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1S1a Models and tools for estimating circularity of alternative food and agricultural systems

Circularity in food and agricultural systems: Blind spots in agricultural landscape assessments

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The spatial level of a landscape is highly relevant for assessing and implementing circularity in food and agricultural systems (FAS). Contrary to focussing on the field or farm level, analyses on the landscape level allow relevant ecosystem dynamics as well as landscape wide feed and manure flows to be captured. At the same time, and opposed to the national and global level, a focus on landscapes allows to acknowledge local dissimilarities. Even though various reviews approach the topic of assessing agricultural landscapes, there is no systematic overview on how they take aspects of circular FAS into account.

We conducted a literature review and investigated how approaches for agricultural landscape assessments capture the circularity in FAS. Publications considered in our study were those that presented spatially explicit models, the spatial unit of analysis was at least the landscape level, and agricultural production was assessed as one landscape function. Furthermore, at least one additional ecosystem service was assessed and the presented approaches were aimed at supporting policymaking.

In agricultural landscapes, which encompass both crop and livestock production, these two parts of the agricultural system are often tightly interrelated. Our preliminary results show that about 30% of the publications considered livestock production and out of these, only 45% incorporated flows from crop to livestock production, mainly in form of feed, either via produced fodder or via the available area for grazing. However, in addition to feed, flows in form of crop residues and by-products for bedding or feeding were not explicitly accounted for. Flows from livestock to crop production were considered even less frequently. In addition, waste and by-products, which are generated during processing, retailing, and consumption of food commodities, are rich in nutrients and could potentially be returned to the FAS in form of organic fertilizer or feed to support circularity. However, none of the publications reviewed, considered such streams

as nutrient sources. Furthermore, agricultural landscapes often rely on external material and energy, like remotely produced feed, fertilizer, seed, and machinery inputs. When aiming at closing cycles, also the usage and impacts of these external inputs should be accounted for, but only two of the publications reviewed considered external impacts. In summary, blind spots with respect to the interconnectedness of crop and livestock production at the landscape level as well as in relation to the integration of the agricultural landscape into the larger food system exist, calling for further modelling efforts.

Keywords: