

# UNLOCKING SUSTAINABLE AQUAFEED WITH UK GROWN HEMP PROTEIN

## PARTNERS

Rare Earth Global (REG) | University of Stirling's Institute of Aquaculture | Mowi Scotland Ltd | Nofima | Sustainable Aquaculture Innovation Centre (SAIC)

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## BACKGROUND

Many ingredients in salmon feed production in the UK are imported from regions such as South America and Central Europe. Of these imported ingredients, soy protein – the primary protein source – contributes to deforestation and has a high carbon footprint due to both its agricultural impact and the emissions from long-distance transport. Recent geopolitical events, such as Brexit and the war in Ukraine, have exposed the vulnerability of global supply chains, underscoring the need for sustainable, locally produced alternatives, particularly those derived from plant by-products, aligning with circular economy principles.

Hemp presents a viable alternative to soy, offering a comparable amino acid profile and low in antinutritional factors. Rare Earth Global (REG) has developed a UK-based model to supply hemp protein concentrate (HPC) sourced from locally grown industrial hemp. The University of Stirling's (UoS) Institute of Aquaculture led the research for this project, while Mowi (via Bergen-based Mowi Feeds) supported the development of commercial formulations and the provision of feed for the trials.

## AIMS

This innovation set out to address five key objectives:

1. Validate hemp protein as a viable non-conventional feed ingredient to improve productivity to meet the projected global demand for 37.4 million additional tonnes of feed by 2025;
2. Improve the sustainability of methods and production across the seafood sector to mitigate environmental impacts;
3. Reduce commercial risks by adapting existing farming, harvesting, and processing methods already used for human-grade hemp seed;
4. Establish collaboration and partnerships;
5. Benefit the UK economy by creating jobs, reducing carbon emissions, and enhancing economic resilience.

## POTENTIAL FOR INDUSTRIAL HEMP

The project focused on establishing a UK-based, sustainable supply chain for a competitively priced fish feed ingredient with significantly lower environmental impacts than soy. These benefits include reducing deforestation, a decreased carbon footprint, and the use of local by-products, all of which contribute to a zero-waste system.

REG cultivates industrial hemp primarily for its stalks, which is used in construction materials such as [hempcrete](#), plastics, and bioenergy. The seeds, which are not used in these processes, are a rich by-product with high protein and essential fatty acid content. When cold-pressed to extract oil, the remaining meal can yield a protein concentration of up to 50%, comparable to soy protein concentrate (SPC), creating the opportunity to process a protein concentrate with a potentially negative carbon footprint.

## RESULTS

Feed trials demonstrated that hemp protein concentrate is an effective replacement for SPC in Atlantic salmon diets. REG's HPC achieved a superior feed conversion ratio (FCR) compared to SPC, meaning less feed was needed for equivalent weight gain. Trials showed that a 15% inclusion of HPC in diets did not compromise fish growth, welfare, or flesh quality. There were no observed behavioural changes, and no adverse findings in gene expression, histology, or gut health metrics.

Lifecycle analysis confirmed HPC as the most sustainable feed protein tested, with emissions reduction of at least 71% compared to other sustainable alternatives.

When considering full plant utilisation, HPC showed a net carbon-negative impact. Its compatibility with UK crop rotations further amplifies its environmental benefits. Moreover, [hemp improves soil health](#), requires less water than other crops, and supports better yields in follow-on crops.

The project enabled advances in farming and processing infrastructure to ensure scalability. Trials helped fine-tune production schedules and protein yield. REG is also working with partners to develop high-yield hemp genetics for large-scale production, reducing raw material costs by up to fourfold.

A collaboration between REG and the UoS was established with support from the Sustainable Aquaculture Innovation Centre (SAIC). This partnership laid the groundwork for novel research into the use of HPC in Atlantic salmon and tilapia diets. The partnership with UoS was expanded to include Wageningen University through EU funding. Continued support from SAIC and new engagements with Cefas, Mowi Scotland, Nofima, and Loch Duart further solidified REG with the wider aquaculture and research communities.

The project's success enabled REG to raise funds from private investment, with additional fundraising efforts currently underway. One new job has already been created, with additional new roles anticipated over the next two years.

## IMPACT

This project confirmed that UK-produced HPC is a viable, sustainable feed ingredient for Atlantic salmon and shrimp. With commercial sales expected to begin in 2025, HPC is positioned to become a trusted, branded ingredient in industrial aquafeed. Revenue from HPC is projected to reach £150,000–£300,000 within 12–18 months, with potential to reach £1 million in the following year.

The successful validation of HPC has broader implications beyond individual trial results. By establishing a domestic supply chain for high-quality protein feed, the project directly supports the resilience of the UK aquaculture sector. It reduces reliance on imported feed ingredients, which are subject to price volatility and geopolitical disruptions, and instead promotes a more stable and locally integrated production model.