



## Pea-wheat intercrops in low-input conditions combine high economic performances and low environmental impacts

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Résumé en anglais	Intensive agriculture ensures high yields but can cause serious environmental damages. The optimal use of soil and atmospheric sources of nitrogen in cereal-legume mixtures may allow farmers to maintain high production levels and good quality with low external N inputs, and could potentially decrease environmental impacts, particularly through a more efficient energy use. These potential advantages are presented in an overall assessment of cereal-legume systems, accounting for the agronomic, environmental, energetic, and economic performances. Based on a low-input experimental field network including 16 site-years, we found that yields of pea-wheat intercrops (about 4.5 Mg ha <sup>-1</sup> whatever the amount of applied fertiliser) were higher than sole pea and close to conventionally managed wheat yields (5.4 Mg ha <sup>-1</sup> on average), the intercrop requiring less than half of the nitrogen fertiliser per ton of grain compared to the sole wheat. The land equivalent ratio and a statistical analysis based on the Price's equation showed that the crop mixture was more efficient than sole crops particularly under unfertilised situations. The estimated amount of energy consumed per ton of harvested grains was two to three times higher with conventionally managed wheat than with pea-wheat mixtures (fertilised or not). The intercrops allowed (i) maintaining wheat grain protein concentration and gross margin compared to wheat sole crop and (ii) increased the contribution of N <sub>2</sub> fixation to total N accumulation of pea crop in the mixture compared to pea sole crop. They also led to a reduction of (i) pesticide use compared to sole crops and (ii) soil mineral nitrogen after harvest compared to pea sole crop. Our results demonstrate that pea-wheat intercropping is a promising way to produce cereal grains in an efficient, economically sustainable and environmentally friendly way.
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