3D-Printed Whole-Cut Meat and Seafood Alternatives

REVO Foods

Like a PRO

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LIKE-A-PRO is a EU-funded project aiming to facilitate sustainable and healthy diets by mainstreaming alternative proteins and products, making them more available, accessible and acceptable.

Benefits of 3D-printed whole-cut alternatives

3D-printed whole-cut alternatives offer opportunities to diversify protein sources while providing familiar plant-based substitutes for conventional meat and seafood. Unlike traditional plant-based products, which predominantly focus on minced and formed formats, whole-cut alternatives aim to reproduce the complex textures, appearance and culinary functionality of fish fillets and meat cuts. By combining recognisable product formats with alternative protein ingredients, these products can facilitate the adoption of plant-based and flexitarian diets while expanding the variety of available food choices.

Development challenges

Developing plant-based whole-cut alternatives requires reproducing complex internal structures, sensory characteristics and cooking performance. Manufacturers must balance ingredient functionality, nutritional quality, texture and flavour while ensuring suitable printability and structural stability during processing. Industrial scalability represents an additional challenge, as advanced food-printing technologies must achieve consistent product quality, sufficient throughput and competitive production costs. The incorporation of different alternative protein sources also requires careful formulation optimisation to address differences in hydration, binding and sensory properties.

Funded by the European Union

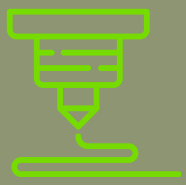
REVO Foods' solution

Within LIKE-A-PRO, REVO Foods developed three 3D-printed whole-cut alternative protein products: a **salmon fillet, a white fish analogue (El Blanco) and a prime cut**. The seafood alternatives incorporated pea, fava bean and rapeseed protein formulations, while the prime cut was developed using cultivated mushroom, microbial and rapeseed proteins. Through its proprietary 3D food-printing and texturisation platform, REVO produced structured alternatives with differentiated textures, internal structures and culinary characteristics.

Following formulation optimisation and prototype development, the salmon fillet and white fish alternatives were successfully produced in **30 kg industrial batches**, demonstrating their compatibility with REVO's manufacturing platform. Industrial printing trials increased theoretical throughput to approximately 10.6 kg/h, while the products maintained structural integrity during subsequent processing, including thermal hardening, vacuum packaging and pasteurisation. The developed solutions offer four key advantages:

Nutritional differentiation and protein diversification

The selected formulations provide approximately 10–12.5 g protein and 6–7.4 g dietary fibre per 100 g, alongside predominantly unsaturated fats and omega-3 fatty acids from microalgal oil. Nutritional assessments identified favourable characteristics compared with conventional meat and fish, although further optimisation of protein quality and selected micronutrients remains relevant.



Complex whole-cut structures through 3D printing

REVO's proprietary technology enables controlled deposition of protein- and fat-based matrices, supporting differentiated internal structures, textures and product geometries. The three product concepts demonstrate its versatility across seafood and meat-style applications.

Product stability and sensory acceptability

Shelf-life studies demonstrated satisfactory microbiological stability for the selected pea- and fava bean-based seafood formulations and the A. bisporus-based prime cut over the 54-day evaluation period. Sensory assessments identified acceptable performance while highlighting formulation-dependent differences in texture, colour and flavour.

Successful industrial validation and formulation flexibility

Salmon and white fish formulations were successfully transferred to industrial 3D-printing equipment, demonstrating increased throughput and compatibility with downstream processing. The use of different alternative protein sources further supports product diversification within a common manufacturing platform.

Commercial potential and value proposition

REVO Foods' whole-cut alternatives offer opportunities within the evolving plant-based meat and seafood markets, particularly through differentiated products addressing consumer demand for familiar culinary experiences. Unlike companies focused exclusively on B2B manufacturing, REVO combines proprietary 3D-printing technology with an established consumer brand, direct-to-consumer online sales, retail distribution and foodservice channels. This multichannel model provides a foundation for introducing new formulations, expanding the product portfolio and reaching additional consumer and commercial segments.

Overall, the LIKE-A-PRO developments demonstrate the feasibility of incorporating diverse alternative protein ingredients into structured whole-cut products using industrial 3D-printing technology. By combining differentiated product formats, nutritional characteristics, acceptable sensory performance and demonstrated industrial scalability for the seafood alternatives, REVO Foods' portfolio provides a foundation for further product optimisation and commercial expansion within the plant-based meat and seafood markets.

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