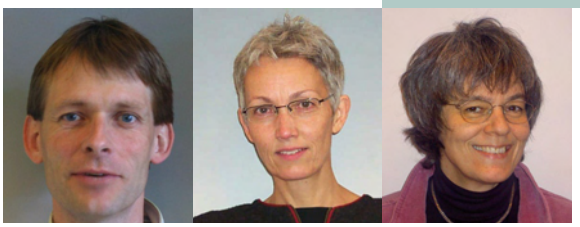
Nitrogen management on large organic dairy farms



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Large dairy herds need much grassland near the farm. Utilisation and losses of nitrogen in such grass-intensive crop rotations can be controlled by management.

In grassland, grazing days or fertiliser input can be reduced, and following grassland cultivation, a barley whole crop for silage undersown with Italian ryegrass can reduce leaching to a minimum.

Historically, a large part of organic milk has been produced on smaller farms with maximum integration of animal husbandry and plant production through grazing of the entire crop rotation. An increased proportion of grass-clover in combination with an ongoing structural development in the size of dairy farms lead to high grassland frequencies near the farms as uniform grazing of all cropped land becomes inexpedient due to long distance to the milking facilities.

Focus on management strategies

This development has got implications. A concentration of grazed grassland near the farm creates loss of fertility furthest from the farm and accumulation of nutrients near the farm, to an extend that may increase losses of e.g. nitrogen if not efficiently utilized. This is especially important in areas with sandy soils and high winter rainfall where a large proportion of organic dairy farms are located in Denmark. However, a longer duration of grasslands may also provide an opportunity to control nutrient losses due to less frequent grassland cultivation.

The theme of an ongoing ICROFS project is grass-clover leys as an integrated part of organic dairy farms. The focus is on management strategies with the purpose of overcoming the above-stipulated shortcomings by manipulating grassland frequency and grazing intensity.

Two crop rotations

Two crop rotations have been established on loamy sand soil in an existing organic grass-arable system at Research Centre Foulum: One represents close to the farm buildings (barley/grass-clover, 4 years of grass-clover and barley whole crop/catch crop) and another represents further away (barley/grass-clover, 2 years of grass-clover, barley/catch crop, maize/catch crop and lupin/catch crop). In all grass-clover leys five grassland treatments have been made varying in nutrient load and grassland management (table).

Nitrate leaching

Two years of data shows that nitrate leaching (figure) in the crop rotation close to the farm was mainly in the grasslands. In both crop rotations the barley wholecrop undersown with Italian ryegrass was very efficient in accumulating N following spring ploughed grassland and therefore leaching losses at this place in the crop rotations were at a very low level. Distant from the farm leaching losses following maize and lupin were considerable, despite both crops were followed by a catch crop. Maize was undersown with a ryegrass/winter rape mixture and lupin was followed by winter rye. Nitrate losses in grasslands depended on both grazing and manure treatment. Highest leaching was found following the grazing regime with manure application, and a drop was observed when avoiding the manure application. Also a drop was observed when removing spring cut before start of grazing. In cut grassland manure application did not influence nitrate leaching.

Further reading
You can read more on the website of the DARCOF III research project, OrgGrass:

www.orggrass.elr.dk/uk

1	Grazing (heifers) regime with cattle manure application in spring, 100 kg total-N/ha
2	Grazing regime without manure application
3	Spring cut followed by grazing. Cattle manure application in spring, 100 kg total-N/ha
4	Cutting with cattle manure appl. (200 kg total-N/ha, ½ in spring and ½ after spring cut)
5	Cutting regime without manure application

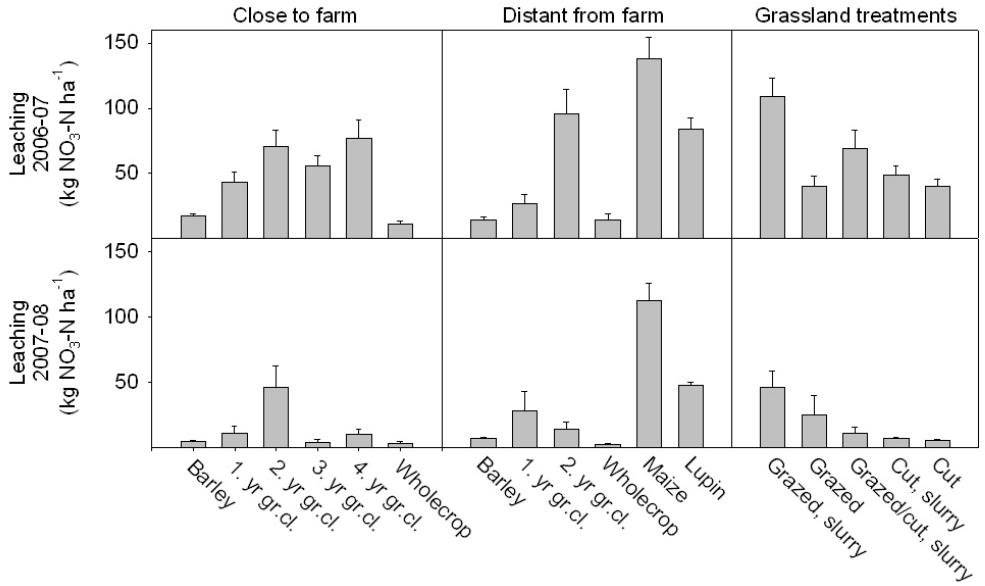

Table above: Grassland management treatments. Figure below: Annual nitrate leaching in two winters (2006/07 and 2007/08). Left and center: Individual crops in the two crop rotations, average of grassland regimes. Right: Grassland regimes, average of grassland age and crop rotation. Error bars: ±SE.