



Market opportunities for camelina and carinata in the bioeconomy



Market segment factsheets – Summary

Camelina and carinata are versatile intermediate oilseed crops whose value lies not in a single end-market but in their ability to supply multiple bio-based value chains (VCs) at once. Their oil, protein-rich meal and residual fractions can feed both established markets, namely vegetable oils and protein feed, and a range of emerging, higher-value applications: biopesticides and bioherbicides, biostimulants, nutraceuticals and cosmetics, biomaterials and biochemicals.

This cascading approach maximises the value generated per hectare, diversifies revenue and strengthens resilience against demand, price and regulatory shocks. Established markets offer immediate, volume-driven opportunities, while emerging applications offer higher value but require further technological development, regulatory validation and market building.

VC maturity is a further critical factor: countries with established bio-based sectors offer favourable conditions for short-term deployment, while less developed regions may require targeted investment, capacity building and stakeholder engagement.

The following factsheets summarise, for each market segment, current applications, market opportunities and market perspectives. A detailed analysis of VC maturity and country-specific roadmaps is provided in *D5.4: National roadmap and enabling business conditions*.



Market opportunities for camelina and carinata in the bioeconomy



Vegetable Oil

Current applications

Vegetable oils are a central intermediate product in camelina and carinata value chains. Depending on quality, composition and market requirements, these oils may be directed towards renewable fuels, oleochemicals, lubricants, surfactants, coatings, cosmetics and other industrial applications. Camelina oil is relevant for its high unsaturated fatty-acid content, including omega-3 alpha-linolenic acid, while carinata oil is mainly suited to industrial and energy applications.

Market opportunities

The same oil fraction can be directed to different downstream markets depending on its composition and quality grade, so production is not tied to a single outlet. This versatility supports cascading valorisation, where the oil serves high-demand industrial applications while meal and co-products are valorised in feed, bio-input or material markets. Interest in locally produced, sustainable oilseeds is increasing as markets are shaped by sustainability requirements, traceability and demand for renewable carbon.

Market perspectives

The market is dominated by established crops (rapeseed, sunflower, soybean, palm), so camelina and carinata are unlikely to compete on volume or price; their potential depends on differentiated attributes. Price competitiveness remains a challenge, and industrial applications require consistent seed quality, efficient extraction and compliance with product-specific standards. Dedicated supply chains, quality protocols and aggregation through cooperatives will be essential to build market confidence.



Market opportunities for camelina and carinata in the bioeconomy



Protein Feeds

Current applications

Protein-rich meal is the co-product generated after oil extraction from camelina and carinata seeds, and its valorisation is crucial for the economic viability of the overall value chain. Its use depends on nutritional composition, protein content, digestibility, processing conditions and antinutritional compounds, aspects characterised within CARINA through palatability and digestibility tests and meal characterisation.

Market opportunities

The main opportunity is linked to European demand for alternative protein ingredients: the livestock sector remains dependent on imported protein, especially soybean meal. The EU Protein Strategy, signalled in the EU Vision for Agriculture and Food, and the broader push for protein autonomy could further improve market conditions for camelina and carinata meal as a locally produced, low-iLUC alternative. The feed pathway is particularly relevant where livestock production, feed manufacturing and oilseed processing are geographically close.

Market perspectives

Feed is the most immediate large-volume outlet. Uptake depends on managing antinutritional factors (glucosinolates, fibre), ensuring consistent meal quality and building familiarity among feed producers, together with regulatory clarity on inclusion rates and species suitability. Without a viable feed or alternative co-product market, the economic attractiveness of oil production would be significantly reduced.



Market opportunities for camelina and carinata in the bioeconomy



Biopesticides and Bioherbicides

Current applications

Camelina and carinata oils, meals and residues contain bioactive compounds with crop-protection activity, notably glucosinolates and their breakdown products, pelargonic acid and pyroligneous compounds (wood vinegar). Within CARINA, extraction and formulation protocols were developed for these molecules and validated candidate products in dedicated field and laboratory tests (WP2: Full biomass valorisation with a circular economy approach).

Market opportunities

Demand is encouraged by the EU policy framework: under the European Green Deal, the Farm to Fork Strategy set targets to reduce chemical pesticides by 50% and expand organic farming to 25% by 2030, supported by mandatory Integrated Pest Management. Validation tests showed real efficacy, for example one candidate reached 100% mortality after 48 hours against rice weevil, and camelina oil reached 77% at 48 hours, while pelargonic-acid and terpene formulations produced herbicidal activity.

Market perspectives

A high-value but demanding pathway: market entry is shaped above all by a long, costly authorisation process, more complex than for biostimulants. In the short term the pathway suits pilot-scale and niche applications, particularly in organic farming; in the medium to long term it could become an important high-value outlet if technical and regulatory barriers are overcome. Commercialisation requires partnerships with crop-protection companies and research organisations.



Market opportunities for camelina and carinata in the bioeconomy



Biostimulants

Current applications

Biostimulants improve plant nutrient-use efficiency, stress tolerance, crop quality or nutrient availability. Camelina and carinata residues and processing by-products can be valorised as raw materials: within CARINA, protein hydrolysates were identified from the residual press cake and polyphenols from the biomass as biostimulant candidates supporting crop growth and resilience (WP2: Full biomass valorisation with a circular economy approach).

Market opportunities

The market is expanding due to increasing demand for low-impact agricultural practices and reduced dependence on synthetic inputs. In the EU, plant biostimulants are covered under the Fertilising Products Regulation (FPR), which creates a harmonised framework and clearer market conditions. This pathway is coherent with circular bioeconomy principles, turning co-products and residual biomass into higher-value agricultural inputs.

Market perspectives

Promising but still emerging. Regulatory approval requires scientific validation of efficacy and clear identification of active components. Commercialisation would require collaboration between research institutions, input companies and processors, with pilot testing, formulation development and field validation before large-scale entry. Development depends on technological readiness, demonstrated agronomic benefits and stable, marketable products.



Market opportunities for camelina and carinata in the bioeconomy



Nutraceuticals, Cosmetics and Speciality Applications

Current applications

Camelina oil is of interest as a plant-based speciality ingredient due to omega-3 fatty acids (alpha-linolenic acid), tocopherols, phytosterols and other bioactive compounds. Beyond food-related uses, cosmetic and personal-care applications represent a higher-value, non-food outlet, supported within CARINA by cooperative experience in cosmetic and essential-oil production in some partner countries. Bio-based films for encapsulation are a further non-food outlet aligned with circular valorisation.

Market opportunities

Consumer demand for natural, plant-based and sustainably sourced products is increasing, creating interest in speciality oils and ingredients. Camelina oil could benefit if marketed as a speciality ingredient rather than a bulk commodity. Cosmetic and encapsulation routes are particularly relevant for small-scale and territorially based value chains where quality and differentiation matter more than volume.

Market perspectives

Selective, higher-value pathways. Success requires strict quality control, regulatory compliance, stable product characteristics and, for several applications, dedicated processing and formulation development. Quality-preserving extraction (e.g. cold pressing), controlled storage and traceability are critical, and certification may further strengthen market positioning. Any nutritional or health-related positioning falls under EU food and health-claim rules and is outside the scope of this assessment.



Market opportunities for camelina and carinata in the bioeconomy



Biomaterials

Current applications

Biomaterials include bio-based plastics, biopolymers, coatings, packaging, mulch films and other renewable material applications. Camelina and carinata may contribute through oils, residues and derived chemical intermediates. Within CARINA, this route is illustrated by the valorisation of brassylic acid from carinata oil as a chemical intermediate for biopolymer production.

Market opportunities

The market is expected to expand as industries seek alternatives to fossil-based materials, with packaging, agriculture, consumer goods and speciality materials among the most relevant application areas. This pathway is particularly relevant in the context of circular-economy policies and growing demand for renewable carbon sources. The opportunity for camelina and carinata lies in supplying sustainable feedstocks to biorefineries and material producers.

Market perspectives

Biomaterials often require higher technological readiness and stronger industrial partnerships than fuel or feed markets, so development is more likely in countries with advanced bio-based industries and processing infrastructure. Key challenges include feedstock consistency, conversion efficiency, material performance and cost competitiveness. Integration into biorefinery systems may improve feasibility by allowing multiple outputs from the same biomass stream.



Market opportunities for camelina and carinata in the bioeconomy



Biochemicals

Current applications

Bio-based chemicals represent a broad market including surfactants, lubricants, solvents, monomers, coatings and oleochemical intermediates. Camelina and carinata oils may be suitable for selected oleochemical pathways, especially where their fatty-acid profiles match specific industrial needs. Vegetable oils already play an important role in oleochemistry, and the two crops could provide additional sustainable feedstocks.

Market opportunities

This market is closely linked to the transition from fossil to renewable carbon in industrial production. Emerging opportunities include bio-based lubricants, surfactants, resins, coatings and speciality chemicals, which may offer higher value than bulk energy markets where product performance, sustainability certification and traceable sourcing matter. Camelina and carinata could also support local or regional biorefinery models processing oils and co-products into multiple outputs.

Market perspectives

Promising but dependent on industrial demand, processing feasibility and price competitiveness. Compared with bulk energy markets, biochemicals may require lower volumes but higher quality specifications and stronger integration with specialised industrial users. Biochemicals should be considered a medium-term opportunity, dependent on continued research, pilot-scale validation, investment in processing technologies and collaboration between farmers, processors and chemical industries.



Recommendations for camelina and carinata in the bioeconomy



Recommendations for Market Uptake

1. Market relationships

Establish long-term contracts, forward purchasing agreements and cooperative business models to reduce uncertainty for farmers and support integration into existing farming systems

2. Processing infrastructure

Invest in oil-extraction, storage, logistics and biorefinery capacity, prioritising less-developed regions where infrastructure gaps limit market opportunities

3. Market diversification

Develop feed, nutraceutical, biomaterial and biochemical applications alongside fuels, valorising oils, meals and co-products to improve value-chain resilience

4. Awareness and knowledge exchange

Strengthen demonstration activities, knowledge-exchange platforms and stakeholder networks to disseminate market opportunities and support adoption





Recommendations for camelina and carinata in the bioeconomy



Research and Innovation Priorities

1. Crop adaptation

Advance breeding for higher productivity, improved oil quality, enhanced protein composition and adaptation to diverse agronomic conditions

2. Processing & valorisation Research & Development

Optimise processing technologies and develop pathways converting oils, meals and residues into high-value products

3. Certification & traceability

Develop robust certification, traceability and sustainability-assessment frameworks, including for low-iLUC, to support market access and compliance

4. Market & consumer research

Improve understanding of consumer acceptance, market dynamics and business models for emerging bio-based products

5. Pilots and Living Labs

Continue pilot projects, demonstration activities and Living Lab approaches to test business models and strengthen stakeholder collaboration

