HARVEST OF GRASSLANDS FOR SILAGE OR HAY INSTEAD OF CATTLE GRAZING

2011 authors: U. Jørgensen, G.H.Rubæk and F. Vertès

Description
Nitrogen leaching is reduced when the utilization of N in manure is optimized. The utilization of N in manure in systems where cattle graze is low, compared to systems where grazing is minimized and manure rates and application methods are optimized.

Rationale, mechanism of action
There is a significant surplus of N on fields used for grazing animals compared to a situation where the grass field is cut for silage (or hay) and manure is applied at doses corresponding to crop requirements. The surplus arises from the local concentration of nutrients in manure-N deposited by the grazing animals, higher amounts than plants and soil can take up, compared to a situation where manure is applied with trail hoses or direct injection just before a growth period for the grass field, at recommended N doses taking N fixation of clover into account. This effect is long well known and well documented for both grass and grass/clover fields [1, 2, 3, 4].

Applicability
The measure is suitable for cattle farms with frequent grazing. It might be in conflict with animal welfare concerns and it has a limited applicability on organic farms, since grazing is mandatory in organic farming. It can be applied on permanent grassland as well as on grass in rotation, but the effect will typically be higher on grass in rotation, as such fields typically have higher N-recommendations or N-norms [5].

Effectiveness, including certainty
The relative effect of grazing strategy on N-leaching and yield are given in table 1 based on [2] and [6]. Similar trends were measured in France with unfertilized grass/clover swards [6], with yields increases of about 10% with one cut + grazing compared to pure grazing, and N leached being reduced by 20-30 % (60 vs. 80 kg N $ha^{-1}.y^{-1}$).

Table 1. The relative importance of grazing strategy on nitrate leaching and yields [2]

Strategy	Relative N leaching	Relative yield
Grazing	100	100
1 cut and subsequent grazing	90	105
2 cuts and subsequent grazing	65	115
Cuts only	30	115

The effect on P losses is not documented, but in areas with a high risk of erosion or losses of P though sub-surface drainage systems it may reduce P losses due to the improved utilization of nutrients in the manure, the improved timing of application, and the more uniform manure distribution.

Time frame
The reductions in N leaching and P losses will occur on the short term.

Environmental side-effects / pollution swapping
The emission of greenhouse gasses will probably be reduced when N leaching decreases and the N use efficiency of manure increases. Ammonia volatilization may increase due to larger ammonia losses from stables, manure storage facilities and during manure application compared to grazing. There is also an increase in energy use and farm machinery needs, for mowing, manure spreading, and hay drying if necessary.

Relevance, potential for targeting, administrative handling, control
The option can be relevant in areas with cattle production where the N leaching is problematic for the aquatic environment. It will also protect soil structure in risky situations, since grazing on wet soils can lead to severe soil compaction that can reduce root growth, earthworms activity and water percolation [7]. It is targeted on grassland fields only and is relatively easy to control by visual inspection.

Costs: investment, labor
Costs are related to the difference in fodder production and the working expenses between grazing systems and harvest of cuts. The costs for harvest, manure handling etc. are typically higher in the harvest of cuts system, but this can be counterbalanced by improved fodder production in this system. Investments in manure storage facilities may be required. In case of hay making in wet climates, barn-drying facilities should be developed to reduce harvest losses, especially for grass/clover, and to increase the quality of the hay.

References

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