Valorisation of Swiss agri-food side streams

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Project insights
VALISS – Valorisation of Swiss agri-food side streams

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Food waste is a pressing global issue that has significant impacts on resources, the environment and society. The VALISS project, led by the Institute of Food and Beverage Innovation, aims to address these challenges through the valorisation of side streams from food manufacturing. These by-products, abundant and rich in valuable components, offer untapped potential for the development of innovative processes. These processes are aimed at integrating such side streams into food and packaging production, starting with comprehensive analysis of side streams and ultimately leading to innovative solutions for their various applications.

Food waste is a global concern, with significant amounts of food being wasted along the food value chain. This not only poses a challenge to resource utilisation, but also underscores the environmental, economic and moral concerns faced by modern society. Among the various stages of food waste generation, the waste produced in the food manufacturing industry (side streams) holds immense potential for valorisation. These side streams occur in large quantities, offering homogeneous and rich sources of valuable components. Despite their potential, in Switzerland these side streams have primarily been used so far for low-value applications such as animal feed, biogas production, composting and incineration. Unfortunately, even though they are well-studied and quantified within each food sector, until now no coordinated efforts have been made to valorise these materials.

To address the United Nation's Sustainable Development Goal 12 (Ensure sustainable consumption and production patterns), particularly Target 12.3, which aims to reduce food loss along production and supply chains, including post-harvest losses, concerted actions are needed in Switzerland to valorise the side streams and minimise food waste. Valorisation of such side streams, however, requires comprehensive research to identify the potential valorising steps and applications and to develop new valuable products.

Side streams in food and packaging applications

The core objective of the VALISS project is to develop innovative processes for the valorisation of side streams, which facilitate their integration into the production of food or packaging materials. Initially, we selected different side streams from the food processing industry in Switzerland (potato peels, rapeseed press cake, wheat bran, spent coffee grounds, sugar beet pulp, cocoa hulls, buttermilk, grape pomace, spent grain, barley rootlets, apricot kernels and more) based on their availability, annual quantities and environmental impacts. We conducted in-depth analyses to understand the chemical, physical and techno-functional characteristics of these side streams, and evaluated the industrial processes where they occurred. We also assessed the potential for biological and chemical contaminants, subsequently identifying strategies to stabilise and reduce such contaminations effectively. Additionally, we evaluated the legal implications of using these side streams for food and packaging purposes. Entering the development phase, our team is now dedicated to developing innovative processes that effectively utilise these side streams in both food and packaging applications. This phase involves a comprehensive exploration of various methodologies and technologies, with the goal of transforming these by-products into valuable resources. By the end of the project, we aim to showcase selected products and establish a decision matrix that can guide the industry in valorising their side streams, well beyond the scope of our project. ■

Within the VALISS project, the objective is to develop processes to valorise side streams and integrate them into food or packaging material production. The selected side streams from the food industry in Switzerland were potato peels, rapeseed press cake, wheat bran, spent coffee grounds, sugar beet pulp, cocoa hulls, buttermilk, grape pomace, spent grain, barley rootlets, apricot kernels and many more.

Cocoa post-harvest processes in Ecuador

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Since 2017, the Food Biotechnology Research Group has been engaged in a long-term project targeting cocoa post-harvest processes in Ecuador. Following the initial phases, where numerous post-harvest processes across the country were closely examined, two scientific articles have been published so far. Building upon this knowledge, a three-day training programme, including theoretical and practical parts, was developed and conducted with local experts (ofi Ecuador). The workshops took place directly in the fields, allowing for a thorough examination of the entire harvesting and post-harvesting process. The importance of correct handling and the ideal moment for harvesting were discussed and demonstrated. Fermentations were performed, involving various process steps and measurements of monitoring parameters (e.g. temperature). Additionally, artificial drying and its important implications were explored during the workshop. Finally, cocoa quality aspects such as cut-test, impurities, and sensory tasting were addressed. Throughout the training, the enhancement of overall quality and the prevention of errors across the entire process were key discussion points. This project was carried out in collaboration with the Lindt Chocolate Competence Foundation.

Project

Publications:

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Leading the way to sustainable solutions with advanced automation

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The first cohort of Food Technology bachelor students with a specialisation in Food Processing and Automation is about to graduate. This milestone arrives at a critical time when the demand for high-quality, diverse food options is rising, as is the urgency for sustainable and efficient production methods. Our curriculum has been carefully designed to address these challenges head-on. Through a hands-on approach to learning, our students are immersed in the intricacies of designing, improving and automating food production processes. They explore various segments of the value-creating network, utilising the latest technologies and methods. For example, they develop automation solutions for vertical farming operations or bioreactors for growing plant cells. A key component of the specialisation involves engaging with industry 4.0 technologies, such as the Internet of Things (IoT), big data analytics and robotics. This integration equips our students not just with theoretical knowledge but with practical skills to leverage these technologies in fostering sustainable food production innovations. Ultimately, the specialisation is designed to equip students with the skills and knowledge that they will need to drive sustainable innovation in food production for the future. ■