

GREEN EUROPE

NEWSLETTER ON THE COMMON AGRICULTURAL POLICY

AGRICULTURAL RESEARCH

PROGRESS AND PROSPECTS



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Agricultural Research - Progress and Prospects

	<u>Contents</u>	<u>Page</u>
I.	<u>The major aims and achievements of coordinated agricultural research in the EC</u>	1.
II.	<u>Exploitation of promising results from the EC Agricultural Research Programmes</u>	2.
	1. Biological Control	2.
	2. Land Resource Evaluation and Conservation	4.
	3. Mediterranean Agriculture	6.
	4. Animal Husbandry	7.
	5. Plant Productivity	9.
	6. Effluents from livestock	11.
	7. Plant resistance and use of genebanks	11.
III.	<u>The outlook for further EC coordinated agricultural research on key problems</u>	11.
	1. Utilization and Conservation of Agricultural Resources	12.
	2. Structural Problems	13.
	3. Improvement of Animal and Plant Productivity	14.
	4. Coordination of research	15.
IV.	<u>Adapting future research to changes in agricultural practices in the EC</u>	15.
V.	<u>Publications:</u>	17.
	Recent major publications from the EC programme for the coordination of agricultural research	

AGRICULTURAL RESEARCH - PROGRESS AND PROSPECTS

The European Community (EC) has a common Agricultural Policy (CAP) which must meet the challenges of the future. Agricultural research, as part of a total Community research effort, can play an important role. In an earlier newsletter in this series (Green Europe no.183) we described the programmes for coordination of agricultural research in the EC. The present publication gives a review of results, and of the prospects for the new programme (1984-88)

I. The major aims and achievements of coordinated agricultural research in the EC

The aim to have an efficient and effective CAP can only be achieved with the backing of a continually developing technology arising from vigorous and relevant research over a wide field of agriculture, food and forestry. Whilst agricultural research in the EC is already competent and comprehensive there is still great merit in combining resources of brains, experience and research facilities across national frontiers to develop a Community strategy. In particular the aim is to ensure that with an EC research programme those projects which are of great concern to the EC are not overlooked in national planning because funding is difficult to justify.

The first successful EC coordinated programme from 1964 dealt with the important subjects of classical and African Swine fevers. Following this success, the Standing Committee for Agricultural Research was formed in 1974 and the first full EC programme for agricultural research started with four subjects:

- . animal leukoses
- . effluent from intensive livestock units
- . beef production
- . plant protein production.

The second programme for the coordination of agricultural research was launched in 1979 with the main emphases on:

- . socio-structural objectives
- . elimination of barriers to intra-Community agricultural markets
- . production efficiency
- . alternative products.

The achievements of these research programmes are numerous and in many subjects promising results are ready for wide dissemination.

II. Exploitation of promising results from the EC Agricultural Research Programmes

Experience in agricultural research in the past decade has shown that by bringing together the considerable resources of scientific expertise within the EC and by stimulating research in subject areas, close to the aims of the CAP, where knowledge is needed, much speedier progress is possible. There are promising results which should be developed and demonstrated more vigorously.

There are several categories of customers who must be informed and encouraged to use the results of the progress made. Certain groups can be clearly identified and each type of information to be communicated will tend to have to be presented in different ways. The main groups are probably:

- (1) research workers
- (2) administrators, teachers
- (3) farmers and their advisers
- (4) industries ancillary to agriculture
- (5) consumers.

The following list of research work indicates the sort of results which are ready to be developed, disseminated and applied.

1. Biological control

This programme (1979-83) aimed at avoiding the use of chemical products and concentrated on control factors which would be less damaging to the environment and consume less energy. In other words the farmer would save on costs and increase the efficiency of his enterprises, whilst ensuring the same level of production.

In view of their importance to the EC it was decided to concentrate the research on fruit, vegetable, and cereal crops. After five years with 30 jointly funded research contracts, not all the problems have been solved, but significant results have been achieved. In some subjects now the need is more for field trials than research.

(1) Biological control in apple orchards

The existence of integrated control programmes in Germany, France, The Netherlands, Italy and the United Kingdom, encouraged research teams to look more closely at the use of microbiological methods in view of the utilization of biopesticides, particularly of

baculoviruses; and then pheromones (hormones for sexual attraction) and other natural products; and entomophagous insects to control the tortrix moth. In particular a preparation of granulosis virus was developed to deal with the codling moth and was subjected to comparative tests in 10 institutions in the EC Member States alongside the most effective synthetic pesticides and the only commercial formulation of the same virus of American origin. The results showed that the granulosis virus offered orchards equally effective specific protection against the codling moth. At present signs of any commercialization of the possibilities seem to be totally lacking.

(2) Integrated control in citrus groves

Pilot projects have been carried out using integrated protection systems in orchards with the aim of establishing economic tolerance thresholds for the main pests, and to use insects which attack other insects.

It was interesting that, in Sicily, a 10 hectare citrus orchard belonging to a cooperative agricultural holding was run for three years without the use of any pesticides. Apart from the observation of the economic thresholds for intervention and use of insects, treatment with mineral oil was all that seemed necessary. The yield from the orchard remained comparable to yields obtained previously and to that of the other orchards on the holding.

(3) Integrated control of olive groves

The same approach was adopted for olive groves as for citrus fruit. Here too, the economic tolerance thresholds were fixed but other natural agents such as pheromones were used in addition to insects.

The use of insects gave remarkable results and with technical assistance from a nearby research station the producers themselves reared the insects which feed on the olive tree pests and released them regularly in their orchards. Rearing the insects required little time and effort. There were substantial savings in the use of pesticides and the harvest was normal.

(4) Pests in cabbage plantations

Pests in cabbage plantations constitute a familiar problem but their biology is little understood. This understanding is essential if the use of pesticides is to be confined to those periods in which the pest is most sensitive and if the best use is to be made of natural control agents. With this in mind, efforts have been concentrated on preventing attack by studying population

dynamics. Simple field sampling techniques have been developed and these are easily applied by farmers observing a carefully chosen 10% of the crop.

(5) Cereals and the Euraphid network

Apart from fungal diseases the main cereal pests are aphids. Attention was focussed on the improvement and cross frontier extension of prevention systems. In the last decade a flight-forecasting system based on trapping adults in flight has been used in the UK. An extensive system of 12.2 metre high suction traps now exists. EC efforts have been directed towards making an international network and five traps are in operation in Italy, eleven in France and two in Belgium. Each week the traps are examined and the progress of aphid flight can be followed from the south to the north of Europe.

All the data from the traps are assembled at the Rothamsted Experimental Station in the UK, where they are processed by computer. For this information to be really useful in prevention a correlation has to be established between insects caught in the traps and field infestations with a radius of 100 metres to 50 kilometres.

In coordinating this research and by modestly financing certain projects the Community has taken a major role in promoting the more widespread use of integrated crop protection systems.

2. Land Resource Evaluation and Conservation

Land and water are the most basic essential resources for agriculture so good management of them is of prime importance. If the quality of these resources deteriorates the costs of maintaining production will increase. Land and water have always been socio-economic sensitive areas and it follows that any research successes on their use will confer socio-economic benefits on the whole Community. A programme on land use must link with aspects of energy, environment, conservation and regional research. The main thrust of the work has been towards drainage improvements, avoiding soil degradation and integrating hill and lowland farming systems.

(1) Land suitability and resource evaluation

Progress has been made in preparing a soils map of Europe including Spain and Portugal. A logical next step may be to produce suitability maps for selected crops including trees and biomass production. In this work the role of the Community has been as a catalyst. In the same programme the feasibility of storing all soil and climate data, including map information, was

studied in relation to new and developing computer technology and systems for teledetection. The information accruing from this programme now needs to be more critically examined by policy reformers, decision makers and farmers; and the ultimate objective is the collection and integration of all the necessary information to cater for multiple land use including the costs of inputs and the value of the likely yields to be obtained.

(2) Integration of hill and lowland farming systems

Several investigations showed that integration of hill and lowland farming systems were easier if a minimum of low land is available and set aside for conservation. Results on land resource development and conservation are immediately applicable to farming and are important in areas with impermeable soils which could be drained. Prospects seem good for the development of certain difficult terrain but demonstrations with economic feasibility studies are needed first to verify the prospects.

(3) Soil erosion, degradation and maintenance of fertility

Aspects of soil degradation are long term but already there is evidence from the EC research programmes to show the effects of mechanization on physical degradation and the need for greater awareness of damage due to soil compaction. Some modern farming systems are hazardous, for example, agronomists are certainly worried about monoculture and the use of heavy farm machinery.

In some Member States leys and animals have largely disappeared from arable farms. This has led to a lowering of organic matter in the soil. Whilst the amount of organic matter essential for maintaining reasonable soil fertility is not entirely clear, scientists are concerned that continuous cultivation may seriously deplete organic matter to unacceptable levels. Hence, research on the long term effects of various cultural systems on organic matter content is valuable. Vulnerability to soil erosion is also increased by reducing organic matter content in certain environmental situations. Inter-relationships between soil type, slope, rainfall intensity and erodibility index are not sufficiently understood in the Member States and research already initiated should continue.

The size of agricultural machinery tends to increase and wheel width and the weight of machines determine the degree of soil compaction. Information has been collected on the soil degradation and models which can predict the effects of wheel traffic on compaction, which are urgently required, are being developed in the EC. Increasingly machinery manufacturers, farmers and their advisers must be shown the consequences of certain damaging actions.

3. Mediterranean Agriculture

There is enormous potential for agricultural change and improvement in the Mediterranean zones. Often farmers and their advisers are a little remote from the technical advances that are possible. The reverse can also be true. It is clear that some technical innovations need considerable refinement to be acceptable at regional and local levels. Research scientists and planners in France, Greece and Italy have benefitted greatly from the contacts made possible in the EC agricultural research coordination activities in the past decade.

The Mediterranean Agricultural research programme is concerned to bring technical and socio-economic expertise to bear to raise the economic and social life in the Mediterranean areas to those of the more advanced parts of the Community.

A number of schemes have been studied and more projects still are required to develop and demonstrate the best results so far.

(1) Sylvo pastoral systems for livestock

There is good evidence that low quality scrub and forestland can be made more productive if strips are improved to provide better grazing pasture. So far the stock carrying capacity is one livestock unit per three or four hectares. In such systems cattle adapt better than sheep. Furthermore this pasture consumed in the forest is available at a time when other food is in short supply. The removal of this pasture also greatly reduced the risk of destruction due to forest fires. Questions remain on the long term consequences of such schemes on climate and wood supply.

(2) Sheep and goat production

Increases in sheep and goat production could be important for the Mediterranean zones but if there is to be an expansion then some of the results need to be provided in husbandry and economic terms. There are questions of crop quality, yield, fertiliser use, land improvement, animal health and reproduction. Some work has already been done to show how feed supply can be improved and it is of cardinal importance that an increased goat and sheep population can be economically fed.

Other trials have improved milking technology and hygiene. On the other hand attempts to develop a large mobile milking parlour for sheep and goats were not successful.

(3) Cypress Canker and resistant clones

Cypress Canker research continues to harness genetic resistance and progress has been made in creating plants with clones which are capable of resisting the infection. Further regular development is needed to establish early tests for resistance, inoculation techniques and to examine the variability of pathogen aggressiveness.

(4) Oriental tobacco shows promise

Oriental tobacco shows promise and research results now need to be substantiated on a practical field scale to establish the importance of choice of varieties, population densities and the economic prospects.

In fact commercialization of tobacco, especially Oriental tobacco, has been encountering major problems of quality in regions of Italy and Greece. As a result of the initiatives of the EC Mediterranean agricultural research projects some 27 varieties have been successfully selected in Italy as likely to give economic yields. Certain guidelines have been established so that mechanization of the crop does not result in any reduction in quality.

(5) Rectified concentrate must from grape sugar

Rectified concentrate must can be used to enrich even high quality wines without reducing their quality. This result is an example of a successful EC coordination programme on a technique where the added effect of contributions from different countries gave a more rapid and complete result than individuals working in isolation. It certainly seems rational that, rather than using sugar from sugar beet, grape sugar should be incorporated, especially if the normal development of the colour, aroma and taste of high quality wines are to be maintained.

4. Animal Husbandry

Increasingly there is an awareness that production orientated research is likely to increase outputs and exaggerate surpluses. Nevertheless there are certain types of research with animals concerning health, welfare and productivity where the Commission needs to be involved. Moreover in addition to the problems created by the surpluses there are certain deficit and new animal products which can be considered to replace the products currently in surplus. Results from recent EC research are at the stage where they must be diffused to farmers, their advisers and administrators involved with national strategies for animal health and welfare.

(1) Disease control and eradication

EC schemes for notification, control and eradication of disease are much easier to implement if all the countries involved have the same diagnostic methods at their disposal. Much has been done in the control of certain slow viruses and Herpes viruses to ensure that the methods of diagnoses are improved and harmonized. Considerable progress has been made in adapting the enzyme linked immunosorbent assay (ELISA) techniques for the diagnoses of Enzootic Bovine Leukosis and for African swine fever virus. Even at this point research coordination, in liaison with the legislative services of the Community, has revealed certain emerging problems which may be of EC importance. The examples of Contagious Bovine Pleuropneumonia in France near the border with Spain and in the Iberian Peninsula; and *Brucella melitensis* (Malta Fever) in France, Italy and Greece are two hazardous diseases on which collaborative work has already started.

(2) Farm animal welfare

The EC research programme on farm animal welfare was started on scientific initiatives which came from some Member States around 1979 and was strengthened subsequently when political pressures on the problem increased. There is no doubt that the small farmer who treats his animals as part of his family is not impressed by tales of animal welfare and the faults of over intensification in livestock enterprises. On the other hand the vociferous animal liberator believes that animals should not be held captive and that meat should not be part of the human diet. The reality of the situation is somewhere between the two extremes and the situation must be avoided where animal products are branded with a bad image. Further research can certainly produce results which will permit some of the welfare debate to be put on a more sound technical basis. Clearly in all of the arguments sight must not be lost of the importance of the effects of any changes on production costs and returns to the farmer.

The EC research programme on poultry, pig and calf welfare has already shown that certain improvements in social space availability may be desirable. However, as in the case of the battery hen, if too much space is provided it may not be used. There is a need for more research to develop alternative systems, although in the case of the battery hen if the costs of new systems, cannibalism, feather pecking and dangers of coccidiosis are recalled then the prospects for new non-battery cage systems are limited. The transport of farm animals internationally is another area where research has helped and has identified aspects where future work is merited.

There are few areas where poor welfare or stress can be linked directly to profitability. But in the case of dark firm dry (DFD) meat and pale soft exudative (PSE) meat the returns to the farmer are reduced if good animal welfare is ignored.

(3) Livestock productivity and management

There were several major sections in the EC Beef Programme between 1975 and 1983. This programme was established because beef supplies in the EC seemed threatened. Certain publications do contain useful data on carcass dissection, butchery methods and carcass quality which may be helpful in organising meat marketing in the EC. The previous research has not yet been fully used in helping farmers to reduce their costs. But now that productivity is such a key aim these points must be developed and used.

(4) Embryo transfer and gene technology

The transfer of embryos may seem very futuristic for many farmers but the technology has been developed. This has been done more recently with the aim of exploiting results which might eventually come from biomolecular engineering research. Certainly the data provided as the result of EC initiatives have produced more thorough discussions of the pros and cons of such techniques to improve regional livestock farming, to develop international trade with EC livestock of high genetic merit, and of the possibility of embryo and gene transfer to solve certain animal health problems when livestock are imported and exported.

Should this research lead to an ability to predetermine the sex of the offspring then there would be considerable prospects, at farm level, for manipulating the relative proportion, for example, of male and female calves, and the breed or crossbreed.

5. Plant Productivity

Possibilities for increasing the amount of protein rich crops produced in the EC have been studied carefully in the EC programmes for many years. Progress has at times not been so swift. A major difficulty has often been that as protein content of crops is improved so yield per hectare is diminished. Despite the difficulties with inconsistent yields and some diseases several crops have emerged as being important for the future. Farmers now need to be shown convincingly that crops such as oil seed rape, lupins, peas and field beans can be more widely grown to reduce reliance on imported soya and other proteins. Emphasis must also be placed on promoting the need to improve grass legume swards to provide cheaper protein for ruminant and monogastric animals. Questions of the quality of the protein must not be overlooked and as new crops are demonstrated their relative profitability and value in a crop rotation must be studied.

(1) Peas, beans and lupins

Clearly, peas, beans and lupins can be grown better in some regions than in others. There are better results now from research on adapted varieties, yield stability, reduction in alkaloids, resistance to cold and the development of good crop rotations.

Since 1980 the Community has played its role in the "European Joint Field Bean Test". In this work eight bean varieties, representing different plant types, and three pea varieties were tested at nine locations in Western Europe. In the average of all environments involved, the highest yielding bean variety was Minica from the Netherlands, reaching its yield because of a higher harvest index. There was indication of a more efficient distribution of dry matter between generative and vegetative parts of the plant. Comparing yielding capacity of faba beans and peas, the results showed that some locations seemed to be more suitable for peas than for beans.

In this work yield stability in beans was also considered as a possible major problem for farmers and the genotype, environment interactions were examined. Eight faba bean varieties in 27 environments showed highly significant interactions. The larger-seeded (major) varieties gave high mean yields, due to greater responsiveness to high-yielding environments, compared with the more stable but lower yields of the minor types. Minica had a high mean yield but made a large contribution to the environment x variety interaction. In both mean yield and yield stability there were greater differences among bean or pea varieties than between the means of beans and peas. Regressions of pea varieties on environmental means of peas accounted for a much higher proportion of the variance than on environmental means composed mainly of beans. That is, one crop was not a satisfactory index of the environment suited to the other. The test also studied the effects of stress through lack of water and the effects of irrigation water to correct this stress.

Farmers need to try some of these crops to establish how they suit farming practice and how profitable they are.

(2) Low glucosinolate rapeseed

The quality of the protein in rapeseed and rapeseed meal is very high. Unfortunately the presence of glucosinolates creates problems when the products are fed to certain classes of livestock - especially poultry. Plant breeders have responded to the glucosinolates problems by creating newer varieties which are much lower in glucosinolates. At the same time analytical methods are beginning to move from gas liquid chromatography (GLC) to high performance liquid chromatograph (HPLC). A consequence is that the most modern analyses tend to show that although glucosinolates are lower in the new rape varieties some particularly noxious components may be present. The question of the method of analyses to be used and the declarations to be made on rapeseed meal are important in the pricing and marketing of rapeseed which is currently becoming a relatively costly matter for the EC Common Agricultural Policy (CAP).

(3) Grass legume combinations have been studied for many years and the wealth of information available tends to have been neglected by farmers. There is no doubt, although farmers have not yet accepted the view, that forages can provide much of the protein required for livestock and that with imported forage conservation and economy in fertilizer inputs, that greater productivity can ensue. The EC protein research programme is a good example of how scientific results have accumulated to a point where, unless the EC takes on an active role in the diffusion process, the gains which are possible may not reach the farmer.

6. Effluents from livestock

Whilst there may be economic reasons for increasing the size of livestock enterprises one has to be aware that very intensive systems may produce more animal effluents and manures than can be conveniently used on the land associated with the holding in view of smells, heavy metals and the likelihood of pollution. In this EC programme practical guidelines were prepared so that farmers could maximise the use of animal manures to keep profits high and minimise at the same time pollution and damage to the environment. A major effort has been made to use results on farms but the pressure must be kept up in the Member States.

7. Plant resistance and use of genebanks

This research programme has studied the methods and means for improving plant resistance against diseases and environmental pressures. Clearly, whilst the farmer will reap the benefits, the impact of this work is first with the plant breeder. The programme has attempted to establish a protocol for descriptors and descriptor states in apples, pears, apricots, peaches, cherries, plums, cereals, maize, beans and strawberries. The results should now be used to persuade the industry of the importance of not neglecting any dwindling genetic potential as older varieties tend to be replaced, but to conserving all the genetic potential for the future.

III. The outlook for further EC coordinated agricultural research on key problems

The current EC programme for the coordination of agricultural research (1984-88) was based on the lessons learnt from earlier programmes and with the continuing aim of promoting research to help the CAP. The main elements of this programme, now being elaborated in detail, are (1) the utilisation and conservation of agricultural resources, (2) structural problems and (3) improvement of animal and plant productivity.

1. Utilization and conservation of agricultural resources

(1) Energy in agriculture

The programme will study economies that can be effected in the energy intensive sectors of agriculture. Also, it envisages the possibility of producing and exploiting biomass and agricultural by-products profitable for energy:

- a) Indirect economy of energy
 - . Optimizing the use of fertilizers, biological nitrogen fixation, organic fertilizers and photosynthesis
 - . Integrated plant protection
- b) Direct economy of energy
 - . Tillage practices, working methods and matching machines to the needs of the job
 - . Maximum use of energy, in particular solar energy, for crops protected in glasshouses and for crop drying
- c) Production of energy
 - . The use of crops of economic and industrial interest to produce energy from biomass
 - . More efficient use of crop by-products
 - . The socio-economic effects of those crops on the CAP and their implications for structures, markets and the environment.

(2) Land and water use and management

Improved use and conservation of the natural resources of land and water within the EC are the objectives of this programme. Soil degradation, effects of management systems on fertility and the evaluation of land production potential will be considered in conjunction with their effects on energy balance, the environment and socio-economic implications

- a) Degradation and fertility
 - . Soil erosion and the effects of reforestation; loss of nutrients by leaching oxidation and denitrification
 - . Adverse facts such as soil compaction, poor soil structure, the misuse of agricultural machinery, and cropping systems
 - . Soil microbiological activity
- b) Control and management of water in agriculture
 - . Control of excesses, or deficits of water, environmental and economic effects of modifications
- c) Management systems
 - . Optimal utilization of land and water resources for the production of food and energy crops

- . Comparison of low-input farming systems with conventional intensive systems
 - . Problems related to periurban agriculture
- d) Land suitability and resource evaluation
- . Production potential maps for the principal crops of the EC
 - . Computerization of land-use data
 - . Potential uses of remote sensing.

2. Structural problems

(1) Mediterranean agriculture

The objective of the programme is to reduce the economic and social disparities that exist between the Mediterranean area and the more advanced parts of the EC. It is hoped to improve its agriculture through advanced economic and technical developments similar to those in the northern parts.

The priorities specific to the Mediterranean region are

- a) To remedy deficiencies especially in the following sectors
- . stock farming in marginal zones - for example the use of forests as grazing land to help prevent fires
 - . forests for quick yields
 - . plant protein, cereal and seed production
 - . problems of surplus production - for example of wine
 - . encouraging promising crops
- b) Attention will be focussed on technical developments in some sectors
- . protected cropping
 - . out of season crops
 - . irrigation
 - . improvement of calcareous soils
 - . diseases of plants and animals
 - . systems of production
 - . farm structures to use effective research results

Improving the techniques of production only will not solve existing problems in many cases. It will therefore be necessary in the programmes to associate research with demonstrations and application of the results in the field under practical farming conditions.

(2) Other less-favoured regions

Other EC regions may feature economic and social imbalances similar to those of the Mediterranean, for example, French overseas departments and the west of Ireland. The need exists to develop an integrated approach to tackle the difficulties which exist in rural communities.

(3) Agro-food

Improvement of the quality of agricultural products is the main aim of this programme, which is basically orientated towards human consumption. The methods of production and processing will be examined. While some qualitative aspects, like hygiene and residues are easy to define and measure others, for example, flavours are more elusive and difficult to control. The programme consists of:

- (a) A study of the relationship between the production system and quality, with particular reference to a comparison between intensive and extensive methods. The impact of such practices as use of mineral fertilizers, organic farming, plant protection methods and so on will be measured.
- (b) Specific problems of hygiene and control and elimination of residues affecting the market.
 - . The importance of hormones, antibiotics, pesticides and heavy metals.
 - . To develop methods for the objective evaluation of quality.
- (c) Markets and marketing in relation to end-product quality and the preoccupations of consumers.
- (d) New products and new techniques of utilization of agricultural products will be investigated.
- (e) By-product development.

3. Improvement of animal and plant productivity

(1) Animal husbandry

The objective of the programme is to examine the actual constraints on efficiency of production such as losses through diseases, conditions for rearing animals, and the rate of reproduction.

There are three main goals:

- (a) Animal health
 - . Strategic research on important diseases especially those which may hinder trade
 - . Immune mechanisms and disease protection
 - . Development and harmonization of diagnostic methods
 - . Occurrence and economics of disease
- (b) Animal welfare
 - . Social and physical space requirements
 - . Disturbed behaviour and stress
 - . Transport of farm animals
 - . Alternative production systems.

- (c) Livestock productivity and management
 - . Study of the physiology of reproduction in cattle, pigs and sheep
 - . Rumen function and feeding standards
 - . Improvement of biological and economic efficiency.

(2) Plant productivity

The aim of this programme is increased returns to the farmer through improving his productivity by more rational use of inputs. The programme will devote particular attention to production that is in short supply within the Community including plant protein for animal feeding. It comprises the following research areas:

- (a) Continued plant breeding for improved disease resistance, better quality products and stability of yield.
- (b) Optimizing agronomic methods and techniques from the point of view of physiological needs of the plants
- (c) The use of modern methods of biotechnology and tissue culture for crop propagation.

Particular attention will be given to forage crops, to crops deficit in the EC, crops of particular regional interest and crops that can be used to produce alternative sources of energy, in line with the emphasis laid by the European Parliament on strengthening research in the field of plant proteins.

4. Coordination of research

Over and above research currently coordinated at the EC level the programme will institute a register of all current agricultural research programmes in the Member States to be made available to cooperating bodies, in order that:

- (1) research programmes can be developed
- (2) duplication can be avoided
- (3) Member States may be able to discuss how to ensure that coordination is really effective.

IV. Adapting future research to changes in agricultural practices in the EC

This newsletter gives a brief review of the aims of earlier programmes for the coordination of agricultural research in the EC; promising results to be exploited and which can be referred to in greater detail in the publications listed; and some of the aspirations of the research to be started in the period 1984-88. Already discussions are taking place

to establish the most useful priorities which should be included after the current programme finishes. An evaluation will take some time but already it is clear that more work is required in certain key areas.

- . In future since farmers may face an even greater struggle to survive more emphasis in the EC agricultural research programme should be placed on economics and management. Such work would help to ensure a fair living for those engaged in farming; to stabilize the markets; to secure supplies; and to give the consumer the opportunity to buy at reasonable prices.
- . In particular, the effort to safeguard farmers' incomes, already under pressure from the limitation of price guarantees, should be aided by research aimed at solving problems by adjustment of farming enterprises, by cost saving, and other novel diversifications which may add value to the product sold at the farm gate.
- . There also seems to be a good case for more work to develop promising research results by setting up demonstrations or pilot projects since these might help to reduce regional disparities in the EC and to communicate the achievements of the research programmes.
- . Agriculture cannot be isolated from the rest of the industries in the EC and increasingly agricultural research aimed at helping the aims of the CAP must be linked with other EC research on food, biotechnology, energy, environment, health, food aid, informatics and so on.

The future programmes are certainly likely to be more secure and more appropriate if all concerned are reminded regularly of the aims of the CAP and discouraged from research which could clearly be better undertaken elsewhere in the EC as part of Community and/or national plans.

After two decades it is clear that the EC programmes for the coordination of agricultural research are producing more and more desirable results, and that success has been achieved in adapting and streamlining the content of the programmes to the future needs of agriculture in the EC.

V. Publications

Recent major publications from the EC programme for the coordination of agricultural research .

1. The Laying Hen and its Environment - 1980
Moss R.

Current topics in Veterinary Medicine and Animal Science
Kluwer Academic Publishers, Dordrecht, NL.

2. The Welfare of Pigs - 1980
Sybesma W.

Current topics in Veterinary Medicine and Animal Science,
Kluwer Academic Publishers, Dordrecht, NL.

3. The Problem of Dark Cutting in Beef - 1980
Hood D.E., Tarrant P.V.

Current topics in Veterinary Medicine and Animal Science,
Kluwer Academic Publishers, Dordrecht, NL.

4. Aujeszky's Disease - 1981
Wittmann G., Hall S.A.

Current topics in Veterinary Medicine and Animal Science,
Kluwer Academic Publishers, Dordrecht, NL.

5. Integrated Crop Protection - 1980
Graffin P.

A.A. Balkema Publishers, Rotterdam, NL.

6. Land Drainage - 1981
Gardiner M.J.

A.A. Balkema Publishers, Rotterdam, NL.

7. Transport of Animals Intended for Breeding, Production and Slaughter - 1981
Moss R.

Current topics in Veterinary Medicine and Animal Science,
Kluwer Academic Publishers, Dordrecht, NL.

8. Beef Production from Different Dairy Breeds and Dairy Beef Crosses - 1981
More-O'Farrell G.J.

Current topics in Veterinary Medicine and Animal Science,
Kluwer Academic Publishers, Dordrecht, NL.
9. Electrical Stimulation and Hot Boning - Effects on Meat Quality
Attributes - 1983
Valin C., Taylor A.A.
10. Perspectives for Peas and Lupins as Protein Crops - 1981
Thompson R., Casey R.

Pergamon Kluwer Academic Publishers Group, Dordrecht, NL.
11. Integrated Control in Citrus Orchards - Sampling Methodology and Threshold
for Intervention against the Principal Phytophagous Pests - 1983
Cavalloro R., Prota R.
12. Soil Erosion and Conservation - Assessment of the Problems and the State
of the Art in the EEC Countries - 1982
Prendergast A.G., Chisci G.
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