FARM DATA NEEDED FOR AGRI-ENVIRONMENTAL REPORTING

Technical document summarizing the findings of the DireDate project for the Final Seminar in Luxembourg on 28 March 2011[1]

Annex 2 Nitrogen and phosphorus balances.

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Authors

O. Oenema, B. Amon, C. van Beek, N. Hutchings, M. Perez-Soba, C. Procter, S. Pietrzak, G.L. Velthof, F. Vinther, L. Wilson

Consortium

DLO-Alterra, Wageningen UR, The Netherlands
Department of Agro-ecology and Environment, University of Aarhus, Denmark
Institute of Technology and Life Sciences, ITP/IMUZ, Falenty, Poland
Department of Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences, Wien, Austria,
ADAS, Wolverhampton, United Kingdom

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Annex 2 Nitrogen and phosphorus balances

This Annex provides supplementary information to Chapter 4 about nitrogen and phosphorus balances. The gross nitrogen and phosphorus balances provide holistic indicators of the related environmental pressure exerted by agriculture. For N, significant losses occur to the atmospheric in the form of ammonia, nitrous oxide, nitric oxide (NO) and dinitrogen (N_2). Ammonia, nitrous oxide and nitric oxide are pollutants whereas the emission of dinitrogen reduces the effectiveness of manure and fertilisers and the fertility of soils. Nitrogen is lost to aquatic environments in the form of nitrate, ammonium and dissolved organic N, all of which can lead to pollution and all of which reduce the fertility of the soil. The nitrogen flows and losses in agricultural systems are schematically shown in Figure A.2.1.

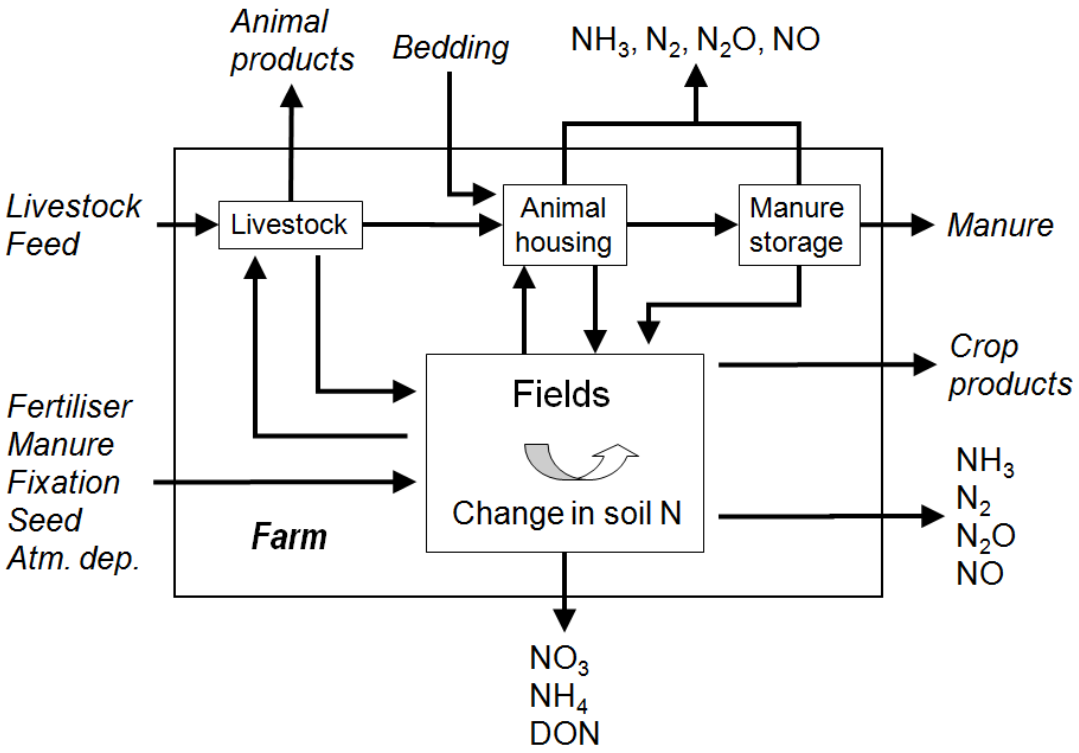

Figure A.2.1. Schematic representations of the main nitrogen flows and losses in agricultural systems.

In a farm N balance, all internal flows of N are ignored (Fig A.2.2). The balance therefore includes all losses of N to the atmospheric and aquatic environments, plus any changes in the storage of N in the soil. When applied at the national scale, it would be more correct to call this a sector N balance, since the transfer of N between individual farms is then treated as an internal flow.

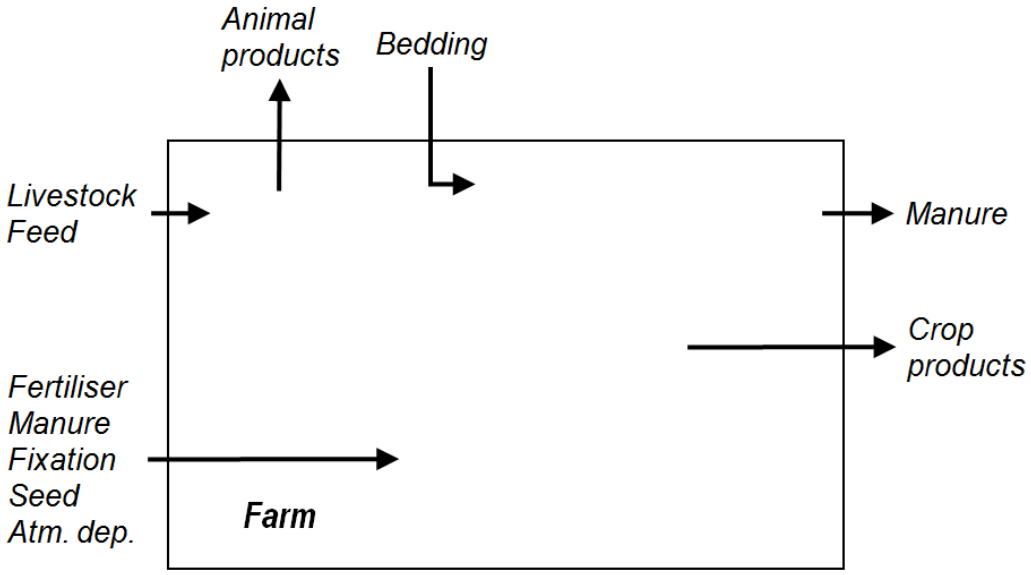

Figure A.2.2 Schematic representation of a farm N balance

The gross N balance captures the identical information as the farm N balance but it is calculated differently (Figure A.2.3). Here, the imports of N in animal feed and the export in animal products are not required, whereas estimates are required for the excretion of N by livestock and the amount of N consumed by livestock in feed that is produced within the area of interest (farm, region, sector).

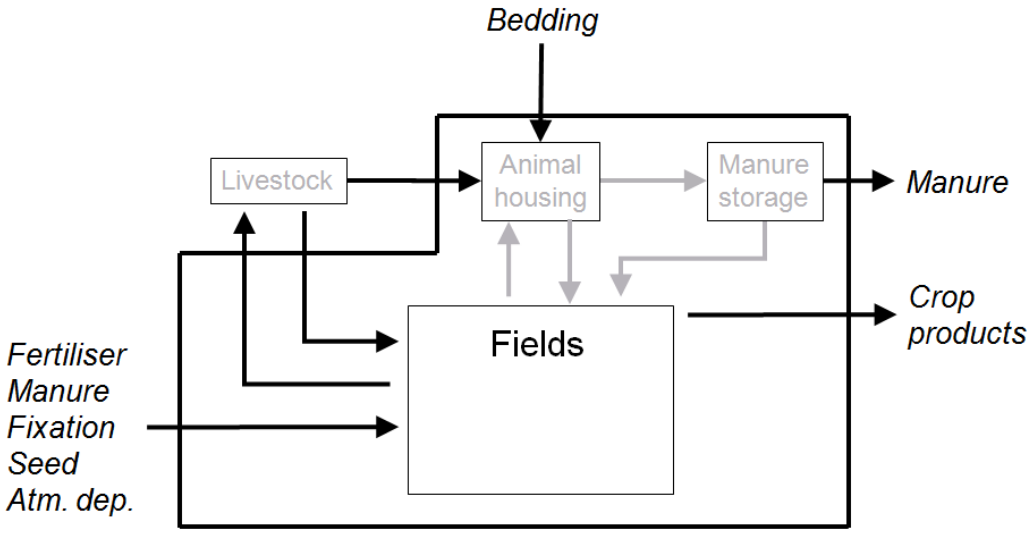

Figure A.2.3 Schematic representation of a gross N balance. Flows shown in grey are not included in the calculation.

In a soil nitrogen balance, the gaseous emissions from animal housing and manure storage are subtracted (Figure A.2.4), so this balance is of greater value if the aquatic environment is the main focus of interest. An even closer relationship to the pressure on the aquatic environment would be obtained if the ammonia emission from field-applied manure was subtracted from the soil nitrogen balance. However, the farm management data necessary to calculate the soil nitrogen balance are currently scarce and uncertain.

Phosphorus is a potential pollutant of aquatic environments, since it leads to eutrophication. There is no major loss of P to the atmosphere; losses occur by surface run-off, erosion and leaching. The calculation of P balances is less problematic than for N because there are fewer sources of inputs of P to agriculture and there are no major gaseous losses. The P flows and losses in agricultural systems are schematically shown in Figure A.2.5. Further, since there are no major gaseous losses of P, the soil P balance is little more informative than the farm balance.

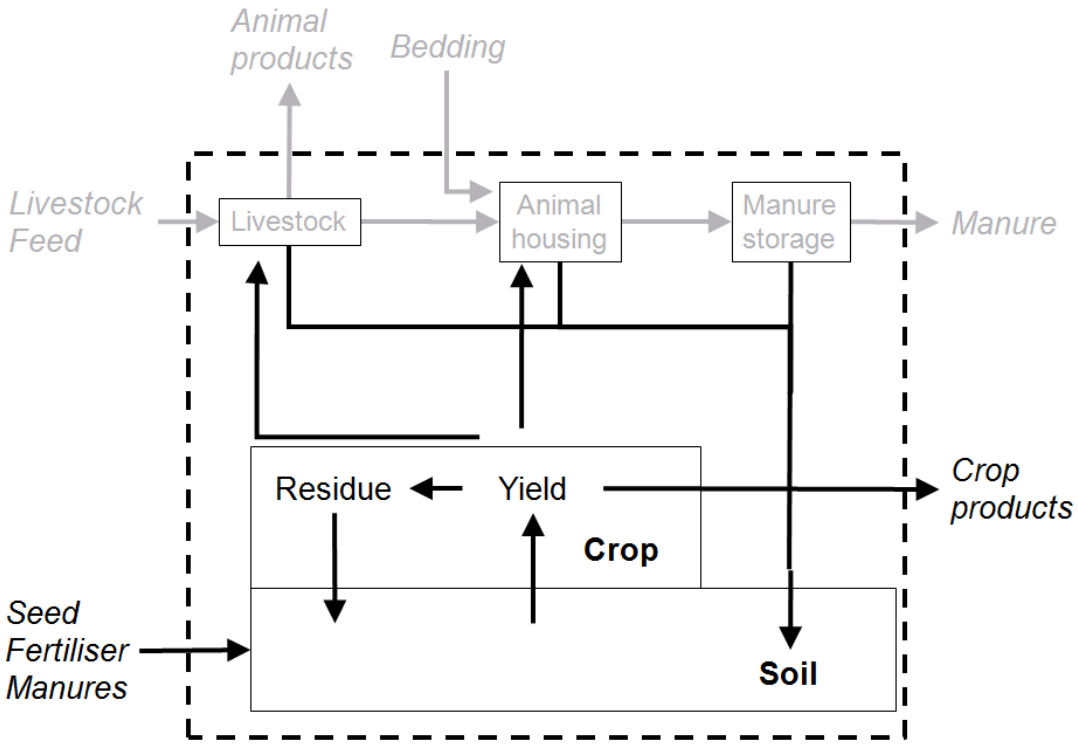

Figure A.2.4. Schematic representation of the main nitrogen flows of a soil nitrogen balance of agricultural systems.

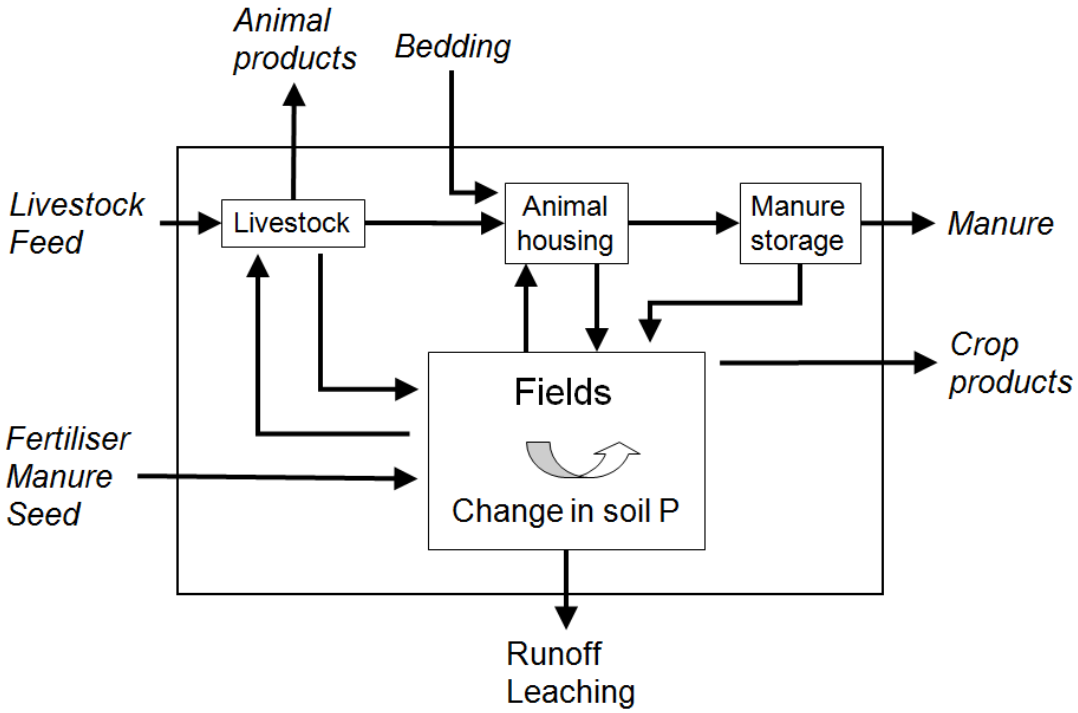

Figure A.2.5. Schematic representation of the main phosphorus flows and losses in agricultural systems.

The following aspects deserve particular attention:

- Changes in the amount of N stored in the soil can have a large effect on the N balances when there are significant changes in land management, especially when wetlands are drained. A methodology should be developed to account for this change.
- The credibility of expert estimates of the excretion of N by livestock should be assessed periodically, using statistics relating to animal production and the efficiency of N use for the production of animal products.
- Efforts should be made to improve the statistics concerning the import of animal feed, with a view of their use in calculating gross N balances, farm P balances and providing an additional method of assessing the credibility of N excretion estimates.
- Disaggregation of national N and P balances to finer spatial scales is often valuable for policymaking but faces significant methodological challenges. Initial investigations concerning the use of farm typologies in the spatial disaggregation are promising and deserve further investigation.