



## Upward N redistribution - Postharvest effect of cover crops on creeping thistle (*Cirsium arvense*)

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### Abstract

Weed control is important in organic farming to improve crop yield. In Northern European countries, the need for mechanical weed control restricts the use of green manure-based cover crops, a key resource of N supply. In a two-year experiment repeated in three seasons, we aim to compare the effect of cover crops and autumn tillage on the N uptake and N competition of barley and thistles growing in the following year. In the autumn,  $^{15}\text{NO}_3^-$  tracer was applied to the topsoil and made subject to leaching or cover crop uptake.  $^{15}\text{NO}_3^-$  content in the soil profile was measured in the following spring, followed by measurement of  $^{15}\text{N}$  uptake by barley and thistles during crop growth. Cover crops reduced leaching of the residual  $^{15}\text{NO}_3^-$  from the topsoil to the deeper soil layer (1.0–1.5 m) by a factor of >18 compared to the tillage treatment. A significant effect of cover crops on soil N distribution was observed: 67–85% of the total recovered  $^{15}\text{NO}_3^-$  was found in the upper 0.5 m under the cover crop treatments, while in the tillage treatment only 4–27% of the recovered  $^{15}\text{NO}_3^-$  were found in this upper soil layer. By keeping the  $^{15}\text{NO}_3^-$  in the topsoil, cover crops shifted  $^{15}\text{N}$  availability away from the deep-rooted thistles and towards the shallow rooted spring barley, and strengthened the competition of barley against thistles. In contrast, the deep N redistribution following the autumn tillage practice enhanced N uptake of thistles. Therefore, intensive autumn tillage used as a tool of perennial weed control should be removed or reduced and cover crops can be part of the integrated perennial weed management in organic cereal production.