COMPLETED PROJECT CASE STUDY

INTEGRATING AVIAN PROTEIN PRODUCTS INTO SALMON FEED PRACTICES

PARTNERS

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BACKGROUND

Global salmon feed production currently relies on three primary protein sources: soy meal, fish meal, and land animal protein. However, the aquaculture sector is continuously seeking sustainable and cost-effective alternatives to traditional feed ingredients. Among these alternatives, avian protein products (APPs) have emerged as an option to be considered. Derived from poultry by-products, APPs include offal, blood meal, and feather meal, which are processed into high-protein feed components.

Compared to many other salmon farming regions worldwide, in the UK there is a higher reliance on marine resources and imported vegetable protein sources, such as soy protein concentrates. Despite their successful use in Chilean and Australian salmon farming, the UK has been hesitant to adopt APPs due to consumer acceptance concerns.

Integration of APPs into salmon diets presents an opportunity to reduce the sector's reliance on fishmeal and soy protein, which are often imported and can have significant environmental footprints.

The potential shift towards APPs is driven by several factors. Firstly, the rendering of poultry by-products into usable feed ingredients aligns with the principles of the circular economy, promoting waste reduction and resource efficiency. Secondly, APPs offer a high-quality protein source that supports the growth and health of farmed salmon. Moreover, their use can lower feed costs, providing economic benefits to producers.

This project was led by the Institute of Aquaculture at the University of Stirling and BioMar, a global leader in sustainable aquaculture feeds. The project also saw collaboration from industry partner SARIA, a leading raw material producer.

AIMS

The primary aim of this project was to drive change and address issues within the UK aquaculture sector by using science and innovation to develop an integrated salmon value chain.

The project focussed on connecting all aspects of the salmon value chain to facilitate the adoption of contentious feed raw materials. The team aimed to promote sustainably produced raw materials and build confidence throughout the value chain. The following objectives were proposed:

1. Assess perceived versus real constraints to retailers and consumers regarding the use of raw materials in salmon feeds
2. Identify key factors affecting the chemical and biological qualities of UK-produced avian protein products (APPs)
3. Evaluate the impact of using APPs as the primary protein source on fish health
4. Evaluate the impact of using APPs as the primary protein source on fish quality
5. Conduct a lifecycle analysis (LCA) to determine the environmental impact of using APPs, marine ingredients, and alternatives.

UNDERSTANDING ATTITUDES TOWARDS AND IMPACT OF APPS

To achieve its objectives, the project team divided the initiative into multiple work packages. The first two work packages (WP1 & WP2) focused on setting the background and scope of the project. These included retailer and consumer surveys, conducted by the Institute of Aquaculture, to understand the perceived and real risks associated with using raw materials in animal feeds.

Consumer surveys involved over 200 participants and introduced them to the concepts of alternative ingredient use, particularly APPs, in salmon feed.

A workshop included participants across the value chain: renderers, feed producers, salmon farmers, processors, retailers, regulators and the media.

CONSUMER SURVEY FINDINGS

The consumer survey revealed that most respondents were not concerned about using APPs in salmon feeds, with many stating they would eat salmon that had been fed diets containing poultry products. However, a significant portion expressed concerns, citing perceptions of unnaturalness and reduced product quality. A similar number of respondents sought more information before forming an opinion.

Compared to another novel protein source, microbial protein (FeedKind™), a similar number of respondents were willing to eat salmon fed this diet, and some were even willing to pay a premium. Fewer respondents indicated they would pay a premium for APP-fed fish. A notable number of respondents wanted more information about microbial protein before forming an opinion.

Many respondents were unaware that salmon is farmed or that feed composition is not detailed on the labels of farmed salmon in the UK. Those aware of APPs recognised their benefits, such as waste reduction, protection of wild fisheries, and environmental advantages.

The survey indicated a need for more information, preferably from an independent source to ensure transparency and trust. Suggestions included developing a trusted website and considering endorsements from environmental NGOs to support alternative feed sources like APPs.

Survey results were shared within the consortium and more broadly through direct engagement, regular meetings and a workshop in Dunblane, alongside several media releases. These insights were intended to help define the parameters for the subsequent work packages.

Nutritional trials were to encompass three work packages (WP3, WP4 & WP5), including biochemical and molecular analyses to evaluate the impact of APPs on fish digestion and growth. Additionally, a lifecycle analysis assessed the environmental impact.

LIFECYCLE ASSESSMENT (LCA) ANALYSIS

The LCA examined the environmental impact of APP production compared to fishmeal, maize gluten, and soybean meal. Key parameters assessed included Global Warming Potential (GWP), Photochemical Oxidation (PCO), Acidification Potential (AP), Eutrophication Potential (EP), Land Use (LU), and Consumptive Water Use (CWU).

The energy-intensive production process of maize gluten meal (MGM) resulted in the highest environmental footprint. Soybean meal production, involving hexane for oil extraction, had high PCO impacts. Fishmeal production had a low land and water use but a high phosphate impact. Poultry by-product meal (PBM) was competitive in emissions but had the highest chlorofluorocarbon emissions.

Overall, PBM had a better environmental footprint than soybean meal and MGM. Fishmeal had one of the lowest ecological footprints across most LCA parameters. Allocation of impacts in production processes, particularly between poultry by-products and edible poultry products, was noted as a factor that could significantly affect LCA results.

The study highlighted feed as the highest contributor to environmental impacts in aquaculture. Therefore, diets with lower energy-intensive ingredients like MGM had the lowest environmental footprints. The PBM value chain is largely within the UK, potentially minimising global impacts and ensuring more responsible production practices.

RESULTS

The project achieved several key milestones, including consumer-focused surveys and a lifecycle analysis. However, many original objectives, particularly lab analysis and feed trials to determine the effects of avian protein products on fish health and quality, remain incomplete and require further work.

IMPACT

This research has the potential to help reduce the environmental footprint of the Scottish salmon aquaculture sector. Findings from this project outline the lower environmental impact of avian protein products, making the case for their use in salmon feeds. This project has also strengthened the relationship between key consortium partners, as well as many more stakeholders across academia, industry, and the media.

A sector-wide workshop brought together diverse stakeholders for the first time to discuss these key issues, emphasising the importance of proactive communication. The event was a landmark in bringing together stakeholders from across the sector to discuss this issue for the first time. Additionally, some learning from the agri-GM sector demonstrated the benefits of proactively communicating such potentially contentious issues.

Students at the University of Stirling MSc cohort were integrally involved in the consumer surveys and data collection and analysis, contributing to next-generation understanding of the role of alternative ingredients in feed production.

A renewed emphasis on waste reduction, the circular economy and local food could further mitigate the risks of using new ingredients like APPs. The consortium has identified the next steps, including further examination of consumers' key concerns and investigating what information consumers would be interested in. This project has also identified several areas for improvement, including clearer guidance and parameters for subsequent project stages.