

## **Phosphorus utilization in mixed-cropping systems**

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The combination of crops in mixed cropping systems can lead to a complementary utilization of growing factors and in an increase of the nutrient and water use efficiency. Legumes as a cultivation partner are especially useful because of the additional fixation of nitrogen. The performance of different crops in sole and mixed cropping are investigated under controlled, semi-controlled and field conditions.

In a field experiment, which was established in 1998 to investigate the effects of phosphorus (P) fertilizer strategies, the following crops were cultivated from 2013 till 2015: Maize (*Zea mays*), sorghum (*Sorghum bicolor*), maize + runner bean (*Phaseolus coccineus*) and Sorghum + blue lupin (*Lupinus angustifolius*) (2013) and Andean lupin (*Lupinus mutabilis*) (2014, 2015). Under optimal P supply maize and sorghum had higher biomass yields than the respective combinations with the legumes. However, under suboptimal P supply the mixtures of maize or sorghum with the legumes had comparatively or even higher biomass yields. Furthermore, the effect of the fertilizer supply was lower in the mixed cropping treatments. Usually higher activities of enzymes and higher bio-available P concentrations in soil were found in the mixed cropping treatments. These facts point to a potential of mobilization of less available P sources when different crop species are cultivated together.

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