5S2: The environmental and economic consequences of adopting circularity at different spatial scales

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The concept of a bio-based circular society resonates well in society. Spatial scale of circularity will affect the actual consequences of circular use of biomass and nutrients. For example, materials and substances (biomass, nitrogen, phosphorus) can be targeted at regional, country or European Union level. Targeting of materials and substances at these different scales may affect environmental (e.g. pollution, greenhouse gas emissions and land and water use) and socio-economic performance (markets, in- and export, food and nutrition security, economic growth) of the food system. The scale at which we may adopt circularity is determined by the interaction of various factors. Differences in agro ecological and socio-economic circumstances make some areas more suitable for producing specific types of crops than others. Localized environmental or socio-economic advantages of certain imported crops may outweigh the emission impact of transport. The choice of our future crops, their rotations and location depend on their main and by-products. Hence, not only their food value for humans will be taken into account, but also their non-food value for soil fertility, feeding of farm animals, production of bio-based materials and possibly of biofuels and/or bioenergy, and general economic contributions like employment and value-added creation. For example, soybean oil for human consumption and for biofuel production originates from soy cultivation and generates soybean meal (SBM) as a by-product. Compared with other by-products from oil processing for human consumption, such as sunflower meal, SBM has a high nutritional Theme 1: overview session 1/page 10 value for animal feeding but may induce extensive global trade flows and deforestation, given current production locations. Combining all such aspects – e.g. quantity and nutritional quality of main product and by-product, food versus non-food drivers of the main product, transportation and environmental impacts and associated economic costs– ultimately determines the optimal scale at which nutrient loops are to be closed. The optimal scale of circularity is thus context specific and requires an integrated analysis. In this session results and insights from studies based on such integrated analysis of spatial scale effects on potential circular use of biomass and on environmental and economic impacts of circularity will be presented.