

Optimising species complementarities in mixed cropping systems to secure local protein supply

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ABSTRACT

Successful grain legume cultivation is important for the food and feed protein supply, soil fertility and functional biodiversity. Current grain legume cultivation accounts for less than 3% of the arable land in Switzerland, mainly due to unstable yields. High incidents of soil-borne diseases, poor resistance to lodging, emerging pests and changing growing conditions result in unstable or low yields. Innovative concepts and cultivation systems are needed to address the growing demand for local protein supply and biological nitrogen (N) fixation, especially in organic farming. Mixed cropping is a promising approach to sustainably increase productivity, yield stability and profitability of legumes.

The overall goal of PROMISE, a national follow-up project of the EU Horizon 2020 project ReMIX (www.remix-intercrops.eu), is to increase legume production by optimising the selection of mixing partners. First year field experiments with pea-barley and pea-lentil mixtures and respective pure stands reveal cultivar combinations and key traits that indicate complementary and facilitative species interactions for increased mixture performance. The results also highlight the effects of cropping system and plant genotype on disease outbreaks and protein content. Further results show that lentil and pea lodge less in lentil-pea and pea-barley mixtures, respectively, compared with their pure stands. A parallel pot experiment determines how plant mixtures respond to varying levels of soil disease pressure and how they feed back on soil quality and pathogen populations.

PROMISE defines key traits for mixing performance by testing diverse genotypes in field trials for three consecutive years. The results from the first year allow to select successful mixing partners. By exploring the effects of N-supply on subsequent crops, the project will provide important clues on how to increase legume in crop rotations. In close collaboration with farmers, PROMISE promotes legume cultivation and contributes to a fast adoption of sustainable farming systems.

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