‘Land sparing vs. land sharing’ and ‘food vs. fuel’ – Energy crops as a joining link for the dichotomies

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Abstract

Sustainable intensification of food production aims at increasing yields per unit area by utilizing regulating and supporting ecosystem services and by optimizing crop cultivation practices, without further increase in environmental harm. Land freed-up through higher yields per unit area could be dedicated for nature conservation either at coarse spatial scales through nature reserves (land sparing) or at fine scales by integrating landscape elements into the production systems to promote ecosystem services (considered either as fine scale land sparing or land sharing). The need of feeding and fuelling a growing human population raises the concern of whether land spared through sustainable intensification would indeed be available for nature conservation or whether it would be utilized for energy crop production instead. This could happen with coarse-scale land sparing, where energy crops are confined to marginal lands, or with fine-scale sparing/sharing, where energy crops are integrated into food production systems. Here is where the two dichotomies of land sparing vs. land sharing and food vs fuel meet and interact. The concepts of land sparing and land sharing can be adapted from nature conservation to energy crop cultivation on a range of spatial scales. Cultivation of energy crops could be segregated from food crops at coarse spatial scales by determining whole regions or farms for energy crop production. In contrast, in a fine-scale sparing/sharing approach, a strip or patch of an energy crop could be developed as integration or sharing measure for improving biodiversity and ecosystem services within the food crop (combined food and energy systems). Additionally, energy crops could become part of the crop rotation cycle of food crops. Both integrating approaches would require proper land-use and landscape planning, to support sustainable intensification within such combined food and energy systems. For this, a better knowledge about the most efficient combinations of energy crops (1st generation or 2nd generation; annual or perennial) and food crops is required. In the present paper, we present scenarios of sparing or sharing food and energy production on either productive or marginal land and discuss their potential impacts on biodiversity and ecosystem services within the respective systems.

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