COMMISSION OF THE EUROPEAN COMMUNITIES

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COMMON POLICY FOR SCIENCE AND TECHNOLOGY : EXPLOITATION AND EVALUATION OF RESEARCH RESULTS

(Communication from the Commission to the Council)

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1. At its meeting on 21 October 1979 and in its conclusions adopted on 20 December 1979, the Council stressed that the ultimate aim of Community research must be to produce results which contribute to the attainment of the economic, social and other objectives of the Community and its Member States.

   Accordingly, the Council asked the Commission to formulate suitable proposals for :

   - a policy on the utilization of results,
   - a system for evaluating the results of common programmes.

2. Utilization of results

2.1. Only part of Community research is designed to promote inventions that can be used directly. This research in many cases involves a long run-up to technological innovation (fusion, hydrogen) or else encourages or facilitates innovation (pure research and the provision of services).

   An appropriate policy for the utilization of the results of this research will therefore involve a good deal of information processing and dissemination and also essential, although more limited, exploitation of inventions on an industrial scale.

2.2. The dissemination of research results should be aimed at all potential users, economic operators and decision-makers, and not be confined, as is often the case, to scientific circles.

To this end, greater efforts should be made to analyse, process and disseminate the information collected, to overcome language barriers and to multiply the number of information access points by calling upon trade associations, chambers of commerce, and regional and local technological advisory services for assistance.

2.3. The transposition of research results from the invention stage to the innovation stage calls for a series of upgrading operations, i.e. development, experimentation and marketing. A more vigorous upgrading policy, given sufficient resources, would make it possible to :

- attain increased benefit from the technological achievements of the Joint Research Centre ;
- use more widely on an industrial scale the indirect-action results obtained by universities and research institutes ;
- follow up more intensively the use made by industry of the results of indirect action ;
- make use of the direct spin-off from long term programmes.

2.4. In line with the Council Resolution of 14 January 1974, a policy for the utilization of Community research results should progressively be extended to include coordination and cooperative projects between the Member States in the field of dissemination and exploitation.

The Commission therefore proposes that during 1981 CREST examines and compares national methods of dissemination and exploitation, indicates those projects of Community interest which it would be worth while to undertake by concentrating existing resources.

3. Evaluation of results

3.1. As to the evaluation of research results, the Commission has investigated evaluation methodologies developed within the Member States and elsewhere in order to examine the possibility of adapting them for the evaluation of Community R&D programmes.

Evaluation of R&D programmes cannot be performed without reference to the overall environment of the programmes and should in particular be appropriate to the nature and specific objectives of the work. The Commission therefore came to the conclusion that the Community should develop its own evaluation criteria to suit the specific characteristics of Community R&D programmes.

3.2. In addition to evaluation activities undertaken by the responsible departments of the Commission (limited mainly to the scientific value of the work), it appeared appropriate to provide Community decision-making bodies with an assessment carried out by independent, external experts of results obtained through Community research programmes.

3.3. This approach is now being tested out in a number of cases. The first exercise has already been completed, but its usefulness can, in the last resort, be assessed only when it is known what practical use decision-makers really make of it.

3.4. When the test runs have been completed, the Commission will draw its conclusions and check them in an international forum, where the results of the test cases can be confronted and compared with similar activities conducted in and outside the Community.

3.5. Only in the light of all this experience would the Commission consider that there was a case for presenting to the Council any proposal concerning a systematic evaluation of Community R&D programmes.

4. Two detailed Commission reports are attached to this communication. The first concerns the exploitation of results (Annex I), the second their assessment (Annex II).

The Council is asked to take note of this communication and of the Commission's proposals included in it, in response to the Council's request of 20 December 1979.

ANNEX 1

Report in response to the Council's request of 20 December 1979 for the definition of a policy on the exploitation of research results.

1. SCOPE OF A POLICY ON THE EXPLOITATION OF RESEARCH RESULTS

The "Research" Council made it clear at its 619th session that the ultimate objective of Community research should be a contribution through its results to the achievement of economic, social or other goals of the Community and its Member States.

The Council consequently requested the Commission to draw up suitable proposals, in particular towards defining a policy on the exploitation of research results.

Because of the responsibility conferred upon it by the Treaties and by Council Regulations for carrying out research programmes the Commission has always been concerned to ensure that research results are passed on to their potential users in the most effective manner possible.

The ECSC and Euratom Treaties assign to the Commission the task of disseminating Community research results widely, and of ensuring the industrial exploitation of any inventions produced in the course of that research. The Commission also has similar responsibilities for EEC research programmes, under Article 41 of the Treaty in respect of agricultural research, and under Council regulation No 2380/74 of 17 September 1974 as regards other research.

In carrying out this task, however, the Commission is constantly obliged to adapt its activities to match developments in the content of research programmes and the nature of the results achieved.

Following the revival of a common policy on science and technology by the Council resolution of 14 January 1974 and in conformity with the guidelines adopted for the period 1977-80, the following points have emerged:

a) those areas of research whose results could not normally be expected to contribute to a Community objective, i.e. funda-

mental research, have been eliminated from the programmes;

b) research projects whose objective is the development of technological innovation will in many cases lead to industrial exploitation only in the medium or long term (e.g. controlled thermonuclear fusion and hydrogen);

c) the process of innovation in industry is stimulated and facilitated by research in other areas which may not itself produce inventions (research into performance or the optimization of new technologies, technoeconomic studies, new applications for known technologies etc.);

d) in the energy sector the Community has resources to finance demonstration projects for exploitable technologies;

e) the programmes also include service activities (e.g. testing of materials and equipment, data acquisition and processing, etc.).

Such a wide range of activity inevitably leads to a wide variety of results. A suitable way of dealing with each type of result must therefore be developed if exploitation is to be effective.

Irrespective of whether the results relate to ECSC, Euratom or EEC research, the policy for their exploitation must nevertheless be based on similar principles, since the economic and social objectives of the three Communities are virtually identical.

Such an exploitation policy cannot be based exclusively either on the dissemination of the results, or exclusively on their "valorization"*. This is because Community programmes are not intended exclusively for the improvement of scientific and technical knowledge, nor exclusively for the development of new products, equipment or processes.

For the purposes of this report the terms "valorization" and "dissemination" will be used only for convenience. In reality there is no sharp boundary between the processes of "dissemination" and of "valorization". These activities are distinct from the evaluation of research results but contribute to it through the information they make available.

* valorization: meaning the entire sequence of steps by which a technically promising invention is introduced into economic use (patenting, commercial evaluation, development, licensing, prototype production, marketing, etc.)

2. GUIDELINES FOR A POLICY ON THE EXPLOITATION OF RESEARCH RESULTS

On the basis of these principles and using the expression "exploitation of results" in its widest sense, the Commission proposes for adoption the following guidelines:

a) Dissemination of results

Results should be channelled more specifically towards the potential users of the knowledge. At present for certain programmes the information remains all too frequently in scientific and research circles, which are producers of knowledge. Results which can be directly utilized should be described in articles written in a language which is accessible to industrialists and other decision-makers who do not always have the means to analyse the original published information. When user needs and habits require it, such articles should be translated into the other Community languages. In addition, results would be better disseminated, and more certain to reach small and medium-sized firms and local authorities, by enlisting the aid of trade associations, chambers of commerce and regional and local technical consultancy services.

b) Valorization of results

For the results of research to pass from the stage of the invention to that of innovation presupposes a series of steps involving development, testing and marketing. As has already been mentioned above, Community research by its very nature does not give rise to a large number of inventions suitable for exploitation. Nonetheless a more systematic valorization policy with increased resources could result in:

- harnessing better the existing technological capacity of the JRC;
- more extensive industrial exploitation of results produced by indirect actions involving universities and research institutes;
- closer follow-up of exploitation by industries benefiting from indirect actions;
- the use of short-term spin-off from long-term programmes (which is frequently neglected);
- taking advantage of economies of scale made possible by the size of the common market, without which many innovations would not reach the break-even point.

c) Links between Community and national research

It should be recalled that in accordance with the Council Resolution of 14 January 1974 the common policy on science and technology "involves the coordination of national policies and the joint implementation of projects of interest to the Community". The policy of exploitation of research results available to the Community should thus not be kept separate from that of Member States for the results available to them.

For EURATOM and EEC research the results of a significant part of indirect action research cannot be separated from the national programmes. Community finance is in fact only partial and it is frequently the case that supplementary finance is made available directly or indirectly from national or regional sources.

In a number of areas - including some having absolute priority - Community research represents only a small part of the publicly-aided research being undertaken within the Community. The establishment of Community-wide systems for dissemination and valorization in these areas would prove of far greater cost-effectiveness if they were established jointly by the Community and the Member States. They could also be used for the dissemination and valorization of national research throughout the Community.

A policy for the exploitation of Community research results should therefore gradually be enhanced by coordination and cooperation with Member States in the field of dissemination and valorization. Such initiatives have already been taken in isolated instances with, for example, listings of research projects including both Community and national projects, conferences aimed at updating results at both Community and national levels, and collaboration with national valo-zation organizations.

3. DISSEMINATION OF RESULTS

3.1 Current methods

The Commission has made considerable progress during the last few years in diversifying its dissemination media.

Dissemination was previously based principally on the systematic publication of research reports, the proceedings of a small number of conferences and, in the nuclear field, the reference periodical "Euratom information".

The Commission is currently giving priority to the use of existing information media - publication of articles in scientific and technical journals and the publication, through the private sector, of works such as conference reports, compilations, data collections, atlases,etc.

The Commission policy encourages human contact. In the context of indirect actions, meetings between contractors whose areas of research are related and complementary have met with real success. Conferences, seminars and study meetings have multiplied to approximately 50 per year where exchanges take place not only of research results but also of associated information in areas covered by Community programmes.

The systematic printing and publication of particular research reports has been discontinued. Selectivity is practised on the basis of the reports' subject matter, and some are published in the conventional way if they have a large potential readership, whilst others are reproduced on microfiche. This selectivity in no way reduces the accessibility of the results, since, irrespective of the medium in which they are published, the availability of all reports is publicized in the information bulletin "Euro-abstracts" with an additional brief summary and bibliographical references. The EABS computerized data base, which contains all the notices published in Euro-abstracts (18 000 references since 1966), can now be accessed via the "Euronet-DIANE" system.

With the same aim of supplying information digests rather than a confusing mass of information, priority has been given to the publication of periodic programme reports, such as the "status reports" on the energy programme.

As it had become difficult to reach a clear assessment of progress in JRC research through the published articles and reports, half-yearly progress reports are now published for each of the direct action research programmes. So that national institutions, researchers and industrialists within the Community have priority access to these reports, personal copies are dispatched to several hundred such users.

In the nuclear field the system of confidential communications established 20 years ago using national contacts has been maintained, though its value has diminished and the Commission intends to overhaul it.

Dissemination of ECSC research results has been the subject of a thorough rationalization. Section II of "Euro-abstracts" is devoted to this research and is particularly appreciated by its 1800 subscribers for its substantial and informative summaries (in a number of languages) which give details not only of available publications but also of new research projects. The study meetings attract a large number of participants. Methods of distributing research reports have been discussed.

The agricultural research programmes include numerous seminars whose proceedings constitute useful works of reference. These programmes also provide for exchanges of research personnel.

As for demonstration projects, proposals are only selected if they welcome visitors and trainees.

3.2 Proposed improvements

3.2.1 Information presentation

Most information disseminated by the Commission has so far been in a form chosen rather freely by the researchers themselves.

Though dissemination may be acceptable in this form when the information is intended for scientific circles it frequently constitutes a major barrier to the flow of information relating to exploitable results towards firms - particularly small and medium-sized ones - and towards other decision-makers.

Directing the dissemination of research results towards their ultimate users so as to encourage their effective and rapid exploitation will entail a major effort in the presentation of certain types of information, such as has been undertaken for ECSC and agricultural research.

It will be necessary to analyse research results to identify those which require editing. In this way popularized texts, summary reports, manuals and monographs could be produced for certain research areas, highlighting points which appear to be suitable for exploitation in the short term.

For the most part such documents will be designed around the requirements of their business readers, particularly in small and medium-sized firms. When the results obtained are likely to affect regulations and standards (e.g. in the environment or energy savings) documents should be prepared for reading by institutional decision-makers.

Document distribution is not the most reliable method of bringing about the exploitation of results, however. A dialogue should be established between the participants in the information transfer, and for that reason information seminars for users would be desirable. Information leaflets would then be published for or after such seminars.

In the same way financial incentives should be available to encourage visits, secondments and study tours for potential users with the research teams or, preferably, with operators of pilot plants or demonstration projects.

Participation at exhibitions and technical notes, both of which are appropriate media for the valorization of inventions and are already being used by the Commission, should be developed along the lines proposed below.

3.2.2 Dissemination channels

Many potential users of the results of Community research programmes remain unaware that the programmes even exist.

Despite the steps taken by the Commission during the last few years (see paragraph 3.1 above), and though there may be improvements in the presentation and packaging of the information available, some businesses and administrations remain beyond the reach of the dissemination network. There are in fact a great many which do not have the necessary staff or financial resources to keep up to date with all the information which would be useful to them, but go in search of information only when they have a specific problem to be solved.

This fact has led to the creation of a number of intermediary information and technical consultancy services, the result partly of private, and partly of public initiative. It should be noted that the "ex-quota" section of the FEDER provides for the financing of such services in certain regions.

Establishing a decentralized network merely for the dissemination of Community research results is out of the question. It would nonetheless be highly desirable to use existing decentralized networks, such as professional associations, chambers of commerce, regional consultancy services, local authority groupings etc.

With this in view, it is recommended that the Commission should establish firm links with such organisations, and should organize information meetings for them.

Meetings between representatives of these organizations could have considerable impact if they also facilitated the exchange of information on the results of research undertaken by Member States and if they led to the gradually establishment of cross-frontier collaboration. This collaboration could, at a later stage, be consolidated by creating Europe-wide associations.

3.2.3 Language barriers

The fact that it is impossible to translate all the scientific and technical texts published by the Commission into the six official languages of the Community is a not insignificant barrier to the optimal dissemination of research results.

The gravity of the problem should not be exaggerated, however.

Among scientists of a certain level a knowledge of the more common languages is constantly improving. On the other hand when the dissemination is extended to include firms (most of which are small and medium-sized) and government bodies the absence of translations may result in information being rejected.

Careful selection of texts to be translated is of course necessary to avoid any waste.

"Euro-abstracts" currently includes summaries in several languages. The proceedings of some conferences are also translated into several languages when it is both possible and useful. Occasionally, major texts are published in all six Community languages.

In future it would be desirable to produce translations of texts written for a wider public, summary reports, manuals, monographs intended for industrialists (particularly small and medium-sized enterprises) and administrative bodies (particularly regional and local government). Such a principle should nevertheless be applied prudently in view of the cost of translation and the time taken. Translation adds considerably to the cost of certain works while at the same time restricting the market for each of the various language versions. At the same time, delays in the translation of technical texts are frequently so long that the information may well be out of date by the time it appears in any language other than the original.

In conclusion, the Commission would like to have further funds (of the order of 100 000 EUA to 150 000 EUA per year) available for the translation and publication of selected works.

The Commission also proposes that a "translation fund" should be set up with the following features. Financial aid would be made available to one or several groups of specialist publishers who would undertake to accept the risks inherent in publishing translations of scientific or technical texts, reporting the results of Community or national research relating to the priority sectors of the common policy on science and technology. The publishers would pay royalties to the fund in proportion to the number of works sold. During its first year the "translation fund" should be financed to the level of approximately 50 000 EUA, sufficient for the translation into a second language of about twenty 200-page works. These appropriations should be increased gradually from year to year, but the first income should be received during the third year.

3.2.4 Problems relating to contracts

In the case of EURATOM and EEC indirect action research, clauses in the contracts lay down that the Commission shall have first priority in dissemination.

At the same time, when the contractor is also in receipt of aid from national sources the Commission is not always able to insist on that priority, and dissemination is then effected by national administrations or research institutes, in accordance with their own standards. Dissemination outside the country of origin may as a result be restricted and delayed. It is the Commission's intention to revise the terms of such contracts to ensure that in the case of joint financing the dissemination of results is undertaken in tandem with the national authorities.

These problems do not arise for ECSC research.

3.3 Budgetary problems

Except for the cases of ECSC and agricultural research, the appropriations necessary for the dissemination of research results are made available under Chapter 36 of the Communities' general budget. For 1980 these appropriations total EUA 600 000.

Each year the Commission proposes an increase in these amounts to take account of the increased volume of research and development undertaken, and to improve the quality of dissemination along the guidelines which have been defined above.

These proposals are regularly rejected by the budget authority, which only allows an annual increase of 10 to 11%. This increase does no more than compensate for the effects of inflation.

At the same time, Community spending on research and development increased by 336% from 70.5 million EUA in 1973 to 306 million EUA in 1980. Over the same period appropriations for dissemination increased by only 100%.

The rationalization already described nevertheless allowed an austere but satisfactory policy to be pursued until 1979, and the increase in costs was contained by recourse to private publishers and the promotion of sales. Even so, in 1979 and 1980 the Commission has had to resort to the transfer of appropriations in order to meet its liabilities.

Receipts, are currently estimated to be 100 000 EUA, but cannot go on increasing indefinitely if the Commission continues its previous policy of actively publicizing research results. This policy is based on the widespread free distribution of 'Euro-abstracts" and progress reports on programmes within the Community to public institutions, committees whose work is connected with the research programmes and researchers and industrialists participating in the programmes; research reports are circulated on a more selective basis.

The Commission realizes that as far as the budget adoption procedure is concerned the Council Budget Committee can work only on the basis of financial considerations and cannot be concerned with the requirements of a rational policy for the management of research results.

A change in procedure would, however, be sufficient to improve the situation.

The Commission's proposals for research appropriations (Chapter 33 of the budget) are by tradition examined by the Budget Committee of the Council and the groups competent for questions of research (the "Research" group and the Atomic Questions group). If, when examining the associated costs of information dissemination, the Budget Committee had the advice of competent technical groups, the Commission's predicament and views would certainly receive more detailed attention.

It would be equally appropriate for each research programme to explicitly allow for the organization of meetings (conferences, seminars, meetings of contractors).

To conclude, a Council resolution in support of the guidelines described above would help to make the necessary appropriations available.

4. VALORIZATION OF RESULTS

4.1 Current methods

The Commission's valorization programme during the last few years has related principally to JRC inventions. This activity involves prospecting in the four establishments for newly-invented products, equipment and processes, developing and testing them to the point where they can be offered for licensing, seeking suitable candidates for the granting of licences and giving licensees appropriate technical assistance.

Within the field of ECSC research a number of promising valorization actions have recently been started.

At present 80 valorization actions are in progress, relating to 55 patented and 25 non-patented inventions. The small number of actions under way is the result of the deliberately selective policy of developing, as a general rule, only those inventions which are likely to achieve an annual turnover greater than 100 000 EUA within 5 years of being commercialized. This evaluation is often based on a market survey.

Exploitable inventions are the object of twenty-eight licences at present in force, of which a number relate to more than one invention. Of these licences 14 have reached the stage of commercial exploitation with royalties being paid to the Commission.

As has been explained above, these modest results are mainly due to the nature of the programmes. They could nevertheless be improved. The Commission has in fact been making use of the services of marketing consultants since 1975 and this is now beginning to produce beneficial effects. In addition, the JRC programme authorized by the Council on 13 March 1980, includes a new financial provision for valorization, totalling 509 000 EUA for four years, with one research worker and eight support staff. This provision will allow the development and testing of inventions which could not take place under sectoral programmes, and consequently attract the interest of industrialists and help licensees.

As regards the indirect action research programmes, the number of inventions notified voluntarily to the Commission by the contractors was so low that the Commission authorities decided to question each contractor by asking him to complete a yes/no statement on his inventions. This procedure was adopted for the first 'new energy' programme, which had been completed in 1979, and brought about the notification of 107 inventions; of these, 90 are or will become the subject of patent applications whilst the other 17 relate to unpatentable inventions.

The contractors are only obliged to exploit these inventions within a 3-year time limit laid down in the contract. (Regulation (EEC) 2380/74 of 17 September 1974 fixes the rules for the dissemination of information relating to EEC research programmes).

Confirmation that these 107 inventions are being exploited by the contractors will not therefore be available in most cases before 1982. For 10 of these inventions, however, the contractors have requested the Commission's assistance in seeking licensees, and priority will be given to the evaluation of these inventions.

A similar survey is now being carried out amongst the contractors of the "Radioactive waste management and storage" programme. It will be extended to include other programmes likely to have produced inventions before being completed.

4.2 Proposed improvements

4.2.1 JRC inventions

The industrial importance of the current JRC programme is recognized, but it includes few research areas likely to produce inventions which can be exploited in the short term.

The budget provisions for valorization mentioned earlier will allow the Commission valuable scope for action. The Commission considers that no further improvements should be proposed before the results of this new line of activity have been evaluated. Nevertheless, the appropriation only covers development and feasibility studies carried out at the JRC. It is essential that funds be made available for further market studies, the effectiveness of which no longer needs to be demonstrated. These studies have produced a number of benefits for the Commission and its partners:

- a more effective selection of inventions which are worth valorizing;
- information about firms likely to be interested in exploiting an invention;
- presentation of arguments likely to convince industrialists of the value of an invention;
- frequently decisive guidelines for research in progress or to be undertaken.

There is, finally, every reason to continue the distribution of technical notes and participation at exhibitions as information media.

4.2.2 Inventions resulting from research carried out under contract

As regards the regime applicable to inventions, most research programmes begun since 1974 are subject to the Council regulation of 17 September 1974. Only on very rare occasions have there been difficulties in negotiating the terms of contracts in line with the Regulation.

However, in June 1977, the Union of European Communities Industries (UNECI), sent to the Commission a report criticizing the current system. The Commission's response to this criticism was as follows:

- that it was not appropriate at the time for the Commission to propose any amendment to the 1974 regulation;

- that on the other hand any proposals for improvement in the drafting of contracts as regards clarifying the rights and obligations of both parties under the 1974 regulation would be acceptable.

The Commission therefore undertook only minor revisions to the drafting of the terms of the contracts and it was observed that few contractors raised any objections during negotiation comparable to those of the UNECI. It can therefore be considered that the present system is widely accepted, at least during the contract negotiation stage.

On the other hand, because of the three-year time limit for exploitation allowed to contractors, there has not yet been any experience concerning the clauses relating to the obligation to exploit.

As has been mentioned above, systematic inquiries regarding contractors' inventions are undertaken when the scope offered by a programme justifies it. Inventions reported are first evaluated by Commission departments with a view to identifying those where a check should be made at the end of three years that exploitation has begun.

It will therefore not be until 1982 that the Commission will be in a position to decide whether or not amendments to the 1974 regulations should be proposed.

Nevertheless, two weaknesses have at this stage been observed in the system:

- the Commission has no explicit right to inquire about a contractor's intention to exploit an invention before the expiry of the three-year time limit, and after that expiry it may well transpire that opportunities for exploitation have been lost;
- provision is made for the sharing of royalties by the contractor and the Commission only if the Commission has exercised its right to grant a sub-licence when insufficient exploitation work has taken place; it would, however, be more equitable if such sharing were possible each time the Commission is obliged by a contractor's inaction to take responsibility for the

valorization of an invention, even if the contractor finally grants the licence by mutual agreement.

These two shortcomings could undoubtedly be overcome by minor amendments to the standard clauses of research contracts and without amending the 1974 regulation.

In order to carry out an effective check that the obligation to exploit is being met, and to offset contractors' failure to act, the Commission should have appropriations available for feasibility studies, market research and any necessary promotional activities.

Finally, it should be noted that for several years the clauses of Euratom research contracts relating to the exploitation of inventions have been in line with those of the contracts under the 1974 Regulation, so far as is possible under the provisions of Article 12 of the Euratom Treaty.

Revision of the clauses in ECSC financial aid contracts would also be desirable. This should allow a clarification of certain obligations of the contractors and ensure effective exploitation.

4.3 Budgetary problems

Apart from the JRC valorization fund, appropriations intended for valorization (feasibility studies and market research) should in principle be entered under the heading of Chapter 36 of the Communities' general budget. This budget does in fact include item 3611 having a token entry and an appropriation under chapter 100. The token entry does, however, allow limited transfers during the year from other Chapter 36 headings. So far only a small number of market studies have been undertaken: about 10 per year at an average cost of 3 000 EUA. The costs of printing and distributing 'technical notes' and of participation at exhibitions are met out of dissemination appropriations.

As in the case of the appropriations intended for the dissemination of research results, it would be appropriate for the groups competent for questions of research to express an opinion on the Commission's budget proposals (see paragraph 3.3 above). A Council Resolution in support of the guidelines defined above would facilitate the allocation of the necessary appropriations.

5. COORDINATION OF NATIONAL POLICIES

As has already been stressed several times in this report, no infrastructure for a policy of exploiting Community research results would be really effective and useful unless it were also be used by Member States for the results of their own research programmes.

There is no denying the obstacles which such a project would meet if it were too ambitious. The coordination of national policies on dissemination and valorization can only be a long-term objective, since the policies are even more diverse than the policies on research and development themselves and, in some Member States, relatively undeveloped.

However a number of specific initiatives in coordination and cooperation would present few political or financial problems and would be in the recognized interests of both the Community and the Member States.

It should not be forgotten that some projects of this nature already exist, for example the listings of national and Community research projects (ACREP, and ENRAP), publications and conferences giving the latest information on national and Community research, and Commission cooperation with a number of national valorization bodies, particularly in joint participation at exhibitions. As part of the second action plan in the field of scientific and technical information and documentation, the Community will also be giving financial assistance to an information and exchange system for non-conventional (grey) literature, established by bodies from several Member States and which should help develop and accelerate the exchange of research results. The Commission will also be giving support to a French system of information on marketable technology which is principally intended for valorizing the results of publicly financed research.

Other joint initiatives could be taken in the following areas:

- cooperation between information and technical consultancy service networks;
- joint organization of scientific and technical conferences of European interest;

- expansion of Community publication activities and data-bases on the results of national research in priority sectors;
- establishment of referral services allowing the areas of interest of researchers engaged in Community or national research and of the potential users of research results to be identified;
- joint market studies aimed at valorizing the results of Community and national research;
- joint publicity projects by valorization organizations, e.g. during technology exhibitions.

Following the guidelines laid down by the Council Resolution of 14 January 1974 and the Council's conclusions of 20 December 1979, the Commission now proposes that during 1981 CREST should examine and compare the various national and Community methods of dissemination and valorization and then decide what initiatives of Community interest could usefully be undertaken by the concentration of existing resources.

6. THE STIMULATION OF INNOVATION

No matter how judicious the efforts made to ensure the exploitation of research results, they will not succeed unless the potential users of research results are prepared to take advantage of them.

It has to be said that the existence of a number of disincentives to innovation and the general economic situation scarcely encourage industry to take risks.

It is nowadays recognized that innovation does not follow spontaneously from support for research and development and that other factors have a role to play before economic development can benefit fully from the contribution of science and technology.

It is for this reason that Member States are introducing a growing number of measures aimed at encouraging the process of innovation, although not on a systematic basis. It is for the same reason that two years ago the Directors-General of industry in the Member States - who meet periodically at the invitation of the Commission - set up an ad hoc group of government experts to conduct a preliminary enquiry into innovation with the Commission. In particular, the enquiry has considered the following questions:

- a comparison of national and Community measures which influence innovation;
- a study of barriers to innovation;
- American and Japanese measures for the stimulation of innovation;
- the funding of innovation;
- the influence of public procurement;
- the aggregation of markets;
- the role of information, patents and licences.

The general problem of innovation is not the subject of this report however, and should not be dealt with here. The Commission will put its proposals on the subject to the Council at a more appropriate time. Nevertheless the exploitation of research results is merely one particular aspect of a far greater problem to which reference was therefore appropriate.

7. SUMMARY OF THE MAIN PROPOSALS

The principal guidelines and proposals of this report can be summarized as follows:

a) General guidelines

- Results should be channelled more specifically towards their users through documents available in a language accessible to them, and through translation and decentralization;
- Valorization of the results of the Communities' own research, and follow-up of the exploitation of results of indirect research require a modest increase in financial resources.

b) Dissemination of results

- Special presentation of certain types of information is necessary to ensure that all potential users have access to research results; for this reason, certain research areas should be the subject of information in non-specialist's terms, summaries, manuals, monographs, etc.
- Information seminars for users and financial incentives for visits, secondment and study tours with research teams and operators of pilot installations and demonstration projects would be desirable.
- More use should be made of existing dissemination channels, including as a matter of priority intermediary information and technical consultancy services.
- Translation facilities should be available for texts of general interest and for this purpose the necessary appropriations should be included in the budget; a 'translation fund' will be proposed.
- Provisions in research contracts should be amended to ensure that in the case of joint financing results are disseminated jointly with national authorities.

c) Valorization of results

- Modest financing is necessary for further market studies in connection with inventions arising from direct and indirect research activities;

- The provisions of research contracts should be amended to ensure

  a) that the Commission is informed of intentions regarding the exploitation of inventions without waiting the three years laid down in the contracts;

  b) that, in the event of the Commission taking responsibility for the valorization of a contractor's invention, Commission and contractor share any royalties.

d) Coordination of national policies

Following the guidelines of the Council's resolution of 14 January 1974 and the Council's conclusions of 20 December 1979, the Commission now proposes that during 1981 CREST should examine and compare the various national and Community methods of dissemination and utilization, and determine on the basis of its findings what initiatives could usefully be undertaken by the concentration of existing resources.

e) Implementation

- The Commission suggests that in future its proposals for the budget relating to the dissemination and valorization of research results should be examined not only by the Budget Committee of the Council, but also that an opinion should be given by the groups competent for questions of research, as is the case for budget proposals relating to research.
- At the appropriate time the Commission will submit to the Council a draft resolution by which the Council would give support to the guidelines set out in this report.
- In 1982 the Commission will if necessary submit to the Council proposals for the amendment of the regulation of 17 September 1974.

APPENDIX II

EVALUATION OF THE COMMISSION RESEARCH AND DEVELOPMENT PROGRAMMES

Current and planned activities

INTRODUCTION

1. At its meeting of the 21st October 1979, the Council stressed that the ultimate aim of the Community research must be to produce results capable of contributing to the economic, social and other objectives of the Community and its Member States. It accordingly requested the Commission to develop appropriate proposals for a system for evaluating the results of common Research and Development programmes (conclusions agreed at the 619th Council Meeting of 20th December 1979).

2. For some time already, the Commission has been studying ways and means to better assess the results of Community R&D programmes in scientific as well as in economic and social terms.

3. In June 1978 it organized an international seminar on "Research Evaluation" in order to analyse existing evaluation methods and procedures with the aim of determining the most appropriate methods to meet the specific characteristics of the Community R&D programmes.

4. In 1979 it was decided to undertake a first pilot experiment by entrusting a team of independent external experts to evaluate two sub-programmes of the energy research programme in order to gain experience as to the methodology best suited to evaluate Community "indirect action" research programmes. The final report of this first test case makes numerous practical recommendations. Additional pilot experiments are presently under way.

5. Setting up a general evaluation system however is a complex task. An assessment of the method and the definition of an evaluation mechanism which might be applicable to all EC research programmes will be made in the light of the outcome of these first evaluations and their utilization.

COMMISSION ACTIONS IN THE FIELD OF RESEARCH EVALUATION

PRESENT SITUATION

6. The Commission has since long (see "Common Policy for Science and Technology" 1977) recognized that the assessment of the scientific, economic and social usefulness of R&D programmes is a matter of great importance and urgency, especially at a time when resources are becoming increasingly scarse.

7. As a first step to improving current evaluation procedures for Community R&D programmes, the Commission organized a seminar in Copenhagen between 29 June and 1st July 1978. The seminar which gathered over 60 participants representing a wide spectrum of interests in R&D and its evaluation, aimed at reviewing current evaluation practice at Community and national level and at suggesting ways and means of improving current evaluation procedures applied to Community R&D programmes in order to facilitate the relevant decision-making and planning processes.

8. When discussing research evaluation, three different phases should be borne in mind : before, during and after the research programme is implemented.
At its first phase, the evaluation allows for the proper definition of the content and aims of a particular R&D programme, including the means required to effectively carry it out.
At the second phase, the evaluation is an essential tool during the management of a research programme. It should ensure that progress of the research is in line with the original aims and objectives so that the necessary adjustments can be made at the

appropriate time. Finally, at its third phase, the evaluation is the measure of the final success of a given research in relation to the input in money and manpower. It should provide an appreciation of the results in terms of their scientific value and their economic and social impact. Although the three evaluation phases are closely related, they serve clearly different objectives and use different procedures.

9. The seminar focussed on evaluation methods and procedures which are necessary to ensure an effective evaluation both during the execution of the programme and an ex-post evaluation of the results.

10. As was recognized at the seminar, the Commission, assisted by the ACPM's and other experts, has been carrying out the evaluation of its R&D activities as an essential and permanent task during the implementation of its programmes. This evaluation ensures that the research is constantly adapted and reoriented in the light of progress made, of new developments and of new problems encountered.

11. As a general conclusion the seminar confirmed that research evaluation is imperative, but highlighted the difficulty of the task and the relatively undeveloped state of the art in evaluation methodology. It was evident that no a priori evaluation system existed which could be applied to all evaluation activities. The numerous methods that had and were being applied nationally had been developed to meet specific needs of particular activities. The evaluation of R&D programmes, it was stressed, should not be made without reference to the overall environment of the programmes and should in particular be appropriate to the nature of the work and the institution in which the work was being carried out. Under these circumstances, it was concluded that the Commission should develop its own evaluation criteria to suit the specific characteristics of Community research and development programmes.

12. It was suggested amongst others that the present use of the "peer review" method could find appropriate application in the European context.

R&D EVALUATION IN MEMBER STATES, THE U.S.A. AND INTERNATIONAL ORGANIZATIONS

13. Growing awareness of the need for research evaluation is developing in the frame of national activities in member countries where research result assessment is being undertaken in different degrees and in different forms. While it is not possible in this context to describe in detail the current state of the art some examples can be cited.

In the Federal Republic of Germany a multi-level evaluation scheme has been set up for evaluating the selection, progress and results of Government supported R&D projects. The scientific, technological, economic and administrative performance of R&D institutions as a whole are also evaluated externally.

In France some interesting examples exist of the evaluation of whole institutes by means of external auditors (e.g. Gaz de France, Bureau National de Métrologie, etc...). The CNRS currently evaluates its research at two levels, that of contracts and that of research teams. This is carried out by two external bodies, the Comité de Direction de Travail and Commission du Comité National which cover all major scientific disciplines. In addition, supervisory bodies have been set up for each research programme, Comités des Actions Thématiques Programmées, which are playing an increasing role in evaluation activities.

In the United Kingdom evaluation efforts have been devoted primarily to the selection of R&D areas and projects and the subsequent distribution of funds. Typical example of the a priori evaluation of research areas is found in the context of the activities of the Research Requirement Boards.

In Italy, examples also exist of R&D evaluation activities and efforts are being devoted to the study and use of appropriate methodologies.

In Ireland, experience exists in the evaluation of results of research, primarily output oriented and concerned with applied R&D and mainly though not exclusively in the area of agriculture and food research.

In Belgium emphasis is placed on the selection of research projects and performance and output monitoring during research implementation. In the Netherlands research evaluation is presently being promoted in the context of specific sectors, system which is being extended, through a more diversified - partly project oriented - flow of funds for university R&D and through the reorganization of institutes as TNO. A specific example being the explicit evaluation of the first Dutch satellite project.

14. Finally the United States have since many years associated great importance to the evaluation of research. Very large sums are devoted annually to evaluate federally sponsored programmes. Evaluation methods and procedures vary widely according to the type of research being evaluated and eventual applications. From quantitative and qualitative reviews of fundamental and applied research, to yearly evaluation of federally sponsored institutes or panel reviews of pluriannual programmes, policy related research activities, etc...

15. At the international level, worth mentioning is the "evaluation of the economic effects of the agreements concluded between CERN and the Industry" and the evaluation of economic spin-offs of the industrial contracts of the European Space Agency.
The OECD has also showed the importance it attaches to the subject of research evaluation by organizing a major conference on "Science and Technology Indicators" in Paris in September 1980. Similarly the U.N. Economic Commission for Europe will organize a symposium in Prague in September 1981 on "Research Evaluation" to review the activities of its member countries in this field, analysing the state of the art and drawing attention to the need for research result assessment.

CURRENT COMMUNITY R&D EVALUATION PRACTICE

16. In attempting to set up a comprehensive Community evaluation mechanism it is necessary to consider the current evaluation practice as applied to Community R&D programmes and to identify areas for improvement. The current evaluation procedures themselves may vary from programme to programme and in particular they vary according to the different programme execution modalities such as direct and indirect actions.

17. In the case of the direct action programmes, the evaluation practices are still evolving. They comprise two major aspects :

- the evaluation of the results with respect to the objectives during the phase of execution of the research programme : this process is referred to as "Programme Evaluation" ;
- the evaluation of the results after completion of a certain activity : this process is known as "Result Evaluation".

18. The "Programme Evaluation" includes internal and external evaluation processes. The internal evaluation in essence consists in channeling information on technical progress, financial status, planning, etc... to management levels where appropriate decisions can be taken. The most important tool in this evaluation is an adequate programme progress reporting which permits a timely comparison of work achievements and stated objectives and enables appropriate modifications to be made whenever necessary. Other typical important inputs are work plan flowsheets, budgetary and manpower analyses, etc... The external evaluation is based on the opinions expressed by the members of the Advisory Committees on Programme Management and the General Advisory Committee. Their inputs carry substantial weight and play an important role in the internal decision making processes. The combination of internal and external evaluation processes highlight if and where adjustments need to be made in terms of objectives, budget, manpower and planning.

19. The "Result Evaluation" can be described as a value judgement of the R&D output, in other words an assessment of the extent to which the R&D results are useful to the outside "customers". For such a purpose some indicators for scientific productivity have been devised such as :

- indicators related to the transfer of knowledge including publications, patents, licences, as well as training and educational activities ;

- indicators related to the degree of joint work with the international scientific community, including work for outside customers and international collaboration.

20. The Joint Research Centre is continuously collecting data on its outputs and on how the R&D results are being put to use. The JRC is also investigating different possible evaluation methodologies in view of their application to its specific needs and is examining ways and means to better channel the evaluation results into the decision-making and planning process.

21. For the indirect action programmes, present evaluation procedures may differ from case to case according to specific characteristics and requirements. A typical example of the evaluation of indirect action programmes concerns an evaluation procedure carried out at two levels : the "evaluation of the programme as a whole" and the "evaluation of individual (or groups of) research projects".

22. The evaluation of a whole programme is performed by examining the programme with respect to :

- its correspondence to the initially defined goals or objectives (success, failure), including its efficiency,

- its general (technical or other) "fall-out",

- potential users of the research.

Such an evaluation is undertaken in order to decide on the review, continuation or abandonment of a programme.
In addition to the contribution of the Commission's staff, the Advisory Committees on Programme Management, the CREST Committee and outside experts contribute to this exercise.
The evaluation of individual research projects includes the examination of aspects concerning the :

- quality of technical or scientific results,
- achievement of goals set out in the contract,
- intrinsic effects (coordination, stimulation of further work, educational impact, etc...).

This kind of evaluation takes place permanently and in differing ways. They include an appreciation of the research work by the Commission's staff, outside experts acting as project leaders and ACPM's on the basis of regular progress reports as well as indicators of "success" such as publications, patents and licences, etc... In this context, the "contractors meetings" deserve particular mention. These are organized on a regular basis during the programme implementation, and allow the contractors working in the same field not only to deliver presentations of their own work but to offer their work for evaluation by their " competitors" as well by the Commission's staff and project leaders.

CHOICE OF AN EVALUATION METHODOLOGY

23. The analysis of the current evaluation practices shows that they are largely based on internal procedures and concentrate on the implementation phase of the programmes. In the light of this analysis and in line with the findings of the Copenhagen seminar, the Commission concluded that its current evaluation procedures could be usefully strengthened by placing greater emphasis on the retrospective assessment of programmes. In order to supplement the internal aspect of

present evaluation procedures, the decision was taken to appeal to external independent experts who were not involved either in the adoption phase of the programme or in its implementation. This kind of "review by external evaluators" is already been followed in many instances both in the Community Member States and outside the Community especially in the United States. However, major adaptations need to be introduced because of the particular characteristics and scope of the Community programmes.
This review should provide an effective aid for :

- the Commission when defining and reorienting its research strategies and priorities on the basis of identified needs ;

- the Council, European Parliament, Economic and Social Committee, Member States and delegated bodies (e.g. CREST) to assist them in the evaluation of the progress, utility and contributions of Community research, providing them with valuable inputs into their decision-making process for programme revisions and extensions.

24. Having identified the above as the most direct and interested users of the outcome of the Community programme evaluations, the following evaluation objectives were defined as of principal importance :

- the scientific and technical quality of the results,
- management effectiveness and use of resources,
- contribution of the programmes to Community sectoral policies and objectives, to the socio-economic development of the Community and to the development of related R&D within the Community.

TEST CASE

25. Before embarking on a systematic evaluation of the Community programmes, it was felt appropriate to carry out some test cases in order to gain experience on procedures and criteria applicable to Community R&D.

Furthermore it was deemed necessary to have a measure of the validity of such an evaluation method by assessing the use made of it by decision-makers and planners.
The decision was taken to start with some indirect action programmes. This does not however exclude the usefulness of testing the method subsequently on direct and concerted actions.
For the first evaluation exercise the Energy Conservation and Solar Energy sub-programmes of the Community's first Energy R&D indirect action programme (1975-1979) were selected. The choice of these two sub-programmes was dictated by their importance in resources and potential impact, the different nature (long and short term) of the research and the timing since the evaluation could follow just after the termination of the sub-programmes and could be utilized as an input for the programme revision envisaged in 1981.

26. The five external experts carrying out the review were nominated by the Commission on the recommendation of the European Committee on Research and Development (CERD), the Commission's principal independent advisory body on all matters relating to R&D. They were selected on the basis of their expertise in their respective fields, their knowledge of evaluation procedures and their independence with regard to the Community sub-programmes being evaluated.

27. The external evaluation team were given the following terms of reference :

- to assess the scientific and technical quality of the research undertaken and of the results achieved ;
- to evaluate the effectiveness of the management of the programme and of the resources utilised ;
- to determine the practical contribution of the results of the two sub-programmes to the progress of R&D in these two areas of research, to Community sectoral policies and to the socio-economic development of the Community in general.

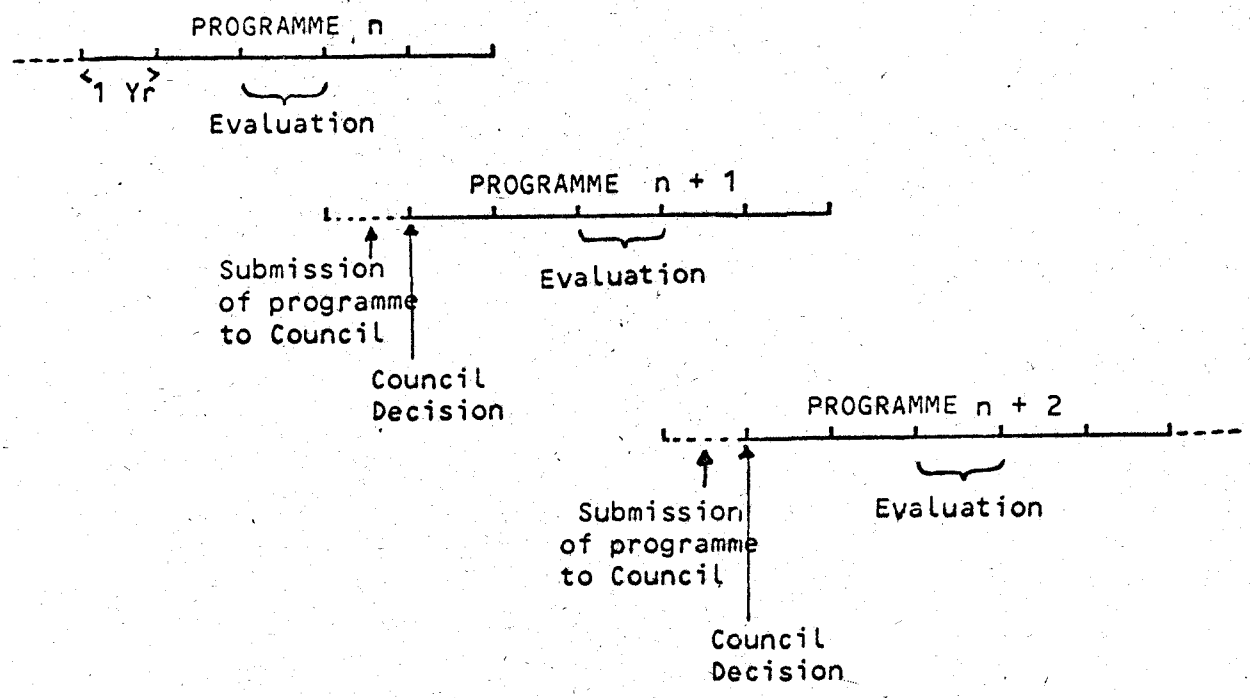
28. The panel started its work in October 1979, taking eight months to complete its final report. Having analysed the many existing evaluation procedures and criteria, the team unanimously agreed, in line with the conclusions of the Copenhagen seminar, that no a priori evaluation scheme could be applied in the given context and decided to follow a flexible and pragmatic approach. The panel has therefore developed and applied its own criteria and procedures to meet the special characteristics of the sub-programmes being evaluated.

29. The final evaluation report has been submitted to the Commission and is being published in the six official languages of the Community for a wide distribution (EUR 6902).

30. As a first general appreciation, the Commission considers that the evaluation report provides substantial information which can be expected to give a valuable input for the 1981 revision of the two sub-programmes. Detailed assessments are presented of the achievements, programme by programme and sector by sector, pointing out not only the scientific and technical value but other important elements such as promotion of international cooperation and impact on national activities. Where relevant, recommendations are made to rectify identified shortcomings. Useful suggestions are included for the valorization of the research results obtained. Attention is also focussed on the programme's managerial aspects including procurement of research proposals, selection of contracts and monitoring of research work.

31. Certain other aspects of the report may be less comprehensive such as the area of economic and social impact assessment. This very important objective is one of the most problematic since the correlation between research results and their practical application is often made difficult due to the time lag involved. In this area the available methodology is clearly insufficient and further research is needed to equip the evaluation team with more adequate investigation means.

32. This pilot experiment has enabled the Commission staff responsible for the evaluation activities to gain experience in the organization of evaluation exercises, in particular in the selection of experts, duration and timing of the evaluation, its methodology and planning. Firstly, it appears that the composition of the team of evaluators should be more heterogenous, the scientific experience of the team which carried out the first exercise was too dominant which may account for the reduced emphasis on the socio-economic aspects. Secondly, the timing of the evaluation could profitably be changed in order to maximize the use made of the evaluation. Instead of carrying out the evaluation immediatly after the completion of a programme it could be timed so that the final evaluation report is available for discussion on the programme extention phase. This is indicated below, taking as reference a 5-year sliding programme scheme.



Such timing would allow the evaluation to entirely encompass the previous programme and part of the current programme with the advantage that assessments and recommendations would also cover the current programme and would therefore provide an updated evaluation report at the time when it is most needed, i.e. before the new programme adoption phase. Furthermore, on the basis of the experience acquired, improved planning of the evaluation will ensure more efficient and speedy procedures and the inclusion of research productivity indicators will add valuable objective information. In this context, the Commission organized a colloque in September 1980 to analyse the methodology utilized during this first exercise. The practical and flexible approach adopted by the evaluation team was widely approved by the participants while stressing the need to strengthen certain methodological aspects in particular for the socio-economic impact assessment.

FUTURE PLANS

33. In order to profit to the maximum extent from the test case the Commission will undertake an in-depth follow-up to this first evaluation. After the wide distribution of the evaluation report, it is essential to receive feed-back from potential users as to its value, to see to what extent the recommendations are applied and how useful they have been so that improvements can be made where necessary. In other words, effective ways of ensuring proper impact and application of the evaluation results must be an integral part of the evaluation mechanism.

34. At the same time the decision was taken to proceed with the evaluation of other programmes to gain further experience and knowledge of evaluation procedures and criteria as applied to the differing characteristics of Community R&D programmes. Thus the three remaining sub-programmes of the 1975-1979 Energy R&D programme, i.e. "geothermal energy, hydrogen production and utilization, system analysis : development of models", are now undergoing an evaluation along the same lines

as the first one. Three of the five original evaluators are participating in the second exercise to provide some continuity ; they were joined by three other experts to fill particular needs of specialized competence.

35. The Community Bureau of References is the object of the third evaluation exercise. Its characteristics will require the application of considerably different evaluation criteria as a function of its specific objectives.

36. At the beginning of 1981 the "Management and Storage of Radioactive Waste" programme will be evaluated.

37. A different exercise will be organized in the field of fusion research. In this area a strategy for future development has to be established. To this end a fusion review panel of independent high ranking experts will elaborate a report which will start with an examination of the existing programme and formulate recommendations on the choice of the next major stages for the European fusion programme, taking into account current international developments and possibilities for international collaboration.
Further experience will also be gained from this unique exercise.

38. In addition, other programmes will be scheduled for evaluation in 1981 possibly including concerted and direct action programmes.

39. The Commission will organize late in 1981 a new major "Research Evaluation" seminar. The seminar, part of the Commission's activities in stimulating the exchange of information and developments in evaluation methodology within the EC countries, will permit the continued confrontation of national evaluation work and drawing recommendations for Community R&D applications.

CONCLUSION

40. The Council has asked the Commission to make appropriate proposals for a system for evaluating the results of common Research and Development programmes.

41. The Commission has investigated available evaluation methodologies within the Member States and elsewhere in order to ascertain the possibility of their adaptation to the evaluation of Community R&D programmes.

42. The Commission considers it appropriate to adopt an evaluation method which would supplement the evaluation practice which is currently being applied in the frame of its R&D activities. This method is based on a periodic retrospective assessment of its research programmes carried out by a small group of external independent experts with the major objective of providing an additional input into the programme revision and extention decision process.
Before drawing final conclusions as to the validity of this method, the Commission deemed it useful to gain some practical experience. A first pilot experiment has been completed satisfactorily. However, the assessment of its utilization by policy makers and planners has still to be undertaken. Other test cases are considered necessary in order to examine different procedures and criteria which will need to be applied to meet the particular characteristics of the differing Community R&D programmes.

43. Late in 1981 the Commission will organize a seminar to present the results of the test cases and confront them with similar activities conducted within and outside the European Community. It will be possible at this stage to draw conclusion as to the practical utilization of the results of the evaluation at the various policy levels.

44. Only in the light of the experience gained from the evaluation test cases, of further investigations and of lessons drawn from national evaluation activities, the Commission would consider it justified to submit to the Council any proposal concerning a systematic evaluation to be progressively applied to Community R&D programmes. It will take into account, inter alia, necessary manpower and financial requirements.