# Derogation on the EU Nitrates Directive: does it make a difference?

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*Abstract*— **The paper discusses an ex ante evaluation of the derogation on the Nitrates Directive for Flanders, Belgium, which is a case of intensive but highly productive livestock areas. The aim is to develop an accurate simulation model to detect small differences in manure surpluses caused by changes of manure production and/or utilization. The system of models consists of various modules to fine tune the calculations of manure production, fertilizing behaviour and manure allocation and disposal on and off farm. The results show that derogation may cause the existing manure surpluses to expire, if only nitrogen limits are considered and no transactions costs are taken into account. When also phosphate fertilization limits are considered, the increase in manuring possibilities is much lower than expected. Ongoing research focuses on the marginal shifts in manure surplus at farm level and possible effects of transactions costs.**

*Keywords*— **Nitrates Directive, derogation, modelling.**

## I. INTRODUCTION

Measures of manure application limit the manure use on land. One of these is the well-known EU standard of 170 kg N/ha issued from the Nitrates Directive (Directive 91/676/EEC1). Manure that cannot be utilized, leads to manure surpluses. In intensive but highly productive livestock areas, this limit may become a severe production constraint. In particular in dairy farming, where manure production is quite in balance with utilization possibilities, small differences in manure production and/or utilization possibilities make great difference on surpluses. The magnitude of manure surpluses influences the organization of manure exchange with lot of transaction costs, on the one hand, and faces high opportunity costs for treatment on the other. Rough estimates of both may bias an ex ante evaluation of policy measures, such as the derogation on the Nitrates Directive.

Our aim is to develop an accurate simulation mode for Flanders to detect small differences in manure surpluses caused by changes of manure production and/or utilization. We investigated manure surplus changes due to the derogation on the Nitrates Directive. At the end of 2007 the European Commission granted the derogation with regard to the region of Flanders, Belgium. The Flemish Land Agency expects in 2007 a magnitude of 13,7 million kg N surpluses (without export and processing); 0,3 million kg N surpluses (with export and processing) [2]. With derogation this surplus is expected to expire. However, there are serious doubts this will happen, given the interaction with phosphate limits and high transaction costs for fulfilling the administrative obligations.

Therefore, it becomes a methodological challenge to model the next compounds as accurate as possible: manure production, fertilizing behaviour and manure allocation and disposal on and off farm. Manure surpluses are calculated with a system of models, predominantly calculations models but also links to regional (transportation) models are possible. Other links to the SEPALE sector model [1] are possible (substitution for inorganic fertilizer, exchange of production and emission rights) are possible but not yet elaborated.

Per module of the model system, the paper discusses some attention points for avoiding biases in manure surplus calculation. It further discusses the co-limiting effect of phosphate fertilization constraints. Aspects of balancing transaction costs with opportunity costs are not yet incorporated

## II. MODEL SYSTEM

### A. Input management module

The input management module uses FSS-data (Farm Structure Survey) on livestock and land use activities at farm level for Flanders. The FSS-categories changes through time and are therefore transformed to generic FSS-categories. The use of generic FSS-categories makes it also easy to convert livestock and land use activities with a simple transformation module to model specific groups e.g. aggregation of pigs (Fig. 1). The definition of a given animal category, e.g. sows, may differ according to the end-user, here SELES (the Flemish agricultural sector model), OECD and MB (the Flemish Manure Bank). The input management module must, therefore, also manage production coefficients, consistent with each definition.

As the FSS-data are one-moment-in-time data, they have to be calibrated to Manure Bank data, an administrative data base on manure production, disposal and abatement. For example the calibration coefficient of grassland is 1,21 for 2006. This means that using non-calibrated area data underestimates the grassland area with 21%.
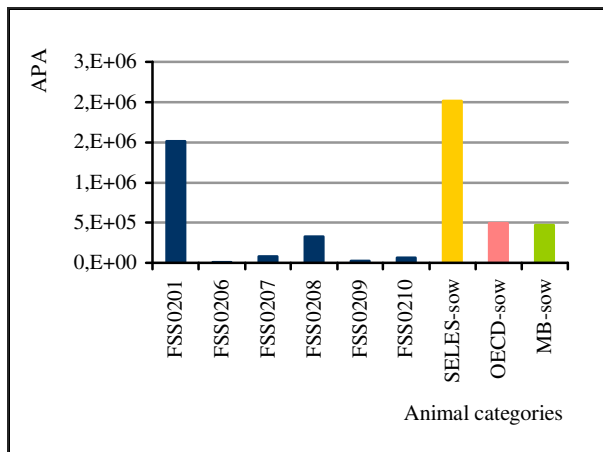


Fig. 1: Average present animals (APA) for different generic FSS-categories of pigs and for model specific groups SELES-sow, OECD-sow, MB-sow
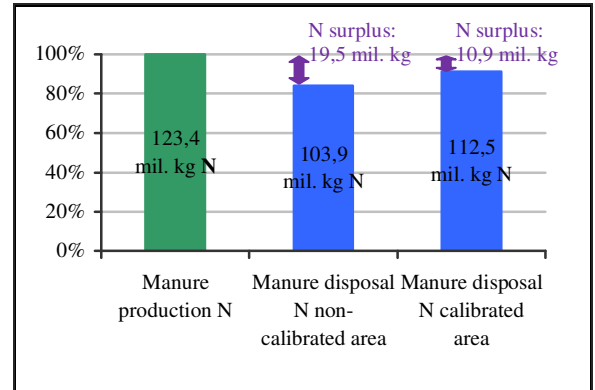


Fig. 2: The effect on manure surpluses of N using calibrated and non-calibrated FSS-data

Fig. 2 illustrates the sensitivity for the calibration assumption in our model. Calculating manure surpluses based on non-calibrated area respectively calibrated area gives 19,5 million kg N and 10,9 million kg N respectively.

### B. Manure production

Manure production is calculated by multiplying the calibrated livestock numbers with the annual excretion per average animal. The used excretion data are derived from the Manure Bank of the Flemish Land Agency. For deriving the net N manure production, a relative ammonia emission coefficient per animal category (14,22% for cattle, 29,74% for pigs, 22,23% for poultry and 15,60% for other) was considered [2].

### C. Manure disposal

Manure disposal was based on the calibrated areas and measures of manure application set out in the Flemish Manure Decree which is an application of the Nitrate Directive.

In Flanders nitrogen livestock manure is limited to 170 kg N per hectare. Derogation relaxes this standard. Under certain circumstances it is permitted to use up to 250 kg nitrogen per hectare per year from livestock manure in parcels cultivated with grassland and maize under-sown with grassland and up to 200 kg nitrogen per hectare per year from livestock manure in parcels cultivated with winter wheat followed by a catch crop and with beet [2].

## D. Manure allocation and disposal on and off farm

In the calculations a 100% filling-in level (on own farm) and a 100% acceptance level (off farm) is assumed. This is probably an overestimation. For comparison, an 85% acceptance level is also calculated (
Fig. 3).

So far, only farms with manure surplus on farm level are assumed to adopt derogation. With an overall adoption of derogation, there is no more a manure surplus (Fig. 4).
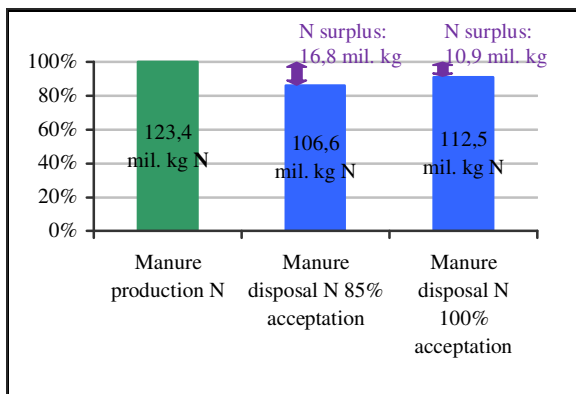


Fig. 3: The effect on manure surpluses of N using an 85% and 100% acceptation level
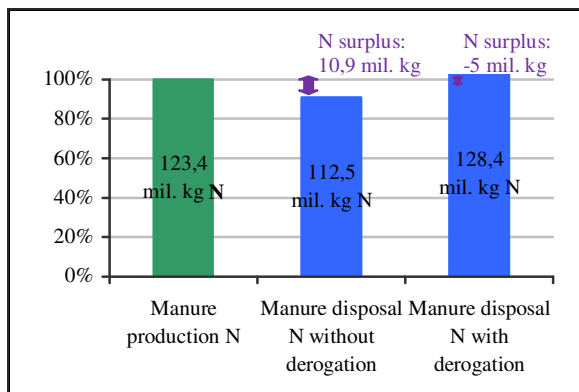


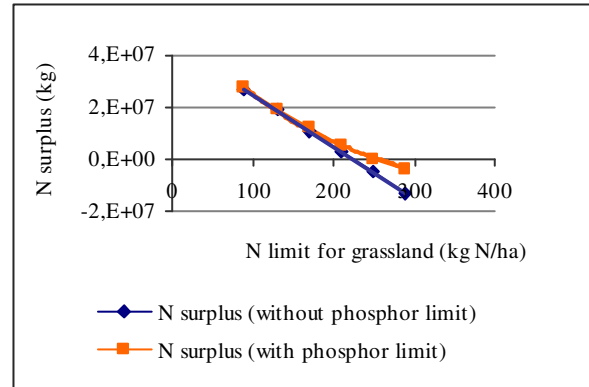Fig. 4: The effect on manure surpluses of N with and without derogation



Fig. 5: The effect on manure surpluses with and without phosphate limit

Manure consists of nitrogen and phosphor. Per hectare, 80 to 100 kg $P_2O_5$ (varying between crops and years) may be utilized. So far, calculations have been done without considering phosphor as a co-limiting factor.

Fig. 5 shows the importance of this limited factor:
- Without phosphor as limited factor: manure surplus in 2007 is -5 million kg N,
- With phosphor as limited factor: manure surplus in 2007 is 0,3 million kg N.

## III. CONCLUSIONS

Small differences in assumptions of manure production, utilization, on and off farm allocation cause great differences in manure surpluses. Therefore, the gains of derogation are much smaller when considering phosphate as limited factor. It will not make that difference as policy makers want the farming sector to believe.

As final results are that sensitive, an ex ante evaluation of derogation needs to offer policy makers a pallet of accurate estimates with transparent link to their underlying assumptions. Ongoing research that will also be reported on the poster, concentrates on the effect of derogation on different farms types, and their balance between transactions cost and opportunity cost (transportation, processing or paying a tax).

## ACKNOWLEDGMENTS

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