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606/240. INVESTIGATING MIXED CROPPING SYSTEMS WITH PEA AND LENTILS FOR CLIMATE-SMART AND DEMAND ORIENTED AGRICULTURE

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Summary:

Objectives

In Switzerland grain legumes cultivation takes up only 3-5% of the arable land, although they contribute significantly to a sustainable transformation of the agricultural and food systems. With more people adopting vegetarian diets, there is an ever-growing demand for plant-based proteins. Moreover, since 2022 ruminants can only be fed with organic-certified fodder produced on Swiss farms (BioSuisse 2022). To up-scale the grain legume production, PROMISE, a national follow-up project of the EU Horizon 2020 project ReMIX, tackles the optimisation of mixed cropping systems (MS) with pea-barley (Haug et al. 2023) and lentil-pea. Cultivation of peas (Pisum sativum L.) and lentils (Lens culinaris Medik.) in pure stands (PS) carries risks of low yield or total yield losses due to lodging, poor weed competition and emerging diseases. Despite their yield potential and higher market value the yield stability across seasons is much lower than for cereals. The objectives of PROMISE are (i) to measure the impact of the two MS on grain and protein yield, and yield stability, lodging and weed tolerance across three seasons, (ii) to assess the root rot disease of the two species in PS and MS, and (iii) to investigate the residual nitrogen for subsequent crops.

Concise description of the work (materials & methods)

Field trials were conducted at two organic certified farms in the Swiss Midlands in three consecutive years (2020, 2021, and 2022). The study comprised three lentil varieties, six up to sixteen (depending on year and experiment) pea varieties and one two-row barley (Hordeum vulgare L.), two treatments (MS, PS) with three replications in a randomised complete block design.

Main Results

Higher grain yields in lentil-pea mixtures in comparison to pure lentil crops in all three years were observed. Land equivalent ratios (LER; Mead, R. & Willey, R. 1980) for total grain yield in 48 out of 54 tested pea-lentil mixtures were above 1.0. Also pea-barley mixtures performed on average better in regards to grain yield in comparison to pure pea crops, which was most pronounced in unfavourable seasons like 2021 with high rainfall. For both systems, we found a strong cultivar effect on mixture performance and genotype x cropping system interaction (Figure 1). Weed incidence and lodging of peas in the pea-barley system, as well as lentils was on average reduced in MS. In pot experiments as well as in the field with same pathogen pressure, symptoms of root rot in lentils was significantly lower than in peas. However, there were no differences in root rot severity between pea grown in MS and PS. Preliminary results showed that the N delivery of the two MS to the following crop were higher than in barley crop (PS). Detailed results across the 2 sites and 3 years will be presented.

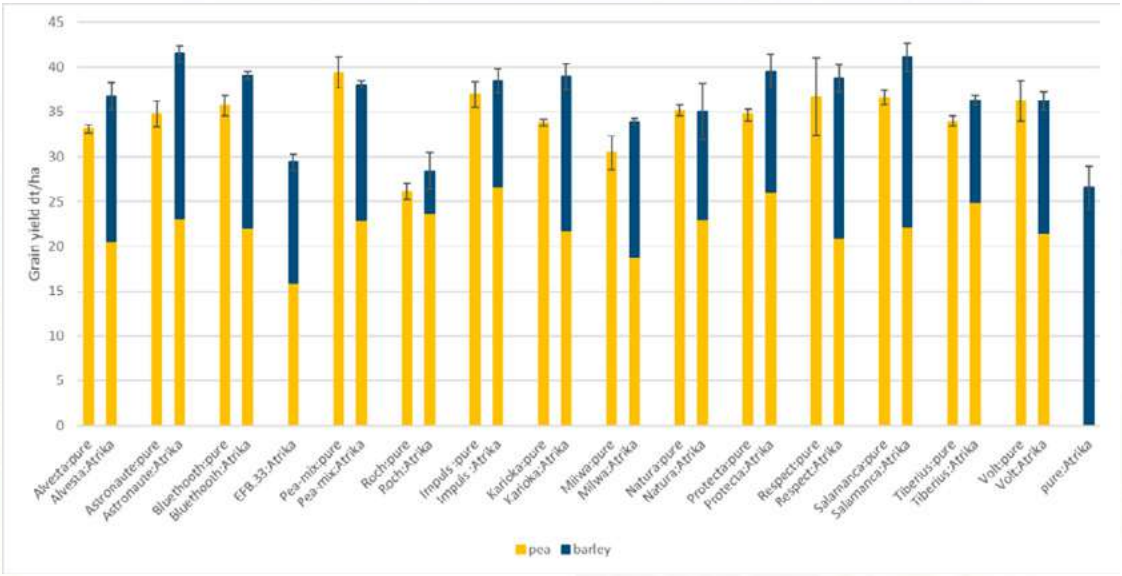

Figure 1 Grain yield with standard error of pea (yellow) and barley (blue) in pure stand and mixture stand for the different cultivars at the farm in Kirchlindach in 2022.

Conclusions

In conclusion, both MS have proven to be resilient cultivation methods, reduce risk of yield losses in years/environments unfavourable for legume cultivation due to the yield of the supporting crop and add values to following crop by enhancing available N and reducing weeds.

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606/248. LONG-TERM LEGUME-BASED CROPPED SYSTEMS FOR 'ECOLOGICAL INTENSIFICATION'

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Summary:

Objectives

JHIs Centre for Sustainable Cropping (CSC) is a long-term field-scale legume-based (and stockless) arable cropped-system experiment whose underpinning agronomy is implemented iteratively, and whose ecosystem functions (or 'services') are monitored continuously, to achieve predefined environmental and ecological benefits (Hawes et al., 2021). This long-term study approach aims to identify agronomic practices which can be integrated to better-balance ecosystem functions with yield and economic imperatives.

Concise description of the work (materials & methods)

Running since 2009, the CSC compares regenerative and conventional agronomic practices in a split-large-field design over multiple six-year rotations (potato → winter wheat → winter barley → oil seed rape → faba beans → spring barley →), to allow commercially realistic estimates of costs and benefits. The regenerative system aims to promote soil health, biodiversity, and crop