

# COMMISSION OF THE EUROPEAN COMMUNITIES

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COM(75) 351 final

Brussels, 15 July 1975

"BIOLOGY AND HEALTH PROTECTION" PROGRAMME

Research programme 1976-80

PROPOSAL

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(submitted to the Council by the Commission)

COM(75) 351 final

CONTENTS

	<u>Page</u>
<u>Part 1: Programme</u>	
1. Introduction	5
2. Radiation protection	
2.1 Motivation	6
2.2 Objectives	8
2.3 Proposed projects	9
2.3.1 Radionuclide behaviour and irradiation levels	9
2.3.2 Hereditary effects of ionizing radiation	11
2.3.3 Short-term effects of ionizing radiation	12
2.3.4 Late-developing effects of ionizing radiation	13
2.3.5 Radiation dosimetry and its interpretation	14
2.4 Structure and management	16
2.5 Funds	17
3. Application of nuclear techniques to agricultural research	19
3.1 Motivation	19
3.2 Objectives	20
3.3 Proposed projects	20
3.3.1 Improvement of a crop species	21
3.3.2 Overall optimization of yield and quality	21
3.3.3 The culture of plant cells	22
3.3.4 Radioentomology	22
3.3.5 Improvement of beef production	23
3.3.6 Food preservation	24
3.4 Structure and management	25
3.5 Funds	25

	<u>Page</u>
<u>Part 2: Proposal for a Council Decision</u>	27
<u>Part 3: Opinion of the Scientific and technical Committee</u>	31
<u>Note from the "Biology and Health Protection"</u> <u>Advisory Committee on Programme Management</u>	33
<u>Appendix: A survey of the accomplishments under the present</u> <u>programme</u>	35

Proposal for a "Biology and Health Protection" multiannual programme

1. Introduction

This proposal for an extension of the "Biology and Health Protection" multiannual programme is submitted pursuant to Article 7 of the EAEC Treaty. It is designed to provide continuity from previous programmes<sup>1</sup> and takes account of the progress of knowledge and the changing social, industrial, and economic requirements of the Community.

The first objective is the study and evaluation of risks associated with ionizing radiation (Radiation protection programme). Research proposed in this context concerns:

- (a) the scientific and technical bases needed for the establishment of basic radiation protection standards and for adequate protection of workers and the general public<sup>2</sup>;
- (b) the biological and ecological consequences of the nuclear industry and the use of nuclear energy and ionizing radiation, in order to ensure protection of the various components of the environment<sup>3</sup>.

This objective therefore concerns three fields of undisputed importance: the social sector, the environment and energy<sup>4</sup>.

The second objective, namely the development of nuclear techniques with a view to their application to agricultural research<sup>5</sup>, backs up two sectoral policies:

- (a) the agricultural policy, through its direct links with the agricultural research involved;
- (b) the environmental policy, in that it aims to reduce nuisance.

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<sup>1</sup>The reader is referred to the appendix: "A survey of the accomplishments of the present programme".

<sup>2</sup>Cf. Art. 30 and 31 of the EAEC Treaty.  
Cf. Social Action programme, COM(73)1600, 24 October 1973.

<sup>3</sup>Cf. Programme of Action of the European Communities on the Environment, OJ C 112, 20 December 1973. Cf. Council Resolution on Energy and Environment.

<sup>4</sup>Cf. Programme of Research and Development Actions in the field of energy, COM(74)2150, 8 January 1975.

<sup>5</sup>The Commission's previous "Applications" programmes also included a sector on medical research. As its efforts in this area remained rather restricted, the Commission does not propose pursuing them.

It is obvious, however, that these two general objectives of the "Biology and Health Protection" programme cover only some of the protection problems arising with the use of nuclear energy and in agricultural research. Other areas of Community action also have close links with the programme proposed here; they include reactor safety, management and storage of radioactive waste, and the coordination of general agricultural research.

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An Annex to the Rome Treaty establishing the European Atomic Energy Community, signed in 1957, laid down the areas in which the Commission should act. A sum of 3.1 million u.a. was allocated to biological work for a period extending to 31 December 1962. The first contract started in December 1959.

A second programme was adopted by the Council for the period 1963-67. It allocated a sum of 17.5 million u.a. to the "Biology and Health Protection" programme. The Commission was not granted any appropriations for contracts for 1968. For 1969 and 1970, temporary annual budgets were granted for the "extension of the previous programme".

In June 1971, the Council adopted the third "Biology and Health Protection" programme, which will end on 31 December 1975.

These three successive programmes have resulted in the building-up of an integrated scientific community which has genuinely worked on a cooperative basis and has substantially increased the potential of all the Member States. With regard to radiation protection, for instance, this integration has been made possible by the fact that the Commission has been able to set up contractual relationships with practically all organizations or national institutes working in the field and has in this way provided a general scientific effort which underlies the establishment of the basic standards for radiation protection, a task assigned to the Commission by the Euratom Treaty. At the scientific level itself, a permanent dialogue is taking place through the study groups which at regular intervals analyse the current state of knowledge and the future needs for each topic in the research programme. The "Community" character of the programme is ensured by the "Advisory Committee on Programme Management", which also secures coordination between the Community programme and the national programmes.

## 2. Radiation protection

### 2.1 Motivation

Protecting human health and safeguarding the environment and its components are major preoccupations of our time. The foreseeable increase in the use of energy of nuclear origin, including the probable use of thermonuclear fusion in the more distant future, the handling of waste, effluent and

fuels throughout their cycles, the gradual evolution of nuclear plant and the various uses of ionizing radiation and radioisotopes are all factors calling for adequate prevention and control measures. The scientific bases for these is build up through objective research designed to gain an adequate understanding of the risks encountered.

The preparation of basic standards for protection against ionizing radiation is one of the tasks incumbent on the Commission pursuant to the Euratom Treaty and is an important part of a common policy for the protection of health against radiation hazards. This work presupposes the existence of scientific knowledge which, as it is improved and enriched, enables the "standards" to be adapted to progress and experience.

At present, the number of workers occupied with peaceful uses of nuclear energy is over 250 000 in the nine Member States. Almost three-quarters of them are engaged in medical, industrial and scientific fields, where protection problems are highly diversified and difficult to define. Nevertheless, the nuclear industry is going to expand considerably. The 20 GW(e) of installed power that will be in service by the end of 1975 in the nine Member States is expected to increase to 150-180 GW(e) by 1985, requiring an investment of 50 000 million u.a. (not including fuel costs). The number of workers employed in nuclear centres, and the general public living in their vicinity, will thus be considerably higher than at present. Consequently, the possible global effect could increase, and this prospect makes it essential to have a more precise and complete evaluation of the implications for man and his environment of the multiplication of nuclear facilities, and in particular of the storage, transport, processing and disposal of radioactive material.

To date, the standard of safety in the nuclear industry has been very high, and every effort must be made to maintain this record in the future, notwithstanding the diversification of hazards and the increase in potential irradiation and contamination sources. Nevertheless, the risk of accident due to technical defects, human error or sabotage cannot be totally ruled out. The consequences of such accidents or incidents are now assuming a further dimension, because of the increasing number of nuclear sites and the constraints on the carriage of irradiated fuel or high-activity material.

The nuclear industry and many other industrial sectors are not, however, the only human activities to have introduced the "irradiation" factor into daily life. Many common products containing radioactive substances and equipment liable to emit ionizing radiation are now available to the public. In medicine, the use of ionizing radiation and radioisotopes is constantly increasing. Obviously no-one seriously considers dispensing with the numerous radiological and radiation therapy techniques used in modern medicine, which have proved to be irreplaceable. Research should, however, be geared to the development of methods designed to keep exposures to the very minimum necessary to obtain the required information. This aspect of research holds out hopes of a very great degree of efficiency in radiation protection.

It is at all events obvious that biological considerations will play a vital role in the development of the nuclear industry and the other uses of nuclear energy. The authorities empowered to take decisions on these subjects must therefore have access to sufficiently full and accurate scientific data that will enable them to deal with the various practical problems which may arise and on which public opinion is particularly sensitive.

## 2.2 Objectives

For the foregoing reasons, the Commission proposes continuing its coordination and promotion activities with the aim of:

- (a) ascertaining the reliability of existing knowledge;
- (b) amplifying the necessary knowhow to limit any damage caused by ionizing radiation and counteract its effects;
- (c) tackling health or ecological problems that could arise from particular situations or accidents.

### 2.3 Proposed projects

The information obtained from previous Commission research programmes and from research conducted elsewhere in the world in comparable fields has been examined, the present state of knowledge reviewed, future guidelines sketched out and the major research subjects identified.

The programme proposed by the Commission is based mainly on the updating and adaptation of the activities in progress, dictated by the expected acceleration in the development of nuclear facilities and by the examination of the effects of this situation on man and the environment. In some cases, however, it appears necessary for the same reasons to step up research on certain special subjects or to include in the programme research on new and topical subjects.

The five sectors which make up the programme form an integrated and coherent body of studies centred on the objectives defined in Section 2.2. These sectors are as follows:

- Radionuclide behaviour and irradiation levels
- Hereditary effects
- Short-term effects
- Late-developing effects
- Dosimetry.

#### 2.3.1 Radionuclide behaviour and irradiation levels

The main objective, in this sector, is to assess radiation doses to man from radionuclides with which he comes into contact or which he might absorb in various circumstances and through various pathways. This assessment will only be fully effective, however, if it takes account of all the radiation doses delivered to man from various sources, whether natural or artificial. It is therefore necessary to draw up irradiation balances for population groups taking account of all the sources involved in whole-body exposure, including natural irradiation. Cases where unacceptable damage could be caused to the environment and its components should also be defined and methods developed to preclude such damage.



Enough data exist at present to execute adequate routine control measures based on existing safety standards, but the proliferation of nuclear installations is adding to the health and ecological problems inherent in their geographical location, their technical characteristics, the type and processing of the waste they produce and the conditions for the transport of radioactive products.

The radionuclides to which particular attention should be given are the transuranic elements, which are increasing in importance with the development of the nuclear industry, and also tritium, krypton and iodine.

In general, the research should be directed towards:

- (a) the collection of basic data on the physical processes of diffusion, advection and dispersion of radionuclides, and the physicochemical processes determining rates of exchange at various interfaces;
  - (b) the parameters governing interactions between radionuclides, chemicals and heat given off by nuclear facilities and the nature of these interactions;
  - (c) the effect of the physicochemical state of the radionuclides, of associated pollutants and of the processing and geographical movement of food products on the radioactive burden of human and farm-animal diets;
  - (d) study of the possible biological and ecological consequences of the storage of high- and medium level radioactive waste (\*);
  - (e) improvement of the assessment of irradiation levels by obtaining improved data on radionuclide biological half-lives, particularly in accident situations, and by studying the long-range distribution of discharged radionuclides;
  - (f) establishment of simulation models for the transfer, distribution and accumulation of radionuclides, methods of applying them to the selection of and the safeguard procedures for sites for nuclear facilities and the use of the models to plan experimental checks to be carried out.
- (\*) In liaison with the programme on "Management and Storage of radioactive Waste" of the Community adopted by the Council of Ministers on June 26, 1975.

### 2.3.2 Hereditary effects of ionizing radiation

The effects induced by radiation upon human genetic material are important and complex because they occur at two different levels: mutagenesis and carcinogenesis. To be undertaken correctly, the quantitative and qualitative evaluation of these effects necessitates the acquisition of knowledge on induction mechanisms, induction frequencies and interference factors such as repair and elimination.

In general, the research to be carried out in this area must essentially be done on animal or plant species allowing precise and detailed experimentation which cannot be performed directly on man. However, in view of the information previously acquired and of the need to increase our knowledge of human radiobiology, it is proposed that as far as possible part of the future research programme be transposed to a direct analysis of radiation-induced effects on man or on cultures of human cells and to the development of methods of applying to human beings the quantitative data obtained from experimental material. At any rate, the use of experimental material will be maintained for analysing induction mechanisms, which are probably common to the majority of cellular organisms, and for the study of particularly important radiation effects which cannot be studied directly on man.

Future work will involve the following research efforts:

- (a) improvement and standardization of methods and techniques for the detection and characterization of chromosomal anomalies induced in exposed humans and the establishment, for different types of exposure, of correlations between the doses received, the frequency of observed anomalies in lymphocytes or amniotic cells and the biological consequences of irradiation. Such consequences of irradiation must be analysed and expressed in terms of aplasia in germinal cells, of the frequency with which induced defects manifest themselves in live-born children in comparison with still-born children and of the transmissibility of induced damage from the direct progeny to the later generations;

- (b) analysis, on species or test-material which are most appropriate for such studies, of the radiation-induced damage to DNA and of repair systems. These researches will essentially be carried out with the aim of:
- defining the role, the mode of action and the requirements of the various repair mechanisms operating in irradiated cells;
  - making possible the adaptation and progressive application to human cells of the information and methods which have been obtained or developed from research on microorganisms, eukaryotes and animal cells;
  - collecting in this way the basic information necessary for detecting and analysing variations in sensitivity to radiation within and between peoples, groups and individuals;
- (c) determination, on experimental species but with emphasis on the extrapolation of data to man or on the effects of low doses, of the induction mechanisms and induction frequencies of important hereditary effects such as nondisjunction, chromosomal translocations and gene mutations;
- (d) studies on the interactions between ionizing radiations, viruses and chemicals at the level of mechanisms which are common to mutagenesis and carcinogenesis.

### 2.3.3 Short-term effects of ionizing radiation

Because of the frequency with which radiation-induced lesions are encountered in industry, research and clinical medicine, it is extremely important to study the effects of acute irradiation. Attention should therefore be concentrated on the diagnosis and treatment of such lesions. Radiological lesions of the hand sometimes occur in workers employed in nuclear power stations or in place through which high-energy beams pass. In such cases, the impairment of the cell-regeneration mechanism is probably the most important factor. In the same category are the effects of irradiation of the endocrinal glands which frequently result from internal or external irradiation and have physiological consequences calling for closer study. Attention should be focussed particularly on the changes in vascular conjunctive tissue and on surveillance of the local immunological system. Techniques borrowed from molecular biology could undoubtedly be very useful here.

As regards the early development of radiological lesions after total irradiation, special attention should be given to intestinal lesions: digestive symptoms are the first to appear after irradiation affecting most or all of the body.

Study of the irradiation syndrome after whole-body irradiation should also be continued. Treatment here is aimed at restoring as far as possible normal functioning of hematopoiesis. One technique used for this purpose is to transplant into the patient a piece of hematopoietic tissue from a healthy donor.

Unfortunately this technique is fraught with a number of risks, in particular the fact that the transplanted tissue soon triggers off an immunological reaction against the host, the effects of which can be very serious indeed. On the basis of these considerations, the main effort will be devoted to stem cells and their characterization, isolation, purification and storage. Special attention will be paid to the post-irradiation monitoring of the immunological system and the reaction of the graft to the host.

The effects of radiation on the development of embryos and teratogenic effects will also be studied.

The study of chromosomic and biochemical indicators could open up new prospects and will therefore likewise be considered.

#### 2.3.4 Late-developing effects of ionizing radiation

The study of long-term effects liable to appear in individuals who have suffered a high dose of radiation or the effects of small doses received over a fairly long period comes up against methodological problems which are still far from resolved. Because radiation would only increase the frequency of natural pathological phenomena, it is impossible to establish for a given case of leukemia or a tumour a cause-and-effect relationship between the dose received and the effect observed. Consequently, all that can be done is to compare vast groups which have received different radiation doses or try to improve our knowledge of the precise mechanism of action of such doses.

Moreover, as almost inevitably an animal or a group of animals is subjected simultaneously to different agents capable of impairing its biological condition, account must be taken not only of the effect of the radiation but also of its possible interaction with other factors relating either to the biological condition per se of the individual or to the environment.

As a compromise between desirable and feasible research, work on the late-developing effects of radiation should relate to:

- (a) latency time before the appearance of tumours and comparison of the different tumours found in different animal species;
- (b) the relationship between tumour induction and dose rate, and the form of the dose/effect relationship;
- (c) the role played by the immune system, in combination with other environmental factors, in the development of leukemia and other solid tumours after exposure to radiation. Similar work on the ability of certain viruses to interfere with normal cell system function and regulation.

Of the localized effects, special attention will be paid to the effect of radioactive dust on lung tissue, its partial incorporation in the skin and its elimination.

The carcinogenic effects of various types of ionizing radiation will be compared. It is probable that the dose/effect relationship is different in this case.

It would also be of interest to supplement the experimental work with epidemiological studies on radiation-induced carcinogenesis in man. It is not absolutely certain that such studies can validly be achieved, but the possibility should be carefully examined.

Of the late-developing effects of bone-seeking and other isotopes often unevenly distributed throughout the organism, special attention will be paid to the effects of plutonium.

Finally, the study of any relationships between irradiation and non-specific shortening of the life span will be undertaken on a limited scale.

In general, more importance should be given to the study of the late-developing effects of radiation than in the past.

#### 2.3.5 Radiation dosimetry and its interpretation

Radiation dosimetry and its interpretation, together with personal dosimetry, are as important as ever for a proper evaluation of the nuclear hazard:

- the study of ionizing radiation effects can only be carried out properly if it is possible to measure the absorbed dose and interpret it from the point of view of its biological effects and the risk to which it gives rise;

- the directives adopted in the European Community's Basic Standards require the measurement and recording of certain data which are essential for radiological protection of workers and the general public.

The dosimetry sector, centred in particular on micro-organ, neutron and personal dosimetry, will embrace the following topics:

- Microdosimetry: these studies are essential in order to improve assessment of the radiological risk and the validity of the quality factors. Particular attention must be given to low doses.

A study should be made of the transfer of radiation energy into matter, the distribution of primary and secondary events in space and time, the mechanisms of radiation effects and the particular metrological problems posed by low doses.

- Analysis and interpretation of dose-effect relationships: these studies, closely linked to energy transfer, are essential for the establishment of limit-doses, definition of the biological significance of mixed radiation fields and the improvement of radiological protection in medical applications of radiation.
- Internal dosimetry: in view of the consequences of radioactive uptake, it is proposed that quantitative methods and apparatus be developed for assessing local, often heterogeneous, distribution of the absorbed products and that internal dosimetry be studied in organs, in particular the lung, having regard to the effects on the lung of inhaling radioactive substances.
- Dosimetry of external irradiation fields: this is important from the dual standpoint of protection and radiobiology. It is proposed that spectrometers, neutron dosimeters, personal and environmental monitors and criticality dosimeters be developed, especially for intermediate energies and mixed fields. Studies should also be carried out on the practical possibilities of reducing somatic doses in medicine and on short-range radiation dosimetry.
- Intercomparisons: owing to their direct value in radiation protection research, it is proposed to continue the intercomparison projects for various types of radiation.
- It is obvious that the development of methods and instruments, notably solid-state dosimeters, must be continued, as they are necessary for the study of the subjects defined above.

## 2.4 Structure and management

2.4.1 The Commission intends to carry out the main part of the proposed programme under association or shared-cost contracts. It will endeavour to group in a single contractual framework several participants whose programmes dovetail into a particular research theme, in order to continue to stimulate cooperation and coordination, the key objectives of Community action.

2.4.2 The work of the Biology Group at Ispra will continue to be an integral part of the programme, whilst supplementing the research carried out in the contract programmes. The different projects within a given programme are distributed between the contracts and the Biology Group on the basis of the skills and technical facilities available. Furthermore, the Biology Group backs up the contract programmes by providing services or products with the aid of its equipment and the techniques which the Group has developed.

2.4.3 As soon as a decision has been taken by the Council on the radiation protection programme, the proposals submitted by the appropriate bodies and laboratories in the Member States will be examined by the ACPM. This Committee will give its opinion on the relevance of each proposal to the programme adopted by the Council, on their scientific value and on the appropriations to be allocated from the budget in the light of the agreed priorities and the available funds.

As in the past, the programmes in hand, both those being carried out under contract and those being performed by the Biology Group, will be regularly examined by the ACPM and, if necessary, redirected in line with the Council decision and the advance of knowledge.

2.4.4 Particular attention will be given to coordination in the various sectors and subsectors of the programme through the holding of symposia, conferences and study group meetings. This type of activity, which has proved its worth, will be frequent in the new multiannual programme.

Study group meetings will be informal and focus on specific subject areas of the programme. They will be attended by research workers involved in the contract programme, as well as some experts from non-participating laboratories or organizations and scientific staff members of the Commission. Working relations with the main international organizations active in the field of radiation protection will be maintained and expanded.

2.4.5 In addition to regular publications, scientific monographs on major radiation protection topics will be published and disseminated.

2.4.6 Exchanges of information and experience between the contractual partners must be efficiently organized. Existing facilities should be supplemented by arrangements for working visits of limited duration by research workers engaged on the contract programme. Past experience has shown the benefit to the Commission's partners of improving the mobility of research workers by enabling them to work for periods ranging from a few months to two years in laboratories taking part in the programme.

## 2.5 Funds

2.5.1 The Commission's proposals are dictated by a desire for efficiency in the execution of the research programme. As the Radiation Protection programme is essentially a form of indirect action, the contracts must be allocated a major share of the funds.

### 2.5.2 Staffing

The staff authorized by the Council Decision of 21 June 1971 is 97 Community servants. ( This figure consisted of 77 Biology posts, distributed among the contracts, the Biology Group at Ispra and the Headquarters, and 20 men/year from the JRC Ispra infrastructure\*.)

The Commission proposes that the staff allocation ceiling for the Radiation Protection programme be fixed at 73 posts (and 20 men/year for the JRC Ispra infrastructure) for the period 1976-80.

### 2.5.3 Financial allocation

The Commission proposes that the ceiling for the programme be fixed at 47.600 million u.a. for the period 1976-80.

This ceiling takes into account the situation of the present programme and a number of other considerations dictated by the task assigned to the Commission by the Treaty and by programme and financial requirements, in particular:

- a significant Commission presence in the combined effort being made in Europe on radiation protection research through its participation, in funds and staff, within a network of research contracts;
- the expenditure for a standard year, taken at the end of the programme now being carried out;

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\*For budgetary purposes, expenditure relating to these 20 men/year from the "Infrastructure" in support of the Biology Group working at Ispra has since 1972 been entered on an "Infrastructure" line instead of the "Staff" line.



- the restoration of the Commission's participation in contract expenditure to its initial level<sup>1</sup>;
- the gradual integration of new Member States;
- the provision of a limited amount for expenditure not scheduled in the contracts;
- the launching of some new activities;
- the need to take account, in some measure, of the increase in costs<sup>2</sup>.

As a guideline, expenditure by categories is broken down in the following manner:

- Contractual activities:

expenditure for contracts, cash	25.6 million u.a.
expenditure for Commission personnel working under the contracts	7.4 million u.a.

- Biology Group at Ispra:

expenditure for research	0.8 million u.a.
infrastructure and technical support	2.6 million u.a.
personnel	5.7 million u.a.

- Management and administration:

expenditure for experts' fees, meetings, etc.	0.7 million u.a.
Headquarters personnel	4.8 million u.a.

- Total

47.6 million u.a.  
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Forseeable payments per year:

1976	1977	1978	1979	1980	1981
6.8	8.4	9.8	10.6	11.4	0.6 million u.a.

<sup>1</sup>The principle of a certain variation in the rate of participation by the Commission in the contracts has been accepted because of the diversity, in nature and organization, of the Commission's contract partners. The average rate of participation amounted to 40%, but was substantially reduced during the period 1974-75 by the very high rate of inflation and by the establishment of an absolute ceiling, in terms of funds, on the Commission's participation.

<sup>2</sup>It is impossible to make any valid estimate of the increase in costs for personnel and other expenditures over a five-year period; the Commission therefore intends to propose a financial adaptation of the programme during its third year which will be based upon the actual economic trend.

### 3. Application of nuclear techniques to agricultural research

#### 3.1 Motivation

The reasons for which the Commission proposes the continuation of research in this field stem from two different considerations.

The first is the usefulness, already demonstrated many times, of radiobiology and of nuclear techniques in the applied biological sciences and, among these, in the array of disciplines involved in research in agronomy and agroecology. It is recognized that nuclear centres, where concentrated use is made of advanced techniques, and radiobiological laboratories, which study the effects of ionizing radiation on living organisms, have furnished methods, techniques and knowledge which, in many cases, play a decisive role in applied biology. Throughout its past programmes, the Commission has always been concerned to make the most of radiobiological investigations by ensuring that the results are applied and rapidly geared to use in agricultural research. Conversely, several research topics proposed in the "Applications" programme are closely connected with radiation protection problems (such as the irradiation of foodstuffs) or are likely to provide information useful for radiation protection purposes (such as soil/plant relations, plant haploid manipulation and plant cell culture.

The second consideration is the development, already under way, of a Community coordination project, both as backing for and as a follow-up to the common agricultural policy, within which priority objectives are defined. In general, these are based on two apparently contradictory trends between which a proper balance must be found: the need to increase the efficiency of food production

and, by reducing as much as possible the use of pesticides, anabolic agents, antibiotics and other products of questionable effect upon human health, the concern to present the consumer with more "healthy" products. An adequate knowledge of the genetic, physiological, nutritional and physico-chemical mechanisms of the phenomena involved, at different levels, in the production processes of living matter is generally essential for the optimization or rationalization of agricultural production. It is within this area that the Commission has elaborated its proposals which do not claim to solve all the numerous problems currently facing European agriculture, but are restricted to a few topics selected for their interest and for the fact that they lend themselves well to effective use of results obtained in radiobiology and to the application of nuclear techniques.

### 3.2 Objectives

The Commission proposes that it continue its efforts to coordinate work on the application of nuclear techniques to agricultural research with a view to enabling the results obtained in radiobiological research and the potential of nuclear techniques to be used for the benefit of the socially and economically very important sector of agriculture, in conformity with the guidelines and needs defined by agricultural research proper.

### 3.3 Proposed projects

As in the case of the radiation protection programme, the current state of knowledge in the various research areas covered by the programme has been reviewed and future guidelines and important research topics defined.

All the research topics proposed aim at the qualitative improvement of agricultural production and the maintenance of productivity levels which are compatible with economic and social requirements. They all tend to contribute towards the development of methods that are more rational, more efficient or less destructive than the conventional techniques currently available. In other words, the use or development of nuclear methods as defined below is recommended only in cases or circumstances where they can be considered as an improvement on or as complementary to traditional techniques.

3.3.1 The improvement of a crop species is a long and exacting task which depends upon the length and frequency of the life cycle and involves comparative trials in the field covering several years, the only method of properly assessing the value of a new variety. Under such conditions, a Community contribution should centre upon the exploration of new paths and the development of new methods which, in certain cases or for certain species, represent a worthwhile alternative or a useful complement to the conventional techniques of improvement.

It is therefore necessary to continue exploration of the potentialities of induced mutagenesis and of nuclear techniques in cases where improvement by genetic means, that is to say, permanently and without any associated pollution, may be expected to result from the use of nuclear methods. More particularly, these methods should be used to obtain an understanding of certain genetic mechanisms, to induce mutations and to eliminate reproductive drawbacks in order to:

- improve the quantity and quality of proteins in cereals and legumes;
- increase the resistance of certain crop plants to disease and thus reduce the use of pesticides;
- overcome the barriers to controlled fertilization and to improvement by the production of interspecific hybrids;
- improve some of the species which are reproduced asexually (ornamentals, potatoes, fruit trees) and which can hardly be handled through conventional breeding methods;
- analyse, by means of depletion mutations, the genetic structures and the metabolic pathways in the most important cultivated species.

3.3.2 Overall optimization of yield and quality results simultaneously from the improvement of the crop plant (3.3.1), the conditions of cultivation in the environment considered and the sum of the treatments applied to the final product. At each of these levels and from the dual point of view of diagnosis and application, nuclear techniques, sometimes in combination with other advanced methods, have demonstrated their high degree of accuracy and efficiency. Examples are numerous, but it should suffice to give as illustrations:

- the relationships between plant transformation and energy conversion on the one hand and final productivity on the other;
- studies of the movement of ions and molecules in soils, plants and water;
- analysis of the pathways of biocides;
- determination of the activity of the fauna and of the flora in soils and the development of root systems.

The Commission proposes continuing the analysis of the methodological features of these techniques, adapting them to the study of problems of recognized importance and making a particular effort to ensure that the knowledge obtained is transmitted to and is available to all laboratories likely to profit from it.

3.3.3 The culture of plant cells, and most particularly of haploid microspores, opens up a wide range of new possibilities for the analysis of basic genetic mechanisms and for the production of improved cultivars. To make full use of the technique, it is necessary to accumulate information on the mechanisms regulating the fate of the plant cell cultured in vitro and the structural organization of plant tissues. Moreover, the methods for radiogenetic manipulations and for the regeneration of entire plants from isolated cells need to be refined and extended to a larger number of important species. Finally, it would be desirable to define methods for preserving, under reliable conditions of stability, and as cells, tissues or organs, the plant material displaying important features from the point of view of applied or basic research.

3.3.4 It is now recognized that the exclusive and repeated use of insecticides to control noxious insects is in many ways a dangerous procedure: accumulation of persistent and toxic residues in the biosphere, increased resistance of the insect, wide spectrum of effects upon all noxious and useful species. It is for such reasons that the concept of "integrated control" is becoming more and more prevalent with the application of a combination of methods based upon the use of specific insecticides, cultivation techniques, and biological and genetic control. A very important facet of this last method is based upon radiobiology and radiogenetics: the use of radiations to induce modifications in the hereditary make-up of the insect, which may range from complete sterility to simple lesions. The accumulation, through generations,

of such lesions makes insect populations less in tune with their normal environment and, as a consequence, tends to bring about their elimination or a reduction of their relative importance.

During the previous programmes, experience in this field was acquired by the Community and encouraging results obtained. The interest of radiogenetic methods as part of the necessary tools for integrated control and the ubiquity of problems which naturally transcend national frontiers prompt the Commission to propose a study of the application of radiogenetic methods to certain insects chosen for their phytosanitary importance, their physiological and genetic features and the lack of more appropriate means of control.

This research should be carried out as part of a series of intercomplementary projects and should concern:

- the definition of the ecological, physiological and genetic principles essential to the choice and proper development of any control method;
- the quality assessment of the insects produced and the mass breeding of these insects;
- the execution of pilot programmes designed to test in the field the validity of the results obtained.

This work will be carried out in close relationship with the International Organization for Biological Control of Noxious Animals and Plants (IOBC) and the International Atomic Energy Agency (IAEA).

3.3.5 In the farming sector, the improvement of beef production efficiency (seen on a European scale) is still a matter of great concern.

Research and management procedures to modernize farming, to improve animal feeds and to undertake genetic selection within the "Friesian Black and White" breed must be carried out to improve cattle production from European dairy livestock and to increase carcass output and meat quality, but full attainment of such objectives depends upon the acquisition of the necessary knowledge of the phenomena and mechanisms which control and determine the processes involved in the improvement of production and of quality. These phenomena and mechanisms

can be exhaustively and accurately analysed only with the use of refined nuclear techniques, which reach their highest level of efficiency and utility in research of this type.

It would be particularly necessary to:

- develop methods of improving protein synthesis in vivo and to demonstrate their effects upon the quality of meat and of carcasses; these methods proceed from the application of radiochemical techniques to the fields of general physiology, nutrition and nitrogen metabolism;
- reinforce, through the use of such techniques, research on defence mechanisms against pathogens in new-born calves and in females during the calving period and, consequently, the development of preventive action in the field of the perinatal pathology of calves.
- generalize radioimmunological techniques for precise hormone dosing in reproduction physiology, and in particular, oestrus synchronization, superovulation, the reduction of time-intervals between calvings, and ovule transplantation.
- apply these techniques to analyses dealing with the reproduction of cows, the testing of reproductive capacities in males and the use of bull-calves for the production of quality beef.

3.3.6 Food preservation by means of radiation treatment is a technique seldom used in practice. A certain evolution has, however, been observed in recent years; this is due, on the one hand, to the results obtained in numerous tests on "edibility" and, on the other hand, to the feeling, shared by increasing numbers of experts, that among the conventional procedures used to date irradiation may well constitute one of the treatments which not only modifies certain products the least while best preserving their quality, but also reduces the use of other preservation agents not always completely free from toxic effects. To avoid wasting the work carried out to date, at a time when there is a clear tendency towards the acceptance of the method, the Commission proposes that limited Community action be maintained in the field of food irradiation. This action would essentially concern certain specific problems arising in connection with the microbiological aspects, the combination of irradiation and other treatment and the methods of assessing edibility. Close relationships with the World Health Organization (WHO) and with the international IAEA - OECD project for food irradiation have been

established and will be maintained.

#### 3.4 Structure and management

The principles defined in Section 2.4 "Radiation protection", of the present note apply equally to the part of the programme dealing with "Applications".

#### 3.5 Funds

3.5.1 The Commission's proposals are dictated by a desire for efficiency in the execution of research programmes. As the "Applications" programme is indirect action, all its funds must be allocated to contracts.

#### 3.5.2 Staff

The staff authorized by the Council Decision of 21 June 1971 is 10 Community servants. The Commission proposes that this figure remains unchanged and that the staff allocation for the "Applications" programme be fixed at 10 posts for the period 1976-80.

#### 3.5.3 Financial allocation

The Commission proposes that the ceiling for the programme be fixed at 18.720 million u.a. for the period 1976-80.

This ceiling has been established by the same criteria as those employed for the part dealing with "Radiation protection" (page 17), that is to say:

- a significant Commission presence in the combined effort being made in Europe on research on "Applications" through its participation, in funds and staff, within a network of research contracts;
- the expenditure for a standard year taken at the end of the programme now being carried out;
- the restoration of the Commission's participation in contract expenditure to its initial level\*;
- the participation of all Member States;

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\*See footnote 1 on page 18.



- the provision of a limited amount for expenditure not scheduled in the contracts;
- the need to take account, in some measure, of the increase in costs\*.

As a guideline, expenditure by categories is broken down in the following manner:

- Contractual activities:

expenditure for contracts	16.000 million u.a.
expenditure for Commission personnel working under the contracts	2.280 million u.a.

- Management and administration:

expenditure for experts' fees, meetings, etc.	0.160 million u.a.
Headquarters personnel	0.280 million u.a.

- Total

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18.720 million u.a.

Foreseeable payments per year:

1976	1977	1978	1979	1980	1981	
2.270	3.280	3.990	4.280	4.530	0.370	m u.a.

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\*See footnote 2 on page 18.

PROPOSAL FOR A COUNCIL DECISION ADOPTING A FIVE-YEAR RESEARCH AND  
TRAINING PROGRAMME OF THE EUROPEAN ATOMIC ENERGY COMMUNITY IN THE  
FIELD OF BIOLOGY AND HEALTH PROTECTION

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The Council of the European Communities,

Having regard to the Treaty establishing the European Atomic Energy  
Community, and in particular Article 7 thereof;

Having regard to the proposal from the Commission, submitted after  
consulting the Scientific and Technical Committee;

Having regard to the Opinion of the European Parliament;

Having regard to the Opinion of the Economic and Social Committee;

Whereas it is in the interest of the Community to supplement, broaden and  
deepen the information necessary to guarantee an objective evaluation of  
the effects of and the dangers arising from ionizing radiations with  
regard to individuals and to plant, animal and human populations;

Whereas nuclear techniques and methods are of importance to agricultural  
research and whereas exploitation of the potential created in the Community  
is of major significance in this field;

Whereas the research forming the subject of this Decision is an appropriate  
way of pursuing such action, and whereas consequently it is in the common  
interest to adopt a multiannual programme in the field of biology and health  
protection;

HAS DECIDED AS FOLLOWS:

Article 1

A research and training programme in the field of biology and health protection,  
consisting of a "Radiation Protection" programme and an "Applications"  
programme, shall be adopted for a five-year period from 1 January 1976; this  
programme is set out in the Annex, which forms an integral part of this  
Decision.

Article 2

The upper limit for expenditure commitments and for staff necessary for the implementation of this programme shall be 47.600 million units of account and 73 Community servants and 20 men/year for the infrastructure of the JRC, Ispra, in support of the Biology Group at Ispra, and 18.720 million units of account and 10 Community servants for the "Applications" programme, the unit of account being defined in Article 10 of the Financial Regulation of 25 April 1973 applicable to the general budget of the European Communities.

Done at Brussels,

For the Council

The President

"BIOLOGY AND HEALTH PROTECTION" PROGRAMME1. "Radiation Protection" programme

An amount of 47 600 million units of account shall be allocated to this objective and the upper limit for staff shall be fixed at 73 Community servants and at 20 men/year for the infrastructure of the JRC, Ispra. The aim of the work is to supplement, broaden and deepen the scientific and technical knowledge necessary for the accurate determination of permissible radiation levels in man and contamination of the various components of the environment, and for the improvement of the practical organization of radiation protection by the Member States.

This aim includes studies on radioactive contaminants, with particular reference to the path which they follow in man and the environment, on the effects of radiation on living matter, and on dosimetric methods and instruments.

These activities shall be carried out mainly under contracts of association or shared-cost contracts and partly by the Biology Group set up at the Ispra Establishment.

2. "Applications" programme

An amount of 18,720 million units of account shall be allocated to this objective and the upper limit for staff shall be 10 Community servants.

The aim of the work consists in the development of nuclear techniques and application of nuclear methods with a view to their use in agricultural research.

The work shall be carried out under contracts of association or shared-cost contracts.

Opinion of the  
Scientific and Technical Committee of 30 April 1975  
on the  
Proposal for a "BIOLOGY AND HEALTH PROTECTION" programme for 1976-80

Having been consulted on the scientific and technical content of the five-year "Biology and Health Protection" programme and its interest to the Community, the STC examined and discussed the programme proposals concerning radiation protection and applications of nuclear techniques to agricultural research.

On account of the considerable importance assumed by questions concerning the protection of man (workers and the population as a whole) and of the various components of the environment against radiation, particularly in view of the foreseeable development of the nuclear industry, the Committee expressed a favourable opinion on the Commission's proposal.

The STC recognizes the objective of the "Applications" programme from an agricultural standpoint. It therefore concurs in the favourable opinion expressed by the Standing Committee on Agricultural Research with regard to the Commission's proposal and hopes that close coordination will be established between this programme and those developing within the framework of general agricultural research.

Brussels, May 23 1975

NOTE FROM THE BIOLOGY AND HEALTH PROTECTION ACPM,  
meeting on 22 and 23 May 1975,  
TO THE COMMISSION AND TO THE COUNCIL

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The ACPM has been informed by Commission staff of the current status of the proposal for the 1976-80 programme on biology and health protection and how this proposal will be handled prior to a Council decision on it. In its capacity as the management body, the ACPM is concerned about the difficulties in the management of the programme that any delay in this decision will cause the Commission's contract partners and the research groups participating in the programme, whose activities form part of the work that should be continued after 31 December 1975. The ACPM hopes that everything possible will be done to ensure that the proposal is examined by the competent authorities and a decision taken on it in time to allow the research work to be continued as from 1 January 1976.

BIOLOGY AND HEALTH PROTECTION: A SURVEY OF THE ACCOMPLISHMENTS UNDER THE PRESENT PROGRAMME.

1. Objectives

However beneficial they may be, the various utilizations of nuclear energy cannot be conceived and accepted unless adequate protection is given to workers, the general public and the environment.

The Treaty establishing the European Atomic Energy Community, signed in 1957, defined the role of the Commission with regard to protection against ionizing radiations and made provision for a Community research effort aiming at acquiring the scientific infrastructure necessary for the preparation of rules and measures in the field of radiation protection.

Anticipating hazards, preventing their manifestation or maintaining them at a preestablished level involves, above all, knowledge and the identification, by means of scientific research, of the various links, in some cases highly complex and in others direct, between nuclear energy and living organisms. This is the objective which has been pursued by the Commission in its successive research programmes on radiation protection and which, in view of the probable increase in the development of the nuclear industry, is still applicable if this industry is to maintain the high level of safety it has acquired to date.

But the Euratom Treaty also made provision for the development of a research sector other than the control of nuclear hazards and which concerned in particular the exploitation of nuclear methods and nuclear techniques in a field of very considerable economic and social importance, namely agriculture. The Commission has thus attempted to organize a cooperative research effort aiming at a rapid utilization of the knowledge gained from radiobiological research and of the facilities available at nuclear research centres, to the benefit of certain areas of agricultural research selected mainly for their specific importance and not solely on account of their suitability for the application of any particular nuclear technique.

## 2. Achievements

### 2.1 Coordination

The coordinating function of the Commission has proved to be an indispensable prerequisite for accurate formulation of Community objectives and for the execution of research mainly carried out under contracts with national bodies, institutes and laboratories. The Commission has established working relations with the majority of bodies in the Member States which carry out research on radiation protection; it has accordingly been able to provide its financial assistance with the amplification effect which must form part of any Community action.

The importance of the network formed by the Community programme is also reflected in the number of graduate researchers who in 1975 have contributed full-time to its implementation: this number amounts to 350, comprising 260 for the "Radiation protection" and 90 for "Applications of nuclear techniques".

Community coordination is carried out at different levels. At the time of preparing each multiannual programme, an inventory of information has been established, future needs defined and, in this context, Community projects selected with due regard to those already performed at the national level. During their execution, the Community programmes have been subjected, on the basis of recently acquired knowledge in Europe and elsewhere, to constant reassessment and reorientation. For every research topic in the programme, the Commission has systematically organized study group meetings during which the results obtained by its partners have been discussed and compared. Thus in 1974, 18 study group meetings were held which were attended by some 360 scientists.



## 2.2 Research

Research on radiation protection can be summarized as follows:

- the evaluation of radiation doses received by living matter after ingestion of radioactive substances or after exposure to an external source of radiations;
- the study of effects from such doses at the level of subcellular fractions, cells, organs, individuals and populations.

Unless a great deal of space and an abundance of detail are to be devoted to the description of the research results and their repercussions on the whole of the programme, the present "Survey" can only describe them in what are manifestly incomplete terms. It is thus obvious that the very short list below of some examples of the work performed and the results obtained in the course of the present programme constitutes only a very brief introduction to the summary of research as presented every year in the progress reports of the Biology Division of the Commission:

Understanding the modes of transfer and factors of concentration of radionuclides in the human food chain requires a multidisciplinary approach, embracing human biology, ecology, soil science, cultivation practices, production networks and diet.

It was necessary to collect complex and comprehensive sets of data and research results concerning the highly diverse natural regions of the Community, in order to single out the data applicable to dissimilar situations. This work has been completed and has been used to compile a digest which is probably unique in its field.

The Commission has taken part in research on the primary effects of radiation on living matter and in microdosimetric research.

The initial and local phases of the successive processes of deterioration triggered by ionizing radiations are of paramount importance, because it is they which determine the very nature of these events, which are precisely those which ultimately cause radiological damage. These initial phases are "free radicals" which can be studied with great accuracy by the method of electron paramagnetic resonance. One way to approach the problem is to use simplified target molecules, such as polynucleotides specially prepared in the laboratory, together with isolated cells.

Work carried out under the Commission's programme has given rise to a complete rethinking of previously accepted views on the toxicology of certain ingested radioactive elements, particularly plutonium, transuranic elements and cerium. These are problems which directly affect workers in the nuclear industry. Emphasis has now been laid on the paramount importance of the physico-chemical state and weight of these elements as regards their metabolic fate in the body, and hence their toxicological effects.

The treatment of severe irradiation, which may occur during nuclear accidents, has been studied along converging pathways through collaboration between various institutes. The main aspects of such treatment, particularly those concerning hematology and immunology, have been discussed and investigated from a number of angles. It has thus been possible to improve the methods to be employed in the treatment of affected persons.

For instance, it is known that one of the most severe irradiation effects is the inhibition or destruction of blood-forming tissue, particularly of bone marrow. In such cases, a logical treatment would consist in transplanting bone marrow from a healthy to an injured individual. It is obvious that the success of such transplants depends on numerous factors, such as the level of compatibility between donor and host, the mechanisms in the host which govern acceptance or rejection of the transplant, the methods calculated to improve acceptance, the prevention of secondary - but often fatal - bacterial infection, etc. It is, among other things, research on factors of this type which has contributed to increase the chances of success of the treatment of irradiated persons.

The work on the treatment of irradiation has been performed mainly in collaboration with the members of the European Organization for Research on Treatment of Cancer (EORTC), whose work largely transcends the field of radiobiology but which has made, on the basis of numerous analogies between radiobiology and cancerology, an indirect but essential contribution to the treatment of irradiated individuals.

Since genetic effects are the only ones which may propagate themselves from generation to generation and thus spread within the population, the Commission has stimulated and set on foot numerous research projects on induction mechanisms and on the frequency of occurrence of the main types of hereditary damage. Evolution of the initial lesion has been defined in relation to the repair capacity of irradiated cells and several methods have been developed which now permit analysis of radiation-induced damage and dose-effect relationships in human cells. It is no exaggeration to say that the quality of the work carried out and of the results obtained by the various laboratories working on hereditary effects set the Commission's contribution in the area on the highest level of scientific research.

Certain diseases have been treated, and some still are, by radioisotopes. Groups of subjects who had received such treatment were selected for the purpose of epidemiological investigations in which the Commission took part. Interesting information was obtained on the effects of such treatment in relation to the age of the patient, and on the nature of the relation between the dose administered and its effects.

The Commission has participated in the creation of the European Late Effects Programme (EULEP), which brings together most of the European laboratories specializing in the study of long-term irradiation effects and which had as primary concerns:

- the standardization of the experimental conditions used by the participating institutions;
- the establishment of effective coordination between the groups studying carcinogenesis, the various radiation-induced malformations and the toxicity of radioisotopes;
- the study of the role played by the immune system during the cancerization process.

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Prompted above all by concern to find alternatives to the massive use of fertilizers and pesticides for maintaining or increasing crop productivity, the Commission has contributed, through its programme on the applications of nuclear techniques to agricultural research, to the improvement of our knowledge of soil-plant relations and to the promotion of a healthier and more productive agriculture. It has been possible, for instance, to induce and to select in cereals and leguminous plants mutations controlling resistance to certain diseases or high protein content. The very detailed analysis which has been made of sexual incompatibility and of the differentiated growth of plant cells cultured in vitro legitimates the hope that new methods for the production of varieties specifically suited to the needs of European agriculture will be worked out in the relatively near future.

The sterilizing and germ-destroying effects of ionizing radiations have been used for developing insect-control methods and food-preservation techniques, which also provide non-polluting alternatives to the massive use of chemical insecticides and germicides.

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These few isolated examples give only a very rough idea of what has been the real part played by the Community in research on "Biology and Health Protection". The results which have been obtained in line with the fixed aims have been analysed and widely disseminated. By way of conclusion it may be said that, generally speaking, the Community has acted as a stimulating and integrating force in an advanced area of modern biology.

# COMMISSION OF THE EUROPEAN COMMUNITIES

COM(75) 351 final/2

Brussels, 10 October 1975

Proposal of

a multiannual research programme 1976 – 1980

on

"BIOLOGY – HEALTH PROTECTION"

(submitted to the Council by the Commission)

COM(75) 351 final/2

Proposal  
of  
a multiannual research programme 1976 - 1980  
on  
"BIOLOGY - HEALTH PROTECTION"

Doc. COM(75) 351 final, 15 July 1975

	<u>Pages</u>
Financial statement <u>"Radiation Protection"</u>	1 - 5
Financial statement <u>"Application of nuclear techniques to agricultural research"</u>	6 - 9

FINANCIAL STATEMENT "RADIATION PROTECTION"

Part I

1. Identification of the statement: legal and administrative information

- 1.0. Number of statement:
- 1.1. Date of statement: 2 October 1975
- 1.2. Budgetary item: Chapter 3.30 of the statement of revenue and expenditure for 1976 relating to research and investment activities (Annex I to the Section III "Commission" of the Budget of the European Communities).
- 1.3. Financial year: 1976 - 1980
- 1.4. Legal basis: Proposal submitted to the Council on 15 July 1975 having regard to Article 7 of the Treaty establishing the EAEC.
- 1.5. Authorizing department: DG XII (Research, Science and Education).

2. Title of operation

Multiannual research programme 1976-1980 "Biology - Health Protection", "Radiation Protection" part.

3. Description of operation / persons involved

3.0. Description

Continuation of a coordinated research programme on "Radiation Protection" carried out under association- and shared-cost contracts concluded with research institutions of the Member States.

3.1. Persons involved in this operation

Commission:

- 3.1.0. Category: Commission's staff, category A, B, C, AE.
- 3.1.1. Number: 73, and 20 men/year from the JRC Ispra infrastructure, in support of the Biology Group working at Ispra.
- 3.1.2. Geographical location: Brussels, Luxembourg, Ispra and in contracts in the Member States.

Contractual partners:

- 3.1.3. Category: Research workers and research personnel, personnel of the contractants.
- 3.1.4. Number:  $\pm$  260 qualified university research workers.
- 3.1.5. Geographical location: at various places in the Member States.



#### 4. Objective of the operation

##### 4.0. General objective laid down by the Treaties:

Community research and training programmes (Art. 7 of the EAEC-Treaty) concerning the study of the harmful effects of radiation on living organisms and the applications of nuclear techniques (Annex 1 of the EAEC-Treaty).

##### 4.1. More specific objective of the operation and contribution of the operation to the general objective:

Its objective is the study and evaluation of risks associated with ionizing radiation (Radiation protection programme). Research proposed in this context concerns:

- the scientific and technical bases needed for the establishment of basic radiation protection standards and for adequate protection of workers and the general public\*;
- the biological and ecological consequences of the nuclear industry and the use of nuclear energy and ionizing radiation, in order to ensure protection of the various components of the environment\*\*.

This objective therefore concerns three fields of undisputed importance: the social sector, the environment and energy\*\*\*.

#### 5. Reasons for the operation chosen to attain the objectives

The "Radiation Protection" programme is justified since it will help to broaden and deepen the scientific and technical knowledge required to determine and update the permissible radiation levels in man and environment contamination levels and to improve the practical organization of radiation protection by the Member States. The proposed research are intended to meet the radiation protection requirements which have been identified by the national experts. This research should be coordinated at Community level in order to optimize the research efforts.

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\* Cf. Art. 30 and 31 of the EAEC Treaty.  
Cf. Social Action Programme, COM(73)1600, 24 October 1973.

\*\* Cf. Programme of Action of the European Communities on the Environment, OJ C 112, 20 December 1973.  
Cf. Council Resolution on Energy and Environment.

\*\*\* Cf. Programme of Research and Development Actions in the field of energy, COM(74)2150 of 8 January 1975.

6. Expenditure

- 6.0. Overall expenditure for the operation for the entire proposed duration 97,1 MJA
- 6.0.0. Expenditure charged to the Community Budget 47,6 MJA
- 6.0.1. Expenditure charged to the national administration ( 49,5 MJA
- 6.0.2. Expenditure charged to other sectors at national level)

6.1. Appropriation authorized, commitments made and payments :

Current programme :

	Current financial year		
	<u>1973</u>	<u>1974</u>	<u>1975</u>
6.1.0. <u>Commitments</u> amounts	4.209.706	2.744.577	3.038.947
6.1.1. <u>Payments</u> amounts	4.090.246	4.104.535	3.935.150

Programme 1976 - 1980 :

Estimates of commitments

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
6.1.0. <u>Commitments</u> amounts	20.801.329	11.343.221	4.755.259	4.987.406	5.712.785	-
6.1.1. <u>Payments</u> amounts	5.871.329	8.188.497	9.600.259	11.035.406	12.554.785	349.724

6.2. Explanation of overall cost and appropriations requested

6.2.0. Method of calculation : the requested appropriations shall be used to finance and manage a volume of research broadly equivalent to that carried out during the years 1971 - 1975. About 87% of the overall appropriations shall cover research expenditure, with the rest of about 13% to be spent on the cost of management and coordination, including the costs of the Commission's staff carrying out these tasks, (see part two).

6.2.1. Principal factors of uncertainty

6.2.1.0. Uncertainty of estimates as a result of price trend : as it is impossible to make an accurate estimate of the increase in staff costs and other costs for a 5 year period, the Commission plans to propose a financial adjustment in the 3rd year of the programme, taking account of the actual economic development.

7. Financing

By entering appropriations in the 1976 to 1980/81 budgets,

or

By means of a supplementary budget if the appropriations are not entered foreseen in these budgets.

8. Audit and re-examination

8.0. Internal audit arrangements for this operation and, where appropriate, in the Member States :

Scientific control : by the management committees of associations, and by the Advisory Committee on Programme Management.

The "Financial Control" verifies the execution of the budget.

The "Contract Service" of DG XII controls yearly the expenditures of the contractual partners.

8.1. Complete reappraisal of the operation : report to be drawn up by 30 July 1977, for submission to the Council and the European Parliament.

Part two

N.B.- It concerns the renewal of the 1971-1975 programme, currently being implemented.

9. Staff needed

9.0. Staff and corresponding appropriations

9.0.0. Number and grade : 73 (49 A, 16 B, 5 C, 3 AE) + 10 local staff, + 20 men/year infrastructure Ispra.

(To compare with the actual situation : 77 (52 A, 17 B, 5 C, 3AE) + 10 local staff + 20 men/year infrastructure Ispra).

9.0.1. Additional staff : none

9.0.2. Appropriations for staff :

1976 : 2.676.182

1977 : 3.085.489

1978 : 3.548.312

1979 : 4.080.559

1980 : 4.692.643

9.0.3. Infrastructure Ispra (20 men/year)

1976 : 393.197

1977 : 451.569

1978 : 519.304

1979 : 597.200

1980 : 686.780

9.1. Other administrative appropriations

9.1.0. Administrative expenditure

1976 : 96.500

1977 : 106.500

1978 : 116.600

1979 : 127.500

1980 : 140.000

9.1.1. Operational expenditure

1976 : 2.705.450

1977 : 4.544.939

1978 : 5.416.043

1979 : 6.230.147

1980 : 7.035.362

1981 : 349.724

FINANCIAL STATEMENT "APPLICATIONS"

Part I

1. Identification of the statement : legal and administrative information

- 1.0. Number of statement :
- 1.1. Date of statement : 2 October 1975
- 1.2. Budgetary item : Chapter 3.31 of the statement of revenue and expenditure for 1976 relating to research and investment activities (Annex I to the Section III "Commission" of the Budget of the European Communities).
- 1.3. Financial year : 1976 - 1980.
- 1.4. Legal basis : Proposal submitted to the Council on 15 July 1975 having regard to Article 7 of the Treaty establishing the EAEC.
- 1.5. Authorizing department : DG XII (Research, Science and Education).

2. Title of operation

Multiannual research programme 1976-1980 "Biology - Health Protection", "Applications" part.

3. Description of operation / persons involved

3.0. Description

Continuation of a coordinated research programme on "Applications of nuclear techniques to agricultural research" carried out under association- and shared-cost contracts concluded with research institutions of the Member States.

3.1. Persons involved in this operation

Commission :

- 3.1.0. Category : Commission's staff, category A.
- 3.1.1. Number : 10.
- 3.1.2. Geographical location : In contracts in the Member States.

Contractual partners :

- 3.1.3. Category : Research workers and research personnel, personnel of the contractants.
- 3.1.4. Number : + 150 qualified university research workers.
- 3.1.5. Geographical location : at various places in the Member States.

4. Objective of the operation

4.0. General objective laid down by the Treaties :

Community research and training programmes (Art. 7 of the EAEC-Treaty) concerning the study of the harmful effects of radiation on living organisms and the applications of nuclear techniques (Annex 1 of the EAEC-Treaty).

4.1. More specific objective of the operation and contribution of the operation to the general objective :

The objective, namely the development of nuclear techniques with a view to their application to agricultural research, backs up two sectoral policies :

- the agricultural policy, through its direct links with the agricultural research involved;
- the environmental policy, in that it aims to reduce nuisance.

5. Reasons for the operation chosen to attain the objectives

The Commission proposes that it continues its efforts to coordinate work on the application of nuclear techniques to agricultural research with a view to enabling the results obtained in radiobiological research and the potential of nuclear techniques to be used for the benefit of the socially and economically very important sector of agriculture, in conformity with the guidelines and needs defined by agricultural research proper. The proposed research are intended to meet the requirements which have been identified by the national experts. This research should be coordinated at Community level in order to optimize the research efforts.

6. Expenditure

6.0. Overall expenditure for the operation for the entire proposed duration	46,14 MJA
6.0.0. Expenditure charged to the Community Budget	18,72 MJA
6.0.1. Expenditure charged to the national administration	( 27,42 MJA
6.0.2. Expenditure charged to other sectors at national level	

6.1. Appropriation authorized, commitments made and payments :

Current programme : (Complementary programme with 5 Member-States participating)

	Current financial year		
	<u>1973</u>	<u>1974</u>	<u>1975</u>
6.1.0. <u>Commitments</u> amounts	1.064.589	249.836	488.115
6.1.1. <u>Payments</u> amounts	1.205.827	1.197.659	1.609.910

Programme 1976 - 1980 : (Common programme with all Member States participating)

Estimates of commitments

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
6.1.0. <u>Commitments</u> amounts	12.313.728	3.434.750	1.529.442	668.177	773.903	-
6.1.1. <u>Payments</u> amounts	1.895.728	3.324.297	3.729.442	4.388.177	4.883.903	498.453

6.2. Explanation of overall cost and appropriations requested

6.2.0. Method of calculation : the requested appropriations shall be used to finance and manage a volume of research broadly equivalent to that carried out during the years 1971 - 1975 but adapted to the participation of all Member States. About 98% of the overall appropriations shall cover research expenditure, with the rest of about 2% to be spent on the cost of management and coordination, including the costs of the Commission's staff carrying out these tasks (see part Two).

6.2.1. Principal factors of uncertainty

6.2.1.0. Uncertainty of estimates as a result of price trend : as it is impossible to make an accurate estimate of the increase in staff costs and other costs for a 5 year period, the Commission plans to propose a financial adjustment in the 3rd year of the programme, taking account of the actual economic development.

7. Financing

By entering appropriations in the 1976 to 1980/81 budgets,

or

By means of a supplementary budget if the appropriations are not entered foreseen in these budgets.

8. Audit and re-examination

8.0. Internal audit arrangements for this operation and, where appropriate, in the Member States :

Scientific control : by the management committees of associations, and by the Advisory Committee on Programme Management.

The "Financial Control" verifies the execution of the budget.

The "Contract Service" of DG XII controls yearly the expenditures of the contractual partners.

8.1. Complete reappraisal of the operation : report to be drawn up by 30 July 1977, for submission to the Council and the European Parliament.

Part two

N.B.- It concerns the renewal of the 1971-1975 programme, currently being implemented.

9. Staff needed

9.0. Staff and corresponding appropriations

9.0.0. Number and grade : 10 A  
(To compare with the actual situation : 10 A);

9.0.1. Additional staff : none

9.0.2. Appropriations for staff :

1976 : 293.860

1977 : 430.653

1978 : 495.251

1979 : 632.821

1980 : 727.744

9.1. Other administrative appropriations

9.1.0. Administrative expenditure

1976 : 22.500

1977 : 23.644

1978 : 34.191

1979 : 35.356

1980 : 46.159

9.1.1. Operational expenditure

1976 : 1.579.318

1977 : 2.870.000

1978 : 3.200.000

1979 : 3.720.000

1980 : 4.110.000

1981 : 498.453