

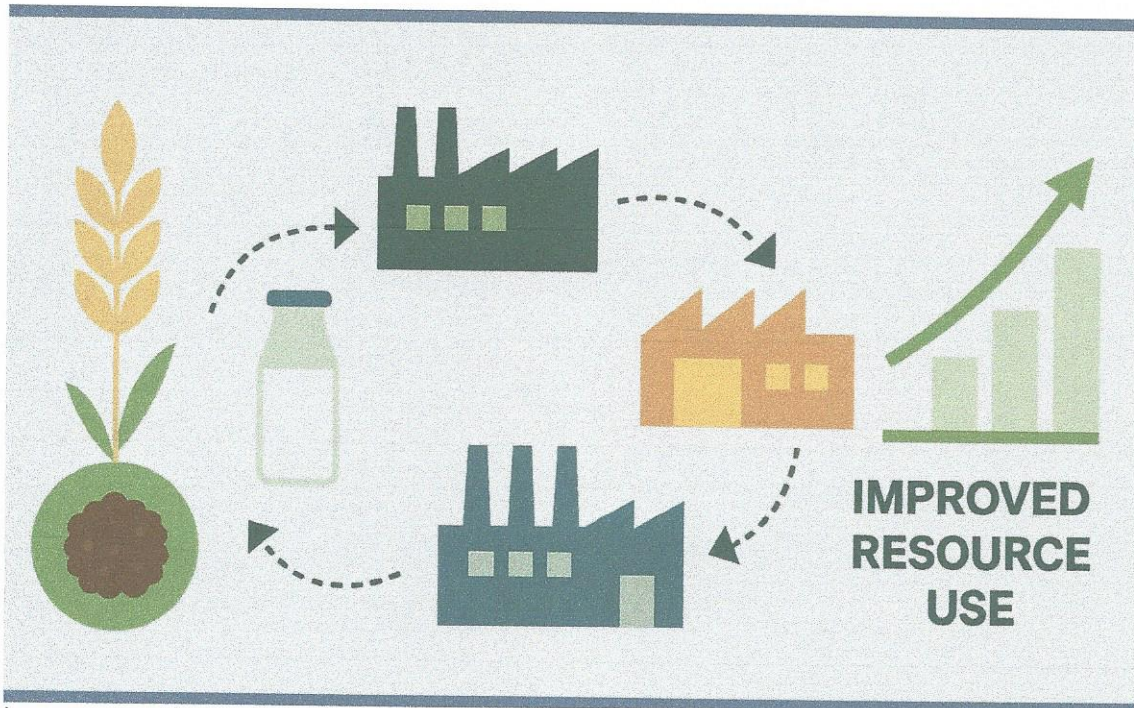


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Side Streams in the Swiss Agri-Food Industry and their Valorisation Potential through Stakeholder Collaboration: A Case Study of the Lyss Seeland Region

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ABSTRACT

The Swiss agri-food industry generates substantial quantities of side streams, including material flows, waste heat, and wastewater. These side streams are often underutilised, leaving considerable room to improve resource efficiency and to close technological and biological cycles. Their inefficient use not only contributes to food and resource waste but also results in a substantial loss of economic and nutritional value. Valorising these side streams generates environmental benefits, strengthens the resilience of the food system, supports the transition to a circular economy (CE), and creates new revenue opportunities for food producers and side stream processors.

Therefore, this master's thesis aims to identify the valorisation potential of agri-food side streams by investigating the Lyss Seeland region. The region is characterised by companies operating in the food and agricultural input sectors. Hence, the valorisation potential through stakeholder collaboration is of particular interest, drawing inspiration from the concept of industrial symbiosis. To identify potential for side stream valorisation, a mass flow analysis (MFA) was applied to map the key side streams and their current recycling pathways. Quantitative and qualitative data obtained from stakeholder interviews thereby served as a primary database. Subsequently, the current recycling pathways were examined for valorisation opportunities. Furthermore, qualitative interview data was analysed for barriers and enablers to the realisation of this potential.

This resulted in the identification of molasses, sugar beet press pulp, soil, oil press cakes, and glue water/greaves sludge as the largest organic side streams in the Lyss Seeland region by mass, alongside lime, stones, and animal by-product ash as the largest inorganic streams. These primarily originate from sugar and oil refining industries, as well as slaughter by-product processing. While 74% of organic side streams, mainly potentially edible ones, are already reused as animal feed and 15% as agricultural raw materials (e.g. fertiliser or substrates), there is still potential to enhance their valorisation to improve nutrient use. High potential was found in side streams that are potentially edible, either directly or when processed, such as oil press cakes, molasses, fermentation by-products, and second-grade or surplus vegetables. These can be upcycled into food products by regional biomanufacturing start-ups, returning nutrients to the human food chain. Wastewater could be upcycled in collaboration with companies specialised in filtration technologies, while the optimised use of waste heat requires further insights from energy experts.

However, barriers such as regulatory constraints, high costs, and limited market demand continue to hinder the further valorisation of side streams. Conversely, enabling factors include emerging technologies, supportive regulatory frameworks, and opportunities through stakeholder collaboration, such as cost savings through synergies and knowledge exchange. The findings highlight the importance of project coordination and stakeholder connection by local associations focused on CE initiatives, such as EcoCircular Lyss Seeland. By fostering collaboration, optimising CE-supportive legal frameworks, and supporting the establishment of new valorisation pathways and technologies, these organisations play a pivotal role in advancing circular practices. Finally, to fully exploit the potential of side stream valorisation, it is recommended to expand cross-sector linkages to other industries and geographical regions.

Keywords: side stream valorisation, by-product, food loss and waste, circular economy, agri-food industry