

The biggest drivers of consumers transitioning from meat to plant-based protein products are the environmental and health benefits. PROTEIN2FOOD has examined the **environmental sustainability** of protein-rich foods made from legumes and pseudo-cereals grown in Europe. Despite containing **highly processed protein ingredients**, the new foods developed within PROTEIN2FOOD show a substantially **better environmental footprint** as compared to traditional animal-based foods. Crop yields, efficiency of protein extraction as well as further usability of by-products were decisive parameters for the overall environmental performance of the plant-based foods and are starting points for future optimisation.

Main Achievements

The **food prototypes** developed within PROTEIN2FOOD have a high potential of providing nutritious convenience foods to consumers. The prototypes are based on legumes and pseudo-cereals that require substantial processing.

A life cycle assessment (LCA) was performed, benchmarking the prototypes against their traditional animal-based counterparts. Data on all steps from field to fork, including processing, was compiled into the life cycle models to reflect the production at commercial scale. Environmental and socio-economic metrics were analysed, such as carbon, land, and water footprint and profitability for farmers. The main findings of the sustainability assessment were:

Environmental footprint (Figure 1)

- The new PROTEIN2FOOD plant-based protein-rich foods have a **much lower carbon footprint** than animal-based alternatives.
- They are also more likely to have **lower environmental impacts for most metrics** as compared to their animal-based counterparts, including i.e. fine particulates emissions and acidification.
- **Crop yields** of and the **efficiency** of protein extraction from **domestic legumes** calls for further optimisation in order to reduce their relatively high land footprint and processing energy demand.

Environmental Footprint in Comparison

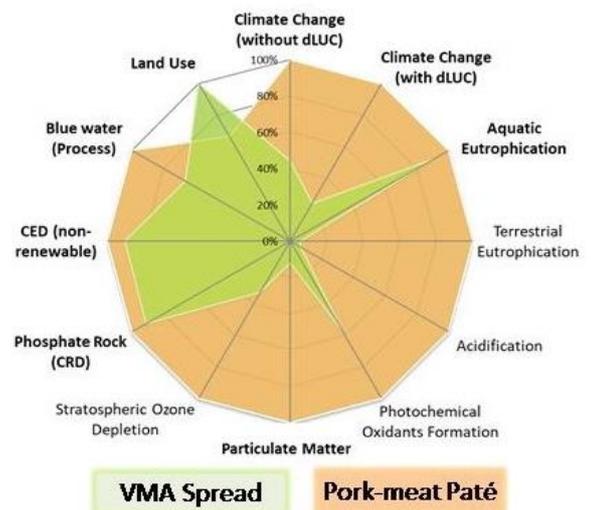


Figure 1. Compared impact level (%) of indicators of environmental footprint

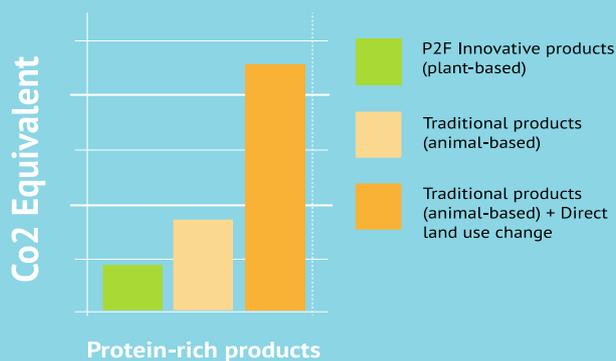
PROTEIN2FOOD Paté: vegetable meat alternative spread (VMA Spread) (green)

Pork meat Paté: traditional animal-based spread (orange).

dLUC: direct land use change related to imported soy for feed; CED: Cumulative Energy Demand; CRD: Cumulative Resource Demand.

“The PROTEIN2FOOD prototypes are protein-rich and nutritional, providing alternative options with a significantly lower environmental footprint than traditional products.”

Carbon footprint



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Impacts

A potential to reduce environmental footprint of European food systems

Food consumption is responsible for 20%-30% of the total environmental burden in Europe, with meat and dairy products sharing a major part. Agriculture is the main driver of biodiversity loss in Europe and a major source of nitrate emissions in water. New plant-based protein foods from locally grown crops that replace meat and cow milk can contribute to a large reduction of the environmental footprint of European food systems and provide incentives for a diversified agricultural production.

More sustainable food consumption

Legumes should play a major role in a balanced diet aimed at shifting from animal-based to more plant-based nutrition. PROTEIN2FOOD prototypes provide opportunities for a broader market supply with nutritious protein-rich foods, in some cases, with preferred nutritional properties, such as a lower saturated fat content. Diet change scenarios assessed within PROTEIN2FOOD showed that highly processed plant protein combined with mildly processed legumes would be ideal to move towards more sustainable food consumption.

Policy Challenge

The Common Agricultural Policy (CAP) framework has a limiting effect on a domestic supply of legumes to EU consumers and the affordability of highly processed protein foods.

Currently legumes only occupy about 1.5% of the agricultural land in the EU. These barriers slow down

the transition of legumes becoming staple feed crops for food production. A supporting framework is needed to achieve this transition.

Recommendations

- To improve overall sustainability of plant-based protein foods, **more research into optimising efficiency** along the supply chain of agriculture and food production is needed to achieve higher crop yields, higher protein extraction rates, and high value use of side-streams of processing.
- Large variations of inventory data are implicit to food systems, yet **robust LCA comparisons** of proteins from plant and animal sources should consider existing parameter ranges and particularly investigate adequate modelling of nitrogen flows during crop growing and animal husbandry.
- **Policy incentives** should make legumes and pseudo-cereals more financially attractive to farmers and plant protein products more affordable to a broad range of consumers.
- Create evidence-based **public information campaigns** about the health and environmental benefits of plant-based protein foods.

References

PROTEIN2FOOD (2018). [Deliverable 5.2: Report on the methodology applies in this project for Life Cycle and Socio-Economic Assessment.](#)

PROTEIN2FOOD (2018). [Deliverable 5.3 Part I – Report on the Life Cycle Assessment Results.](#)

PROTEIN2FOOD (2018). [Deliverable 5.3 Part II – Report on results of Socio-Economic Assessment.](#)

PROTEIN2FOOD (2019). [Deliverable 2.5 – Ingredient selection.](#)

For more information visit: <https://www.protein2food.eu>



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