Business Models for the Circular Economy: Valorisation of Food Industry By-products to produce Animal Feed Ingredients

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Introduction

The NEWFEED project aims to develop sustainable business models for the valorisation of food industry by-products into high-value animal feed ingredients, in accordance with the principles of a circular economy, promoting resource efficiency and waste reduction. The project focuses on transforming by-products from the winery, orange juice, and olive oil industries into alternative feed sources for dairy cattle, sheep, and broiler chickens.

New business models are essential to promote the circular economy, as they provide the framework for integrating circular principles into business operations. These models focus on resource efficiency, waste minimization, and the creation of closed-loop systems where by-products and waste are repurposed into new products. The development of such business models requires innovative thinking, collaboration across industries, and the adoption of innovative technologies and processes.

The NEWFEED project addresses these challenges by developing innovative business models that transform food industry by-products into high-value secondary feedstuff. This approach not only optimizes resource use and minimizes waste but also aligns with the principles of sustainability. The solution adopts a multi-actor approach, engaging a diverse range of stakeholders across the value chain, including food industries, feed producers, farmers, research centres, and advisory institutions. This collaborative strategy ensures that the project benefits from a wide array of expertise and perspectives, enhancing the robustness and applicability of the solutions developed.

This abstract focuses on the case study that has demonstrated the viability of producing a feed ingredient for dairy cattle by valorising grape stems, a by-product of wineries.

Methodology

The business model creation process begins with idea generation and feasibility studies, where potential by-products are identified and assessed for their suitability in animal feed production. This phase includes market research and stakeholder consultations to understand industry needs and opportunities. The feasibility study involves analysing the technical, economic, and environmental aspects of using these by-products as feed ingredients. This analysis helps in identifying the most promising by-products, their potential uses and the best methods for their conversion into animal feed.

After preliminary laboratory analysis, prototypes of the new ingredients need to be included in feed products and tested in pilot trials with livestock to validate their nutritional value and market acceptance. These trials are conducted in collaboration with research institutions, feed producers, and livestock farmers. The pilot trials involve feeding the new feed ingredients to the animals under study, and monitoring their health, growth, and productivity. Feedback from these trials is used to optimize both the product and the business model. The pilot trials also provide valuable data on the practical benefits of the new feeds, such as improved animal health, increased milk production, and reduced feed costs that would be or paramount importance for the set-up of the business model. This will help to Key Exploitable Results (KER) and products data sheets, which will be essential for communicating the benefits and potential of the new feed ingredients to stakeholders and potential investors. Furthermore, the data collected from these trials will support regulatory approval processes by providing evidence of the safety and efficacy of the new ingredients.

After positive results and the detailed definition of the valorisation scheme, a comprehensive Freedom to Operate (FTO) analysis is performed to ensure that the proposed process and products do not infringe on existing patents or intellectual property rights. This step is crucial for mitigating legal risks and securing the freedom to commercialize the new feed products. The FTO analysis involves a thorough review of existing patents, trademarks, and other intellectual property rights related to the proposed feed ingredients and processing methods.

A VALUE MAP was used to visually represent how the products meet customer needs and desires. It includes three main components: “Products & Services” which detail the offerings; “Gain Creators” which explain how these offerings benefit the customer; and “Pain Relievers” which describe how they alleviate customer problems. This tool helps businesses align their products and services with customer expectations, ensuring a better fit and leading to higher customer satisfaction and loyalty.

The CANVAS business model development framework is employed to outline the business strategy, including key partners, activities, value propositions, customer relationships, channels, customer segments, cost structure, and revenue streams. This structured approach helps in visualizing and refining the business model. The CANVAS model provides a clear and concise overview of the business, highlighting the key elements that contribute to its success. It also helps in identifying potential challenges and opportunities, allowing for proactive planning and risk management.

This comprehensive approach ensures that the new feed products are not only scientifically validated but also commercially viable, paving the way for successful market entry and adoption by the livestock industry. The goal is to create a sustainable and profitable business model that leverages the innovative feed ingredients to meet the needs of livestock farmers and contribute to the overall improvement of animal husbandry practices.

Results

NEWFEED project has successfully designed and validated a valorisation process to upgrade grape stems and to produce a feed ingredient that can be introduced in dairy cattle feed [1] and evaluate its sustainability and viability [2]. Two main KER where selected, one related with the valorisation process and the second related with the resulting feed ingredient.

The FTO analysis was performed by looking for selected keywords in a worldwide patent database looking for the selected keywords in "Title", "Abstract" and "Claims" sections:

(Title: (grape AND stem) OR (Abstract: (grape AND stem) OR Claims: (grape AND stem))) AND (Title: (animal AND feed) OR (Abstract: (animal AND feed) OR Claims: (animal AND feed)))

Thirty-four patents were found whiting these parameters and where thoroughly analysed to determine any constrain that could hinder project result exploitation. As a result of the study, none of these patents had an impact on the exploitability of the process or the product developed during NEWFEED project.

The VALUE MAP for this case study, highlights as Gain Creators that it emphasizes the nutritional benefits, such as high fibre and polyphenol content, which improve animal health and productivity. As Pain Relievers it addresses issues like waste management by utilizing grape stems, reducing environmental impact, and providing a cost-effective feed alternative.

The CANVAS model outlines several key results and highlights. The value proposition focuses on transforming grape stems, a by-product of wineries, into a valuable feed ingredient for livestock, particularly dairy sheep and cattle. This approach not only addresses waste management issues but also provides a cost-effective and sustainable feed alternative. Key partners include wineries, which supply the grape stems, and organisations that optimise processing, scale up production, and determine feeding strategies. The customer segments targeted are livestock farmers and feed manufacturers who benefit from the high nutritional value of grape stems, including their fibre and polyphenol content. Revenue streams are generated through the sale of this innovative feed ingredient, while cost structures focus on processing, scaling up, and distribution. The CANVAS model highlights the importance of collaboration between various stakeholders to ensure the successful implementation and commercialisation of this sustainable feed solution.

For the case study region a detailed business plan was created, outlining the operational, financial, and marketing strategies. The business plan includes a comprehensive analysis of the market potential, competitive landscape, and regulatory environment. It also outlines the production process, supply chain management, and quality control measures. Funding options, including grants, investments, and partnerships, are explored to support the start-up phase. The business plan serves as a roadmap for the start-up company, guiding its growth and development.

Conclusions

The NEWFEED project showcases the potential of circular economy principles in creating sustainable business models for the livestock industry. By leveraging food industry by-products, the project not only addresses waste management challenges but also creates new economic opportunities. The structured approach to business model development, including FTO analysis, a VALUE MAP, and the CANVAS model, ensures the robustness and scalability of the solutions.

The project has developed new alternative feed sources, each tailored to the specific needs and conditions of the Mediterranean region. The expected outcomes include a significant reduction in environmental impact and feed costs, as well as the promotion of circular economy principles in livestock production. By utilizing local food industry by-products, the project reduces dependency on imported feedstuffs, which are often subject to price volatility and supply chain disruptions.

The project's innovative approach to valorising food by-products not only addresses the pressing issue of feed sustainability but also contributes to broader environmental and economic goals. By fostering a circular economy in livestock production, the project aligns with global sustainability initiatives and sets a precedent for similar efforts in other regions. The successful implementation of the NEWFEED project serves as a model for future projects aimed at enhancing the sustainability of agricultural systems worldwide.

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