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SCIENCE AND TECHNOLOGY

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INTERNATIONAL AFFAIRS

INTERNATIONAL ORGANIZATION SUPPORTING RESEARCH IN DEVELOPING COUNTRIES

Paris LE PROGRES SCIENTIFIQUE in French Nos 199-200 Mar-Jun 79 pp 55-67

[Article by J. Gaillard, Projects Secretary]

[Text] Training of research workers in developing countries is the objective of one of the priority programs of the 7th Plan. However, the very great efforts which France has authorized in this regard, through the activities of universities and specialized organizations, are aimed essentially at initial training.

The International Foundation for Science* (IFS) presents the original concepts of aiding research workers who already have their diplomas and are natives of developing countries to put into operation, in their own countries and within national structures, research programs whose purposes coincide with the priorities of French tropical research. It is principally a question of exploring natural environments for improvement of rural development.

Through its participation in financing the IFS and its administrative bodies the DGRST [General Delegation for Scientific and Technical Research], in association with ORSTOM [Bureau of Overseas Scientific and Technical Research], is ready to show, once again in concrete form, France's interest in strengthening the research organizations and scientific policies of developing countries. Such strengthening is essential to the success of the French policy of scientific and technical cooperation with Third World countries, the principal

*Secretariat of the Foundation: Sibyllegation 47,11442 Stockholm

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characteristic of which is to be negotiated co-operation in a climate of real equality with partners who are complete masters of their own scientific policies.

Developing countries have had, and still have, recourse to existing structures in developed countries for training and specialization of their research workers. However, the degree of such dependence varies with the country, and depends upon whether or not the country has its own research tradition. Young research workers returning home after having pursued long studies in a developed country encounter considerable difficulties when they try to put their training into the service of their national scientific communities. Too often they discover that the training they have acquired is not adapted to the research priorities of their countries and also that the facilities available for research* are inadequate, sometimes even non-existent. The feeling of frustration which thus results, strengthened by the acquired culture resulting from a long stay abroad, often leads them to a decision to establish themselves in a developed country** where they will more easily find work which is both better adapted to their training and better paid. Others choose to leave research and accept upper management positions in a government administrative or private sector.

Those to whom research positions are offered and who decide to remain must face isolation in addition to a lack of facilities; as a matter of fact the scientific relations of an institute or university in a developing country with the outside world are frequently limited to the contacts established by the research workers in the course of their training in developed countries. Thus it very often happens that adjacent developing countries or those which are in the same ecological region, and have similar research programs, have no relations with each other.

Particularly on the basis of these considerations there appeared the concept of establishing an international organization for material and moral support of young research workers of developing countries in their own countries. Thus the International Foundation for Science was founded in 1972 by research academies and councils of 12 countries.

By the end of 1978 the IFS, which comprises 49 member organizations from 44 countries had allocated 315 research grants to young researchers working in 51 countries of Asia, Africa, and Latin America.

*According to recent estimates the worldwide resources devoted to research and development are distributed as follows: 62 percent for OECD countries, 34 percent for CEMA countries, and 4 percent for developing countries. Moreover, this latter 4 percent is concentrated in a few countries.

**According to a UNESCO investigation performed in 1970 in five developing countries, 20 to 30 percent of students from those countries do not return after having received their training in developed countries.

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Historical: From Pugwash to Stockholm*

The concept of such an organization, appearing at the end of the 1960 decade, was presented and discussed during two consecutive meetings of the Pugwash Group. It is difficult to state with certainty who was its father. However, several names may be advanced: Robert Marshak, nuclear physicist then at Rochester University; Roger Revelle, Director of the Harvard Demographic Studies Center; Abdus Salam, Director of the International Center for Theoretical Physics in Trieste, and Paul Auger of UNESCO.

Among those it was undoubtedly Robert Marshak who most actively promoted the concept. He persuaded the National Academy of Sciences and the American Academy of Arts and Sciences of Boston to study this project. The president of the Swedish Academy of Technical Sciences (IVA) who then was Prof Sven Brohult, at that very time was in the United States and met Robert Marshak who acquainted him with "his" project.

Upon his return to Stockholm Prof Brohult undertook to convince the Swedish academies of the importance of supporting research workers in developing countries. With the benefit of a \$5,000 grant from UNESCO the two Swedish academies in July 1970 organized a meeting lasting 3 days in which 32 representatives of scientific academies and organizations from 16 countries, six of them developing countries, discussed problems induced by the growth of science and support for scientific research and research workers in developing countries.

General principles which would later serve as reference points for future work were enunciated and adopted. Developing countries need scientific research to promote their growth and works to carry out their research. To help these countries develop their national research capabilities it is now necessary to support talented young scientists; later these will be able to train other young scientists and thus contribute to establishment of a research tradition in their countries. The modest grants which the new organization hopes to disburse, if allocated judiciously, would have a multiplied effect. Support is to be granted for research work to be carried out in the workers' own countries and the areas of research supported would be established in accordance with the requirements of the country concerned.

Another important result expected following allocation of a grant, is recognition of the new grantee within the scientific community upon the national, regional, and international levels. Such recognition ought to facilitate relations between the grantee and the other scientists working in similar domains. Relations so established will enable him to obtain information and advice which will be useful to him in elaborating and carrying out his research project.

*See "Developing Science" by M.L. Baveryd, an article accepted for publication in NEW SCIENTIST

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At the conclusion of the Stockholm meeting a committee responsible for drawing up plans for establishment of the organization which was going to be called the International Foundation for Science, was set up, with Prof Paul Auger as chairman.

During discussions which followed there proved to be profound differences among the committee members, in particular, as far as the size, structure, and the method of operation of the new organization were concerned. Two groups represented two different trains of thought. The first would have liked the IFS to be associated with UNESCO. The second, comprising especially the representatives of academies, wanted the IFS to be an independent, non-government organization. The views of the second group prevailed.

In January 1972 a letter was sent to 50 research academies and similar institutions, inviting them to join the IFS as founding members and on 25 May 1972, when 14 members had announced that they were joining, the interim committee proclaimed the official existence of the IFS.

The IFS Becomes a Reality

In order for the IFS to become a reality it was now necessary to procure the funds necessary for its operation and allocation of the first grants. The work of installing the organization was made possible by several contributions from a Swedish private foundation--the Salen Foundation--and the World Bank. However, to effectuate a program of allocating grants larger and more numerous contributions were needed. In the beginning of the spring of 1973 Prof Brohult succeeded in persuading the Swedish Minister of Foreign Affairs that the IFS deserved support from Sweden. He thus obtained the first Swedish contribution. The president of the Canadian International Center for Research and Development was also convinced of the worth of the ends of the IFS and decided to allocate to it a contribution through the Royal Society of Canada, an organization member of the IFS, as intermediary. The Canadian contribution was followed some time later by the French, issuing from the Bureau of Overseas Scientific and Technical Research which reinforced its support by assuming responsibility, from 1976, for the salary of a French scientist working within the secretariat at Stockholm. Since 1976 the French contribution is contained within the research envelope at the instance of the Minister of Foreign Affairs.

By the end of 1978 nine countries were contributing to the IFS budget which then was 5.5 million French francs: Sweden, Canada, Federal Republic of Germany, Belgium, France, Norway, the Netherlands, Nigeria, and Switzerland.

Elaboration of the initial grants program and in particular, the various domains of research which were to be adapted also gave rise to impassioned discussions, the suggestions going from theoretical physics through biology to medicine, and their applications. As a result of contacts made by Prof Brohult with numerous research workers and administrators of research institutions of developing countries, a program centered about biological research applied to rural development was elaborated and proposed.

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From Science to Technology, to Serve Rural Development

This program, limited to biological and agronomical sciences, and comprising six priority domains, was adopted by the interim council in 1974. These six priority domains, which are agriculture, animal production, plant production, mycorrhizae and problems related to reforestation, fermentation, and natural substances, although subjected to minor changes within each particular domain, are still in effect today. The program was expanded however, in 1978 with the addition of a seventh domain, technology in the rural environment, which reveals the installation of a second branch-- "technological research"--in the IFS grants program.

Four years after adoption of the initial program it is interesting to observe what the trends and criteria were at its definition and which today still constitute the basis for the philosophy of the IFS. The following criteria may be considered decisive:

within the overall problem of growth of the developing countries rural development has priority and the target group of the programs, that is, the direct potential users, must be the small growers and breeders;

this first basic criterion adopted, and the social-economic environment of the small growers and breeders known, it becomes logical to center the programs upon making operative production systems with low investment levels in which the aim is to utilize to the maximum extent all locally available resources;

the definition of particular domains must take into account the past and present trends of research in the developing countries. During the colonial period the industrial growers for export (coffee, cocoa, oil palms, sugar cane, cotton, and so forth) had priority to the detriment of foodstuff cultivation; in the IFS program stress is placed upon the improvement and growth of the latter. Following the colonial era various international organizations for assistance to research and development in the Third World countries especially promoted the expansion of large crops, such as the cereals (maize, rice) as well as of large animals (cattle); within the scope of its priority domain, under the heading "animal production," the IFS, for its part, places emphasis on small domestic animals.

As a general rule it can be said that the research domains adopted as priority ones by the IFS are those which were neglected in the past and for which research activity should enable results, applicable in the short or medium term, to the benefit of the country or region concerned, to be obtained;

in accordance with its by-laws IFS support is directed to worthy young research workers coming from developing countries whom it helps to carry out work by making research grants. These grants are made according to the nature of the projects presented, the prospects which they are capable of opening, and the interest they hold for the country or region concerned. The research activity must mandatorily be performed upon the territory of a developing country.

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The special feature of the IFS approach resides in the fact that it deals with, and supports, the research worker directly and not a research institution. Later it will be the grantees, as individual research workers, who will form the basis of the networks by geographic or ecological sector or by domain which the IFS is interested in instituting; and

the maximum amount of a research grant is 45,000 francs annually. They are intended to cover costs of equipment and instrumentation, scientific literature, transportation, and other important requirements related to a research project. Such support is to be added to the resources placed at the research worker's disposal by local organizations; thus, salaries and general operating expenses are normally the responsibility of the institute sponsoring the candidate.

Grants Program

A detailed report* upon the foundation's activities during the 1974-1977 period was prepared by the secretariat in collaboration with various experts associated with IFS activities and was presented during the second general assembly held at Stockholm in the month of September 1978. The second general assembly was the occasion for evaluating the content of the various priority domains as well as for proposals and recommendations concerning future work.

Aquiculture: At the present time aquiculture is providing more than 8 percent of the world's production of fish, crustaceans, and mollusks, and represents more than 6 million tons annually. Since traditional fisheries are already fully exploited, if not overexploited, prospective increased production of aquatic organisms by aquiculture is essential. In fact, it is possible to define various means by which aquicultural production per unit of area can be increased ten-fold, and the total area now devoted to aquiculture can be considerably increased without, for all that, competing with other agricultural production sectors.

These considerations led the IFS to select aquiculture as one of its priority domains at the beginning of its grants program. If there be need for another consideration to justify the selection by the IFS it is that at least 75 percent of the fish, crustacean, and mollusk production serves directly to feed the producing country's people.

In this domain 61 research grants have been made by the IFS during the 1974-1978 period. These grants have been allocated for projects of research on the physiology of reproduction and artificial techniques for inducing egg laying, production of fry (young fish), raising techniques, and combatting diseases. The principal species represented are: mullet, tilapia, catfish, carp, chano, and shrimp. Nine grants were also made for study of other species which are part of the local fauna with the view to their utilization in aquiculture projects, three for mollusk raising, three for study of seaweed with the view to their cultivation, and one for frog breeding.

*International Foundation for Science Work, 1974-1977, 188 pages

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More than half of these 61 grants were made to research workers from Asia, in particular, from India, Indonesia, and Malaysia. Such concentration in this region is easily understood in view of the fact that about 80 percent of the world's production comes from the Indo-Pacific region. However, in accordance with recommendations accepted during the second general assembly the IFS will make a special effort in its future program to continue encouragement of the development of aquiculture in Africa, Latin America, and Oceania by instituting new projects and assisting in the transfer of technology, acquired in these domains, from Asian countries to the other continents.

Animal Production: Experience has demonstrated that the techniques of animal raising developed in temperate zones are ill adapted to the demands of hot and humid climates; thus, systems whose objectives are high daily weight gain, large milk production, or early weaning of calves have little chance of success, considering the conditions which prevail in tropical countries. Moreover, in developing countries the price paid to the breeder for animal products is low in comparison with other products, which entails a lack of means to buy feed for cattle. Another major problem is the preservation of these products; thus, because of a lack of refrigeration systems the evening's milk is often unfit for sale the next morning.

The IFS has made 57 research grants in this domain during the 1974-1978 period. About half of these grants were made for research projects aimed at improved exploitation of sheep and goats. The disciplines involved include livestock feeding and, in particular, the use of agricultural and industrial by-products in feeding, systems of exploitation and raising, improvement of the breed and selection, as well as veterinary research. Among the recommendations for future work adopted let us cite research on the secondary animal species or those not having been the subjects of studies, and research on high productivity fodder plants. As far as secondary animal species are concerned, the IFS is already supporting a project in Ivory Coast aimed at domestication of the rodent "Thryonomis sivinderianus," whose flesh is very highly regarded by the inhabitants of West Africa; relations have also been established with research workers in the Congo and Nigeria for the purpose of initiating and supporting similar projects. As far as high productivity fodder plants are concerned, the IFS has just made four grants for projects aimed at using banana plants as fodder once the fruit has been harvested.

Plant Production

With 80 grants out of 315 the plant production domain is the one which has benefited the most from IFS support. This choice is justified in view of the fact that more than 75 percent of the calories and proteins in the diet of the rural population of developing countries comes from vegetable products.

When drawing up the grants program began particular attention was paid to support of food crops, such as tubers, seed legumes, and market gardening.

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Four years later about 75 percent of projects are centered about programs for improvement of, and research on nutrition and improvement of crop raising techniques as well as preservation of such food crops, in particular, seed legumes and tubers. As far as tubers are concerned, a special effort has been made to institute a network of relationships among the various researchers involved in programs of research on the yam, especially in western Africa. That network is composed mainly of seven grantees of the IFS working on the yam in eastern Africa, as well as researchers working on the same plant within the International Institute of Tropical Agriculture of Ibadan, Nigeria. A project aimed at establishing a similar network for another tuber plant, the taro (*Colocasia esculenta*), which has not been the subject of research in the past, is in the process of being elaborated. As for research on plant nutrition, a special effort will be made to continue support for research aimed at decreasing production costs due to utilization of chemical fertilizers which, in most cases, must be imported.

Mycorrhizal and Reforestation: The importance of mycorrhizal was especially demonstrated when exotic species of pine were introduced, particularly into the developing countries. In most cases such introductions could be successfully executed only when accomplished by introduction of mycorrhizal mushrooms adopted to the pine species and types of soil as well as the climates involved.

The term "mycorrhiza," which comes from the Greek (mykes = mushroom; rhiza = root), is employed to designate the symbiosis between certain mushrooms and the roots of higher order plants. This symbiosis, by which the mushroom can satisfy its requirements for carbohydrates through the roots of trees as intermediaries while, in return, it contributes to the nutrition of higher order plants by making available to them phosphorous, mainly, but also nitrogen and potassium which occur in forms not directly assimilable, is of considerable practical importance.

Thus, although this domain, Mycorrhizal and Reforestation, has had the benefit of only 25 research grants, 22 of which were allocated to projects of research on mycorrhizal, it nonetheless remains that the practical results which can be expected should be of considerable importance, especially within the scope of future reforestation projects.

Interesting results have already been obtained. In Nigeria an IFS grantee, Dr Z. Momoh, has successfully introduced a mycorrhizal mushroom, *Pisolithus tinctorius*, resistant to high temperatures, with which, at present, inoculation tests are being performed on the scale of a reforestation project underway in the northern part of the country where the climate is hot and dry. Similar tests have been carried out with other mycorrhizal mushrooms in Ghana and other developing countries.

The limits of this domain were recently widened also to include methods of reforestation adopted to tropical countries.

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Fermentation and Other Methods of Food Preparation: When the grants program began this domain included the traditional fermentation processes used for food preparation as well as simple methods for popularizing the use of agricultural residues as food for man or livestock. Later this domain was widened to include improvement of harvesting technology and economics and processing, storage, and preparation of foods, as well as design and construction of simple equipment adapted to production of fermented foods, and of fuels, at the village level.

Of the 29 grants allocated to this domain during the 1974-1978 period, about half were to research workers from Southeast Asia for projects to study and improve traditional fermentation processes. The other half was distributed among projects of research on the proteins of one-celled organisms, techniques of composting, and the biogases.

For future programs it was recommended that traditional fermentation processes retain a priority position because of their importance and the role they play in detoxification, preservation, and flavor improvement of food. Research on contamination by certain molds resulting in the presence of mycotoxins in foods will also receive support from the IFS.

Natural Substances: In developing countries natural substances of vegetable origin have traditionally played an important role in the advancement of medical science (quinine, for example) and of technology (rubber, for example).

The 65 grants allocated up to the present were equally distributed between Asia and Africa with 29 and 28 grants, respectively; the eight remaining grants having been allocated to research workers in Latin America. The disciplines involved, in order of decreasing importance denoted by the number of grants are as follows: phytochemical studies, technical applications, specific therapeutics, anti-tumor substances, traditional medicine, substances of marine origin, elucidation of structures, and biological studies.

Among the recommendations adopted for the future program there will be noted continued support for research on new sources of chemical products derived from plants and increased support for ethnobotanical and pharmacological studies as well as for putting into cultivation plants which may prove interesting.

An example which well illustrated the decisive role of IFS support in this domain is that of Dr Vichai Reutrakul of Bangkok, Thailand. Following training in the United States Dr Vichai was appointed assistant in a chemistry department devoid of research equipment. He obtained a first grant from the IFS in 1974 which enabled him to begin equipping his laboratory which is today, thanks to his ingenuity and sustained efforts, one of the best equipped laboratories of the chemistry of natural substances in Southeast Asia. One of his laboratory's latest acquisitions is a combination gas phase chromatograph/mass spectrophotometer which was partly financed by an IFS grant.

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Dr Vichai obtained his first grant to study the action of local fruits used as a traditional remedy for intestinal worms. The active substance, diosphyrol, which was extracted from these fruits, is sensitive to oxidation by the air. Dr Vichai succeeded in finding derivatives of diosphyrol which are biologically active while being stable against air oxidation. The results were submitted for the purpose of obtaining a patent.

Today Dr Vichai is recognized as one of the most brilliant natural substances chemist in Southeast Africa and his laboratory is visited by numerous students from the other countries of the region.

Technology in the Rural Environment: This new research domain which constitutes the technical component of the IFS grants program was added for the first time in 1978 under the title "Construction in the Rural Environment." Following recommendations made during the second general assembly this domain was renamed "Technology in the Rural Environment." Future expansion of this domain should be in two main directions.

The purpose of the first subsection of this domain is to support technical research directly related to the initial program of biological and agronomical research applied to rural development. The following examples may be cited for purpose of illustration: drying installations for fish or plants, installations for preservation of harvests, and construction of fish raising pools, irrigation and drainage systems, livestock buildings, and so forth.

The purpose of the second subsection of this technical research domain will be support for research on energy in the rural environment.

This subprogram "Technology in the Rural Environment" having been but recently adopted, only three grants have been allocated, of which two are for projects of research on utilization of local construction materials and one for production of paper as well as other paper industry products from papyrus and banana leaves.

Working Seminars and Regional Networks: Another goal which the IFS set for itself is to break the isolation from each other of researchers in developing countries by helping them to establish relations and to promote expansion of south-south cooperation.

Thus, during the early years of activity some study grants were allocated to a certain number of grantees, either to establish contacts with other grantees or research institutes having similar programs or to participate in conferences organized by other bodies, such as, for example, the Accra Conference on Aquiculture in Africa organized by the FAO in 1975.

The year 1978 was the first during which working seminars were organized by the IFS in close collaboration with grantees and their institutes as well as member organizations of the IFS.

Four working seminars were thus instituted by the IFS during the year 1978 which were the occasions for the meeting of grantees and a varying number of international experts performing research in the following areas: mycorrhizal, aquiculture in Southeast Asia, yams, and rabbit breeding.

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Each of these seminars had a particular profile due to the specific nature of the needs identified when their organization began.

The Working Seminar on Mycorrhizal in Tropical Countries, held at Kumasi, Ghana in September 1978 was the first meeting on mycorrhizal held in a developing country and it assumed a largely international character; all the IFS grantees, working on mycorrhizal from three continents (Latin America, Africa, and Asia), as well as a large number of international experts, from developed countries as well as from developing countries, participated. The program comprised both presentation of the work performed and of the results obtained by each participant as well as demonstrations of techniques, especially by inoculation, and practical experiments in the field. The obvious success of this seminar is in large part due to Dr Ofosu Asiedu, an IFS grantee, who was responsible for local organization. Among the positive results there will be noted the establishment of a regional collaboration program aimed at instituting comparison tests with different mycorrhizal strains in Togo, Ivory Coast, Ghana, and Senegal.

As we have already seen aquiculture in Southeast Asia is an ancient tradition. By organizing a Regional Seminar on Aquiculture in this region where more than half the grantees in that speciality are to be found, IFS intended not only to promote and strengthen relations among the researchers in this region but also to determine the status of research being carried out in that domain and of the practical results obtained with a view to redefinition of priorities and, over a longer term, better coordination of programs at an inter-regional level. The success of this seminar, held at the end of September in Penang, Malaysia, was also due to the dynamism of an IFS grantee Dr Chua, who also had the opportunity to present the results of his work in raising *Epinephalus tauvina* in floating cages.

The International Seminar on the Yam, which took place in October 1978 at Buea, Cameroon, although attendance had been solicited internationally, was principally, and above all, a regional seminar bringing together the English speaking and French speaking grantees and researchers working on in western Africa, the region where the most important edible species of yam originated. It was the first time that such a meeting was devoted entirely to the yam and for many of the participants this was the occasion to find that some of them resided in adjoining or not very distant countries.

In addition to numerous recommendations which were adopted this seminar also gave rise to numerous discussions aimed at instituting collaboration networks among the different institutes in the countries represented in various research projects ranging from physiology of the yam to methods for its preservation.

Finally, the last seminar organized by the IFS in 1978, on Rabbit Raising in Africa, took place in Morogoro, Tanzania, where one of the IFS grantees, M. Mgheni, has established a center for rabbit raising by bringing together the various local strains coming from all areas of Tanzania. Except in some

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countries, one of which is Ghana, rabbit raising is not widespread in Africa although it poses no problems of adaptation and it does provide clear advantages over the other forms of animal production. The goal of the seminar, which was to assemble information on research and practice related to rabbit raising in Africa as well as to propose a set of recommendations appropriate for rabbit raising, was achieved and will be the subject matter of a publication which ought to contribute to expanding rabbit raising in Africa.

The presentation, as well as the recommendations adopted, at these various seminars have been collected and will be contained in a series of provisional reports published by the IFS in a limited number of copies. The first two reports in this series have already been accepted for publication: one by the Oxford University Press and the other by the Journal of Aquiculture. Steps are underway for publication of the last two.

Although each of these seminars had a special profile they nevertheless had points in common: size, structure, and purpose. The number of participants varied from 20 in the case of the rabbit raising seminar to 50 in the case of the mycorrhizal seminar. The number was deliberately limited in order to enable each of the participants to take part in the discussions. Another common goal was establishment of networks by region or by research domain.

These four experiences having proved that the criteria applied in the organization of those seminars were correct, the IFS will henceforth strive to support more activity of this kind, which should become an important element in its work.

Various topics have already been chosen for the forthcoming seminars; among others let us mention research on the camel, utilization of the banana plant (stems and leaves) as fodder, research on the taro (another secondary tuber), and techniques for inducing egg laying in aquiculture. The IFS grantees, assisted by member organizations, will play a central role in organization of those forthcoming seminars.

Future of the IFS

From 1974 to 1978 the number of grants allocated increased from 45 to 315 and the budget grew linearly from 1.2 million to 5.5 million French francs. This growth, the quality of the reports regularly submitted by IFS grantees, and the many contacts established with scientific circles in developed and developing countries attest the success of the IFS in its first few years.

Although the IFS is a small organization, and the resources at its disposal are still greatly limited, it has proved that its initial plan could be realized. This positive balance sheet after 5 years of satisfactory operation does not mean that all problems relating to its future are resolved. The answers to the questions now being discussed within the IFS will decisively determine the structure, mode of operation, and quality of IFS services in the future. These questions may be grouped about the following topics:

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five years after allocation of the first grants several projects have been terminated or are at the point of being terminated. In certain cases the results obtained should be the subjects of practical applications. As a general rule the IFS should not itself undertake the application of these research results, however, but should, in liaison with member organizations, rely upon other institutions to take its place. It is in fact a question of defining a dividing line between research and application in order that the IFS does not lose its proper profile and that it continues to concentrate its efforts on support for research workers while recognizing that such a dividing line can be varied depending upon the particular case;

the 315 grants allocated since 1974 have been distributed among 51 countries. The number of grants for each country varies from one to 28, with some concentrated in the countries of Southeast Asia. Although the geographic dispersion has up to the present given the IFS its truly international dimension and enabled it to establish numerous contacts which will be valuable in future work it may nevertheless be desirable in the future to effect a better balanced distribution by fixing quotas for certain countries and in contrast encouraging the less favored countries;

according to its by-laws the objective of the IFS is to promote and support scientific and technical research, in the domains of the exact, the natural, and the social sciences, in developing countries. Up to 1977 the IFS limited its support to biology applied to rural development while carefully laying out a program, starting in 1978, intended to support technological research in the rural environment, the expansion of which is linked mainly to the future growth of its budget. As the budget is increased, other domains of science and technology can be contemplated. Elaboration of such future programs will have to be based upon the same criteria that prevailed in the definition of the initial program. In particular, it will be necessary, within the scope of those programs, to identify the specific domains which will continue to give the IFS of tomorrow a unique profile; and

the IFS secretariat in Stockholm, now consisting of eight members, has sufficient capability to administer the present 315 grants but will rapidly reach its limits if the total number of grants continues to increase as in the past. Such growth is inevitable if the IFS wishes to cover domains other than those of the present program. In that case a substantial increase in the secretariat staff must be contemplated, and then there would be the danger of no longer being able to provide the same quality of service which is possible today because of personal contacts established with each grantee. Several solutions to minimize the risks of transformation into a bureaucracy can be envisioned. Among those we shall mention, on the one hand, decentralization by delegating to member organizations the responsibility for administering the grants allocated in their countries and, on the other hand, regionalization, leaving it to member organizations of each region to decide on the place where the regional secretariat is to be located. Specialization by program can also be envisioned with the establishment of a new autonomous secretariat whenever the IFS decides to support a new domain. These solutions will have to be studied, with the administrative costs which

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would result from their adoption considered, recognizing that up to the present the IFS has succeeded in limiting administrative costs to less than 25 percent of the total budget.

In particular, it will devolve upon the new administrative council elected at the second general assembly to weigh these questions.

In the wake of the United Nations Conference on Science and Technology for Development it appears unlikely that the recommendation and resolutions adopted will result in establishment of a new organization as was the case with the Conference on the Environment at Stockholm as a result of which the United Nations Program for the Environment was established.

It is believed more likely that the concerns identified by the various member countries in the course of that conference will result in definition of a series of resolutions and of activities to be undertaken, which could be distributed among various organizations combined within the same network. The IFS, because of its international dimension, as well as the many relations it maintains with scientific and technical organizations working on development, in developed countries as well as developing countries, should be able to play an important part in such a network.

Appendices

Distribution of Grants By Countries
1974-1978

Country	Grants	Country	Grants	Country	Grants
Argentina	2	Jamaica	3	Sudan	6
Afghanistan	4	Kenya	9	Sri Lanka	12
Bangladesh	5	Liberia	1	Swaziland	1
Burundi	3	Madagascar	6	Tanzania	13
Cameroon	3	Malawi	5	Thailand	17
Chile	2	Malaysia	28	Trinidad	1
Colombia	8	Mexico	6	Tunisia	1
Korea (Republic of)	4	Nicaragua	1	Turkey	1
Ivory Coast	9	Niger	2	Uruguay	1
Cuba	7	Nigeria	14	Zaire	4
Dominican Republic	2	Uganda	4	Zambia	4
Egypt	8	Pakistan	5		
Ethiopia	3	Peru	13		
Ghana	9	Philippines	13		
Guatemala	2	Rwanda	3		
Guyana	2	Solomon Islands	1		
Upper Volta	2	Western Samoa	1		
India	27	Sengal	5		
Indonesia	23	Sierra Leone	5		
Iran	3	Singapore	1		
Total: 51 countries - 315 grants					

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Distribution of Grants by Priority Scientific Domain
and by Geographic Region
1974-1978

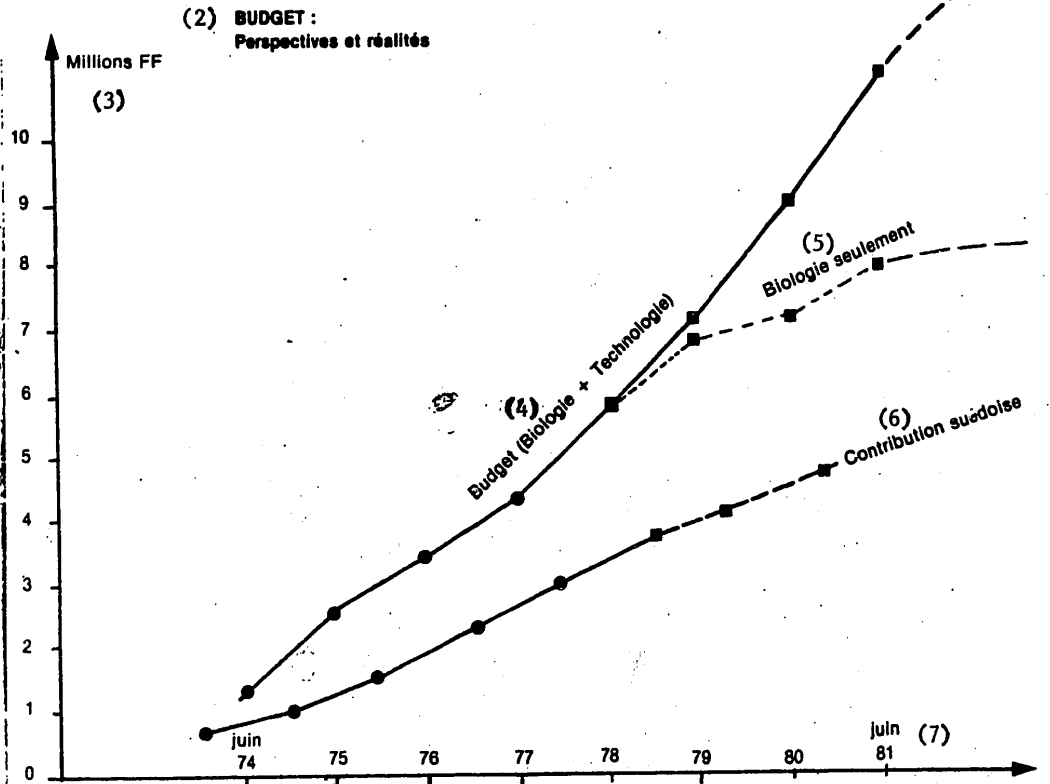
Priority Scientific Domain	West and Central Africa	East and North Africa	Southern and Western Asia	Southeast Asia	Latin America	Total
Aquiculture	5	12	13	21	10	61
Animal Production	10	13	8	7	13	51
Plant Production	24	13	11	24	8	80
Mycorrhizal	4	3	7	6	5	25
Fermentation	2	3	2	16	6	29
Natural Substances	10	18	15	14	8	65
Rural Construction	1	1	1	--	--	3
Public Health	--	1	--	--	--	1
Total	56	64	57	88	50	315

Key: [to source p 66]

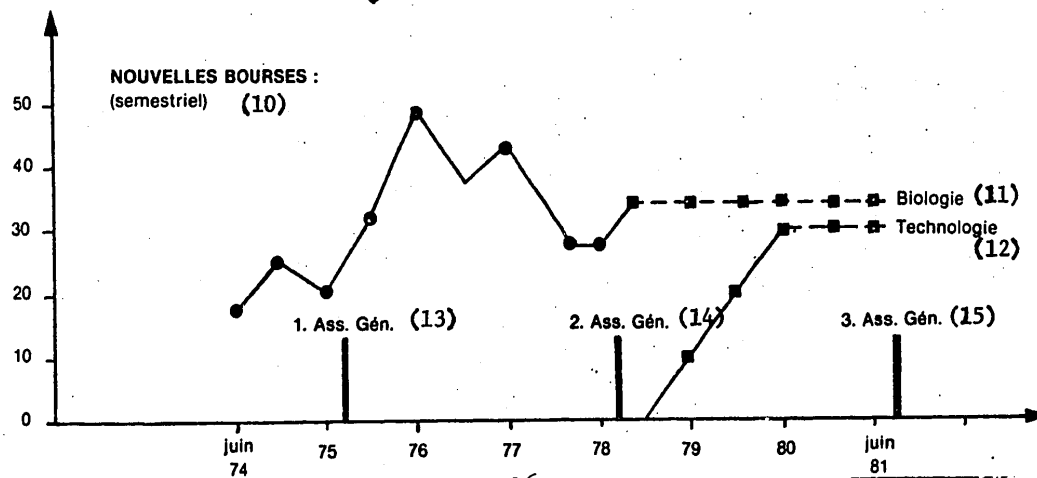
1. Growth of budget and allocation of new grants
2. Budget: prospective and actual
3. Millions of French francs
4. Budget (Biology & technology)
5. Biology alone
6. Swedish contribution
7. June
8. Definite amounts
9. Estimated amounts
10. New grants (semi annual)
11. Biology
12. Technology
13. First general assembly
14. Second general assembly
15. Third general assembly

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 EVOLUTION DU BUDGET ET ATTRIBUTION DE NOUVELLES BOURSES (1)



(8) ● = Chiffres connus
 (9) ■ = Chiffres estimés



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IFS Administrative Council -- 1979/1981

- * Sven Brohult, Sweden, Chairman
 - * Gordon Butler, Canada, Vice Chairman
 - * B.D. Nag Chaudhuri, India, Chairman
of the Grants Committee
 - * Carl Heinz Schiel, FRG, Chairman
of the Donors Committee
 - * Nicolai Herlofson, Director ex-officio
- } Executive Committee
- * S. Oluwole, Nigeria
 - Jacques Diouf, Senegal
 - * Kodi Husimi, Japan
 - Dennis Horace Irvine, Guyana
 - * Andra Jaumotte, Belgium
 - Hosea Yona Kayumbo, Tanzania
 - * Donald J. Kuenen, Netherlands
 - ** Thomas F. Malone, ICSU
 - Christian Jochaud du Plessix, France (DGRST)
 - * Roger Revelle, United States
 - * Sanga Sabhasri, Thailand
- * were members 1976/1978
** nominated by the ICSU, 25 September 1978

Member Organizations

Federal Republic of Germany	German Research Association
Argentina	National Academy of Exact, Physical, and Natural Sciences National Council for Scientific and Technical Research
Belgium	Royal Academy of Science, Letters, and Fine Arts of Belgium
Cameroon	National Bureau of Scientific and Technical Research (ONAREST)
Canada	The Royal Society of Canada
Chile	Academy of Sciences
Colombia	Colombian French for Scientific Research (COLCIENCIAS)
Congo	General Secretariat for Scientific Research
Costa Rica	National Council for Scientific and Techno- logical Research
Korea, Republic of	National Academy of Sciences
Ivory Coast	Scientific Association of Ivory Coast
Denmark	Royal Danish Scientific Society
Egypt	Academy of Scientific Research and Technology
United States	American Academy of Arts and Sciences National Academy of Sciences
Finland	Finnish Scientific Society

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France	Bureau of Overseas Scientific and Technical Research (ORSTOM)
Ghana	Council for Scientific and Industrial Research
Guyana	National Science Research Council
India	Indian National Science Academy
Indonesia	Lembaga Limu Pengetahuan Indonesia
Iran	University of Tehran
Israel	The Israel National Academy of Sciences and Humanities
Japan	Japanese National Liaison Committee for the IFS
Kenya	Kenya National Academy for Advancement of Arts and Sciences
Kuwait	Kuwait Institute for Scientific Research
Liberia	University of Liberia
Nepal	National Council for Science and Technology
Niger	University of Niamey (replacing the former National Council for Scientific and Technical Research)
Nigeria	National Science and Technology Development Agency
Norway	Norwegian Academy of Sciences
Uganda	National Research Council
Pakistan	National Science Council
Netherlands	Royal Netherlands Academy of Sciences
Peru	National Research Council
Philippines	Sciences Foundation of the Philippines
United Kingdom	The Royal Society
Senegal	General Delegation for Scientific and Technical Research
Sudan	National Council for Research
Sri Lanka	National Science Council of Sri Lanka
Sweden	Academy of Technical Sciences Royal Academy of Sciences
Switzerland	Swiss National Fund for Scientific Research
Tanzania	Tanzania National Scientific Research Council
Thailand	National Council for Scientific Research

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INTERNATIONAL AFFAIRS

EUROPEAN SPACE AGENCY'S RESEARCH PLANS OUTLINED

Paris AIR & COSMOS in French 20 Oct 79 p 52

[Text] A new European space research program oriented towards knowledge of the earth has just been agreed upon by the Council of the European Space Agency (ESA) meeting in Paris on 10 and 11 October. Eight ESA member states: U. K., Germany, the Netherlands, Denmark, Switzerland, Spain, Belgium and Ireland approved this new program and committed themselves to its financing; the program will be defined at the next Council of ESA which will take place on 27 and 28 November 1979. Two countries abstained (France and Sweden) and one resigned (Italy). It is in fact an optional program where each member state is free to participate or not.

This new European space program was launched to "fill a great gap in the activities of ESA and to allow Europe to play its role in the world orchestration," which presently implements the world research program in climate (adopted by the Geneva world conference in February 1979), the work of UNESCO (a follow up on the international symposium in Paris, April 1979), the work of the European Council (seminar on research on the forecast of earthquakes) and the proposals of EEC (in discussion).

The objective of the new ESA program is "the understanding of the overall behavior of the complex formed by solid Earth, the cryosphere, the atmosphere and the oceans and in particular the interactions between these different components."

This European program of "understanding of the Earth" is therefore by its very nature multidisciplinary. It equally concerns climatology (radiation balance of earth and clouds, atmosphere, oceans interactions, vertical structure of the troposphere, etc). and glaciology (seismic forecasts, structure of the crust and mantle, tectonic plates etc). But ESA draws attention to the fact that the justification of this program is not only scientific; the ultimate goal, insists the agency, is the "forecast" whose human and economic benefits justify a European initiative.

The program will be conducted in two stages comprising a permanent element and specific projects. ESA proposed to establish first "a permanent annual outlay of about 3 millions of counting units which constitutes the

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permanent element of the program whose objective will be essentially to carry out "the complex of necessary studies and projects to bring a project to a state of detailed definition" (result of a competitive industrial phase B). This part of the program will also permit to carry out certain technological developments of critical components or of new sensors and to do terrestrial tests, complementary to space explorations. ESA plans the start of this preliminary stage for January 1980.

Then, on the basis of studies thus carried out, ESA foresees the possibility of undertaking one or several specific projects comprising either tests put on board the orbital laboratory "Spacelab" (orbited by the American "Space Shuttle") or satellites specializing in one or several of the disciplines concerned. The Agency thus considers it "reasonable" to envisage a competitive phase B for the detailed planning of a satellite project every 1.5 to 2 years and a "phase B study for an experiment on board the Spacelab every 3 or 4 years."

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