

Post-harvest sown catch crops – results from two years of organic field trials.

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Implications:

Post-harvest sown catch crops should be sown as early as possible in order to obtain maximum biomass and nutrient uptake in the harvested crop, as biomass production decreased by 2-3.5 percent per day, when time of sowing was postponed throughout August. Furthermore, the winter hardy species included in these experiments had a tendency to yield less than the non-winter hardy catch crops. These experiments imply that early sown catch crops may become a biomass supplement for organic biogas production, provided sufficient yields are obtained and costs for harvest, transportation and storage are adequately low.

Background and objectives:

This study is part of the Danish HighCrop-project (<http://agro.au.dk/highcrop/>) funded by the Danish Organic RDD-programme and 'Promilleafgiftfonden' (a public funding body based on Danish pesticide tax revenues). Growing catch crops in organic plant production is a key element in efficient nutrient management and serve as a tool to preserve the nutrients in the top-soil layers for the succeeding crop and reduces nutrient leaching. Catch crops have traditionally been ploughed under and thus used as green manure. However, as the Danish biogas production in both organic and conventional agriculture is expected to expand, catch crops may become an easily accessible and low cost biomass resource for farm-scale produced biogas, provided sufficient biomass yields may be obtained. The objectives of these experiments are therefore, to investigate the effects on harvested biomass yield (and nutrients) as a function of A) sowing date of post-harvest sown catch crops and B) catch crop species or mixtures.

Key results and discussion

An important result from experiment A (post-harvest catch crop establishment from the end of July to early August) is that early establishment is a prerequisite for obtaining above-ground dry matter yields of 2.5-3.0 ton per hectare in the non-winter hardy catch crops (mixture of yellow mustard and hairy vetch, yellow lupin and yellow mustard). The winter-hardy mixtures (turnip rape/hairy vetch and rye/Persian clover) were not as productive and yielded below 1.5 t per ha when sown early at the end of July. An analysis of variance showed significant effects of both factors: catch-crops and sowing times, but revealed no significant interaction between the two factors. On average biomass dry matter yield decreased by 2-3.5 percent per day that sowing was postponed during the month of August (figure 1).

In experiment B, which compared 15 different catch crops, yield levels varied and the analysis of variance of three field trials conducted in 2011 and 2012 did not show any significant difference between the catch crops. The winter hardy species had a tendency to yield less than the non-winter hardy catch crops. Buckwheat, common mallow, foxtail millet and Structurator, which were only field tested one year, yielded below 1 ton dry matter per hectare. On average 57 kg N, 9 kg P and 36 kg K per hectare were harvested in the non-winter hardy catch crops whereas 47 kg N, 7 kg P and 29 kg K per hectare were harvested in the winter-hardy catch crops.

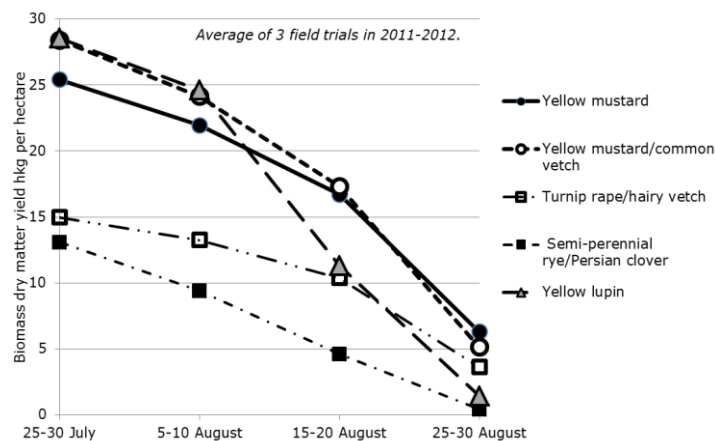


Figure 1. Harvested biomass of five post-harvest grown catch crops in field experiment A (see below) sown at four subsequent sowing dates from late July to late August in 2011 (one site) and 2012 (two sites) (from Pedersen 2012).

How work was carried out?

Two different field experiments were carried out on sandy soils (Pedersen, 2012).

The first field experiment (A) investigated the effect of 4 subsequent sowing dates from late July to late August in five different catch crops: yellow mustard (*Sinapis alba*), a mixture of yellow mustard (*Sinapis alba*) and common vetch (*Vicia sativa*), yellow lupin (*Lupinus luteus*), a mixture of turnip rape (*Brassica rapa*) and hairy vetch (*Vicia villosa*) and a mixture of semi-perennial rye (*Secale cereale* var. *multicaule*) and Persian clover (*Trifolium resupinatum*). Experiment A was located at 2 sites in 2011 and 3 sites in 2012, with 4 replicates per site. In 2011 one site was excluded from the analysis due to very low yields caused by low soil nitrogen content (previous crop: ryegrass) and a high weed infestation. In 2012 one site was excluded due to extremely wet harvest conditions.

The second field experiment (B) compared 15 different crops and crop mixtures used as catch crops. In 2011 the experiment was established at 2 sites and did not hold replicates, but one site was excluded (same site as in exp. A with ryegrass as previous crop). The 2012 experiment were carried out at two sites each with two replicates. The non-winter hardy catch crops included in both years in experiment B were fodder radish (*Raphanus sativus* var. *oleiformis*), yellow mustard (both fulfill the current Danish requirements for post-harvest sown catch crops), a mixture of yellow mustard and common vetch, yellow lupin and faba bean (*Vicia faba*). Buckwheat (*Fagopyrum esculentum*), common mallow (*Malva sylvestris*), foxtail millet (*Setaria italica*) were field tested only in 2011, whereas phacelia (*Phacelia tanacetifolia*), narrow-leaved lupin (*Lupinus angustifolius*) and Structurator (*Raphanus sativus* L. var. *Longipinnatus*) were field tested in 2012. The following winter hardy catch crops were included in both the 2011 and 2012 experiment: turnip rape, a mixture of turnip rape (*Brassica rapa*) and hairy vetch, a mixture of Italian rye-grass (*Lolium multiflorum*) and Persian clover, a mixture of rye and hairy vetch, a mixture of triticale and hairy vetch, a mixture of semi-perennial rye and Persian clover and finally, a mixture of triticale and yellow lupin.

The experiments were carried out through the Danish National Field Trials and data was analyzed by the SAS 9.2 statistical procedure available in the Nordic Field trial System.

References

Pedersen JB (2012) Oversigt over Landsforsøgene 2012 (*Overview of the National Field Trials*). Forsøg og undersøgelser i Dansk Landbrugsrådgivning. Videncentret for Landbrug, 488 p.