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Contribution of legumes to the soil N pool.

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Grain legumes can be used for nitrogen acquisition in different ways in sustainable agriculture (Fustec et al., 2009). They are seen as a tool to reduce mineral N fertilizers in cropping systems. However, estimates of biological N fixation, N balance and N benefit either for the following crop or in mixed crops, remain unclear. The contribution of legumes to the soil N pool is difficult to measure, especially N rhizodeposition, since it is a critical point for assessing N benefits for other crops and for soil biological activity, and for reducing water pollution (Mayer et al., 2003). We adapted and refined the cotton-wick 15N stem labeling method for measuring the amount of soil N derived from rhizodeposition by field peas (Mahieu et al., 2007, 2009). The method was tested in different conditions in the field and in the greenhouse with various pea varieties and isolines. In addition, we used the cotton-wick method for assessing N transfers from pea to neighbouring durum wheat. In the greenhouse, a positive relationship was found between the amount of N rhizodeposits and the legume N content. N rhizodeposition was about 15% of the plant N and 30% in the field. In field pea / durum wheat intercrops, plant-plant N transfers were quantified and found to be bidirectional. Such results should be taken into account when estimating N benefits from biological N fixation by a grain legume crop and for the prediction of N economies in legume-based cropping systems. More studies dealing with rhizodeposit compounds and soil biological activity would now be necessary.

Fustec et al. 2009. Agron. Sustain. Dev., DOI 10.1051/agro/2009003, in press.
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