not invest in regional infrastructure without a guaranteed local supply, and farmers will not scale up without visible, secure market infrastructure. **Five mutually reinforcing barriers underpin this confidence gap**: a deficit in aggregation and post-harvest infrastructure; weak collective organisation, with almost no Producer Organisations (POs) or Interbranch Organisations (IBOs) dedicated to food-grade protein crops; market opacity and contractual insecurity; feed-oriented lock-in within existing CAP instruments and cooperative business models; and persistent knowledge and coordination gaps.

The infrastructure challenge is not uniform. It is most acute for advanced protein ingredients requiring capital-intensive fractionation, but considerably more tractable for minimally processed products, where coordination rather than capital expenditure is the primary constraint. Evidence from the case studies demonstrates that small groups of farmers, working through cooperatives or regional hubs, can access minimal-processing pathways at manageable cost.

Four cross-cutting findings recur across the case studies. **Guaranteed offtake is the single most important factor in farmer willingness to adopt a new crop**. Interventions that address only one stage of the supply chain deliver partial results; the most promising approaches bundle multiple measures simultaneously. Existing cooperative and institutional structures can be extended to accommodate protein crops more readily than new structures can be built from scratch. The distinction between short and long value chains matters for policy design: what remains underdeveloped is the long value chain from dispersed farm production through aggregation, processing and distribution to mainstream retail.

Recommendations

Five policy recommendations are directed at EU and Member State policymakers:

1. **Invest in regional aggregation and minimal-processing infrastructure**, supporting shared post-harvest facilities through the CAP Strategic Plans, and from 2028 onward, the National and Regional Partnership Plans, with priority for cooperative and farmer-led ownership.
2. **Support the creation and professionalisation of food-grade legume Producer Organisations**, using the proposed protein-sector interventions to provide a legal basis and sustained operational funding.
3. **Improve market transparency and contractual security**, extending EU market observatory mechanisms to food-grade legumes and developing standardised contract templates with risk-sharing provisions.
4. **Ensure that CAP and CMO instruments actively support food-grade value chains**, with eligibility criteria that distinguish feed-oriented from food-oriented activities.
5. **Invest in knowledge infrastructure and supply-chain coordination**, funding legume-specific advisory services, peer-learning networks and cross-border coordination platforms.

In short, the conditions for scaling food-grade legume production are institutional and organisational as much as they are agronomic or economic. Markets for European-grown legumes exist; farmers are willing to diversify; the environmental and strategic case for legume crop expansion is widely accepted. What is missing is the connective tissue: the aggregation infrastructure, the collective organisation, the contractual frameworks and the coordination mechanisms that would allow these elements to come together into functioning supply chains. The policy windows currently available, including the CAP reform cycle, the proposed CMO protein sector, and the European protein plan, offer a real, if time-limited, opportunity to put in place the structural foundations on which food-grade legume markets can develop.

1. INTRODUCTION

1.1 Protein diversification: acknowledged policy priority

Europe's agricultural and food systems are under increasing pressure to reconcile objectives that are not always easily aligned: reducing climate emissions and environmental impacts, addressing human health and animal welfare issues, ensuring farmer livelihoods and strengthening the resilience of food and feed supply chains. Protein diversification, i.e. through a combination of animal-sourced, plant-based and novel proteins within the food system, offers an opportunity to address many of these interlinked key EU priorities (van Vugt and Nadeu, 2025). In this context, the production of legume crops - such as peas, faba beans, lentils and chickpeas - is increasingly acknowledged as a strategic policy priority gaining attention from farmer organisations and food manufacturers to environmental NGOs and EU institutions for a wide range of reasons; its potential to enhance soil health, reduce feed and food import dependency and support resilient, sustainable and healthy food systems (EEA, 2026, European Parliament, 2024; EPC, 2025; Muro and van Vugt, 2025, Systemiq, 2025a).

Despite the rising interest in legume production, its adoption in Europe remains modest and uneven. Grain legumes occupy only around 3 per cent of EU arable land (European Commission, 2023), and practical experience with their production, storage, processing and marketing has eroded over decades of specialisation in cereals and livestock systems. The EU remains dependent on imports (mainly soy from Argentina, Brazil and USA) of approximately 19 million tonnes of plant protein annually (European Commission, 2024a). This dependency not only limits the agronomic, climate and environmental benefits of increased legume cultivation (see Box 1) but also exposes the EU to economic and geopolitical risks linked to global market volatility.

In response, the European Commission has intensified its focus on legume crops through recent communications and the evolving framework of the Common Agricultural Policy (CAP). CAP Strategic Plans across Member States now include instruments from coupled income support to eco-schemes aimed at promoting legume crop cultivation (European Commission, 2024b). The Commission has also signaled its intention to publish a European protein plan, though this initiative, initially framed as a protein strategy, has been narrowed in scope and delayed by approximately two years, raising questions about the level of political ambition behind it. Proposals associated with the next CAP reform cycle suggest the possibility of recognising protein crops as a distinct Common Market Organisation (CMO) sector (European Parliament, 2024). Such a move would create a legal basis for recognising Producer Organisations (POs) and Interbranch

Organisations (IBOs) for protein crops, enabling collective investment, coordinated quality standards and collective contracting mechanisms comparable to those in more established sectors such as fruit and vegetables or wine. The European preference mechanism, proposed under the Commission's Industrial Accelerator Act of March 2026 to prioritise EU-produced goods in public procurement, could in principle reinforce these ambitions, although agriculture has so far been excluded from its scope.

Box 1: Benefits of legume production

From an agronomic perspective, the rationale for legumes is well established. Their capacity for biological nitrogen fixation, contribution to soil health and role in diversified crop rotations align closely with EU objectives on climate mitigation and environmental protection (Stagnari et al. 2017). Research also points to their potential to enhance agro-ecosystem resilience under changing climatic conditions, including through reduced dependence on synthetic nitrogen inputs and improved soil water retention (EU CAP Network, 2025). Crop diversification relates to the inclusion of one or two protein crops within existing arable rotations (Magrini et al., 2016). Climate change is already altering growing conditions across European regions, and crop diversification with legumes may offer adaptation benefits alongside their mitigation potential, by improving resilience and reducing vulnerability to input price shocks (EEA, 2026).

The increased interest in legume production is unfolding within a broader transformation of the protein production system. Advances in food-production technologies, particularly fermentation, are beginning to reshape how protein can be produced, processed and consumed. Fermentation is increasingly recognised as a complementary pathway within Europe’s protein diversification rather than a substitute for agricultural production. Recent assessments by the European Parliament’s Panel for the Future of Science and Technology (STOA, 2024), the European Policy Centre (EPC, 2025) and Systemiq (2025a) all position classical, biomass-based and precision fermentation technologies as potentially significant contributors to diversifying EU’s protein supply and improving system resilience. Modelling by Systemiq (2025a) suggests that medium adoption of fermented proteins could deliver substantial environmental benefits, including greenhouse gas reductions and land sparing. These assessments frame fermentation as a technology that could integrate with existing agricultural value chains, for example, by creating alternative outlets for crops and by-products, enabling more localised processing, and expanding demand for diverse protein inputs, including legumes.

1.2 The legume crop challenge

A growing body of research suggests that the core constraint in legume crop production is not agronomic potential alone, but structural weaknesses across the supply chain (e.g. Brannan et al. 2023, Ferreira et al. 2021, Meynard et al. 2018). EU-funded projects such as LegumeGap, Legumes Translated and SmartProtein have advanced knowledge on cultivation techniques, varietal improvement and product development. However, they also highlight persistent gaps in aggregation, processing capacity, market coordination and contracting. Farmers consistently point to uncertainty around market access, price formation and the availability of food-grade processing infrastructure as key factors limiting their willingness to scale up legume production.

At the same time, it is important to distinguish between different types of processing needs. These range from relatively simple operations such as cleaning, milling, thermal treatment and packaging for many food-grade applications (edamame, hummus, falafel, lupin flour, pulse-based bakery ingredients), to capital-intensive fractionation and protein isolation facilities. While the latter dominate much of the policy discussion around processing infrastructure, several of the supply-chain initiatives examined in this research demonstrate that small groups of farmers, working through cooperatives or regional hubs, can access minimal-processing pathways at manageable cost. **The infrastructure challenge is therefore not uniform: it is most acute for high-tech protein ingredients, but considerably more tractable for whole-food and minimally processed products where the primary barrier is coordination rather than capital expenditure**.

Taken together, these developments suggest that the protein challenge facing Europe is no longer simpenly a question of increasing acreage under legumes or reducing import dependence. Rather, it is about building integrated and resilient protein production systems in which agricultural production, processing technologies and institutional arrangements evolve in a coordinated way. This raises a central question for this research: **how can Europe's legume crop supply chains be organised and governed so that farmers can diversify into food-grade legume production in an economically viable and resilient manner, within an evolving protein landscape that increasingly includes fermentation technologies?**

Addressing this question requires moving beyond agronomic assessments to examine how supply-chain structures, economic incentives and policy instruments interact in practice. As the analysis in this report will show, the barriers to expanding food-grade legume production tend to co-exist and reinforce one another, which is why the report argues for coordinated intervention rather than isolated measures.

1.3 Scope and research design

To address the research question set out above, **this report examines how supply-chain interventions can reduce financial risk and improve income stability for European farmers embarking on food-grade legume production**. The analysis focuses on legumes grown for human consumption (peas, faba beans, lentils, chickpeas, lupins and soybeans) rather than on legume crops destined primarily for animal feed, though the relationship between feed and food markets is a recurring theme given the path dependencies that shape the sector.

To address the questions above, this research adopts a qualitative, policy-oriented methodology combining desk-based research, comparative case studies and semi-structured stakeholder interviews. The approach examines how supply-chain organisation, economic incentives and policy frameworks interact to shape farmers' ability to diversify into food-grade legume production in Europe. Rather than evaluating agronomic performance (extensively documented by EU-funded projects including LegumeGap, Legumes Translated and SmartProtein), the analysis focuses on value-chain structures, governance mechanisms and institutional arrangements that influence farmer income stability. The underlying assumption, supported by the literature reviewed in the following section, is that the principal barriers to scaling food-grade legume production are structural and organisational rather than agronomic.

The case studies and structural analysis are organised around five critical stages of the food-grade legume value chain: breeding and seed supply, primary production, aggregation (collection, cleaning, drying and storage), primary processing (dehulling, milling, fractionation), and secondary processing (food manufacturing). This five-stage framing is used throughout the report to map where structural weaknesses arise and where intervention is most needed.

Seven interviews were conducted with representatives of farmer organisations, non-profit organisations working on protein diversification and food systems, and the seed industry. The interview programme was designed to test and enrich the findings of the desk-based analysis, in particular to identify where the experience of practitioners diverges from what is reported in project deliverables and existing policy documents.

2. CURRENT STATE OF THE SUPPLY CHAIN

This section examines how food-grade legume supply chains are currently organised in Europe and where economic and organisational risks arise for farmers seeking to diversify. While legumes are agronomically suited to many European regions, their uptake in higher-value food markets remains limited. The analysis below maps these constraints along the value chain, from upstream breeding and seed supply through to downstream market access and price formation, first from structural and later from organisational perspective.

Fig 1: A general overview of current supply chain within the food grade plant protein production.

Box 2: Requirements of food manufacturers

Requirements of food manufacturers

Food-grade legume markets demand specific functional attributes that distinguish them from feed markets. These include: consistent colour and appearance; protein solubility and neutral flavour profiles; standardised batch sizes meeting industrial volume requirements; food-safety certification and full traceability; and segregated handling throughout the supply chain to prevent contamination with feed-grade product (SmartProtein, 2021, Huamaní-Perales et al. 2024).

2.1 Structural analysis: the food-grade legume supply chain

To understand why European farmers hesitate to diversify into food-grade legumes, one must look beyond the farm gate. While agronomic challenges exist, evidence suggests that the primary inhibitor of expansion is the structural disconnect between primary production and downstream food manufacturing. The economic confidence gap is not accidental; it is the result of a value chain that has historically evolved to serve a different purpose (European Commission, 2018; LEGVALUE, 2021). Mapping the value chain helps clarify how these weaknesses accumulate and why they shape farmer decision-making.

The diagram above illustrates the typical flow of food-grade legumes in Europe. Unlike the streamlined, high-volume pathways for cereals, the legume chain is characterised by fragmentation across five critical stages: breeding, primary production, aggregation (collection, cleaning, drying), primary processing (dehulling, fractionation), and secondary processing (food manufacturing). The "middle" of this chain, aggregation and primary processing, is frequently its weakest link.

2.1.1 Upstream: breeding and seed systems misalignment

At the upstream end of the chain, breeding and seed systems remain only partially aligned with the needs of food processors. Food manufacturers increasingly require legumes with specific functional characteristics, including consistent colour, protein solubility and neutral flavour profiles. However, varietal availability differs widely across Member States, and farmers often have limited choice when sourcing seed for food-grade markets (SmartProtein, 2021; Wageningen UR, 2020).

Breeding efforts over recent decades have largely focused on yield stability and suitability for feed use rather than food functionality. This has resulted in gaps between what farmers can reliably grow and what processors require (LEGVALUE, 2021). For farmers, this creates a quality risk from the outset, since crops that fail to meet processing specifications are commonly redirected to feed markets at lower prices.

Stakeholder interviews suggest that current yield levels are already sufficient to support viable business models for a range of food-grade applications, particularly where legumes are integrated into rotations of three to seven years. Several interviewees emphasised that treating breeding improvement as a prerequisite for market entry risks delaying action on structural barriers (coordination, contracting, infrastructure) that are more immediately tractable.

2.1.2 Production: Fragmentation and farm-level risk

Food-grade legume production in Europe remains fragmented and unevenly distributed. Grain legumes account for approximately 3 per cent of EU arable land, Production is concentrated in France, Germany, Spain, Italy and parts of Central and Eastern Europe, with significant variation both between and within regions from year to year (van Loon et al. 2023, Eurostat, 2023; Legumes Translated, 2021).

Yield variability further increases economic uncertainty. Advisory services specific to food-grade production are often limited (Legumes Translated, 2021). Several interviewees emphasised the importance of agronomic support during the first years of production, noting that typical mistakes by farmers new to a crop (wrong inoculation, poor harvest timing, inadequate drying) lead to disappointing yields and a decision not to continue. The Donau Soja project in Germany has addressed this directly by incorporating farmer training, peer-to-peer knowledge sharing and real-time troubleshooting alongside a guaranteed buyer, so that first-year difficulties do not immediately become reasons to abandon the crop.

In this context, farmers frequently rely on feed markets as a fallback when quality thresholds are not met. While this reduces short-term risk, it lowers expected returns and weakens incentives to invest in food-grade performance over time (LEGVALUE, 2021).

2.1.3 The path-dependency problem in feed vs. food

The European arable sector is characterised by a strong "technological lock-in" favouring major crops intended for animal feed (Magrini et al., 2016). Approximately 60 per cent of EU cereal production is directed towards animal feed (European Commission, 2024a), and decades of CAP support and private investment have optimised supply chains for high-volume, homogenous commodities like feed wheat and soy.

In the established feed-oriented system, quality parameters are limited (mostly crude protein content and moisture) and logistics are highly efficient. A farmer growing feed peas faces low transaction costs: the crop is harvested, aggregated in bulk by a local cooperative, and sold into a transparent market with clear reference prices.

By contrast, the food-grade market is structurally immature. Downstream buyers, particularly plant-based food manufacturers operating at industrial scale, demand specific functional attributes: colour consistency, neutral flavour profiles, and protein solubility (SmartProtein, 2021). However, because the volume of food-grade pulses is small relative to feed, few cooperatives have invested in segregated storage and cleaning facilities. This is unsurprising given the substantial capital investments required, which many agricultural actors cannot justify without more predictable demand.

The path dependency is reinforced by existing cooperative infrastructure. Most agricultural cooperatives in Europe were built to handle cereals and oilseeds, and their business models, equipment and trading relationships reflect this orientation. Extending operations to food-grade legumes would require physical investment in segregated storage and specialised cleaning equipment, but also new competencies in quality management, food-safety certification and buyer relationships. The result is a classic coordination failure: the infrastructure that would make food-grade production viable does not exist because production volumes are too low, and production volumes remain low because the infrastructure does not exist.

2.1.4 Aggregation and Processing: the 'missing middle' of the infrastructures

The most critical bottleneck is the **lack of intermediate actors and infrastructure capable of bridging the gap between scattered production and concentrated industrial demand.**

On the aggregation side, food manufacturers require large, standardised batches of raw material, but legume production in Europe is regionally scattered. Without intermediaries aggregating small batches from multiple farms, individual producers cannot access industrial buyers. Food-grade legumes require dedicated facilities for cleaning, drying, sorting and segregated storage (LEGVALUE, 2021; Legumes Translated, 2021). Interview evidence from the Donau Soja case confirms this: in parts of Germany where soy production is agronomically viable, the absence of a regional collector or dryer within a reasonable transport distance can be sufficient to deter farmers from planting at all.

On the processing side, two quite different sets of requirements should be distinguished. For advanced food ingredients (protein isolates, concentrates, textured vegetable proteins) processing does require capital-intensive facilities for fractionation, membrane separation and drying, often involving investments running to tens of millions of euros. This is the segment where European capacity is most clearly lacking relative to North American or Asian competitors.

However, a significant share of growing demand involves products that require only minimal processing: edamame beans requiring thermal treatment and packaging; lupin beans milled to flour for bakery applications; chickpeas cleaned and sold whole; peas sorted, graded and packaged in bulk. Stakeholder interviews highlight that in the Netherlands, for example, a single facility already processes approximately 4,000 tonnes of lupin to flour per year using straightforward milling equipment, and that small groups of ten to twenty farmers pooling resources can acquire the equipment needed for basic processing. The barrier in these cases is not capital investment but coordination: identifying the market, organising collective procurement of equipment, and establishing reliable buyer relationships.

> Barrier identification matters for policy. If the processing gap is understood exclusively as a problem of large-scale industrial capacity, the policy response will focus on attracting corporate investment for major facilities. If the gap is also understood as a coordination problem at the level of minimal processing, a wider range of interventions becomes relevant: support for cooperative investment in shared post-harvest facilities, technical assistance for small-scale processing ventures, and frameworks connecting regional producers with downstream buyers.

The Legumes Translated project (2021) highlighted that without regional "micro-hubs"(small-scale shared facilities providing cleaning, drying, sorting and basic processing for groups of 10-20 farmers within a manageable transport radius) for aggregation and basic processing, logistics costs erase the potential earnings associated with food-grade production. Processors often prefer Canadian or Australian pulses not due to superior quality, but because they are available in aggregated, standardised volumes that European supply chains cannot currently match (Balazs et al., 2021).

2.1.5 Market opacity and price discovery

A functioning supply chain requires **transparent price signals**, publicly available, regularly updated reference prices that allow farmers to assess excpected returns before planting, yet these are largely absent for European food-grade legumes. Unlike wheat or rapeseed, which have established futures markets (e.g., MATIF), legume prices are typically negotiated bilaterally with limited transparency (European Commission, 2018). There is no centralised EU reporting on prices for food-grade lentils or chickpeas. Farmers face "contractual insecurity": forward contracts frequently include strict quality rejection thresholds, and if a crop is rejected for food use, it is downgraded to feed at a severe price penalty absorbed entirely by the farmer (Ferreira et al., 2021).

A recurring argument in policy discussions is that there is simply "no market" for European-grown food-grade legumes. The evidence gathered for this research suggests otherwise. Established markets exist for a number of legume-based food products (edamame, lupin flour, soy-based dairy alternatives, hummus, falafel) but European demand is currently met overwhelmingly by imports. The EU imports more than 90 per cent of its soy consumption (European Commission, 2024a), and a substantial share of lentils and chickpeas consumed in Europe are sourced from Canada, Turkey and Australia (European Commission, 2018). What is missing is not demand but the supply-chain infrastructure needed to connect European farmers to these existing markets at competitive quality and volume. The Dutch experience offers a concrete illustration: through targeted deal-making between a producer organisation and a major retailer, Dutch-grown edamame now appears on supermarket shelves alongside imported product, with similar arrangements brokered for lupin flour and soy for plant-based dairy.

The Donau Soja certification scheme has succeeded in building a significant volume of certified European soy supply, however, as discussed in detail in Case Study 3, actual demand for certified soy falls well short of certified capacity, and demand has softened in recent years. This suggests that certification can help structure supply chains, but cannot on its own guarantee the demand needed to sustain food-grade premiums.

2.2 Organisational analysis: weak collective governance and bargaining power

A further weakness in the legume crop sector lies in the underdeveloped state of collective governance for legume producers. In sectors such as fruit and vegetables, dairy, or wine, Producer Organisations (POs) and Interbranch Organisations (IBOs) play a decisive role in concentrating supply, negotiating contracts and managing market volatility. For legume producers, such institutional support is largely absent.

2.3 Conclusion: the structure basis of the confidence gap

The hesitation of European farmers to adopt food-grade legume production is a rational economic response to a challenging supply chain. The sector is caught in a vicious cycle: processors will not invest in regional infrastructure without guaranteed local supply, and farmers will not scale up without visible, secure market infrastructure. Stakeholder interviews conducted for this research reinforce the point: the barriers most frequently cited are not agronomic but organisational, from the absence of reliable buyers to the difficulty of accessing appropriate post-harvest infrastructure and the weakness of collective bargaining arrangements.

Therefore, the main barrier to expanding food-grade legume production in Europe is not a lack of agronomic potential or farmer interest. Instead, it lies in **the absence of coordinated infrastructure and governance in the middle of the supply chain**. Without investment in aggregation, storage and processing, supported by more stable contractual arrangements and stronger collective organisation, legume markets are likely to remain oriented towards lower-value feed uses.

The barriers described in this section do not operate in isolation. Weaknesses in infrastructure, market access, collective organisation and farmer confidence co-exist and reinforce one another. This mutually reinforcing character means that addressing any single constraint in isolation is unlikely to be sufficient. What the sector requires is coordinated intervention across multiple points of the supply chain simultaneously. The case studies that follow illustrate how different actors across Europe, and beyond, have attempted to address these structural weaknesses, with varying degrees of success.

3. CASE STUDIES

The following case studies examine how different supply-chain actors and institutional configurations have sought to address the structural gaps identified in the preceding analysis. Each case represents a distinct intervention logic. Together, they illustrate a range of approaches to closing the economic confidence gap for legume producers, while also revealing the limits of any single intervention in isolation.

The cases were selected to cover different crops, different Member State contexts, and different points along the supply chain. Germany's Lupin Network and ProLupin address the upstream-to-processing link. Terres Univia in France demonstrates how an interbranch organisation can provide coordination across the value chain, but also how existing institutional structures may default to feed-oriented priorities. Donau Soja represents a cross-border, certification-based approach to market development. Canada's lentil sector provides a benchmark case of a mature, food-oriented value chain. Where relevant, findings from stakeholder interviews are incorporated.

3.1 Case study 1: The German Lupin Network and ProLupin (Germany)

Overview

The German Lupin Network was established in 2015 as a federally funded initiative to rebuild knowledge, coordination and market pathways for lupin cultivation in Germany. Coordinated by the Leibniz Centre for Agricultural Landscape Research (ZALF) and supported by the Federal Ministry of Food and Agriculture (BMEL), the network brings together farmers, regional advisory services, breeders, researchers and downstream users.

Alongside this publicly funded network, ProLupin GmbH represents a private-sector effort to develop a food-grade outlet for German-grown lupins. Founded as a spin-off from the Fraunhofer Institute for Process Engineering and Packaging (IVV), ProLupin has developed proprietary processing techniques to produce functional lupin protein isolates for food applications.

Supply-chain structure and intervention logic

The combination of a farmer-facing knowledge network and a dedicated food-grade processor illustrates an attempt to address multiple supply-chain gaps simultaneously. The Lupin Network focuses on upstream and farm-level constraints (varietal choice, yield stability, agronomic know-how), while ProLupin operates at the processing stage, creating demand for specific quality characteristics and providing a potential price premium relative to feed markets.

However, processing capacity remains concentrated and dependent on a limited number of facilities, and scaling beyond niche markets has proven challenging. The case illustrates a broader pattern: a single dedicated processor can improve market access for farmers in its immediate vicinity, but does not resolve the aggregation deficit across a wider production area.

Evidence from the Netherlands suggests that lupin flour production, using relatively straightforward milling equipment, already operates at approximately 4,000 tonnes per year, with raw material sourced from Australia. The challenge is not the absence of processing capacity but the absence of organised domestic supply chains that could substitute for imports.

Assessment

The German Lupin case confirms a finding that recurs across the cases examined in this report: supply-chain interventions that address only one stage of the chain deliver partial results. Without complementary investment in aggregation, collective organisation and contractual stability, the confidence gap for farmers is narrowed but not closed. Where the German case illustrates the limits of addressing production and processing without stronger collective organisation, the French case offers a contrasting model in which institutional coordination is the primary intervention.

3.2 Case study 2: Terres Univia and interbranch coordination for protein crops (France)

Overview

Terres Univia is France's recognised interbranch organisation for oilseeds and protein crops, operating under the EU CMO framework. It brings together representatives from production, collection, processing and downstream markets, with a mandate to improve sector coordination, support market transparency and guide strategic investment. Through its link with the technical institute Terres Inovia, the organisation supports data collection, research dissemination and advisory activities across the value chain.

Supply-chain structure and intervention logic

The French model illustrates how legally recognised interbranch organisations can provide a platform for aligning incentives and sharing information. Terres Univia contributes to market monitoring, quality standard-setting and strategic foresight, helping to reduce information asymmetries that often disadvantage farmers. This directly addresses the market opacity identified in the structural analysis.

However, much of the existing infrastructure and organisational capacity remains oriented towards feed. France has a more developed institutional landscape for protein crops than most Member States, but even within this favourable context, the translation from strategic coordination to operational supply-chain capacity for food-grade products remains incomplete.

Regional coordination in France seems to be more advanced than in most other EU countries. Farming advisory institutions in several French regions have taken an active role in organising stakeholder processes and connecting farmers with downstream actors. The EU CAP Network Focus Group on protein crops under climate change, drawing on the expertise of twenty practitioners across Europe, similarly highlights the importance of building diverse value chains and strengthening regional advisory support as key enablers for protein crop adoption (EU CAP Network, 2025). Similar patterns were reported in Belgium, where farming advisory bodies have facilitated contracts between existing cereal cooperatives and farmers willing to diversify into pea and faba bean production, and in Switzerland, where cereal cooperatives have begun purchasing protein crops from member farmers alongside their established grain operations.

Assessment

Terres Univia provides the sector with a forum for strategic alignment and market intelligence that producers in less organised countries lack entirely. But coordination alone cannot substitute for physical infrastructure, contractual security or collective bargaining power at producer level. For the interbranch model to deliver meaningful results for food-grade legume producers, it would need to be combined with targeted investment in regional aggregation and processing capacity, and with PO structures that give farmers a stronger voice in negotiations with downstream buyers.

A complementary example from Belgium illustrates how existing cooperative structures can be extended without heavy new investment. A Belgian cooperative, originally established to aggregate wheat from approximately 150 member farmers, introduced a dedicated contract line for pea intercropping. The cooperative offers a small price premium and handles the cleaning, sorting and bulk packaging itself. This case, reported by stakeholder interviewees involved in the IMPACTS project, demonstrates that where cooperatives already have established relationships with farmers and basic post-harvest infrastructure, extending operations to protein crops can be relatively straightforward.

3.3 Case study 3: Donau Soja and European protein value-chain coordination (across Europe)

Overview

Donau Soja is a European multi-stakeholder association working to strengthen regional protein crop production, with a focus on non-GM soybeans. With its HQ in Vienna and offices in Kyiv, Novi Sad and Chisinau, the organisation brings together over 330 members, from farmers, processors, retailers, researchers and civil society organisations, across more than 30 countries. Its activities combine certification, market development, research collaboration and policy engagement.

The Donau Soja and Europe Soya standards provide traceability and sustainability criteria for certified crops, covering non-GM production, European origin, deforestation and conversion-free supply chains, restrictions on certain pesticides, and traceability through third-party audited supply chains.

Supply-chain structure and intervention logic

Donau Soja operates primarily as a coordinating and enabling actor rather than a direct market participant. Its certification infrastructure is substantial: total certified production stands at approximately one million tonnes per year, representing around 10 per cent of total European soy production. Within the EU, certification operates mainly through primary collectors but also direct farm-level contact.

A significant innovation has been the Protein Partnerships programme, through which the transition of non-certified farms, primarily in European non-EU countries, to certified production is supported. This includes training on soy cultivation (delivered through the Donau Soja Academy), support for primary collectors to achieve certification, and assistance in establishing supply-chain infrastructure. According to interview evidence, this programme contributed to a near-doubling of certified production capacity, from approximately 500,000 to one million tonnes per year.

Market development: successes and constraints

Despite growth in certified supply, the demand side has proven more challenging. Actual demand for certified soy currently stands at only 300,000 to 400,000 tonnes per year, a fraction of total EU soy consumption of approximately 15 to 16 million tonnes (European Commission, 2024a). This means that a substantial share of certified production is sold as undifferentiated commodity without a price premium. Demand has softened in recent years, driven by post-2022 inflation and cost-cutting pressures among downstream companies, broader political signals associated with the EU omnibus process, and weakening corporate sustainability commitments.

This illustrates a fundamental limitation of certification as a market-development tool: certification can structure the supply side, but cannot on its own generate demand. There are companies now reassessing their engagement in certified sourcing projects, due to cost considerations and market pressure.

A further constraint on scalability emerged from Donau Soja's attempt to extend its approach beyond soy. An umbrella certification called "Fields of Europe" was developed to cover other crops, but companies did not see sufficient commercial benefit in certifying crops already predominantly produced within the EU. For soy, where the EU imports more than 90 per cent of what it consumes, certification proving European origin carries clear market value. For faba beans, lentils or peas, where imports are a smaller share, the proposition is weaker. Different instruments (POs, standardised contract templates, quality grading systems) may be more relevant for crops where the primary challenge is domestic supply-chain coordination rather than import substitution.

New approaches: regenerative agriculture and integrated project design

Donau Soja has begun developing a new project model that attempts to address several structural barriers simultaneously. Due to planned launch in Germany in the first half of 2026, the initiative bundles guaranteed offtake (from a large oil mill), agronomic training, peer-to-peer knowledge-sharing mechanisms, and certification of the primary collector with establishment of a complete Europe Soya certified supply chain. According to the organisation, the carbon footprint of Europe Soya is up to 90% lower than that of non-certified Brazilian soya. Farmer recruitment is being conducted in partnership with a seed company with an established farmer network reaching beyond self-selected “frontrunners” to target conventional arable farmers. The project aims to support participating farms in establishing soy as a stable market crop and implementing regenerative criteria that help them become more resilient to future challenges - through reduced pesticide use, improved soil fertility, and more stable yields. Genusskoarl, one of Donau Soja’s members, buys local soybeans from partner farms, further highlighting the need for guaranteed offtakes and collaboration between different parties of the value chain.

A related model can be observed in the case of Taifun-Tofu GmbH (hereafter Taifun, not a Donau Soja member as of this report’s publishing date), a South German organic tofu producer that contracts regional farmers directly and provides guaranteed offtake. This processor-led model demonstrates that food-grade soy supply chains can operate at regional scale without capital-intensive infrastructure, though its scalability is limited by Taifun's production capacity.

Assessment

The Donau Soja case demonstrates that building certified, traceable supply chains is achievable at considerable scale. It also demonstrates that supply-side capacity is a necessary but not sufficient condition for a functioning food-grade market: without sustained demand, certification premiums erode and the business case for farmers weakens. The newer bundled project models represent a more promising approach precisely because they address multiple barriers simultaneously.

3.4 Comparative case: Canada's lentil sector and the reduction of farmer risk

Overview

Canada's rise as a leading global producer and exporter of lentils results from a gradual alignment between agronomic suitability, coordinated supply-chain development and targeted public support. Concentrated largely in the Prairie provinces, particularly Saskatchewan, lentil production expanded from a niche crop in the late twentieth century to a core component of Canada's arable export economy. Unlike many European legume markets, Canadian lentils are primarily produced for food use and international trade.

Supply-chain structure and intervention logic

The Canadian lentil value chain is characterised by early and sustained investment in the middle of the chain. Farmers deliver lentils into a dense network of grain handlers and pulse processors equipped for cleaning, grading and segregation according to food-grade specifications. This infrastructure allows quality differentiation to be rewarded rather than penalised.

Industry coordination bodies such as Pulse Canada have acted as intermediaries between producers, processors and policymakers, focusing on market development, trade access and information sharing rather than setting prices directly. This provides some of the same functions as Terres Univia in France, but within a supply-chain context already oriented towards food use.

Role of policy

Canadian agricultural policy has shaped the sector through enabling conditions rather than direct price support. Federal and provincial funding has supported crop research clusters, extension services and innovation programmes. Trade and agri-marketing policies have reinforced an export-oriented model. From a European perspective, this contrasts with the CAP's historical focus on income support and environmental schemes. The Canadian case suggests that policy attention to aggregation, processing and market institutions can be as important as direct incentives to grow legumes.

Assessment

The Canadian experience offers relevant insights for Europe, though structural differences limit direct transferability. Canada's large export orientation, farm scale and concentrated production regions differ from the EU's fragmented geography. The Canadian model evolved over several decades with sustained investment; it cannot be replicated by a single policy intervention. What it does demonstrate is that the confidence gap for legume farmers is not inherent to the crop but to the supply-chain environment, and that where the right institutional and infrastructural conditions are in place, legumes can become a stable and commercially attractive component of arable farming systems.

3.5 Cross-cutting observations

Several findings recur across the case studies.

1. **Guaranteed offtake is the single most important factor in farmer willingness to adopt a new crop (LEGVALUE, 2021; EU CAP Network, 2025).** Every case in which farmer engagement has been sustained features a buyer committed to purchasing the harvest at a known or negotiated price.

2. **Interventions that address only one stage of the supply chain deliver partial results.** The cases that show the most promise are those that address multiple barriers simultaneously: training, offtake, infrastructure, and collective organisation.

3. **Existing cooperative and institutional structures can be extended to accommodate protein crops more readily than new structures can be built from scratch.** The Belgian pea programme and the Swiss cereal cooperatives demonstrate that where trust, logistics and post-harvest infrastructure already exist, including a new crop line is relatively straightforward.

4. **The distinction between short and long value chains matters for policy design.** Short value chains (direct selling, farm-gate sales) are already functioning. What remains underdeveloped is the long value chain: the multi-stage supply path from dispersed farm production through aggregation, processing and distribution to mainstream retail shelves. These findings inform the synthesis and policy recommendations that follow.

4. CONCLUSIONS AND RECOMMENDATIONS

The expansion of food-grade legume production in Europe can contribute to reducing import dependency, deliver environmental benefits and overall strengthen the resilience and sustainability of EU's food systems. The analysis presented in this report suggests that a major barrier to expanding food-grade legume production in Europe is not a lack of agronomic potential, farmer interest or consumer demand. Instead, it lies in the absence of coordinated infrastructure and governance in the middle of the supply chain, the segment between the farm gate and the food manufacturers where aggregation, quality management, processing and contracting must be organised if legumes are to move from a marginal rotational crop to a commercially viable one.

This finding is not new. What this research adds is a more granular account of how these weaknesses interact, and why they have proven resistant to the policy instruments deployed thus far. Three conclusions stand out.

First, the barriers are mutually reinforcing rather than sequential. The absence of processing infrastructure discourages collective organisation among farmers; the absence of collective organisation weakens bargaining power; and the resulting low volumes discourage investment in processing. The most promising initiatives examined in this report are those that bundle multiple interventions simultaneously.

Second, as demonstrated in the structural analysis, the infrastructure gap is not uniform: the barrier is most acute for advanced protein ingredients but considerably more tractable for minimally processed products, where coordination rather than capital expenditure is the primary constraint.

Third, the question of who coordinates the emerging sector is as important as whether coordination happens at all. If no deliberate institutional framework is established, the most resourced actors will shape the market by default, potentially replicating the concentrated, corporate-led structures that characterise the soy import chain.

Several mechanisms that could stabilise the supply chain are currently weak or unevenly developed. Proposals under the forthcoming CAP reform, including the possible recognition of protein crops as a CMO sector, could provide tools to address these gaps (European Parliament, 2024). However, whether these instruments benefit food-grade markets will depend on who mobilises them in practice and whether the policy design actively prevents feed-oriented lock-in.

4.1 Mapping barriers, enablers and recommendations

The recommendations draw directly on the evidence from the case studies and structural analysis. The case studies revealed that the most effective supply-chain interventions bundle multiple measures simultaneously; offtake guarantees for farmers or cooperatives, infrastructure suitable for food grade processing, training and collective organisation. The recommendations are accordingly designed as a coordinated set rather than isolated measures.

As documented in the structural analysis, first-year cultivation difficulties frequently lead to disappointing yields and a decision not to continue. The most effective support models combine agronomic training with peer networks, guaranteed offtake, and access to post-harvest infrastructure.

The table below maps the findings into a structured framework, linking the principal barriers identified in the structural analysis and case studies to the enabling conditions that could address them and the recommendations that follow (further elaborated below). These are directed primarily at EU-level and Member State policymakers, though several also have implications for cooperative organisations and sector bodies. They are framed as enabling conditions rather than prescriptions for specific market outcomes and are presented in order of the supply-chain stage they primarily address.

Barrier	Enabling condition	Recommendation
Aggregation and post-harvest infrastructure deficit: cooperative infrastructure optimised for cereals; few facilities for food-grade legumes	Regional shared facilities for post-harvest handling; incentives for existing cooperatives to extend operations to protein crops	**Recommendation 1:** Invest in regional aggregation and minimal-processing infrastructure
Weak collective organisation: few POs or IBOs for food-grade protein crops; farmers as fragmented sellers with limited bargaining power	Dedicated POs with professionalised management; ongoing operational funding; protection against buyer circumvention of collective bargaining	**Recommendation 2:** Support the creation and professionalisation of food-grade legume Producer Organisations
Market opacity and contractual insecurity: no centralised price reporting; bilateral contracts with strict rejection thresholds; price penalties	Transparent price information; standardised contract templates with risk-sharing clauses; minimum-price mechanisms	**Recommendation 3:** Improve market transparency and contractual security for legume producers
Feed-oriented lock-in and path dependency: decades of optimisation for feed; food-grade markets structurally immature	CMO protein sector designed to support food-grade markets specifically; eco-scheme conditionality linked to food-grade outlets	**Recommendation 4:** Ensure that CAP and CMO instruments actively support food-grade value chains
Knowledge and coordination gaps: limited agronomic advisory; first-year cultivation failures; no cross-border coordination	Bundled support combining training, peer networks and guaranteed offtake; cross-border coordination platforms	**Recommendation 5:** Invest in knowledge infrastructure and supply-chain coordination for food-grade legume production

1. Invest in regional aggregation and minimal-processing infrastructure

The EU and Member States should support the development of shared regional facilities for post-harvest handling of food-grade legumes, including cleaning, drying, sorting, segregated storage and basic processing such as milling and thermal treatment.

The structural analysis and case studies consistently identify the "missing middle" as the most critical bottleneck. The infrastructure needed for many food-grade applications is less capital-intensive than commonly assumed. Evidence from Belgium, the Netherlands and Switzerland suggests that cereal cooperatives can extend operations to include protein crops with relatively modest additional investment. Policy instruments to support this could include:

- Dedicated investment support under CAP Strategic Plans, and from 2028, the corresponding chapters in National and Regional Partnership Plans, for shared post-harvest infrastructure (e.g. cleaning, drying, sorting, basic processing), with eligibility criteria that prioritise cooperative and farmer-led ownership models through Investment measures or the proposed transition payment in CAP 2028–2034.
- Co-financing mechanisms enabling small groups of farmers (ten to twenty, as observed in Dutch practice) to collectively invest in basic processing equipment.
- Incentives for existing agricultural cooperatives to diversify into protein crop handling, with eligibility rules ensuring food-grade rather than feed-oriented outcomes.

2. Support the creation and professionalisation of food-grade legume Producer Organisations

EU and Member State policy should actively facilitate the creation of Producer Organisations dedicated to food-grade legumes, and should provide sustained operational funding to support their professionalisation beyond the initial establishment phase.

The organisational analysis highlights a persistent institutional void. The Dutch Protein Farmers PO demonstrates that such organisations can deliver tangible results but also illustrates their vulnerability in the absence of financial reserves or professional management capacity. Policy instruments to support this could include:

- Establishing protein crops as a recognised CMO sector with dedicated sectoral interventions, as proposed in the draft CMO regulation, thereby creating the legal basis for food-grade legume POs.
- Dedicated start-up and operational funding for legume POs, drawing on the health, biotech, agriculture and bioeconomy pillar of the European Competitiveness Fund, complemented where appropriate by national co-financing.
- Stabilisation or guarantee mechanisms enabling young POs to provide members with a degree of income security during negotiation periods, reducing vulnerability to being bypassed by individual buyers negotiating directly with members.
- Technical assistance programmes supporting PO governance, quality protocols and contractual frameworks, e.g. funded through Operational Programmes in the CAP and Knowledge interventions.

3. Improve market transparency and contractual security for legume producers

The EU should explore the development of price reporting mechanisms for food-grade legumes, and should support the dissemination of standardised contract templates with risk-sharing provisions.

The absence of transparent price signals compounds every other barrier. Policy instruments could include:

- Extension of EU market observatory mechanisms to cover food-grade legumes.
- Standardised contract templates incorporating quality tolerance bands (rather than binary accept/reject thresholds), risk-sharing in the event of quality downgrading, and minimum-price clauses.

4. Ensure that CAP and CMO instruments actively support food-grade value chains

The proposed protein sector interventions and CAP Strategic Plans should include provisions ensuring that support for protein crops is not captured by feed-oriented supply chains, but actively enables food-grade markets.

The structural analysis demonstrates that without deliberate policy design, new instruments risk reinforcing feed-oriented lock-in. The European Parliament's resolution on a European protein strategy (2023) and the European Policy Centre

(EPC, 2025) have both called for dedicated support structures for protein crops through the CMO framework. Policy instruments could include:

- CMO eligibility criteria distinguishing feed-oriented and food-oriented activities, with priority access for organisations serving food-grade markets.
- Linking at least a portion of coupled support and agri-environmental and climate actions to demonstrated food-grade market outcomes, rather than to production volume alone.
- Alignment of the European protein plan with operational CAP and CMO mechanisms. The downgrading from a "protein strategy" to a "protein plan," with no dedicated budget and approximately two years' delay, raises concerns about political commitment.
- Consideration of protein crops within the European preference mechanism. The exclusion of agriculture represents an inconsistency with the stated goal of strategic autonomy.

5. Invest in knowledge infrastructure and supply-chain coordination for food-grade legume production

EU and Member State policy should support agronomic advisory services, peer-learning networks and cross-border coordination platforms specifically oriented towards food-grade legume production. Specific actions include:

- Cross-border coordination platforms connecting supply-chain actors across Member States, e.g. the co-creation of a European plant-based innovation cluster (van Vugt and Nadeu, 2025) uniting research, industry, the public sector and civil society stakeholders.
- Improved dissemination of recommendations from Horizon projects such as those in the EU Crop Diversification Cluster (EU 2020).
- Integration of food-grade legume production knowledge into Member State advisory services and, where relevant, into national AKIS frameworks.

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