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Editorial

This special issue of the Netherlands Journal of Agricultural Science finds its origin in the national symposium 'Nitrate policy: research, dairy sector and policy makers', organized in November 2000 by Plant Research International in collaboration with the Centre for Agriculture and the Environment, and the Research Institute for Animal Husbandry, with contributions from the Ministry of Agriculture, Nature Management and Fisheries, the Ministry of Public Health, Physical Planning and the Environment, and the National Farmers' Association.

The aim of the symposium was to evaluate the relevance of recent research results for policy makers and the dairy-farming sector. The symposium was conducted in Dutch, but considering the relevance of the subject within the framework of European agricultural and environmental policy, publication of the papers in English for a wider audience appeared attractive. Therefore, the symposium organizers are grateful to the publishers of the Netherlands Journal of Agricultural Science for providing this platform.

The policy

An important issue in the ongoing discussion on dairy farming and the environment is the nitrogen load of surface- and groundwater through nitrate leaching. Nitrate forms a health threat via the drinking water supply, and a menace to nature development, when groundwater comes to the surface via lateral and upward flow. Dutch environmental policy aims at restricting nitrate leaching to levels that comply with the EU nitrate standard for drinking water of 50 mg per litre (Henkens & Van Keulen). To evaluate the impact of policy measures on the actual state of the resource, groundwater quality in the Netherlands is monitored in various networks through chemical analysis of the upper groundwater (Boumans *et al.*).

The problem

Recently, the Dutch Government has introduced the MINeral Accounting System (MINAS) as a major tool in its environmental policy for restricting nitrate leaching. However, the Netherlands has not been able (yet) to show convincingly that MINAS, in combination with the supplementary nitrogen policy for drought susceptible soils, indeed results in tangible reductions in nitrogen surpluses and improved groundwater quality (Henkens & Van Keulen). Such results are necessary to convince the EU that the Netherlands through its nutrient policy attains the required groundwater quality. An additional concern is the implementation of MINAS in terms of technical feasibility, economic viability and enforceability.

The research

The experimental farm for Dairy Farming and the Environment, 'De Marke', was established in 1992. Project 'De Marke' originated in the mid-1980s, when it was real-

ized that dairy farming caused severe environmental problems, through emissions of nitrogen and phosphorus. One of the objectives of project 'De Marke' (Hilhorst *et al.*) is the implementation, further development and evaluation of a dairy farm that on the most susceptible sandy soils in the Netherlands, technically complies with the EU nitrate standard in the upper groundwater (Aarts *et al.*), while maintaining a milk production level that guarantees economic viability (De Haan).

Since the start of the project, the cooperating research institutes Plant Research International, Centre for Agriculture and the Environment and Research Institute for Animal Husbandry, have collected a wealth of data on the performance of the 'De Marke' farming system. The major part of these data has now been analysed and forms the basis for the discussion among the stakeholders.

The questions to be answered

The discussions centre on the following questions:

a. Can the nitrate standard as formulated in Dutch (and European) environmental policy be attained in the actual practice of Dutch dairy farming on sandy soils (Aarts *et al.*; Vellinga & Hilhorst)?
b. What are the means available for meeting this standard (Vellinga *et al.*)?
c. How can the results of 'De Marke' be applied for extrapolation to other sandy soils (Hack-Ten Broeke), to other soil types in the Netherlands (De Visser *et al.*) and to commercial farms (Oenema *et al.*)?

The results

For policy development, the most important results of 'De Marke' appear to be operationalization of the concept of the dairy farm as a system and the introduction of mineral balances as policy instruments.

The methodology of 'prototyping' for the design of alternative farming systems aiming at attaining specific, explicitly defined objectives has shown its applicability. Implementation of the experimental farming system 'De Marke' has shown that a dairy farming system with acceptable nutrient losses is technically feasible and economically viable, even though the discussion about the economic consequences for commercial farms continues. Even within the tightest loss norms, annual application of about 240 kg of nitrogen per ha in animal manure appears feasible, with nitrate concentrations in the upper groundwater approaching the EU nitrate standard. But changes in some of the characteristics are so slow that the system is still in a transient state, and conclusions should be drawn with caution.

The spatial and temporal variability in dairy farming systems appears to be of such magnitude that the performance of the system also points to the need for long-term research as a basis for reliable predictions.

Herman Van Keulen
Guest Editor

Paul Struik
Jan Wienk
Editors