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**2s3: Risk management and trade-offs**

# MODELLING HEAVY METAL FLOWS UNDER INCREASED NUTRIENT CIRCULARITY IN AGRICULTURAL PRODUCTION

LESSMANN M 1), ORSI F 1), KROS J 2), BAKKER M 1), KANELLOPOULOS A 3)

1) Wageningen University and Research, Land Use Planning Group, The Netherlands,

2) Wageningen Environmental Research, The Netherlands

3) Wageningen University and Research, Operations Research & Logistics Group, The Netherlands

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Applying the concept of a circular economy to agricultural production entails that waste streams from food and feed production are not discarded but utilized to their fullest potential. By reusing streams like surplus animal manure, organic household waste, sewage sludge, biogas digestates, or other agricultural by-products more closed material loops can be achieved. However, potentially unwanted substances such as heavy metals (e.g. cadmium, lead, zinc, copper) can unwillingly or unknowingly be (re)introduced through changing practices. While previous research has been focused on enhancing nutrient recycling from waste streams, knowledge on the effects on metal flows remains limited. In particularly, insights into the spatial variability of the amount of applied metals and their risk through the local recycling of waste streams remains limited. To overcome these limitations, we developed a linear programming-based optimization model to study different spatial layouts of waste distributions and to evaluate their effects on metal flows. Our findings show that LP modelling can be used effectively to trace metal flows associated with the local recycling of waste and to explore their spatial variability across agricultural landscapes. The latter is specifically relevant for identifying potential hotspot regions in which site-specific contamination risks under more circular scenarios can be evaluated. Future work will focus on expanding the model with a dynamic (temporal) component by integrating the methods of stock and flow modelling so that long-term accumulation effects can be assessed.

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