

Unlocking the Rockrose (*Cistus ladanifer*) value chain: Insights from the ESTEVA+ project on post-distilled biomass valorization in Alentejo, Portugal.

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The Problem



Across the Iberian peninsula, the shrub *Cistus ladanifer* is considered a weed in agroforestry landscapes. Its rapid spread and regrowth requires frequent removal to ensure eligibility for CAP payments. This leads to severe soil erosion of these poor-quality soils, reduces soil carbon and biodiversity and increases stream and river sedimentation, blocking dams and reducing water quality.

An agroecological solution?

Despite its status as a 'weed', *Cistus ladanifer* is a source of essential oil (EO) of high market value. Currently, extracting EO from *Cistus* is mainly an artisanal, small-scale and labour-intensive practice. At MVARC, we have introduced a mechanized harvesting system to scale up production and developed a line of cosmetics using the EO and hydrolate. However, to produce 1kg of EO by steam distillation requires up to 2000kg of *Cistus* biomass and generates around 1500 litres of hydrolate, thus generating a considerable amount of "waste".

Can we build on agroecological principles to re-think this "waste" into co-products that help improve soil and animal health, and reduce inputs such as synthetic fertilisers and fossil fuel?

Current System



Circular Bioeconomy

Soil amendment

Rationale: Ramial chipped wood (RCW) is made from the small diameter branches of woody species and when applied as a soil amendment, has been found to increase soil biological activity and soil organic matter in agricultural systems (Lemieux & Germain, 2001; Westaway, 2020).

ESTEVA+ trial: Replicated on-farm trials are investigating the impact of applying post-distillation biomass as RCW in orchard habitats. In March 2026, biomass was applied at 10 and 20 t/ha and the impact on soil health and plant growth is being assessed and compared with a no-application control.



Bioenergy

Rationale: Growing concerns over the environmental and geopolitical risks of relying on non-renewable fossil fuels have intensified interest in renewable energy sources. Existing bioenergy research on *Cistus ladanifer* has focused mainly on its chemical composition, with limited work evaluating its potential as a solid biofuel (Marques *et al.*, 2019) and no work on post-distilled biomass to date.

ESTEVA+ trial: The energetic potential of post-distillation biomass is being assessed through the characterization of fuel properties (including moisture, ash, volatile matter, and calorific value), contrasting harvest season and different plant ages. Pelletisation trials will follow in 2027.

Compost

Rationale: The composting of aromatic plant residues, particularly post-distilled biomass, is gaining traction as a sustainable waste management strategy that adds value to underutilized by-products (Mehdaoui *et al.*, 2024). Composting degrades toxic compounds (e.g., terpenoids, phenolics) found in aromatic species.

ESTEVA+ trial: Biomass harvested in spring and summer 2026 is being composted in combination with locally and seasonally available co-materials (sheep manure with either olive or grape pomace). Degradation dynamics, nutrient stabilization, and compost quality parameters are being assessed.



Animal fodder

Rationale: Shrub species such as *Cistus* may provide supplementary forage for ruminants during periods of scarcity. Young growth can contain higher crude protein and lower fiber levels. Although condensed tannins may reduce intake at high concentrations, they can also improve protein utilization, reduce methane emissions, and control gastrointestinal parasites.

ESTEVA+ trial: While extracts from fresh *Cistus* have shown promising results (Guerreiro *et al.*, 2020), the nutritional value of post-distillation biomass remains unknown. ESTEVA+ is analysing the nutritional composition over a 12-month period to understand changes in nutritional value.

Challenges to upscaling

Changing mindsets. Farmers perceive the shrub as a weed, as a sign of poor land management, as well as a financial risk that jeopardises CAP payments. We need to demonstrate that managing *Cistus* as a crop with multiple products can work financially, as well as benefitting farming practices by improving soil quality.

Changing policies. Portuguese CAP does not consider *Cistus ladanifer* as a crop, treating it as a weed despite its classification under CN Code 1211 90 86 in Annex I of the TFEU. Under EU law, this listing automatically defines it as an agricultural product, making the government's denial a contradiction of primary EU law. A dialogue is underway with IFAP and GPP to discuss this status. Interestingly, ESTEVA+ is funded by Portuguese government through the National Innovation Agency.

