

**Session Cross-cutting: April 11th 15.45 hrs**

**5s2: The environmental and economic consequences of adoptig circularity at different spatial scales**

## **To trade or not to trade: environmental consequences for our food system.**

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Applying circularity to food systems is increasingly seen as an important pathway to a sustainable food future. Circular food systems increase the resource use efficiency of the food system by utilising residual streams (e.g., manure, co-products, food-waste) to close the loop of materials. However, closing the loop of materials in a food system dominated by international trade of food and animal feed is challenging. Using the Netherlands as a case study, we assess how the loop of materials can be closed in a circular food system with varying levels of international trade (of food and animal feed; food only; or no trade) by employing the CiFoS-NL model. The CiFoS-NL model is an iterative linear optimisation model of a circular food system developed to minimise land-use and greenhouse gas (GHG) emissions in the Netherlands while meeting the dietary requirements of the Dutch population. In the model, maintaining the loop of materials when including international trade was possible by applying a nutrient balance between the import and export of food and livestock feed (i.e., the import of nutrients is equal to the export of nutrients). Our results show that importing a limited (instead of zero) amount of food and livestock feed has a positive impact on reducing land use and GHG emissions in the Netherlands. By substituting some domestically produced food with imported products, the dietary requirements of the Dutch population could be met with less land-use and GHG emissions. We show that applying nutrient balances at a national level is one option to maintain international trade of food and animal feed in a circular food system.

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*Keywords: Circular food systems, Trade, GHG emissions, Land-Use*