Brussels, 14 March 1997

COST 228/97

Memorandum of Understanding

for the implementation of a European Concerted Research Action designated as COST Action 832

"Quantifying the agricultural contribution to eutrophication"

The Signatories to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the Technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 400/94 "Rules and Procedures for Implementing COST Actions", the contents of which are fully known to the Signatories.

2. The main objective of the Action is to develop a common methodological framework for quantifying phosphorus loss from agriculture to water in order that the agricultural contribution to eutrophication within the EU can be more uniformly assessed.

3. The overall cost of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at ECU 5,7 million at 1995 prices.

4. The Memorandum of Understanding will take effect on being signed by at least 5 Signatories.

5. The Memorandum of Understanding will remain in force for a period of 5 years, unless the duration of the Action is modified according to the provisions of Chapter 6 of the document referred to in Point 1 above.

COST ACTION 832

Quantifying the agricultural contribution to eutrophication

A. GENERAL BACKGROUND

The accelerated nutrient enrichment or eutrophication of surface waters has become a significant environmental problem in many developed countries. The extent of eutrophication in fresh waters is most commonly related to the concentration of phosphorus and agriculture has been identified as a significant phosphorus source. Identification of mitigation options to reduce phosphorus inputs to water, in line with EU initiatives (PARCOM), requires a sound knowledge base of the significance of agriculture as an eutrophication source.

Current research programmes within European countries attempt to quantify agricultural P loss but data are not strictly comparable because of differences in the methodologies used; for example in the forms of phosphorus measured, the sampling methods adopted, the definition of pathways and calculation of loads. Work is currently in progress within the Nordic countries on the need for harmonization of techniques. A recent comparison of fertilizer recommendation systems between different countries also indicates scope for unification of the principles upon which recommendations are based.

The accumulation and loss of agricultural phosphorus to inland and coastal waters is an international problem involving considerable research effort. This research effort requires coordination in order to develop a common technical understanding of the justification of phosphorus use in European agriculture and a methodological framework for identifying the relative contribution of different sources of agricultural phosphorus loss to water at the farm and catchment level. This is necessary to underpin current R&D programmes and provide a sound knowledge base for decision support systems relating to phosphorus use on agricultural land and upon which Government policy on phosphorus loss control strategies can be decided.

A recent EU (AIR programme) project entitled "Phosphate release potential of representative soils of contrasting agricultural areas of the EC: implications for the sustainability of agricultural systems and for the environment (Contract No AIR 3 CT92-0303)", and an EU (Environment programme) project entitled "Soil-borne organic phosphorus as affected by different regimes and climate: leaching and potential contribution to eutrophication (Contract No EVSV-0469)" are relevant to this Cost Action and key individuals from these projects will be represented. COST Action 49 "Macroalgae" is also relevant.

B. OBJECTIVES OF THE ACTION

Main objectives

To define conceptual models of phosphorus cycling in agricultural systems within the EU based on current research.

To develop common methodologies for quantifying phosphorus loss from agriculture to water.

To identify further research areas relating to the agricultural contribution to eutrophication which would benefit from a European approach.

Secondary objectives

To define terminologies and criteria for describing the forms, pathways and environmental impact of phosphorus within agricultural systems.

To unify decision support systems for phosphorus fertilizer recommendations based on soil analysis.

To develop methodologies for estimating the relative contribution of different sources of phosphorus loss to water within catchments.

Achievement of the objectives will be assessed by the development of conceptual models of phosphorus cycling within agricultural systems in the EU and the production of guidelines on key subject areas: terminology, recommended sampling and analytical procedures, principles of fertilizer recommendations, phosphorus loss risk assessment, approaches to modelling phosphorus loss at the catchment level and future research needs.

C. PROGRAMME OF WORK

The project will bring together soil scientists, agronomists, catchment hydrologists and aquatic scientists currently working on phosphorus R&D programmes in a series of working groups to develop specific topic areas as follows:

Working Group 1 (WG1) – Processes of phosphorus loss from fields

This Group will undertake a comparative study of the sampling and analytical techniques used in EU countries in determining the concentrations and loads of phosphorus transported from agricultural land to water. Processes of inorganic and organic phosphorus loss at the field scale will be examined and common terminology defined. Methodologies for assessing the influence of soil type, fertilizer history and land management on phosphorus loss will be evaluated and a common method for estimating potentially mobile forms of P will be developed. Novel techniques will be reviewed where appropriate and inter-laboratory comparisons will be necessary.

Working Group 2 (WG2) – Decision support systems for fertilizers and manures

This Group will review the underlying principles upon which phosphorus fertilizer recommendations are based in EU countries and the extent to which they can be unified into a phosphorus fertilization model. This will involve comparative studies on crop requirements, crop responsiveness, the influence of soil type and contributions from organic manures. Existing fertilization models will be reviewed. Attempts will be made to relate the different soil tests used in different countries to a common reference standard. This will involve inter-laboratory comparisons. The impact of EU fertilization strategies on soil phosphorus accumulation in each country will be appraised.

Working Group 3 (WG3) – Modelling of phosphorus dynamics in agricultural systems

This Group will bring together the conclusions and recommendations from Working Groups 1 and 2 with a view to developing a conceptual model describing the flows of inorganic and organic phosphorus forms within different agricultural
systems. The influence of biological (soil microbiota) and chemical (inorganic cycling) reactions in the soil system following application of phosphorus amendments will be defined and appropriate methodologies identified. Key land and soil-based parameters for quantifying surface and sub-surface losses at the field scale will be identified. Guidelines on the recommended methodology for assessment of the parameters identified will be prepared.

Working Group 4 (WG4) – Processes of phosphorus loss from catchments

This Group will compare the relative contribution of phosphorus loss pathways at the catchment scale and identify landscape features and processes which trap suspended sediment and attenuate phosphorus loss within different catchments. Relationships between storm flow, sediment transport and phosphorus loads will be examined. Methodology for estimation of catchment loads and for determining the impact of hill-slope processes and in-stream processes on the amounts of phosphorus measured in different catchments will be reviewed and developed e.g. the feasibility of fingerprinting techniques to assess the relative contribution of stream bank erosion to total phosphorus load. Research techniques will need to be developed.

Working Group 5 (WG5) – Modelling phosphorus loss in catchments

This Group would extend the recommendations from Working Group 4 towards developing a conceptual framework for modelling the transport of agricultural phosphorus within catchment e.g. relating catchment hydrology to variable phosphorus loss sources areas, an approach being developed in the USA. Existing empirically-based (land use export coefficients) and process-based catchment models for assessing phosphorus loss would be compared and related to the requirements specified by Working Group 4. The feasibility of unifying a modelling approach incorporating GIS techniques will be evaluated and developed.

Working Group 6 (WG6) – Agricultural contribution to phosphorus loads in the environment

This Group will synthesize the recommendations from Working Groups 3 and 5 and develop a common methodology for quantifying the relative contribution of point and non-point agricultural sources within catchments and for routine assessment of sources of non-point P loss within catchments requiring implementation of control measures based on land management. Identifying high risk areas and assessing the contribution of land, livestock and farm buildings within a methodological framework. This may be an extension of model development but may also be achieved by reference to a simple index rating as proposed in the USA.

Figure 1. Structure and organization of the working groups

COLLAGE

D. TIMETABLE

After an initial meeting at the start of the Action, working groups will convene according to the following timetable:

COLLAGE

An international conference detailing the methodology developed will mark the end of the Action in the fifth year. The proceedings of the conference will publicize the work undertaken in the Action together with the main conclusions and recommendations.

E. ORGANIZATION, MANAGEMENT AND RESPONSIBILITIES

Twelve countries have expressed an interest in the Action to date. Participating scientists already identified are listed in Appendix 1 to this Annex. It is anticipated that at least two relevant scientists from each country will participate in each working group.

An initial meeting for all participants will lay down the management and organization of the COST Action, identify members of each working group and agree a timetable for each working group to follow. Each working group will have a coordinator who is responsible for the delivery of the objectives of the working group within the specified timetable, the design of a workplan for the group and the preparation of written reports, including a final report. The working group coordinator will liaise and report directly to the management committee. The structure and organization of the working group is given in Figure 1.

Each working group will convene on 3 occasions during their 2,5 years lifespan. Sub-groups may be formed to progress key areas but will not convene at separate locations to the main working group. Each working group will follow a schedule:

1. First meeting – identify objectives, formulate sub-groups and agree responsibilities.

2. Review – preparation of review papers of current thinking/position in each country.

3. Second meeting – discuss review papers, design workplan to progress objectives.

4. Workplan – undertake inter-laboratory comparisons or method development.

5. Final meeting – discuss results of the workplan and formulate conclusions.

6. Guidelines – preparation of final report.

F. ECONOMIC DIMENSION OF THE ACTION

The following COST countries have actively participated in the preparation of the Action or otherwise indicated their interest:

Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Spain, Switzerland, United Kingdom.

The number of scientists potentially interested in participating in the Action is estimated to be 60 for 12 countries. Thus, after contacting all the countries interested, it can be expected that approximately 60 man-years for scientific staff and 50 man-years for technical staff will be involved.

The following estimates are valid under the assumption that all the countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

Staff costs

60 man-years scientific staff	ECU 2,3 million
50 man-years technical staff	ECU 1,9 million
Total staff cost	ECU 3,2 million per year
Laboratory equipment and consumables	ECU 1,8 million
Overhead costs	ECU 0,7 million
Total estimated costs (covered from national sources)	ECU 5,7 million per year
Coordination costs for the first year	ECU 50 000