35 Building Research Capacity in the Developing World: Issues and Prospects. The Experience of the International Foundation for Science, IFS

Jacques Gaillard

The overall goal of the International Foundation for Science (IFS) is to contribute to the strengthening of capacity in developing countries to conduct relevant and high quality research on the management, use, and conservation of biological resources. IFS does this by identifying promising young scientists through competitive research grants and a careful selection process, and supporting them in their early careers in order to enable them to become established and recognised in national and international scientific circles.
After briefly presenting the mandate and activities of the International Foundation for Science this paper discusses the extent to which the changing context (shrinking public budgets, growing disparities, increasing emergence of national research grant schemes, changing professional values and employment conditions, etc.) will affect the mode of work and the future of IFS and other like-minded institutions. A number of issues and prospects related to research capacity strengthening in developing and transition countries, for instance, critical mass (concentration versus dispersion), capacity building versus problem-solving, linkages and networking activities versus research grants are also discussed. In the conclusion, strengthened or new forms of research partnerships are advocated.

Introduction

Scientific and technological cooperation with the developing world over the last forty years has gone through a number of overlapping phases and has reflected different approaches and concepts (Gaillard, 1999). The colonial period was mainly characterised by the identification, assessment, development, and exploitation of natural resources. The post-colonial era can be divided into two phases. The main objective of the first problem-solving phase, culminating in the 1960s, was to find solutions to development problems, primarily by means of scientific and technical resources from the North. The problem-solving phase overlapped, to a certain extent, with the technical assistance phase. During that period, it was entirely irrelevant who was solving the problems and how. It was only during the second phase (starting in the 1970s) that the notion of capacity building emerged and became widespread. New institutions were conceived and created: the International Development Research Centre (IDRC) in 1970, the International Foundation for Science (IFS) in 1972, and the Swedish Agency for Research Cooperation with Developing Countries (SAREC) in 1975. (Today, SAREC is the Department for Research Cooperation of the Swedish International Development Cooperation Agency – Sida.)

Although problems faced by research in the developing world and the overall international context have changed or shifted over the last 10 or 15 years, key emphasis is and will increasingly be placed on creating, strengthening, and reproducing pools of well-qualified men and women. IFS, which has supported more than 3000 scientists from developing countries in their early research careers over the last 25 years, has greatly contributed to this goal. Yet, a number of trends and challenges at the onset of the "knowledge society" may affect the IFS mode of work and its future.

The IFS: Mandate, mode of work and achievements

IFS is a non-governmental organisation governed by an international Board of Trustees which represents Donors and Member Organisations. The IFS Member Organisations – more than 100 in some 80 countries – are national, regional, and international academies of science and research councils. IFS Donors – bilateral donor organisations, aid agencies, and national research councils – contribute to the IFS budget, which is around USD 5 million per year.

In order to fulfil its mandate, IFS targets its support on young researchers at the start of their careers. The core of IFS support is financial, in the form of research grants (maximum amount of USD 12,000 for each grant), which can be renewed twice. The major budget items covered by the grant are equipment, literature, and supplies. In some cases, local travel costs connected with the research project, as well as salaries of research assistants and technical personnel, can be covered.

IFS provides various opportunities for grantees to meet and interact with other scientists. Travel grants permit grantees to attend scientific meetings or visit other research institutes or universities for training or collaboration. IFS organises its own workshops as well: to date, some 90 meetings relating to the IFS programme have been held. IFS is also active in promoting and stimulating scientific networks at a regional or international level. IFS has an award scheme that gives recognition to

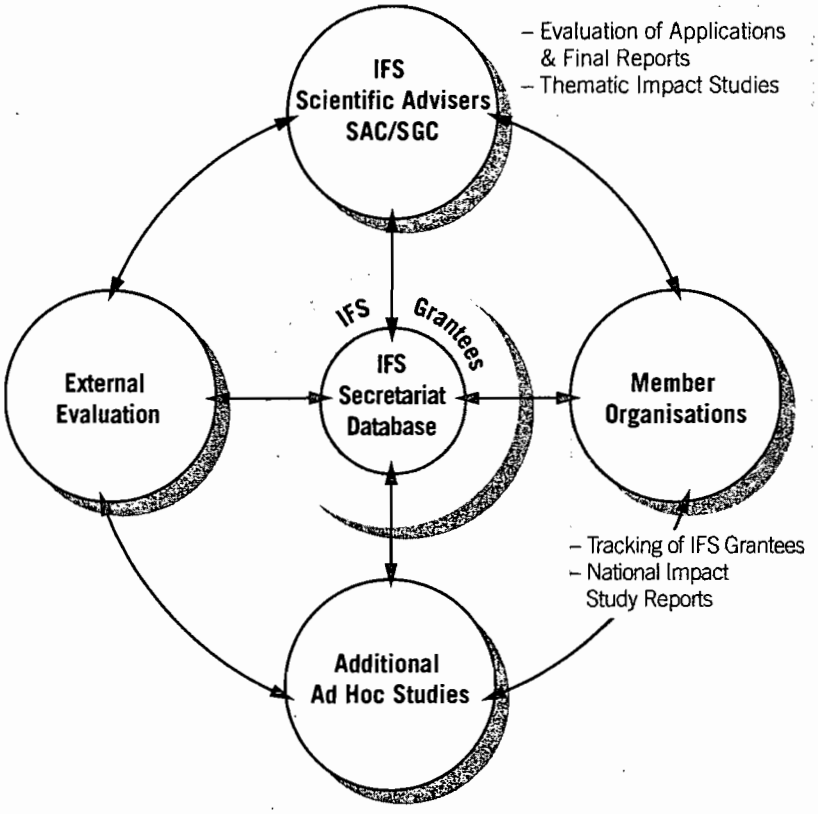

Figure 1: MESIA

grantees for noteworthy achievements associated with research projects supported by IFS. All of these efforts are intended to enhance grantees' credibility as scientists and to enable them to become established and recognised in national and international scientific circles.

The grant programme includes the following research areas: Aquatic Resources, Animal Production, Crop Science, Forestry/Agro-forestry, Food Science, and Natural Products. The central strength of IFS must be attributed to the commitment of some 1,000 Scientific Advisers from all over the world, experts in their fields, who contribute their time to advise the Secretariat and to scrutinise the qualifications of the applicants and the scientific merit and feasibility of their proposals.

To better monitor and evaluate the impact of IFS work, a Monitoring and Evaluation System for Impact Assessment (MESIA) is being established. The main objectives are to determine how IFS support has influenced the academic and institutional careers of its grantees as well as to assess their scientific achievements (Gaillard, 2000).

It is a system centred around the IFS database that MESIA will use and enrich (see Fig. 1). To that end, the IFS database is being currently upgraded and updated. MESIA is a very interdependent system in which not only the IFS staff, grantees, and Scientific Advisers take part, but also the IFS Member Organisations.

MESIA will also be a useful reference tool for forthcoming external evaluations and for other studies related to research capacity building and science development in the developing world. The ultimate goal is to establish MESIA as a permanent system.

The changing context

Recent trends and challenges are already affecting and will continue to affect research aid policies and programmes. They will impact on the mode of work and the future of organisations such as IFS and other like-minded organisations. Some of the main challenges are outlined below. The list is by no means exhaustive. Other important issues (e.g. intellectual property rights, gender issues, circulation of scientists, safety and ethics) are currently being discussed at IFS. They also require more thought and discussion.

Growing disparities

The gulf between industrial and emerging countries (mainly in Asia and Latin America) on the one hand, and the least-developed countries (mainly in Africa) on the other, is growing. These growing disparities have already affected the eligibility of countries in Latin America (scientists from Argentina and Uruguay are today no longer eligible for an IFS grant) and call for different strategies and probably a special programme for Africa.

The emergence of national grants schemes

An increasing number of developing countries have established or are establishing competitive research grants schemes at the national level (Brazil, Cameroon, Egypt, India, Mexico, Morocco, Tanzania, Thailand, etc., to name just a few). This is a very positive move for science development in these countries, which may have a direct impact on the number of potential applicants for an IFS grant. In Thailand, for instance, the number of applicants for IFS grants has been reduced to almost nothing over the last 5–10 years because of the establishment of four such schemes. I will come back to this issue in the conclusion.

Changing professional values

Until recently, scientific knowledge was considered a universally 0available commodity. It is increasingly being turned into a private asset that is not so readily shared. Professional values such as sharing results with one's peers, or seeking academic notoriety, rather than personal economic gain, or also being increasingly replaced by more market-oriented values. In the near future, this may affect the potential role of IFS as a matchmaker and an information-provider. It may also affect the willingness of the new generation of reputable scientists to volunteer as IFS Scientific Advisers.

Shrinking public budgets

The post-Cold War period, marked by the elimination of political blocks, has created a context for a unified, global economy, with the role of the State fading and public budgets shrinking (there are notable exceptions such as Sida-SAREC which had doubled its budget by the end of the 1990s). This has direct implications for many research aid organisations and granting programmes (including IFS), as they compete for the same funding. It also has implications for countries in the South (and particularly in Africa), where the State is no longer in a position to recruit young researchers. As a result, in many African countries, no recruitment has taken place over the last five to ten years, and the population of scientists is rapidly ageing.

Shifting employment conditions and status

Academic and research institutions in the South are increasingly losing their scientists to private institutions (including private universities), NGOs and research consultancies as a result of the ever-shrinking public budgets. Some of these scientists are establishing their own consultancy firms while keeping their position in national public universities and research institutes, while others are struggling to continue working on research in their home countries and are physically present without being formally employed. This has already called for a revision or a more flexible interpretation of the IFS criteria for eligibility related to employment conditions.

Growing complexity of the scientific enterprise

Given the growing complexity of the problems, scientists increasingly need to work in multi-disciplinary groups and new disciplines are increasingly emerging at the frontier of former disciplines, such as bio-mathematics and computer sciences, environmental economics, etc. Clearly, before getting involved in a multi-disciplinary group, a young scientist needs to have solid training in a specific discipline. But he or she should also be encouraged at the beginning of his/her career to be open to other disciplines and to work in groups. Without changing its basic approach of supporting individual scientists, IFS needs to establish new incentives for encouraging potential applicants and grantees to engage themselves more in multi-disciplinary research groups. This could be achieved by concentrating IFS support on young scientists working in institutions in which a critical mass can ensure such collaboration and by very slightly changing the IFS recruitment, selection, and monitoring processes.

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IFS and Europe

On the "research aid for development" scene, the European Commission and its member countries have become key players. At the same time, the identity of IFS has never been more European than it is today. When the European Commission discusses the possible creation of a European Foundation for Research for Development (Bezanson and Oldham, 2000), IFS should consider involving itself in the enterprise. Assuming that a rather flexible model with a high degree of autonomy from existing European institutions can be established, I believe that the opportunities (such as greater financial sustainability, increased networking, opening the granting programme to new areas) clearly outweigh the potential threats.

Research capacity building: Issues and prospects

Partly based on the first national impact studies initiated in Tanzania, Cameroon, and Mexico in 1999, the questionnaire survey in Africa, as well as on the first 80 interviews conducted in the framework of MESIA, I will discuss below some preliminary results and some of the main issues which should be considered and taken into account in order to strengthen research capacity

Table 1: Foreign institutions funding research at Sokoine University in Tanzania

AAS	African Academy of Science
AFRNET	African Feed Resources Network
BADC	Belgian Agency for Development Cooperation
DFID	Department for International Development of UK
CASEC	Community Aid Small Enterprises Consultancy
CIAT	Centro Internacional de Agricultura Tropical
CIDA	Canadian International Development Agency
DAAD	German Academic Exchange Service
CIFOR	Centre for International Forestry Research
CSID	Centre for Sustainable Development
CSIRO	Commonwealth Scientific Industrial and Research Organisation of Australia
DANIDA	Danish International Development Agency
ELCT	Evangelical Lutheran Church of Tanzania
ECEP	Environmental Capacity Enhancement Project
ENRECA	Enhancement of Research Capacity in Developing Countries
EU	European Union
EARMESA	Farm Level Applied Research Methods for East and Southern Africa
FAO	Food and Agricultural Organization of the United Nations
FFACI	French Food Aid Counterpart Fund (French Embassy, DSM)
FINNIDA	Finnish Development Agency
GTZ	German Technical Cooperation
IAEA	International Atomic Energy Agency
IAEA	International Agricultural Engineering Association
IBSRAM	International Board for Soil Research and Management
ICRAF	International Research Centre for Agroforestry
ICRISAT	International Crop Research Institute for Semi-arid Tropics
IDRC	International Development Research Centre
IFS	International Foundation for Science
IFUW	International Federation of University Women
ILRI	International Livestock Research Centre
INR	Institute of Natural Resources
JICA	Japanese International Cooperation Agency
NORAD	Norwegian Agency for Development Cooperation
NRS	Norwegian Research Council
NORAGRIC	Norwegian Centre for International Agric. Development
NUFU	Norwegian Council of Universities for Development, Research and Education
NIRP	Netherlands Israel Research Development Programme
OSSREA	Organization for Social Science Research in Eastern Africa
REPOA	Research on Poverty Alleviation
SACCAR	South African Countries Centre for Agricultural Research
SADC	Southern African Development Cooperation
SASAKAWA	SASAKAWA Global 2000
SIDA	Swedish International Development Agency
UNDP	United Nations Development Programme
USAID	United States of America Agency for International Development
USDA	United States Department of Agriculture
VLIR	Flemish Inter University Council
WFP	World Food Programme

building activities in developing and transition countries. Here again, the list is by no means exhaustive.

A multiplicity of actors

While IFS occupies a very specific niche (support for individual and young scientists), it is not unique on the scene of institutions contributing to scientific capacity strengthening in the developing world. As a result, it is sometimes difficult to distinguish IFS's impact from that of other organisations.

At Sokoine University of Agriculture (SUA) in Tanzania, I found no fewer than 48 different funding sources (Tab. 1). IFS was one of them, others included NORAD, Danida, Flemish Institutions, etc. Based on a questionnaire received from IFS grantees in Africa, more than 300 different funding sources over the last 25 years in Africa were identified. Very often, the support received from other institutions came after the IFS support or during the second or third granting period, but in a good number of cases it came before IFS support.

As mentioned earlier, an increasing emergence of national research grant schemes has recently also been observed in many developing countries. This should be acknowledged as rather good news. In Tanzania, I came across four such grant schemes co-funded respectively by Danida, Sida-SAREC, the World Bank, and the Swiss Development Cooperation Agency. In Cameroon, one scheme is being developed at the University of Yaoundé, with funding from the Ministries of Higher Education and Research. CONACYT, IFS's Member Organisation in Mexico, administrates several such schemes including a recent one targeted at individual young Mexican scientists at the beginning of their career. It is a one-time grant amounting to USD 100,000. One big difference between Tanzania and Mexico is that in Mexico 100% of the funding for these schemes comes from the federal State.

In this context, the role of IFS needs to be revisited, and new forms of partnerships need to be developed when appropriate.

Do growing disparities call for differentiated strategies?

If we were to continue the comparison between Mexico and Tanzania, we would no doubt conclude (even if Mexico could certainly do much more to support its research activities) that we are in a situation of growing divergence rather than convergence. The widening of the knowledge generation gap between South and North and between the countries of the South is no doubt greater today than 10 or 15 years ago. With the creation of a number of first class centres of excellence in a number of countries, of which Mexico is a good example, there are also clearly growing disparities between national research institutions in a given country.

How should IFS deal with these growing disparities? Should IFS stick to a unified strategy to address all eligible countries or should it look for different strategies? I would advocate that a particular and different effort be made to support countries where science is less developed, the majority of which are to be found in Africa.

Concentration vs. dispersion: critical mass?

These disparities reinforce the notion that science is increasingly a highly concentrated activity. This is true world-wide, as a handful of countries is responsible for more than 80% of the world scientific outputs. This is also true within the developing world. Just two countries in Africa, South Africa and Egypt, produce more than half of the total mainstream scientific production of the continent as a whole; even so, Egypt's production is far less than the scientific production of one faculty at Harvard University.

Similarly, IFS grantees are concentrated in a limited number of countries. With regard to institutions, nearly 20% of the total number of grantees are to be found in the top 19 recipient institutions with more than 20 grantees (Tab. 2). Conversely, there is a relatively large number of institutions with only one or two grantees. In Mexico, for example, IFS grantees are both concentrated in two cities and dispersed in some 33 others. Mexico City and Merida (in the state of

Table 2: Top recipient institutions, 1974–1999

Institution	No. of Grantees
Institut Agronomique et Vétérinaire Hassan II, Morocco	71
Universidad de la República, Uruguay	39
Academia Sinica, China	33
Huazhong Agricultural University, China	31
Universidad de Buenos Aires, Argentina	31
University of Peradeniya, Sri Lanka	30
Université Cadi Ayyad, Morocco	27
University of Nairobi, Kenya	27
Universidad Autónoma de Yucatán, Mexico	26
Zhejiang Agricultural University, China	23
University of Ibadan, Nigeria	23
Bangladesh Agricultural University, Bangladesh	23
Chinese Academy of Agricultural Sciences, China	22
Université de Yaoundé 1, Cameroon	22
Universidad Nacional Autónoma de Mexico, Mexico	21
Obafemi Awolowo University, Nigeria	21
Universidad de Chile, Santiago, Chile	20
Addis Ababa University, Ethiopia	20
University of Agriculture (UPM), Malaysia	20

Yucatan) concentrate close to half of the grantees and at the other extreme, there are 17 cities, like Chihuahua, Tapachula and Torreon, with only one grantee each.

All of us could find good reasons to justify concentration on the one hand and dispersion on the other. One argument would be to say that dispersion and isolation are not a problem if we can assume that linkages and networking activities are in place.

Linkages and networking vs. research grants

Three facts came out very strongly during the interviews conducted with IFS grantees:

- An IFS research grant is much more than USD 10,000 or 12,000;
- The IFS grant brings recognition nationally and internationally and opens new avenues and contacts; and
- The turning point of a grantee's career has often been participation in a workshop or a scientific meeting, or a meeting with a senior scientist, which in turn opens new networks of contacts.

What, then, is the proper balance between research grants and other kinds of support, such as networking activities? While the two are clearly interlinked, networking activities should be increased, and more former IFS grantees should be involved in those activities.

Capacity building vs. problem-solving

The question of whether to opt for problem-solving or capacity building has divided the donor community for many years. Today, most donors supporting research for development seem to agree that research in the broad sense is a key to development, or to use the current modern wording: "Capacity building for knowledge generation is a key to development." That may seem trivial, but it is a real shift in development thinking.

Figure 2 illustrates that the way from knowledge generation to knowledge application and development is a complex one and goes through a number of non-linear steps, including acquisition, assimilation, creation, innovation, dissemination, adaptation, and use of knowledge. Within this overall framework, IFS has decided to focus

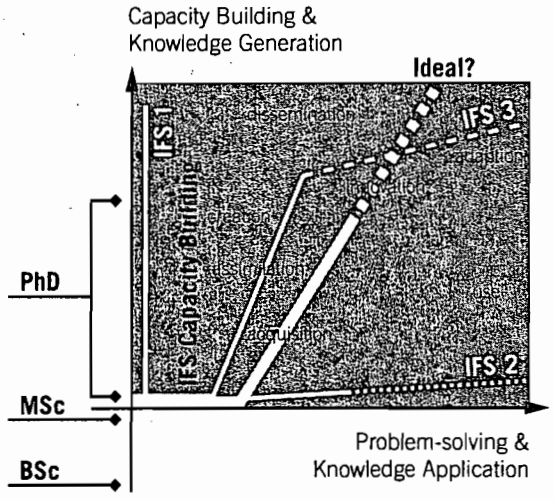

Figure 2: Problem-solving through capacity building?

its mandate on research capacity building and strengthening of young scientists, and, as all organisations do, has made the assumption that the remaining functions or activities will be taken care of by others.

Given this framework, a simplified theoretical typology of IFS grantees and projects using three types is proposed. Additional types would of course be needed to reflect the complexity of the reality, but let us start with these three. The typology is also simplified since it takes only rather successful examples into account. A more complete typology would also need to consider failures.

The first type, IFS 1, is a typical case of the grantee starting with a challenging, universal research question. The project went rather far into knowledge generation; the grantee's scientific capacity and academic rewards increased significantly; additional scientists around the grantee were also trained; and high quality research results were produced and published in reputable international journals, thus contributing to the international accumulation of knowledge. Yet, the results were not of an applied nature and ultimately not implemented.

In the second type, IFS 2, at the other extreme, the grantee (often with more limited scientific training and experience) started by tackling a very practical question. The grantee's scientific capacity increased very little; no publication or very few publications (often published in local journals) came out of the project; and results obtained were of a very practical nature and were eventually, but not necessarily, applied.

In the last and third type, IFS 3, the grantee took great care to study the local conditions and the socio-economic environment before defining the research project for his or her application. Potential users were sometimes identified from the beginning. The project went quite far into knowledge generation; the grantee's scientific capacity and academic reward were increased; additional scientists around the grantee were trained; and high quality research results were produced and published in reputable international journals, thus contributing to the international accumulation of knowledge. The results were ultimately implemented and had an impact on development. It is hard to say how many grantees are of this calibre, but one of them is Prof. Keto Mshigeni, whose research project on seaweed supported by IFS laid down the basis for Tanzania's seaweed farming industry, which has now provided employment opportunities to over 40,000 villagers (mainly in Zanzibar). In this particular case, the partnership between NORAD, IFS, USAID, the Rockefeller Foundation, the United Nations University, UNDP and a number of commercial enterprises in Tanzania and the Philippines, all of which were orchestrated by Prof. Mshigeni, turned out to be exemplary.

These three types partly reflect the diversity of situations in the IFS grantees' population. Should we keep this diversity or should we try to look for an ideal type with a more systemic approach? To phrase it differently, should the IFS mandate be limited to "scientific capacity building" or should it be redefined as "problem-solving through capacity building"?

To illustrate such a type, I suggest one possible ideal type (Fig. 2), but there are others. In the proposed type, a new set of guidelines and probably improved evaluation procedures should be designed to ensure that the applicant and future potential grantee takes into account the local conditions and the socio-economic environment before defining his or her research project.

Mechanisms and linkages should also be established to facilitate the interface between the grantee and the rest of the donor community as well as the local socio-economic actors and the overall national knowledge system at an appropriate time in the development of the project. This may not be needed in all cases but may improve the chances of the research results contributing to successful socio-economic developments. To achieve this aim, a pilot project could also be launched.

Concluding remarks: Strengthening partnership programmes in the field of research capacity makes sense

IFS has already proved to be a valuable partner in the international science and development aid communities in different ways, including the coordination of specialised or targeted programmes. Recent examples are a completed programme on the repair and maintenance of scientific equipment and another programme on dry-land forestry research. More recently, cost-sharing partnership programmes have been implemented between IFS and partner organisations such as the United Nations University (UNU), the Organisation for the Prevention of Chemical Weapons (OPCW), and the Organisation of Islamic Conference Standing Committee on Scientific Technological Cooperation (COMSTECH). For each of them, IFS has matched its funds to those committed by the partners to support young scientists in specialised research areas or in a targeted group of countries. These partnership programmes have so far proved to be very successful and cost-effective, and there is certainly scope for added opportunities.

In particular, I firmly believe that IFS ought to look for new partnership associations with the emerging national grant schemes in developing and transition countries. In addition to transferring its accumulated knowledge to these schemes during their learning process, IFS could find new ways of cost-sharing and of division of responsibility for the benefit of an increased number of young scientists in the developing world.

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