

COMMISSION OF THE EUROPEAN COMMUNITIES

COM(78) 768 final.

Brussels, 17 January 1979

PROPOSAL FOR A COUNCIL DECISION

adopting a European Economic Community research and development
programme in the agricultural research sector
consisting of four multiannual
concerted projects

(submitted to the Council by the Commission)

COM(78) 768 final.

MULTIANNUAL CONCERTED PROJECTS
in the sector of
AGRICULTURAL RESEARCH.

TABLE OF CONTENTS.

	<u>Page</u>
I. Summary	3
II. Introduction	3
III. Description of the concerted actions	5
Project A. <u>Maize as a basic feed for beef production</u>	5
1. Motivation	
2. Aims and objectives	
3. Research topics	
4. Requirements and Timing	
Project B. <u>The production and feeding of single cell protein</u>	8
1. Motivation	
2. Aims and objectives	
3. Research Topics	
4. Requirements and Timing	
Project C. <u>Early weaning of piglets</u>	15
1. Motivation	
2. Aims and objectives	
3. Research Topics	
4. Requirements and Timing	
Project D. <u>Mineral nutrition on basic field crops (Soil-Humus-Nitrogen)</u>	18
1. Motivation	
2. Aims and objectives	
3. Research Topics	
4. Requirements and Timing	
IV. Implementation	21
V. Financial Aspects	21
<u>ANNEX I</u> Proposal for a Council decision adopting a R & D programme of the European Economic Community in the sector of Agricultural Research	23

ANNEXES A - D to ANNEX I

Contributions of the Member States to the concerted
action by research topics 26

ANNEX E. to ANNEX I.

Terms of reference and composition of the Concerted
Action Committee 30

I. Summary

A coordination programme in the sector of agricultural research is proposed. This programme consists of four multiannual concerted actions in the fields of :

- A. Maize as a basic feed for beef production (5 years)
- B. The production and feeding of single cell protein (5 years)
- C. Early weaning of piglets (5 years)
- D. The mineral nutrition of field crops (soil-humus-nitrogen) (5 years)

The legal basis for this programme is Article 43 of the Treaty establishing the European Economic Community and the Council Regulation (EEC) n° 1728/74 of 27 June 1974.

This programme is consequent upon a suggestion made by the Yugoslavian delegation to the Committee on European Cooperation in the field of Scientific and Technical Research (COST).

A concertation between this programme and the relevant programmes of Third States will be established.

The principal objectives of this programme are :

- to facilitate the co-operation with the Community's European neighbours, including potential new entrants,
- to bring under Community R + D policy an increasing proportion of European research activities in the sector relating to agricultural policy in the mutual interest of the Community and the Member States,
- to complement the findings of the Community Agricultural Research programme.

The maximum financial contribution of the Community for expenditure commitments and for staff necessary for the implementation is estimated at 1.76 million EUA and 2 staff for the duration of the programme.

The programme is foreseen to start in June 1979.

II. Introduction

It is recognised that the Community research, wherever possible, be complemented by international co-operation mainly within the COST (European Co-operation in the field of Scientific and Technical Research) framework which is the principal forum for co-operation with the Community's European neighbours. Such co-operation would optimise research efficiency and save time and money. Furthermore, considering the scientific achievements of certain countries outside the Community in some specific sectors of agricultural research, the most successful outcome to some coordination effort could be best achieved by an extended European Co-operation.

The present programme, consequent upon a suggestion by the Yugoslavian delegator in COST, has to be seen against this background. This proposal for a Council decision adopting a R + D programme of the EEC in the area of Agricultural research has been elaborated by the Commission, advised by the experts of the different Working Parties appointed by the COST countries, in the spirit of the Council Resolution of 14 January 1974 on a programme of the European Communities in the field of science and technology.

Moreover this programme proposal corresponds to the guidelines for the Common policy in the field of science and technology adopted by the Commission in which the Community agricultural research programmes must also wherever possible support the objectives of other Community policies, for example, environment, regional development, energy saving and aid to developing countries.

This programme consists of four multiannual concerted actions in the fields of :

- A. Maize as a basic feed for beef production
- B. The production and feeding of single cell proteins
- C. Early weaning of piglets
- D. The mineral nutrition of field crops (soil - humus - nitrogen).

These actions relate to three of the four groups (viz. socio-structural aspect, efficiency of production and alternative products) of main development and trends in agricultural research in the Member States drawn up by the Commission as most urgent following consultation with the Standing Committee on Agricultural Research.

In general the choice of topics for the coordination of each project has been formally accepted by the national research organisations in accordance with the following criteria :

- compatibility with common agricultural policy
- complementarity with the Community agricultural programme
- scientific and economic importance
- possibility of implementation and of coordination
- common interest of Member States
- the relevant activities ongoing in other countries as well as those of appropriate international organisations such as international Society of Soil Science, FAO, OECD etc.....

III. Description of the Concerted Actions.

PROJECT A. Maize as a basic feed for beef production.

1. MOTIVATION.

During recent years the area under forage maize cultivation in Europe has increased spectacularly.

The principle reasons for this extension are as follows :

- a) much work has been done on the creation of hybrids with short vegetation periods so that the area of maize production has moved northwards to the very areas where the previous species with long vegetation periods were unable to thrive due to unfavourable weather conditions.
- b) the maize crop can be completely mechanised and with the use of hybrid varieties is capable of giving high yields.
- c) there are numerous possibilities for using maize in animal feeds. In practice, the entire maize plant, supplemented with other concentrated feeds, rich in protein, is quite suitable for the nutrition of young as well as mature animals.

Thus emerges, the leading role of maize in the technology and economy of cattle production.

A seminar on this subject was held in Yugoslavia in 1976 under the auspices of the EEG and with the participation of COST countries :

- to make an assesement of the present situation on the utilisation of the maize crop for beef production in relation to its scientific and economic aspects.
- to discuss the needs for further research and to identify the topics most suited for a coordinated research action.

The present project meets these requirements.

2. AIMS AND OBJECTIVES.

The aim of the proposed research project is a systematic investigation of the most efficient method of use and supplementation of maize feed to provide adequate nutrition and quality of products. Inevitably these investigations will involve a study on the use of alternative feeds in addition to maize and an examination of methods of predicting feeding value with a view to their standardization throughout the COST region. Research objectives must take account of factors which lead to maximum efficiency of use of specified resources per unit of beef produced. Efficiency can be considered in relation to land or crop use ; the energy used growing and feeding the crop ; the intake and utilisation of nutrients by the animal ; and in economic terms. Problems requiring research arise in seeking to minimise the input of protein and energy supplements and to replace these with non-protein nitrogen (NPN) and to increase voluntary intake, which limits the use of maize as silage. There also may be interactions between genotype, sex or age of animal, and the type of maize diet.

The proposal is directed towards promoting and coordinating a joint collaborative research effort with the following main objectives :

- Better utilisation of animal feed and prevention of waste.

- Adoption of standardised methods of measuring and predicting feeding value.
- Establishing, by reference to the use of alternative feeds, the role of maize in farming systems under varying cost/price and market situations.

3. RESEARCH TOPICS.

Research topics were limited to two broad subject areas. Projects undertaken in both of these areas will be linked, wherever possible, by using the practical experiments described under research topic number 3.1, to investigate the more fundamental aspects contained in research topic number 3.2

The research topics are as follows :

3.1. Practical and applied aspects of using the maize crop (whole plant, grain and stover) for beef production, including reference to the use of alternative feeds.

3.1.1. The use of supplements supplying energy, protein, non-protein nitrogen (NPN) and minerals plus vitamins

- Plant protein (bean, lucerne)
- Non-protein nitrogen
- Concentrate level.

3.1.2. Utilisation of crop by-products

3.1.3. Effect of smut fungal infection of the maize crop on its feeding value and on possible toxic residues (alkaloids) in meat

3.1.4. Systems of feeding beef cattle on the maize crop in relation to other feeds.

3.2. Methods of measuring the nutritive value of the maize crop and alternative forages or crop residues for ruminant production.

3.2.1. Standardisation of techniques

3.2.1.1. In vivo digestibility measurement with sheep and cattle.

3.2.2. Methods of predicting feeding value.

3.2.2.1. Dry matter.

3.2.2.2. Energy.

- Stage of growth
- Digestible organic matter (DOM) determinations with detailed analyses of feed and faeces for soluble carbohydrates, cell walls (cellulose, hemi-cellulose) etc.
- If DOM is not determined then some digestibility trials should be used for local regression between digestibility and simple tests.

- Morphological analyses of the plant
- Total metabolisable energy (ME) content.
- Nett energy content

3.2.2.3. Protein

- Total nitrogen (N) content of the crop
- Non-Protein nitrogen fraction
- Age and type of animal

3.2.3. Factors affecting crop growth and nutritive value.

- Stage of maturity
- Cultivar
- Climate
- Soil
- Fertilisation
- Plant density

4. REQUIREMENTS AND TIMING

Besides the general requirements for co-ordination purposes (meetings of the Management Committee, secretary and project co-ordinator), this project will need facilities for meetings, seminars, workshops, visits and short exchange of research workers for the dissemination of knowledge and the discussion of results, training of specialists and publications.

It is envisaged that the project will last five years. In agricultural research, especially where it is of an applied nature and so dependant on weather factors, it is acknowledged that shorter periods of investigation could give misleading results. In the initial years, work will be concentrated on co-ordination of existing work and, wherever possible, the standardisation of methods. In the final period, the research programme will be reoriented to take account of the most recent developments.

PROJECT B. The production and feeding of single cell protein.

1. MOTIVATION.

The use of by-products and waste from agriculture and forestry as substrates for the production of Single Cell Protein (SCP) shows a definite potential. Unicellular organisms have the ability to convert into proteins a wide range of low cost and often little used raw materials. This approach combines recycling of organic matter, environmental protection and the supply of more proteins for animal feeding. In the near future, this unconventional protein source could also play a more direct role in human nutrition.

EEC countries produced 1.5 billion tonnes of waste in 1976, almost two thirds of which were generated from the agricultural sector. Waste production is increasing at 5% per annum. On the other hand, the world demand for protein is expected to double by the end of the century. The EEC has been able to supply from its own resources only 20 % of its supplemental protein requirements for animal feed. The balance, equivalent to 7.5 million tonnes of soya bean, is imported mainly from a single source as one product, at a cost of 1.2 billion dollars in 1976.

If research into the use of cellulose and whey for the production and feeding of single cell protein is successful, it could have a pronounced impact on protein production. However, the greatest short term impetus for SCP production comes from the increasing legislative requirement for the disposal of both solid and liquid wastes in a manner compatible with the preservation of the environment. If effluent treatment charges are allowed for, then it would improve the competitiveness of SCP for animal feed. The main cause of uncertainty with regard to profitability is the price of reference proteins, e.g. soya bean. This position is likely to change under the pressure of population growth accompanied by world food shortage. In general, it can be expected that as processes improve and production expands and diversifies, SCP costs will become increasingly competitive.

The complex problems associated with an examination of the multidisciplinary aspects of SCP production and feeding were made during the last year. It showed that the scientific problems were both many and complex. Moreover to realise the most efficient use of the limited research facilities available a close multidisciplinary collaboration between chemist, biochemist geneticist microbiologist, enzymologist, toxicologist, nutritionist, engineer, etc. at International level was the most likely way of achieving a successful outcome. Therefore an efficient coordination between the different Institutes is recommended if clear and relatively early results are expected.

2. AIMS AND OBJECTIVES.

The aim of the proposed action is to obtain knowledge on all aspects of SCP production for agriculture and forestry waste in order to provide scientific and technical assistance to farmers, industry and environmental agencies concerned with the efficient recycling of an ever growing amount of by products and waste.

The research work is expected to cover the following objectives :

- better use of agricultural and forestry by products and waste
- reduction in environmental pollution
- increased supply of protein containing material for animal feed compatible with nutritional and toxicological requirements.

- possible development of novel technology for use in the third world where the valorisation of waste for either animal feed or human food is especially important.

3. RESEARCH TOPICS.

The objectives of the programme can be best attained by categorising the topics of research into three main areas :

- 3.1. Single cell protein production from whey.
- 3.2. Single cell protein production from cellulosic materials.
- 3.3. Nutrition and toxicology.

These selected topics involve much applied research although nutrition and toxicology aspects relate largely to checks and controls required to determine nutritional value and to assess the harmlessness of the product and consequently its acceptability to consumers.

3.1. Single Cell Protein (SCP) production from whey.

The steady increase in world cheese production has accentuated the problem of whey disposal. The development of cheese production in the 19 member countries of COST from 1948 - 1976 has trebled. Thus creating additional problems of whey disposal. Assuming a mean production of 8 tonnes whey per tonne of cheese, the total amount of whey in these countries was 31.3 million tonnes in 1976. The cheese production in the COST area comprised 82 % of the production in Europe and 40 % of the world production in the same year. Increasing demand by environmental protection agencies, and the necessity for efficient recycling of byproducts make it necessary to find an urgent solution to the whey disposal problem.

SCP production is one of a number of options for the disposal of whey or waste process streams from whey processing, e.g. ultra-filtration and lactose production. The other possibilities are mainly processing to whey powder, lactose chemicals or whey proteins and direct feeding. However, acid whey and permeates are known to present some problems when processed through the last mentioned channels. A quantitative survey should be made of the kinds of whey processing presently employed in the 19 COST countries, as well as an analysis of the quantities of whey available for SCP production on a national and local basis. The most reliable estimate from some countries indicate that some 25 % of the whey is treated as waste and consequently acts as a serious pollution hazard.

The research sub-topics aiming at clarifying the different aspects of SCP production from whey and whey products, are the following :

3.1.1. Selection of microorganisms

- 3.1.1.1. Selection of microorganisms for growth on lactose medium
- 3.1.1.2. Selection of microorganisms for initial breakdown of lactose
- 3.1.1.3. Selection of microorganisms for growth on lactose derived products, e.g. lactate and carbohydrates.

3.1.2. Selection of fermentation systems.

- 3.1.2.1. Design and/or adaptation of pilot scale and industrial fermentors to handle liquid and/or concentrated whey products. Emphasis to be placed on systems with prospects for viability at relatively small scale of operation.
- 3.1.2.2. Substrate modification by chemical or enzymic methods.
- 3.1.2.3. Substrate supplementation, e.g. carbohydrates and other nutrients.
- 3.1.2.4. Conditions of fermentation.
 - Efficient oxygen transfer and CO₂ removal
 - Temperature and pH control in relation to nucleic acid levels.
 - Batch v. continuous fermentation and degree of asepsis.
- 3.1.2.5. Recovery and treatment of biomass
 - Recovery e.g. filtration, centrifugation, flocculation etc.
 - Treatment e.g. drying, autolysis, preservation, etc.
- 3.1.2.6. Fermentation waste.

3.1.3. Nutritional and toxicological properties.

(see 3.3 : Nutrition and Toxicology)

- 3.1.3.1. Composition : protein and amino acids, nucleic acids, cell wall components, minerals, vitamins and contaminants.
- 3.1.3.2. Nutritive value
 - Availability of amino acids and degradation of cell wall components
 - Suitability for human and animal nutrition
- 3.1.3.3. Toxicological aspects : short and long term studies.

3.1.4. Relative economics.

- 3.1.4.1. COST analysis
- 3.1.4.2. Comparison with alternative methods for processing whey.
- 3.1.4.3. Prospects of SCP in comparison with other available protein sources
- 3.1.4.4. Energy balance of the process.

An evaluation of the present situation has been compiled from the responses of national co-ordinators.

3.2. Single cell protein (SCP) production from cellulosic materials.

Important amounts of agricultural and forestry by-products are not effectively utilised. Environmental protection as well as improvements in recycling organic matter need more appropriate consideration in future. Production of single cell protein from cellulose containing waste material like sawdust, woodwaste, leaves, corn cobs, corn or wheat straw, oil seed husks, sulphite liquor and fibrous matter is a possible way for proper utilisation of such material. Besides the possibility of simple pre-treatment with chemicals to improve the digestibility of such material, recent developments show a more efficient way by saccharification. The entire process is analysed through the following sub-topics:

3.2.1. Substrate Preparation.

3.2.1.1. Pre-treatment of the substrate.

- Physical methods : evaluation of various milling methods.
- Chemical methods : short acid or alkaline pre-treatment; pre-treatment with solvents.
- Microbial methods : screening for rotting strains.

3.2.1.2. Hydrolysis of substrate.

- Chemical : Saccharification with acid or alkalines, recovery and recycling of chemicals.
- Enzymatic : Development of potent enzyme preparations ("cellulase", "lignase", "hemicellulase")
- Microbial : Screening for cellulase producers, treatment with mixed cultures (cellulase producers and SCP strains)

3.2.1.3. Waste water : recovery and recycling of chemicals and enzymes.

3.2.2. Selection and Improvement of microorganisms

3.2.2.1. Selection of microorganisms for pre-treatment of substrate

3.2.2.2. Selection of microorganisms for the saccharification of the substrate

3.2.2.3. Selection of microorganisms for SCP-production

3.2.3. Selection of fermentation systems

3.2.3.1. Scale-up studies : optimisation for cheap equipment, process control

3.2.3.2. Substrate supplementation : optimisation of nutrients for microbial growth or enzyme production

3.2.3.3. Conditions of fermentation : optimisation of process parameters, evaluation of relevant process parameters for maximum protein yield, high productivity on enzymes etc., process layout (batch or continuous)

3.2.3.4. Preparation of feed : concentration of product (filtration, centrifugation, flocculation), preservation of product (drying, autolysis), upgrading through supplementation.

3.2.3.5. Fermentation waste treatment : upgrading of waste water recovery.

3.2.4. Nutritional and toxicological aspects (see 3.3. : Nutrition and toxicology)

3.2.4.1. Composition : protein and aminoacids, nucleic acids, cell wall components, minerals, vitamins, contaminants, development of routine tests

3.2.4.2. Nutritive value : animal feeding tests, acceptability.

3.2.4.3. Toxicological aspects.

3.2.5. Economics

3.2.5.1. Cost analysis, cost structure

3.2.5.2. Comparison with alternative methods for processing by-products e.g. sulphite liquor

3.2.5.3. Prospects of SCP in comparison with other available protein sources

3.2.5.4. Energy balance of the process.

An evaluation of the present situation has been compiled from the responses of national co-ordinators.

3.3. Nutrition and Toxicology.

Previous investigations have shown that the nature of substrate, the composition of the medium, conditions of fermentation, drying procedures and storage of the product, have important effects on the nutritional properties of the SCP products.

In this project, nutritional and toxicological aspects of SCP produced will be studied in relation to :

- a) the specificity of microorganisms;
- b) the conditions of fermentation (including pretreatments and composition of media) and type of substrate;
- c) the processing of the resulting product.

This programme is, in principle, in accordance with IUPAC (1) and PAG guidelines (2) and Commission proposals (3). Special attention was given to the time sequence of the various tests to be performed. It was stressed not to do too many toxicological tests on rodents but to commence small scale field trials on target animals at an early phase of the programme. Depending on the outcome of the first early feeding trials, specific and limited toxicological studies may be envisaged for the elucidation of possible adverse effects observed in the target animals. However, it was felt to be mandatory to conduct careful and extensive studies of the possible pathogenicity and allergenicity of the chosen microorganisms for man and animals.

When the experimental characterisation of the material has been completed and promising results for large scale use of the product become evident, then a careful evaluation of the animal food product safety must be carried out. In the animal products, residues of the substrate and its contaminants should be determined and their tolerance level should be established. Experimental studies, which are both long term and costly, are only justified for such substances shown to have a futuristic value. The cost estimate of one long term study in rats is approximately \$ 1/4 M.

In the course of the project, a good dialogue between toxicologists and nutritionalists must be developed to ensure that possible adverse effects of the material can be detected as early as possible.

The time sequence of the various research sub-topics proposed for the co-ordination action is in descending order from 3.3.1. to 3.3.6 ; the research sub-topics being as follows :

-
- (1) I.U.P.A.C. (International Union of Pure and Applied Chemistry) Technical Reports N° 12, August 1974. Proposed Guidelines for Testing Single-Cell Protein Destined as Major Protein Source for Animal Feed. 25 pp.
 - (2) PAG Guideline N° 15 on Nutrition and Safety Aspects of Novel Protein Sources for Animal Feeding, 9/9/74. Protein-Calorie Advisory Group of the United Nations System.
 - (3) Draft proposal for a Council directive concerning certain products used in animal nutrition. O.J. N° C 197/3, 18/8/77.

- 3.3.1. Test to ensure the harmlessness of the microorganisms for exposed people during production and handling of the material and for animals which are fed with the product.
- 3.3.2. Chemical Composition.
- Proximate principles (Wende analysis)
 - Amino acids, Non-protein nitrogen (NPN)
 - Principal minerals.
- 3.3.3. Short term tests for nutritional quality determinations in vitro and in vivo, e.g. in rats, piglets and chickens (e.g. digestibility, biological value and protein efficiency ratio (PER))
- 3.3.4. Tests on target animals of different species and age, with various concentrations of SCP in balanced practical diets (including determination of nutritive value such as metabolisable energy (ME) and amino acids digestible protein and supplementary value) to allow economical evaluations.
- 3.3.5. Detailed chemical, microbiological and physical characterisation of the products and definition of product specification.
- Chemical composition (carbohydrate, aminosugars, nucleic acids, lipids, trace elements, vitamins, by-products and/or toxicants such as heavy metals polycyclic hydrocarbons and others depending on the substrate).
 - Development of routinely applicable methods for the control of the presence of SCP in animal feeding stuffs (+)
 - Physical properties (density and particle size; storage properties; functional properties).
 - Development of screening methods for the evaluation of nutritional quality of SCP
- 3.3.6. Animal Product Quality determinations and toxicological evaluation of residues in the animal product.

4. REQUIREMENTS AND TIMING.

Besides the general requirements for coordination purposes (meetings of the Management Committee, secretariat and project coordinator), this project will need facilities for meetings, seminars, workshops, visits and short exchange of research workers for the dissemination of knowledge and the discussion of results, training of specialists and publications.

It is envisaged that the project will last five years. A shorter period of investigation is not recommended following an evaluation of the present research situation in the various countries. In the initial years work will be concentrated on coordination of existing trials. In the final period of the investigations the research programme will be reoriented to take account of the most recent developments.

(+) In several countries, such methods are not required for registration.

PROJECT C. Early weaning of piglets with special reference to age, rearing and physiology of reproduction of sows.

1. MOTIVATION.

The adoption of early weaning techniques at farm level has been partly successful. The average age at weaning has been reduced from 6-8 weeks to 5 to 6 weeks. If the modern pig farm represents a guideline for future developments weaning will tend to be achieved at 3 rather than 5 weeks. This will mean a lowering of production cost and a large improvement in the meat production per sow per year. It is known that the production of piglets is the most sensitive phase in the production of pig meat as a whole and that the further profitability of pig production depends on success in rearing piglets. The introduction of natal cages and improved feeding methods in the rearing of piglets has created a real possibility to cut time of weaning still more ; thus enabling the production of more and heavier piglets per sow. However these efforts of researchers to cut the time of weaning still further by cage rearing methods and better feeding has given rise to new unforeseen problems in the reproductive cycle of sows from which piglets have been early weaned. These problems include :

- a) an increase in the number of matings which prove infertile,
- b) fewer fertile ova and therefore fewer piglets in the litter.

Hence further progress in pig production is limited with out intensive work on this subject in particular and also on certain nutritional and rearing aspects of the piglets.

Nutritional aspects are concerned with the preparation of an appropriate feed to replace the mother's milk. Such feeds must :

- a) satisfy all the piglets' nutritional requirements.
- b) contain only ingredients which are digestible by the enzymes present in the digestive system of the animal at different ages.
- c) be palatable to the piglets.

The rearing aspects are mainly concerned with the development of equipment to keep temperature, humidity and air flow constant at pre-set levels designed for disease control and maximum productivity. The type of cage for piglets from the time when they are removed from their mother until their weight reaches 15 - 20 kg is continually being improved.

The cost of all these investigations would be prohibitive without some way of sharing the research topics and limiting them to some selected aspects of early weaning that can be readily adopted at farm level. With this in mind the preferred standard or control weaning date is 21 days in which to compare the effects of weaning dates from birth to 6-8 weeks. A 28 day standard weaning date was considered optional for the benefit of some countries especially those where animal welfare laws and restrictions on the use of feed additives favour late weaning. In such cases an acceptable system of early weaning must be compatible with such restrictions. For many countries weaning at birth has considerable scientific and practical interest but the cost of the research was prohibitive for most countries to undertake.

2. AIMS AND OBJECTIVES.

The aim of the proposed research project is to produce more and heavier piglets per sow per year. The selected topics involve much applied research into the most profitable way of producing piglets under both high and low cost systems.

The proposal is directed toward promoting and coordinating a joint collaborative research effort with the following main objectives :

- to improve sow output through an increase in the number of piglets born per sow each year.
- to rear more uniform piglets by eliminating competition for feed and reducing their dependence on the possibly unequal milk content of the mothers teats.
- to reduce piglet mortality by better control of environmental conditions and nutritional deficiencies.
- to lower production costs and increase farm profitability.

The results of the research will be assessed by using a uniform and detailed system of measurements to be taken at regular intervals.

3. RESEARCH TOPICS.

Generally all the research topics will be aimed at the elimination of the most serious constraints to early weaning. The research topics are as follows :

3.1. Rearing of piglets in cages and sow fertility as affected by length of lactation.

3.1.1. Embryonic mortality and ovulation rate.

3.1.2. The effect of age at weaning of females and nutrition on successive reproductive capacity.

3.1.3. Hormonal status.

3.2. Ration composition for early weaned piglets.

3.2.1. Proteins.

3.2.2. Additives and Vitamins.

3.2.3. Other.

3.3. The effect of age at weaning and piglet rearing method on subsequent performance.

3.3.1. Cage rearing and management of piglets in cages.

3.3.2. Environmental conditions e.g. Health, Hygiene, Behaviour

3.3.3. Economical considerations.

3.3.4. Fattening performances.

4. REQUIREMENTS AND TIMING

Besides the general requirements for co-ordination purposes (meetings of the Management Committee, Secretariat and Project Co-ordinator), this project will need facilities for meetings, seminars, workshops, visits and short exchange of research workers for the dissemination of knowledge and discussion of results, training of specialists and publications.

It is envisaged that the project will last five years. In agricultural research, especially where it is of an applied nature, it is acknowledged that shorter periods of investigation could give misleading results. In the initial years, work will be concentrated on co-ordination of existing work using new standardised methods for the assessment of the results. In the final period, the research programme will be reoriented to take account of the most recent developments.

PROJECT D. Mineral Nutrition on Basic Field Crops (Soil-Humus-Nitrogen)

1. MOTIVATION

Nitrogen is the most important aspect of the mineral fertilisation of crops to-day. Three main factors have to be considered in the utilisation of nitrogen, namely

- energy
- crop yield and quality
- environmental pollution

Energy. It is estimated that 15 to 25% of the total energy input into intensive agricultural production is necessary for nitrogen fertilisation, compared with less than 5% energy for potassium and phosphorus fertilisation. The energy used for fertilisation is about equivalent to that used for the production of agricultural machinery and is exceeded only by fuel energy consumption in agriculture. Hence it is clear that in an effort to lower energy consumption as well as cost in all technical processes, agriculture must make more efficient use of nitrogen fertilizer.

Crop yield and quality. Excess of nitrogen has an unfavourable effect on crop yield and quality because of alterations of some inorganic constituents of the plants. Furthermore, an excess of nitrogenous fertilization increases the susceptibility of plants to diseases and can be harmful to the consumers.

All these considerations refer to protein production by plants and their nutritional properties.

Environmental pollution. Wasteful use of nitrogen causes serious pollution damage to inland waters through leaching losses of nitrogen in ionic form and to the upper atmosphere through gaseous products of denitrification.

There is some evidence that these economic, quality and environmental factors are influenced by the source of nitrogen, especially that of organic origin.

Better use of both organic and inorganic forms of nitrogen depends on our understanding of the Dynamic of Soil Organic Matter (DSOM).

In the past, the lack of knowledge in methodology prevented a thorough investigation of this problem. The methodology can now be made available but the solution of the problems requires a large set of experiments carried out with different types of soils and under different climatic conditions. As these variables are naturally spread over many countries, the best way to realise this project is to carry out experiments within them in their natural environment in a co-ordinated way.

2. AIMS AND OBJECTIVES

The aim of the proposed action is to acquire a knowledge of the dynamic of soil organic matter (DSOM) in order to improve the efficiency of nitrogen utilisation, not only in economic terms as a financial input/output relationship, but also for crop yield and quality and environmental reasons.

Therefore, the proposal is directed toward promoting and co-ordinating a joint collaborative research effort with the following main objectives:

- to examine the nitrogen cycle in the soil plant system to establish a possible relationship between the dynamics of organic and inorganic nitrogen compounds and plant yield and quality,
- to examine the dynamics of the easily decomposable and hydrolysable materials in soils and their effect on plant yield and quality, in connection with the availability of soil nitrogen,
- to evaluate economic and nutritive value aspects of using organic material of different origin for plant production,
- to elucidate the possible effects of the dynamics of the soil organic matter system (DSOMS) in order to be able to effect more efficient control over soil fabric, soil carbon and nitrogen contents, leaching and gaseous losses of nitrogen, nitrification, urease activity, infections of crops and interactions between soil organic matter fractions and pesticides.

3. RESEARCH TOPICS

A limited number of field trials on the rate, time and method of application of inorganic and organic nitrogen will be undertaken to investigate the dynamics of the soil organic matter system. These will be supplemented with some existing field trials (including the long-term studies on nitrogen and straw incorporation carried out by the International Working Committee on Soil Fertility under the auspices of the International Society of Soil Science). The investigation will give special emphasis to changes in the soil organic matter fraction and its use by plants (cereals, sugar beets and some other crops).

The results of this research will be assessed by using a uniform and detailed system of routine and specific measurements on soils, crops, and climate.

The programme proposals are as follows :

3.1. Investigation of the Dynamics of Soil Organic Matter

3.1.1. Mineral Nitrogen fertilization efficiency with and without addition of organic materials of different sources.

- 3.1.1.1. The relationship between the efficient utilisation of mineral fertilizers, crop yield and the dynamics of the soil organic matter system (DSOMS)
- 3.1.1.2. Influence of environment (climate, soil cropping system, rotation, irrigation, etc.) and biological factors (species, variety) on the dynamics of soil organic matter system in connection with inorganic and organic fertilization.
- 3.1.1.3. Alterations of some inorganic and organic constituents of harvested crops, as symbols for quality (amino acids, protein baking quality, noxious nitrogen, etc.), by a shift of metabolic pathways.

- 3.1.1.4. Possibilities of regulating the nitrogen cycle in the Soil-Plant-System by addition of chemicals (inhibition of nitrification or urease activity, etc.). Correlation of the speed of nitrification with other enzyme activities as a measure for biological activity in soil (e.g. dehydrogenase activity, etc.).
- 3.1.1.5. The residual effect of legume crops on the dynamics of soil organic matter system (DSOMS), especially changes in the soil organic nitrogen fraction.
- 3.1.2. The residual efficiency of plant protection products on plant growth, as affected by the dynamics of soil organic matter system (DSOMS).
- 3.1.3. Preliminary investigations on the content of phenolic compounds in plant varieties as a possible explanation for higher resistance of some plants against disease.

4. REQUIREMENTS AND TIMING

Besides the general requirements for co-ordination purposes (meetings of the Management Committee, secretariat and Project Co-ordinator), this project will need facilities for meetings, seminars, workshops, visits and short exchange of research workers, training of specialists, and publications.

It is envisaged that the project will last five years. In agricultural research, specially where it is of an applied nature and dependant on weather and other environmental factors, it is acknowledged that shorter periods of investigation could give misleading results. In the initial years, work will be concentrated on co-ordination of existing work and, wherever possible, the standardisation of methods. In the final period, the Research Programme will be reoriented to take account of the most recent developments.

IV. Implementation.

The present programme in the sector of agricultural research will be implemented by carrying out four multiannual concerted projects. Because of its scientific, and economic importance, it will be of interest to all Member States, even to those not involved in a particular line of research or lacking the required facilities to participate actively.

In principle, the competent national authorities intend, as part of the rules and procedures applicable to their national programmes, to carry out their contributions to the respective projects, and are prepared to integrate such research into a process of coordination at Community level.

A Concerted Action Committee will be established for each project, in which the Member States are represented by the persons responsible for coordinating the national contributions to the programme.

The coordination of the concerted project will be carried out under the responsibility of the Commission, assisted by a project co-ordinator to be appointed by the Commission in agreement with the respective Concerted Action Committee.

After the Council Decision, a concertation between the present concerted actions and the relevant programmes of the COST Third States will be effected.

The Standing Committee on Agricultural Research will be kept informed of the implementation of this programme; this Committee is, in particular, duly qualified for giving this research its proper place within the sectorial policy of the European Communities as well as for ensuring its success.

V. Financial aspects.

The financial volume of the national research contributions to the respective concerted projects is estimated at 23.5 million EUA (European Units of Account) for the duration of the programme.
It is apportioned as follows:

Concerted Project	Duration in years	EUA in million
A	5	5
B	5	10
C	5	3.5
D	5	5
TOTAL		23.5

The cost of coordination, charged to the Community budget, is estimated at 1.76 million EUA for the duration of the programme.

These costs include salaries for scientific and secretarial staff involved in the coordinating action, (the allocation of 1 A and 1 C is requested for this programme), administrative costs (expenses for experts and meetings) and expenditures by contracts (project leader, exchange of personnel, workshop, training of specialists, publication, subgroup meetings), subdivided as follows :

Personnel	493.800	EUA
Administration	181.400	EUA
Contracts	1.088.600	EUA
TOTAL	<u>1.763.800</u>	EUA

PROPOSAL FOR A COUNCIL DECISION
adopting a European Economic Community
research and development programme in
the agricultural research sector consisting
of four multiannual concerted projects

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 43 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament,

Whereas, in its Resolution of 14 January 1974 on an initial outline programme of the European Communities in the field of science and technology¹, the Council stressed that the whole range of available ways and means, including concerted projects, should be employed, and that whenever it proved desirable, steps should be taken to make it possible for non-member countries, particularly European non-member countries, to become associated in these projects;

Whereas, Council Regulation (EEC) No 1728/74² provides for coordination at Community level of national agricultural research projects;

Whereas the four research projects in the sector of agricultural research were proposed by the Yugoslav delegation to COST (European Cooperation in the field of Scientific and Technical Research);

Whereas the Member States intend, under the rules and procedures applicable to their national programmes, to carry out the research described in Annexes A to D, and are prepared to coordinate such research at Community level over a period of five years;

(1) O.J. No C 7, 29.1.1974, p.6

(2) O.J. No L 182, 5.7.1974, p.1

Whereas the execution of such research as described in Annexes A to D will require a financial contribution of about 13 million European Units of Account from the Member States;

Whereas the Community is empowered to conclude agreements with non-member countries in the fields covered by this Decision; whereas the Council of the European Communities agreed on certain methods of co-operation within the framework of COST on 18 July 1978;

Whereas the Scientific and Technical Research Committee (CREST) has given its opinion on the Commission proposal,

HAS DECIDED AS FOLLOWS :

Article 1

In the sector of agriculture research, the Community shall implement for a period of five years four concerted projects, hereinafter referred to as "the projects", in the fields of :

- A. Maize as a basic feed for beef production;
- B. The production and feeding of single cell protein;
- C. Early weaning of piglets;
- D. The mineral nutrition of field crops.

The projects shall consist in coordination at Community level of the research described in Annexes A to D, which form part of the research programmes of the Member States.

Article 2

The Commission shall be responsible for coordinating such projects.

Article 3

The total amount required for the duration of the programme is estimated at 1,76 million EUA, as defined in Article 10 of the Financial Regulation of 21 December 1977, and the staff allocation at 2 servants. These figures are intended merely as a guide.

Article 4

To facilitate the execution of the four projects, a Concerted Action Committee, hereinafter referred to as "the Committee", shall be established for each project.

For each project, a project coordinator shall be appointed by the Commission in agreement with the respective Committee. He shall, in particular, assist the Commission in its coordinating action.

The terms of reference and the composition of these Committees are defined in Annex E.

Each Committee shall draw up its rules of procedure. Its secretariat shall be provided by the Commission.

Article 5

In accordance with a procedure to be adopted by the Commission in agreement with the Committee, Member States participating in the projects shall exchange regularly all useful information concerning the execution of the research covered by each project and forward to the Commission all information that may be useful for coordination purposes. They shall also endeavour to provide the Commission with information on similar research planned or carried out by bodies for which they are not responsible. This information shall be treated as confidential if so requested by the Member State which provides it.

The Commission shall prepare annual progress reports on the basis of the information supplied, and shall forward them to the Member States and to the European Parliament.

At the end of the coordination period, the Commission shall, in agreement with the Committee, forward to the Member States and to the European Parliament a general report on the execution and results of the coordination process. The Commission shall publish this report six months after it has been forwarded to the Member States unless a Member State objects. In this case the report shall be distributed, solely to institutions and undertakings which so request and whose research and production activities justify access to the results of the research carried out under each project. The Commission may make provision that the reports remain confidential and are not disclosed to third parties.

Article 6

1. The Community may, in accordance with Article 228 of the Treaty, conclude agreements with non-Member States involved in European Cooperation in the field of Scientific and Technical Research (COST) with a view to ensuring cooperation as regards the Community concerted projects relating to topics defined in Annexes A to D and the relevant programmes of these COST States.
2. The Commission is hereby authorized to open negotiations for the conclusion of agreements of the kind referred to in the preceding paragraph in accordance with the conclusions adopted by the Council on 18 July 1978 in connection with European Cooperation in the field of Scientific and Technical Research (COST).

Article 7

This Decision shall enter into force on

Done at

For the Council,
The President,

ANNEX A

Maize as a Basic Feed for Beef Production.

Contributions of the Member States to the concerted projects by research topics.

Research Topics	B	D	DK	F	GB	I	IRL	L	NL
1. Practical and applied aspects of using the maize crop (whole plant, grain and stover) for beef production, including reference to the use of alternative feeds.	X	X		(X)	(X)	(X)	X		X
2. Methods of measuring the nutritive value of the maize crop and alternative forages or crop residues for ruminant production	X	X		(X)	(X)	(X)	X		X

(X) not confirmed

ANNEX B

The Production and Feeding of Single Cell Protein (SCP)

Contributions of the Member States to the concerted project by research topics.

Research Topics	B	D	DK	F	GB	I	IRL	L	NL
1. Single Cell Protein Production from Whey	X	X		X			X		X
2. Single Cell Protein Production from Cellulose		X		X	X	X	X		X
3. Nutritional and Toxicological evaluation of Single Cell Protein	X	X		X	X				X

ANNEX D

Mineral nutrition of Basic Field Crops

(Soil-Humus-Nitrogen)

Contributions of the Member States to the concerted project by research topics.

Research Topics	B	D	DK	F	GB	I	IRL	L	NL
1. Mineral nitrogen fertiliser efficiency with and without the addition of organic materials of different sources	(X)	X				(X)	(X)		(X)
2. The residual efficiency of plant protection products on plant growth as affected by the DSOMS	(X)	X							
3. Preliminary investigations on the content of the phenolic compounds in plant varieties as a possible explanation for higher resistance of some plants against disease.		X				(X)			

(X) Not confirmed

ANNEX E

TERMS OF REFERENCE AND COMPOSITION
OF THE CONCERTED ACTION COMMITTEE

1. The Committee shall :
 - 1.1. contribute to the optimum execution of the programme by giving its opinion on all of its aspects ;
 - 1.2. evaluate the results and draw conclusions as regards their application ;
 - 1.3. ensure the exchange of information referred to in Article 5 (a);
 - 1.4. keep abreast of national research being done in the fields covered by the concerted project, and more especially of scientific and technical developments likely to affect the execution of the project ;
 - 1.5. suggest guidelines to the project co-ordinator.
2. The Committee's reports and opinions shall be forwarded to the Commission and to the Member States participating in the project. The Commission shall forward these opinions to the CREST and to the SCAR.
3. The Committee shall be composed of persons responsible for coordinating the national contributions to the programme, and the project co-ordinator. Each member may be accompanied by experts.

FINANCIAL DATA.

1. BUDGET CHAPTER : Chapter 33 item 3371 financial plan reference 371.1
2. HEADING OF THE BUDGET TITLE : Item 3371 - implementation of concerted action projects. Financial plan reference : 371.7 : Agricultural Research.
3. JURIDICAL BASIS : Article 43
Council Regulation (EEC) N° 1728/74 of 27 June 1974 -
O.J. N° L 182/1 of 5 July 1974.
4. DESCRIPTION, OBJECTIVES AND JUSTIFICATION OF ACTION :

4.1. Description

Coordination of some important research work in progress or planned in the Member States on four agricultural subjects. The enlargement of the coordination to the relevant activities undertaken in European Non-Member States is also foreseen.

4.2.

Objectives :

Joint European research effort by implementing four concerted projects in the field of

- A. Maize as a basic feed for beef production (5 years)
- B. The production and feeding of single cell protein (5 years)
- C. Early weaning of piglets (5 years)
- D. The mineral nutrition of field crops (5 years)

4.3.

Justification.

This proposal for a research programme is consequent upon a suggestion made by the Yugoslavian delegation in COST. The proposed research work is in line with the second agricultural research programme (Decision of the Council of 30/31 October 1978) and it has a direct bearing on the Council regulation (EEC) n° 1728/74 of 27 June 1974).

TOTAL FINANCIAL INCIDENCE OF ACTION IN EUA.

5.0. Incidence on expenditure

5.0.0. The total costs, during the term envisaged, funded

- on Community budget 1.763.800
- by national administrations } 13.000.000
- by other sectors at national level }

TOTAL 14.763.800 EUA

5.0.1. Multiannual term :

COMMITMENT

in EUA

	1979	1980	1981	1982	1983	TOTAL
Staff	87.100	93.200	98.400	104.500	110.600	493.800
Admin.	32.000	34.200	36.160	38.400	40.640	181.400
Contracts	192.000	205.400	217.000	230.400	243.800	1.088.600
TOTAL	311.100	332.800	351.560	373.300	395.040	1.763.800

PAYMENT

	1979	1980	1981	1982	1983	TOTAL
Staff	87.100	93.200	98.400	104.500	110.600	493.800
Admin.	32.000	34.200	36.160	38.400	40.640	181.400
Contracts	192.000	205.400	217.000	230.400	243.800	1.088.600
TOTAL	311.100	332.800	351.560	373.300	395.040	1.763.800

5.0.2. Evaluation method

a. Staff expenditures

The staff needs for this programme are estimated at :

- 1 category A staff
- 1 category C staff

In addition to staff number estimates, the evaluation takes into account the parameters adopted for the establishment of the proposal for the budget forecast 1979. Only a variation of the correction coefficients is considered to meet possible needs originating from the general evolution of prices in the Community.

b. Administrative expenditures

They cover the costs of missions, organization of meetings (concerted action committees), convocation of experts.

c. Contracts expenditures

They cover all expenditures arising from service-contracts and provide the means for : project coordinator, his secretariat, workshops, exchange of research workers, training of specialist, publications, etc.

d. Multianual forecasts

The indices applied to calculate the forecasts are as follows :
1980 - 1.07, 1981 - 1.13, 1982 - 1.20, 1983 - 1.27.

5.1. Incidence on the funds

6. CONTROL MEASURES FORESEEN.

Scientific control : each concerted project is controlled by its Concerted Action Committee.

Administrative controls :

- Regularity of expenditures : Financial Control
- Budget execution : Financial Control

7. FUNDING ACTION.

7.0.

7.1.

7.2.

7.3. Funds to be included in future budgets.