

Annual report: EkoForsk project (2012-2013)
Multifunctional cover crops

Project aim The aim of the project is to determine the efficiency of cover crops (CCs) in stockless organic systems for mineral N retention (N catch crops), for N₂ fixation in autumn and spring, organic matter supply to the soil and the effect of CCs on the subsequent crop in the rotation. Mixtures and sole CCs of common vetch, oil radish, hairy vetch and winter rye will be cultivated in an organic rotation after cultivation of spring barley and spring pea to obtain different levels of available soil N in the autumn in a 3-year project. Multifunctional annual CCs will be compared with an under-sown grass-clover CC. Dry matter production, mineral N in the soil profile, crop accumulation of mineral and symbiotically fixed N determined by stable isotope methodology as well as yield and N accumulation in subsequent crops will be determined.

Activities 2012-13

The main crops (pea and barley) were well-established on a more sandy soil (Photo 1) than in 2011, where the experiment failed, due to too wet conditions in August .



Photo 1. Pea and barley crops 2012-08-08. Crops in middle. Weedy field margin in front.

The cover crops were established with different degree of success, due to the dry season and incorporation of straw. Average establishment were judged to be sufficient to continue the experiment. Soil was sampled from the top 50 cm of the profile to analyze for nitrate and ammonium one week after harvest of main crops.



Photo 2: Cover crops of oil radish, winter rye, common vetch and hairy vetch. October 2012.

Cover crops oil radish and common vetch (not frost resistant CC) were sampled in 0.5 m² plots for analysis of DM, total N accumulation and the proportion of soil N uptake and N₂ fixation in the respective crops. Main crop, oil radish and common vetch samples are being process for analysis in the lab.



Photo 3: CC mixture of oil radish and common vetch after pea. October 2012.

The dry matter production of oil radish, common vetch and the mixture of the two CC species were on average 1, 1.2 and 1.3 t/ha, respectively after barley. After pea the total yields were 23, 19 and 8 % greater than after barley, respectively. In the mixed CCs the legumes constituted about 15-20% of the total biomass.

The experiment also included undersown clover-grass. Photo 4a and b shows the effect of precrop on botanical composition of the grass-clover in October 2012. After barley the proportion of clover is much higher than after pea, where clover is almost absent. The difference is due to N dynamics, with more competition from grass after pea, where levels of soil N is greater than after barley (Hauggaard-Nielsen, Mundus and Jensen, 2012).



Photo 4a (left) and 4b (right). Undersown grass-clover CC after barley (a) and pea (b) in October 2012.

In March winter-hardy cover crops will be sampled as in October and all CCs will be incorporated before establishment of spring wheat.

A new experiment with the main crops is being established in March 2013.

Publications

Hauggaard-Nielsen, H., Mundus, S. and Jensen, E.S. 2012. Nitrogen dynamics in a sequence of an arable organic rotation with grain legumes undersown grass-clover followed by two succeeding cereals. *Field Crops Research* 136, 23-31

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