LIFE Project “Optimisation of nitrogen management for groundwater quality improvement and conservation” – OptiMa-N

1st European Orientation Group Meeting
Reggio Emilia, 22-23 April 2005

Summary of activities

On April 22nd it was held the first session of the EOG meeting with the presence of the following members of the group:

Dr. Marco Ligabue C.R.P.A Italy
Dr. Paolo Mantovi Fondazione C.R.P.A Studi e Ricerche Italy
Dr. Frans Aarts Plant Research International The Netherlands
Dr. André Pfimlin Institut de l’Elévage France
Dr. Theodore Karyotis National Agricultural Research Foundation – Institute for Soil Mapping and Classification Greece
Dr. Stefan Pietrzak Institute for Land Reclamation and Grassland farming – Soil and Water Chemistry Department Poland
Dr. Steen Gyldenkaerne National Environmental Research Institute Denmark
Dr. Francesco Mundo Ministero dell’ambiente e tutela del territorio Italy
Dr. Jeroen Casaer European Commission Belgium
Dr. Franco Berre Regione Emilia Romagna Italy
Dr. Giampaolo Sarno Regione Emilia Romagna Italy
Dr. Andrea Giapponesi Regione Emilia Romagna Italy
Dr. Giuseppe Bonazzi CRPA Italy
Dr. Kees de Roest CRPA Italy
Dr. Elena Bortolazzo CRPA Italy

During the first part of the meeting Dr. Ligabue introduced CRPA and then, the rest of the members of the EOG introduced their Institutes and also the projects in which they are involved.

At 11, a press conference was held with the presence of the provincial assessor of Agriculture Mrs. Roberta Rivi and the participation of Dr. Jeroen Casaer, European Commission representative, who stressed the importance of this project for the EU. In the end, Dr. Mundo from Ministero dell'ambiente explained the Italian environmental situation.

During the last part in the morning, Dr. Ligabue, explained the LIFE OPTIMA-N project's objectives and tasks. It was also briefly described the work in progress.

In the afternoon, the group visited "COTTI" demonstrative dairy farm, where they saw the demonstrative site cultivated with lucerne, tall fescue and a mixture of both. They met Mr. Cotti and talked with him about the characteristics and conduction of the farm.

At the end of the afternoon, the group went to "CHIERICI" pilot farm. They visited the site, with irrigated permanent meadows, a typical crop in this region. The management of this monitoring site was explained and the differences between the treatments could be observed.
Summary of remarks made during the discussion held on 23rd April.

The programmed discussion for the morning of 23rd April opened with the presentation of “Evaluation and improvement of N use efficiency in a demonstrative dairy farm”, by Paolo Mantovi and Kees De Roest (downloadable files available on the Internet site).

The speakers illustrated:
- the methods adopted to draw up the “barn gate” and “farm gate” nitrogen balances,
- the main features of the “Cotti Luca & Silvio” demonstrative dairy farm,
- the results of the two nitrogen balances compiled for the above farm, for the year 2004.

The presentation stimulated much talk over the adopted methods and their results, and the following series of observations were forwarded.

1) Doubt was expressed over classifying the soil in the experimental site as Inceptisoil without the support of available data on the concentrations of exchangeable cations. The Greek representative indicated that he was willing to accept soil samples from the experimental site for assessing the concentrations of exchangeable cations at his institute’s laboratories.

2) Full specification was requested on the crude protein content in feed used on the farm. This can be taken as an average of 15.5-16.0% for 2004. (15.3% and 16% in dairy cow feed, 17-18% in dry cow and heifers feed, used in quantities of about 1/10 compared to that used for dairy cows).

3) Full specification was requested on lucerne productivity. Approximate average production is around 8-10 tons dry matter/hectare*year. This value was considered rather low by some participants who thus justified acquiring elevated feed quantities. Specific evaluations on lucerne productivity will be carried out as part of the project in the future.

4) The speakers were asked if they had assessed the proportion of lucerne leaves left in the field during harvesting. They replied that they had not done this but would definitely plan to do so in the future, in order to define how much forage nitrogen is left in the field and consequently how much could be recovered through artificially drying the crops.

5) The speakers were also asked if the barn gate balance, as nitrogen excretion per cow, had been determined by collecting and measuring the excrement from one single animal over one or more days. The answer was no. Assessments will be made to decide whether or not to programme this type of activity in the future.

6) It was confirmed that the nitrogen contents of irrigation water must be included in the farm gate balance, as for precipitation. It was pointed out that 2000 m³/ha = 200 mm irrigation water, with nitrates concentration of 50 mg/l, signifying a nitrogen input of 100 (kg NO₃/ha)/4.43= 22.6 kg N-NO₃/ha or 3000 m³/ha = 300 mm irrigation water, with nitrates concentration of 80 mg/l, signifying a nitrogen input of 240 (kg NO₃/ha)/4.43= 54.2 kg N-NO₃/ha.

7) There was discussion over the value, included in the farm gate balance, given to the nitrogen fixation of lucerne, which was estimated, through literature, as 160-165 kg N/ha. It was specified that this value only considers the amount of nitrogen fixed in the epigeal biomass and not the amount fixed in the roots. The value was provisionally accepted as adequate; more indications on how to carry out this estimate will derive from the discussion in the Thematic Working Group on “Assessment of biologically fixed nitrogen”, scheduled for the next Nitrogen Workshop (Maastricht, 24-26 October 2005).

8) Explanations were required on the type of livestock waste produced on the farm and the methods of use. It was specified that the farm exclusively produces farmyard manure which is mainly used before the ploughing during late summer and autumn. Some members of the work
group criticised the use of manure on cropland left bare over winter (e.g. for spring tomato crops); in fact, this practice could increase nitrate losses from the soil to the water. Some participants pointed out that, in the case of manure with a lot of straw, nitrogen mineralization is possibly rather slow resulting in low nitrate losses.

9) It was pointed out that atmospheric nitrogen emissions, from the part of the stall where lactating cows are kept (hardstanding included), have been measured and resulted in average values of about 9 kg NH₃/lactating cow*year and 0.3 kg N₂O/lactating cow*year.

10) Explanations were also requested on the practice of tomato cultivation. It was specified that the rows are generally planted 1.5 m apart, the irrigation is mainly carried out using punched irrigation pipes or sprinklers and that the fields are dressed with manure in the autumn and mineral nitrogen during the crop season (dissolved in irrigation water and distributed using punched irrigation pipes, where applicable). The group agreed that this type of cultivation is barely sustainable from the viewpoint of nitrates dispersion from the soil to the water. It was suggested that a farm nitrogen balance could also be compiled excluding tomato fields; in fact this crop can be considered unconnected with farm rearing activities.

11) Participants agreed, in discussion over the “ball on top of a mountain” metaphor (see presentation), that the mountain slopes are steep, especially because of the farm’s location in a vulnerable zone with high sensitivity; in fact the main soil type is very permeable with reduced depth (50-60 cm). There was however some dissent over the dimension of the ball. Some considered it bigger, due to the marked presence of tomato cultivation, the autumnal use of manure and a widespread use of mineral fertilisers, others saw it as smaller, considering the low number of cows per land area and the elevated surface area dedicated to forage crops, which notoriously contribute to reducing nitrogen losses by providing land cover all year round with medium-high uptakes of nitrogen.

12) It was stressed that the practice of silage can lead to significant reductions in nitrogen losses from forage. However it was stressed that it is legally forbidden to use silage forages on farms, like the demonstrative dairy farm in question, where milk is destined to produce Parmigiano-Reggiano cheese.

13) The application of mineral nitrogen on lucerne, at least from an agronomical viewpoint, was considered contradictory. Comparisons are to be made between the yields from fertilised and unfertilised lucerne.

14) It was noted that, in the future, liquid manure production in the newly built stalls might promote greater flexibility in farm use of livestock manure. In fact it is more convenient to use slurries, rather than solid manure, in spring (e.g. on meadows) and the liquid material could, at least partially, substitute spreading chemical fertilisers at the start of the vegetative season or in the pre-sowing stage.

15) It was also noted that environmental sustainability could be encouraged by increasing the surface area of meadows, replacing tomato cropping.

16) It was pointed out that it might be a good idea to promote farm involvement in the project by organising occasions for meeting farm managers, in the farm, and also to involve family members employed in farm operations, wives in particular. It was also suggested that farm feed and fertiliser suppliers should be invited to attend these meetings.

17) A likely strategy was proposed to encourage farm managers to adopt any indications emerging from the project: to prepare an estimate of future possible economic benefits to the farm.

18) Demonstration days should be held on the farm when other guest farmers could take part in a guided itinerary, with posters informing participants on the good farming practices in each part
of the Cotti farm, including animal waste management (no badly built heaps), herd feeding and soil fertilisation.

19) Another important environmental problem connected to that already under discussion emerged during discussion: the accumulation of phosphorous in lands subject to repeated applications of manure. This element can saturate the land and consequently be leached and cause eutrophication of surface waters. For example, contributions from the concentrates: if we take 3.5 g P/kg feed (mixture of cereals and protein concentrate), 3 tonnes feed/cow*year and 2 cows/ha it would make an input of 21 kg P/ha; the output through milk is about 0.9 g P/kg milk, so the surplus of P is about 21 kg – (9*2*7500 kg milk) = 7.5 kg/ha. The suggestion that P could be a more difficult problem to solve in the future should be discussed with the full P balance, including mineral fertilisers, mineral supplementation to the cows, manure import, etc. CRPA promises to consider the problem in a new project… (!).

20) Ways were considered on how to persuade farmers to adopt methods for optimising nitrogen management and farm environmental sustainability. It was concluded that, at present, there are no satisfactory, really effective instruments available. We are awaiting verification of changes involved in application of the new PAC (eco-conditionality).