

Environmental aspects of grazing animals in a European context

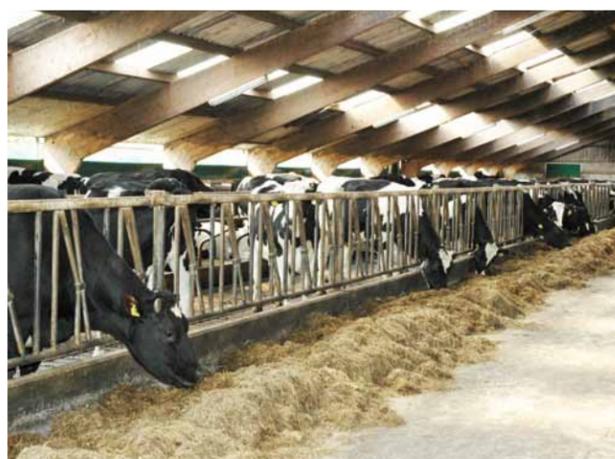
Introduction

The total agricultural area in the EU-27 member states is 190 million hectare, divided in 121 million hectare arable land and 69 million hectare permanent grassland (Figure 1). Ruminants spend a part of the year in the meadow and changing the actual length of the grazing period for ruminants has multiple effects on the environment (Table 1).

Impact of the length of the grazing period on the emission sources

- Ammonia emission from animal manure deposited during grazing is lower than the emission from the same amount of animal manure excreted during housing and subsequent land spreading. In the actual Dutch situation 70% of cattle manure is excreted in the stable and 30% in the meadow. In case of zero grazing ammonia emission from dairy cattle will increase with 25% and in case of all summer grazing ammonia emission will decrease with 16%.
- For the emission of nitrous oxide the IPCC default emission factor for cattle grazing is 2% and for surface application of animal manure on mineral soils 1%. This implies that nitrous oxide emissions are increasing with increasing grazing time. The IPCC does not provide an emission factor for incorporation of animal manure, but this factor will be higher than for surface application. In this situation there will be no much difference in nitrous oxide emissions with changes in grazing time.
- For the emission of methane the IPCC default methane conversion factor for cattle grazing is 1% and for stored animal manure 10 – 30% depending on the temperature and duration of storage. Methane emissions are therefore decreasing significantly when cattle spend more time in the meadow.
- Nitrogen in animal manure deposited in the meadow has a much lower efficiency for crop uptake than nitrogen in spreaded animal manure. Increasing the time cattle spend in the meadow will decrease the amount of collected manure to be spread. To maintain an equal grassland production this implies a higher consumption of synthetic fertilizer and subsequent a higher nitrogen surplus on the soil balance leading to more nitrate leaching.

The overall effect of changes in duration of the grazing period on the environment is dependent on the specific farm conditions and corresponding site specific emission factors.



Discussion

Grazing management is one of the key factors for improving nutrient use efficiency on dairy farms. Restricted grazing contributes to increasing nutrient use efficiency at farm level through:

- better utilization of animal excretions, because these are collected in the manure storage instead of deposited in the meadow,
- more balanced animal feeding, because cattle are fed in the animal house with the possibility of supplementing the grassland products by fodder maize and concentrates.

On the other hand grazing is cheaper than housing and grazing benefits the animal welfare.



Figure 1 Spatial distribution of grassland as a percentage of utilized agricultural land (average of 1995-2004) in Europe (Smit et al., 2008).

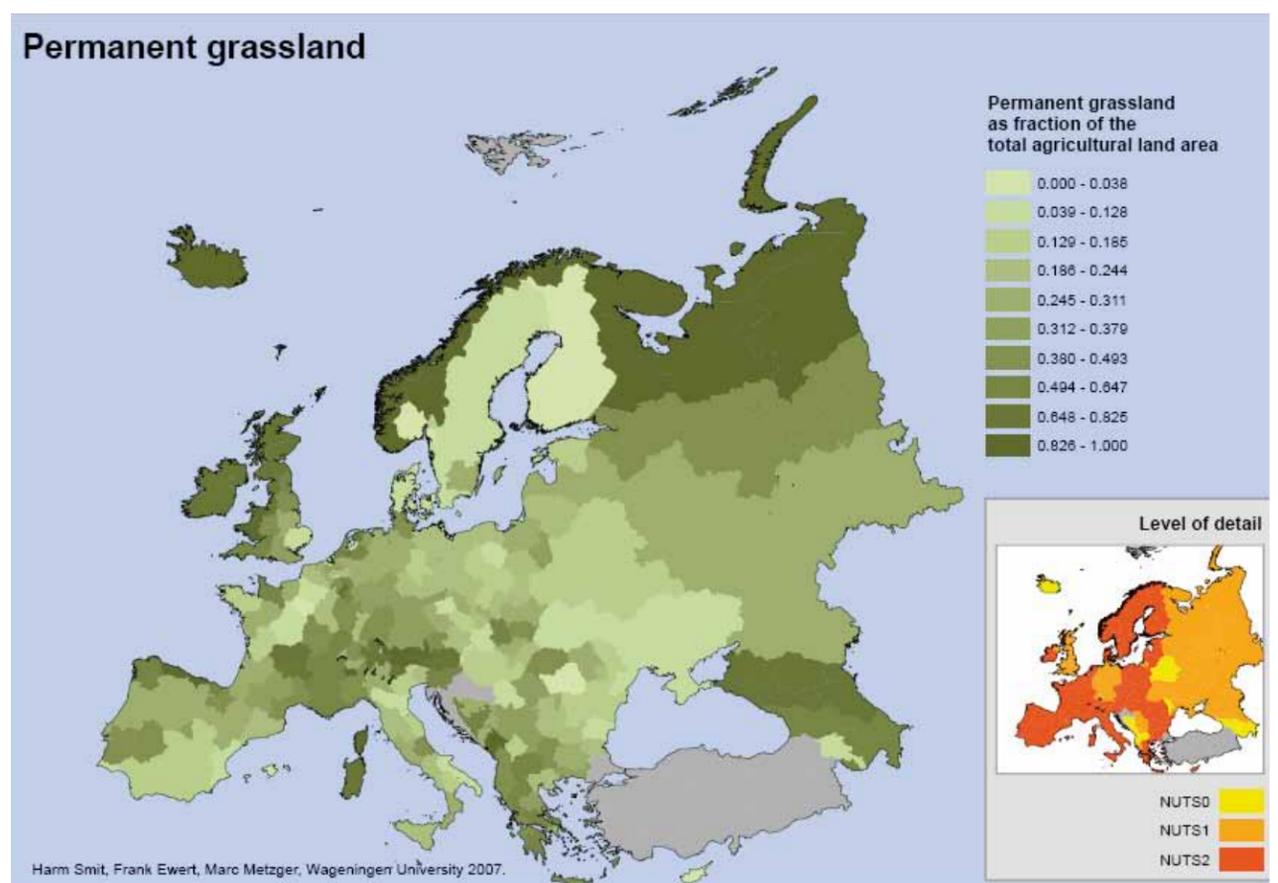


Table 1 Overview of the environmental effects of increasing the duration of the grazing period in relation to the actual situation.

	Effect of increasing grazing period
Emission of ammonia	Lower
Emission of nitrous oxide	
- surface spreading of animal manure	Higher
- incorporation of animal manure	No much effect
Emission of methane	Lower
Leaching of nitrate	Higher
Consumption of synthetic fertilizer	Higher

References

- Smit, H.J., M.J. Metzger and F. Ewert, 2008. Spatial distribution of grassland productivity and land use in Europe. *Agricultural Systems* 98, 208–219.
- Van der Hoek, K.W., 2010. Environmental aspects of grazing animals in a European context. *Grassland Science in Europe*, 15, 130-132.

Conclusion

In general increasing the grazing period leads to lower emissions of ammonia and methane and to higher leaching of nitrate and higher consumption of synthetic fertilizer. The effect on nitrous oxide emissions depends on the application method of the animal manure, whether surface spread or incorporated.