Enhancing the Sustainability Outlook through Upcycling of co/by-product: A Case of Fruits and Vegetable Production Value Chain in Canada

AGYEMANG P. (1), KWOFIE E. (1)
1 McGill University, Montreal, Canada

Supposedly, the current global food production capacity cannot compensate for the food demand of the perpetually growing global population. This growth will require a 60-70% increase in food production by 2050. Hence, interventions, production and processing pathways and food system framework developments are needed to enhance the current food value chain while operating within a safe and healthy planetary space. In achieving this, the circularity and upcycling of biological and technical resources have played a critical role. However, when it comes to biological resources, especially co/by-products and waste from process industries, the attention has been on either converting these co/by-product and waste streams into value-added products or reinserting them into the value cycle without considering the sustainability implications. In achieving this, all supply chain members should be involved to accelerate the transition to a circular economy, and collaboration is crucial. In this regard, food processing and production industries play crucial roles in the sustainability transition at multiple levels within the food value chain, especially in adding value to highly perishable and less containable raw materials. This study, in collaboration with a food process industry in Canada, explores the upcycling potential of co/by-products from the primary process. A Life Cycle Sustainability Assessment is conducted to determine the implications of the identified upcycling opportunities. The study results were integrated into an interactive dashboard, Circular Bio-economy StartKit, to enable stakeholders to explore and visualize "what if scenarios". The Circular Bio-economy StartKit allows a broader system-level analysis considering the stakeholder decision's economics, environmental, and social implications of selected co/by-products. Additionally, it enables stakeholders to gain access to an in-house decision support system that allows multiple trade-off analyses across different upcycling pathways for different co/by-products. The proposed approach to the Circular Bio-economy StartKit could be extended to other process industries within the food sector.