

Intercropping oilseed crops with legumes in a diversified crop rotation

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Organic arable cropping systems are challenging, especially in terms of nitrogen (N) management, pest and weed regulation. In Scania, sole crops of cereals and oilseed with the use of high external inputs (especially for N) dominate the mainstream organic cropping systems. Several studies have shown that the use of legumes and cover crops in the cropping systems can offer multiple benefits: building up soil fertility, increase yield, ecosystem services, etc.

In an effort to help the transition of current simplified cropping systems to a diversified cropping systems, two six-year crop rotations; a Reference and a Diversified system, were co-developed by actors (farmers, advisers, researchers and value chain actors) and established in 2018 at SITES Lönstorp, SLU, Alnarp. The main aim was to understand the benefits and challenges of introducing a combination of multi-species cropping practices (in both time and space) in organic farming. The study specifically assesses the effects of integration of a variety of grain cash crops legumes and cover crop legumes on the use of external inputs, the level of productivity, carbon input to the soil, biocontrol of pests, diseases and weeds. Oilseed rape is an important crop in the rotation, and is sensitive to different pests and has a high nitrogen demand. Thus, intercropping could facilitate the growing of oilseed rape in organic systems. In the Diversified system, oilseed and cereal crops are intercropped with legumes as well as with mixed species cover crops.

Sowing of frost-sensitive legume with oilseed rape (*Brassica napus*) was tested in 2019 but it failed due to drought in autumn and pests/wild animals. In 2020, the failed winter oilseed rape crop was replaced by white mustard (*Sinapsis alba*) in spring, and preliminary results shows that there was significantly higher mustard seed yield, and weed reduction in Diversified system (where mixtures of black medick+melilot+whiteclover+ rye grass were undersown in mustard) compared to Reference system (sole crop of mustard).

Another lesson from the field experiment is that a good crop emergence and early growth of legumes in sole grain legume cash crops, intercrops and also in cover crops is essential for their success in terms of both yield and ecosystem services. Weeds are undoubtedly a critical yield-reducing factor in organic rotations and the results so far showed the tendency of a lower weed pressure in the Diversified system compared to the Reference system.

The effects of diversification strategies on product quality, ecosystem services other than production, as well as economic performances and workload will be assessed when the experiment will have been running for more years in order to include carry-over effects and between-year variability in the analysis.