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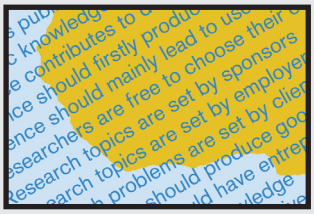

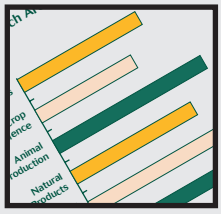

Questionnaire Survey of African Scientists

IFS Grantees and INCO Beneficiaries

Jacques Gaillard
Anna Furó Tullberg

in collaboration with
Eren Zink
Brian Porter
Henrik Hovmöller

IFS

The International Foundation for Science, IFS, is an international, non-governmental organization, founded in 1972. The mandate of IFS is to assist in building capacity in developing countries in sciences related to the management, conservation, and sustainable use of natural resources.

The strategy to achieve this objective is to identify young, talented scientists who have the potential for becoming the future research leaders and lead scientists in their nations, and to effectively support them in their early careers.

The primary form of support, and the entry point to the "IFS system", is the small grant awarded in international competition. Once a grantee, the scientist can be supported in many other ways - invited to workshops, purchasing services, travel grants, training, scientific contacts, participation in networks, publishing reports, etc.

To date, more than 3,000 scientists in Africa, Asia and the Pacific, and Latin America and the Caribbean have been supported by IFS.

INCO-DEV

Formerly named Science and Technology for Development (STD), the Research for Development programme within the International Co-operation programme (INCO-DEV) is a programme of the European Union (EU) aimed at supporting scientific collaboration between organizations in EU countries and in developing countries.

In most cases, only a consortium of organizations can apply. The programme is designed to foster, strengthen, broaden and deepen scientific linkages between organizations in the EU and developing countries.

The smallest acceptable consortium must involve at least two European organizations and two organizations from developing countries. Because the EU is interested in supporting regional development, the consortium must have at least two organizations from the same developing country region.

The co-operation takes place exclusively within areas defined by a dialogue between the EU and developing countries. These areas must be relevant for the development of the developing countries. The co-operation involves common activities in a balanced partnership.

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May, 2001

This Questionnaire Survey was conducted by IFS with the additional support of the French Institut de Recherche pour le Développement (IRD), the European Commission (DG RTD) and the French Ministry of Foreign Affairs (MAE).

Contents

Contents (cont.)

Preface

The mission of IFS is to strengthen scientific capacity in developing countries through the support of young scientists at the beginning of their careers. Research grants are awarded for projects to be carried out in a developing country in the areas of the sustainable use of biological natural resources.

Besides the research grant, IFS supports its grantee with a range of important services, including help in purchasing laboratory equipment and expendable supplies and access to literature databases. Travel grants provide opportunities for grantees to attend scientific meetings or to visit other research institutes or universities for training or collaboration. IFS organises training courses in developing countries to help potential applicants prepare a research grant application or write a scientific paper. All aspects of IFS support are intended to increase the chances for young scientists to become lead scientists and science leaders both in their home countries and internationally.

IFS aims at long-term relationships with its grantees, which today number more than 3,000 in some 90 developing countries. Through the IFS database we try to keep track of the scientific careers of our grantees. The database is also a vital tool for the success of the IFS Monitoring and Evaluation System for Impact Assessment (MESIA), which is currently being developed to become a permanent component of the IFS.

Within MESIA, information has been collected through a questionnaire sent to more than 1,000 IFS grantees as well as almost 700 beneficiaries of the INCO-DEV programme of the European Comission (EC). These scientists were all located in Africa, but IFS grantees in Latin America and Asia will also receive a similar questionnaire.

The results from this study provide important insights into the perceived needs and constraints experienced by young scientists in developing countries. These, in turn, will help IFS to better define its priorities and adapt its programme as well as its *modus operandi* in order to provide the best possible support to its grantees.

While this report has a special relevance for IFS, the information gathered and conclusions drawn are bound to appeal to a much wider audience. I hope that it will be read and provide inspiration for everyone who is involved in scientific capacity building in the developing world.

The co-operation of the IFS grantees and INCO-DEV beneficiaries in answering the questionnaire is gratefully acknowledged. The first author of the report, Dr Jacques Gaillard, IFS Deputy Director with special responsibility for International Affairs, has extensive knowledge of African science institutions and scientists and a solid grasp of how development aid can help promote research and capacity building. His insights were crucial for the establishment and early development phase of MESIA. In addition to Anna Furó Tullberg, Eren Zink and Henrik Hovmöller have very ably assisted the MESIA questionnaire project. Their contributions are also gratefully acknowledged.

Finally, we would like to express special appreciation to the French Institut de Recherche pour le Développpment (IRD) for the secondment of Jacques Gaillard to the IFS Secretariat. We are also grateful to the EC through DG Research and the French Ministry of Foreign Affairs for their financial support.

Stockholm, March 2001
Thomas Rosswall
IFS Director

Summary

1. This report "Questionnaire Survey of African Scientists" is a component of the Monitoring and Evaluation System for Impact Assessment (MESIA) being established at the IFS Secretariat to assess the impact of IFS activities on the achievements and career development of the IFS grantees. It is also part of a Research Project on the assessment and prospects of Science in Africa co-funded by the European Commission (DG RTD), the French Institut de Recherche pour le Développement (IRD), and the French Ministry of Foreign Affairs.

2. The questionnaire was sent in March 2000 and a reminder in June 2000 to IFS grantees in Africa and African beneficiaries of the STD3 and INCO-DEV1 programmes (referred to as INCO beneficiaries in the rest of the text) of the European Commission. The two funding bodies cover partly overlapping scientific areas: IFS gives grants to scientists working in the areas of biological, agricultural and environmental sciences, while beneficiaries of the INCO programme are active in the areas of agricultural, environmental and medical sciences.

3. Altogether, 702 questionnaires were returned to IFS. Half of the IFS grantees (49.8%) and close to one-third of the INCO beneficiaries (30.4%) answered the questionnaire. The overall response rate was 41.8%. Taking into account, the size of the questionnaire, the time frame of the survey (IFS grantees were awarded their first grants more than 25 years ago), postal delivery shortcomings, and the fact that many countries on the African continent over the recent past have gone through various forms of conflict or natural disaster situations (in particular Burundi, Congo and Congo DR, Côte d'Ivoire, Mozambique, Rwanda and Sierra Leone), the overall response rate, particularly for the population of IFS grantees, can be considered satisfactory.

4. Given the above target groups, the population surveyed is active in the most widely represented research areas in Africa today: biological, agricultural, environmental and medical sciences. Mathematics, physics, social and engineering sciences are not, therefore, represented in the survey. Most of the African countries were part of the survey. However, the two major science producers in Africa, namely South Africa and Egypt, are under-represented, and the scientifically middle or small-sized countries in terms of scientific production are over-represented.

5. Many characteristics of the population surveyed are representative of the African scientific community today, as observed in the different country case studies: 83.2% are male, 75.3% are more than 40 years of age, 90.4% are married, and more than two-thirds have between one and three children. The spouses of African scientists are overwhelmingly skilled workers (researchers, university lecturers and schoolteachers accounting for about one-fourth of the total). Few are housewives. Given the grossly inadequate salaries obtained by the scientists, employment is a must for both parents.

6. In 1999, the majority of IFS grantees and INCO beneficiaries held a PhD (78.0%), 19.2% held an MSc degree, and 2.7% a BSc. Most of the PhD-holders worked at public universities, while most of the MSc-holders worked at public research institutes. Based on the different degrees held by the respondents, the African continent is nearly self-sufficient for BSc education (83.5% of the BSc degrees were awarded in an African country), but less so for MSc education (55.7%), and even less so for PhD studies (39.5%). European countries (in particular France and the United Kingdom) were the preferred countries for higher education, rather than the USA or Canada. Dependency for higher education is, however, decreasing over time, particularly for BSc studies, while the tendency is more mixed for MSc and PhD studies. There are also big differences between the different regions in Africa: the Republic of South Africa shows a very clear tendency towards self-sufficiency over time for all three levels of education, whereas Northern Africa

displays increases in self-sufficiency for BSc and MSc studies, but not PhD studies, and the rest of Africa (which is by no means a homogeneous region) is increasing its self-sufficiency for all levels of higher education, but starting from a much lower level than the other regions.

7. Over 90% of the scientists surveyed work at public universities (60.0%) and public research institutes (32.7%). Relatively few work for NGOs (4.2%), private institutes (1.9%), or private universities (1.2%). The three latter categories are likely to increase in the future. Whereas the scientists are largely satisfied with the job security, they are largely dissatisfied with their salaries and the social benefits. Although they earn on average nine times the minimum salary, they cannot live on this alone. Half of them supplement their incomes with extra jobs, which provide on average four times more income than their salary. To supplement their incomes, they are employed by a consultancy or private business (37.0%), teaching (25.0%), having their own consultancy or private business (20.0%), or farming (13.0%).

8. One-fifth of the respondents (20.4%) have been offered jobs abroad since the beginning of their career. INCO beneficiaries are more likely to be in such a situation (50.0%) than IFS grantees (9.5%). The difference is mainly due to the medical professions for which international mobility is greater. A large majority of the scientists (72.3% for IFS and 60.3% for INCO) who were offered a job abroad accepted it. More than half of the offers came from the USA and European countries (mainly France and the United Kingdom), but also from African countries (mainly Kenya, South Africa and Botswana). Findings from interviews with IFS grantees and MESIA country case studies (Tanzania and Cameroon), however, suggest that mobility should be perceived as circulation rather than exodus.

9. The vast majority of the scientists surveyed work with other scientists or in teams (93.2%). The proportion of IFS grantees working alone was only 8.3%. Given the fact that IFS targets its support to individual scientists, this result is partly unexpected and tends to indicate that team work is more the rule than the exception in Africa. Similarly, scientists work in multidisciplinary teams to a very large extent (85.4%).

10. The two most important statements characterizing the role of science and scientists in society for the African researchers are by order of importance: "science contributes to development" and "science knowledge is universal". This confirms the existing tension for the African scientists between addressing local questions relevant for the development of their societies and, at the same time, being part of mainstream science and recognized by the international scientific community. As for the choice of research topics, the fact that the statement "research topics are set by employers" is placed at the end of the list with the lowest score, strongly suggests that the research agenda is far from being driven by the African universities and research institutes.

11. Despite the rapid development of communication technologies in Africa, many African scientists interviewed during the last two years complained that they still suffer from isolation. At the time of the survey, slightly more than half of the respondents (53.0%) had access to the Internet and slightly less than half (46.9%) had easy access to bibliographic databases. On average, the respondents have attended around 20 scientific conferences since the beginning of their research careers. More than half of these conferences took place in the respondent's own country (55.6%), mainly with national and self-support; followed by conferences in the rest of Africa (20.1%), mainly with foreign support, and conferences in Europe (15.7%), also mainly with foreign support. Fewer conferences are reported in the USA (5.4%) and even fewer in the rest of the developing world: Asia (2.4%) and Latin America and the Caribbean (0.8%). Opportunities to attend conferences abroad over the last five years seem to be increasing (slightly more than one a year).

12. The main constraint holding back research work (for IFS and INCO together) is the lack of funds (25.2%), immediately followed by the non-availability of research equipment (18.6%, including the lack of basic research equipment, access to equipment, and equipment maintenance and repair). Then come poor library facilities (6.6%), lack of competent support staff (6.2%), low salaries/lack of incentives (4.0), heavy teaching and administration workloads (3.7%), and lack of transportation (2.8%).

13. More than half of the respondents (57.2% for IFS and 64.6% for INCO) reported that their research work was regularly evaluated. The most important criterion for the promotion of scientists is by far "publications in international journals". This is followed by "publications in local journals", "seniority", and "contribution to development".

The criteria considered as slightly less important are ″contribution to teaching″, ″strategic social relations″, ″contribution to the institution″, and ″award of research grants″.

14. Public research budgets in Africa have been cut to such an extent that, with a few exceptions, hardly any research activities can be undertaken without foreign aid. During 1999, INCO beneficiaries had access to higher budgets than IFS grantees. 15.1% of the IFS grantees had a research budget (excluding salaries) between USD 1,001-5,000 and one-third (33.3%) between USD 5,001-20,000. A large proportion of them (29.9% for the IFS and 24.0% for INCO) reported no research budget at all during 1999. The main component of research funding comes from international organizations (52.2%), followed by the home institution (20.2%), national public funds (13.1%), foreign industry and foreign private foundations (5.9%), and national industry and national private foundations (1.5%).

15. Altogether, more than 300 foreign research-funding sources were reported. The four main funding sources were, by order of decreasing importance: USAID, the European Union, the Coopération française and WHO. The best scores of satisfaction were obtained by the Rockefeller Foundation, the International Development Research Center (IDRC-Canada), as well as a number of organizations in the Nordic countries, including NORAD (Norway), Danida (Denmark), and Sida/SAREC (Sweden).

16. What if IFS or INCO support had not been available? There are no significant differences in the responses from IFS grantees and INCO beneficiaries. Half of the respondents reported that they would have been able to pursue their research work but ″on a reduced scale″, and 15.0% claim that they would have done it ″in a substantially different form″. This tends to suggest that IFS and INCO support was more enabling than decisive. However, approximately one fourth of the scientists (23.3% for IFS and 27.9% for INCO) answered that they would not have been able to pursue their research work at all without IFS or INCO support. Interestingly, the proportion of IFS grantees in the latter group has increased over time: 12.6% for the period 1974-1985 and 25.7% for the period 1986-1999, thereby suggesting that IFS support is even more important today than 20 years ago.

17. IFS or INCO support has had a catalytic effect on the ability of the recipients to obtain funding from additional sources. It has been easier for the recipients of both programmes to get additional funding from an international institution, but even more so for IFS grantees (49.5% for IFS and 35.7% for INCO), somewhat less from their home institution (36.7% for IFS and 17.0% for INCO), and even less from a national funding institution (22.8% for IFS and 17.0% for INCO). The individual reward (in the case of the IFS grant) seems to have carried more weight than team support (in the case of INCO) in order to obtain additional funding, particularly from foreign sources. Close to 60% of the respondents reported that it has become easier for them to obtain scientific and technical assistance from their home institution after receiving support from IFS or INCO.

18. Opportunities to collaborate with new partners were provided to most respondents thanks to the two support programmes (95.6% for INCO and 85.9% for IFS). This result is not unexpected for INCO, since partnership collaboration is central to its mandate. For IFS, while its support is targeted to individual scientists, it clearly shows that – through its extensive network of scientific advisers, grantees and other associated scientists – it also provided many opportunities for new partnerships. Participation at IFS organized workshops and other international conferences with IFS support was also reported in many interviews as unique opportunities to meet new partners. Most of the respondents (87.0%) also claimed that they continued to collaborate with the new partners once the IFS/INCO support was terminated.

19. In order to assess the IFS/INCO mode of work and support and to identify some of the main constraints of the working environments of the African scientists, they were asked to rate 13 activities from ″selection process″ to ″follow up activities once the supported project is terminated″. IFS gets significantly higher scores than INCO for its three most highly ranked activities, namely ″grant administration″, ″purchase of research equipment″, and ″contacts with staff″. In general, activities getting the lowest scores are related to scientific visibility and networking (″scientific counselling″, ″research training″, and ″networking activities″), ″maintenance of research equipment″, as well as ″follow-up activities″ and the ″assistance with publication of research results″.

20. Despite the different professional constraints presented in this report, the future career goal of African scientists is for 40% of them (43.0% for IFS

and 38.6% for INCO) a national scientific career. Paradoxically, there are many more IFS grantees among the younger generation (first grant awarded during 1986-99) who favour a national scientific career as compared to the older generation (first grant awarded during 1974-85). A career within national development programmes (30%) is the second most favoured career goal, followed by private business (12%). The other career opportunities, including administration, politics, foreign or international organizations or consultancy work in one's own firm are less attractive.

21. The main findings are discussed in the conclusion in light of the extent to which they may affect the IFS mode of work in Africa. A number of recommendations are made, such as the establishment of special sub-regional programmes for Africa, closer collaboration with national Member Organizations to better ensure national ownership, the strengthening of strategic alliances with other organizations working in Africa, the establishment of new reward systems, a strategy to improve communications, including connection to the Internet, as well as a number of programmes aimed at improving the quality of applications, scientific networking, maintenance of scientific equipment, and the publication of research results.

Résumé

1. Ce rapport intitulé: "Enquête sur les chercheurs africains" fait partie de l'Etude d'Impact (MESIA) sur les résultats et le déroulement des carrières des boursiers de la Fondation Internationale pour la Science (IFS). Il fait également partie d'un projet de recherche intitulé "Etat des Sciences en Afrique, Bilan et Perspectives", projet co-financé par la DG RTD de la Commission Européenne, l'Institut Français de Recherche pour le Développement (IRD) et le Ministère français des Affaires Etrangères.

2. Le questionnaire a été envoyé en mars 2000 (et un rappel a été fait en juin) aux boursiers africains de l'IFS ainsi qu'aux bénéficiaires africains des programmes de la Commission Européenne STD3 et INCO-DEV1 (désignés comme "INCO beneficiaries" dans le rapport et "bénéficiaires INCO" dans ce résumé). Les domaines de recherche couverts par les organismes IFS et INCO se chevauchent partiellement: l'IFS octroye des bourses en biologie, agriculture et sciences environnementales, alors que le programme INCO couvre l'agriculture, les sciences environnementales et les sciences médicales.

3. En tout, 702 personnes ont répondu à l'enquête: la moitié des boursiers de l'IFS (49,8%), et presque un tiers des bénéficiaires INCO (30,4%). Le taux de réponse global est de 41,8%. En tenant compte de la longueur du questionnaire (six pages), de la période couverte par l'enquête (les premiers boursiers de l'IFS ont reçu leur bourse il y a plus de 25 ans), du mauvais fonctionnement du système postal dans certains pays, et du fait que nombre de pays du continent africain ont connu dans le passé récent des situations de conflit ou de catastrophe naturelle (en particulier le Burundi, le Congo, la République Démocratique du Congo, la Côte d'Ivoire, le Mozambique, le Rwanda et Sierra Leone), le taux de réponse global peut être considéré satisfaisant, en particulier pour les boursiers de l'IFS.

4. En raison des spécificités de l'échantillon, l'étude a touché une population de scientifiques actifs dans les domaines de recherche les plus répandus aujourd'hui en Afrique: les sciences biologiques, agricoles, environnementales et médicales. En contrepartie, elle exclut les sciences mathématiques et physiques, les sciences sociales et celles de l'ingénieur. La plupart des pays africains sont représentés. On constate toutefois une sous-représentation des deux plus importants producteurs scientifiques du continent: l'Afrique du Sud et l'Egypte, et une sur-représentation des pays ayant une production scientifique moyenne voire modeste.

5. Les caractéristiques de la population observée sont, pour la plupart, représentatives de la communauté scientifique africaine d'aujourd'hui, telle qu'elle ressort des différentes études de cas (par pays). C'est une population composée à 83,2% d'hommes, 75,3% ont plus de 40 ans, 90,4% sont mariés et les deux tiers ont entre un et trois enfants. La plupart des conjoints sont des professionnels qualifiés (un quart d'entre eux sont chercheurs ou enseignants) et peu sont au foyer. Cela peut s'expliquer par l'excessive modicité des revenus des chercheurs qui rend le travail des deux parents indispensable.

6. En 1999, la majorité des boursiers IFS et des bénéficiaires INCO étaient détenteurs d'un doctorat (78,0%), 19,2% étaient titulaires d'une maîtrise (ou équivalent), et 2,7% seulement avaient une licence (ou équivalent). Les détenteurs de doctorat travaillaient le plus souvent dans des universités publiques, alors que les titulaires de maîtrise étaient pour la plupart affiliés à des instituts de recherche publics. D'après les diplômes détenus par les bénéficiaires des deux programmes, le continent africain est presque auto-suffisant en matière d'éducation supérieure de niveau de licence (83,5% des licences ont été décernées par un pays africain), mais il l'est moins pour les maîtrises (55,7%), et encore moins pour les doctorats (39,5%). Les pays étrangers de prédilection pour l'obtention d'un diplôme supérieur sont européens (France et Royaume-Uni surtout) plutôt que nord-américains

(Etats-Unis et Canada). La dépendance africaine en matière d'éducation supérieure s'amenuise cependant avec le temps, en particulier pour les licences, alors que les tendances sont plus mitigées pour les maîtrises et les doctorats. Il y a aussi de grandes différences entre les différentes régions d'Afrique: la République d'Afrique du Sud montre une tendance très claire dans le temps vers l'auto-suffisance pour les trois différents niveaux d'éducation supérieure, alors que l'Afrique du Nord montre une tendance vers l'auto-suffisance pour les niveaux de licence et de maîtrise, mais pas pour le doctorat, et le reste de l'Afrique (qui n'est bien évidemment pas une région homogène) démontre des tendances vers l'auto-suffisance, mais partant d'un point de départ beaucoup plus faible que les autres régions.

7. Plus de 90% des chercheurs travaillent dans des universités publiques (60,0%), ou des instituts publics (32,7%). En conséquence, ils sont peu nombreux à travailler dans le secteur privé: ONG (4,2%), instituts privés (1,9%) et universités privées (1,2%). Il y a toutefois de fortes probabilités pour, qu'à l'avenir, ces derniers pourcentages s'accroissent. Les scientifiques manifestent une forte satisfaction au regard de la sécurité de leur emploi, mais ils sont particulièrement insatisfaits de leurs salaires et des bénéfices sociaux qui sont attachés à leur travail. Bien qu'ils gagnent en moyenne neuf fois le salaire minimum, leurs traitements ne sont pas suffisants pour les faire vivre et la moitié d'entre eux augmentent leurs revenus par des activités complémentaires qui leur procurent en moyenne quatre fois leur salaire initial. Parmi ces activités, les principales sont: activité de consultation ou travail en entreprise privée (37,0%), enseignement (25,0%), cabinet de consultation ou entreprise personnelle (20,0%), agriculture (13,0%).

8. Un cinquième des personnes interrogées (20,4%) se sont vus offrir un travail à l'étranger depuis le début de leur carrière. Ceci a été plus fréquent pour les bénéficiaires INCO (50,0%) que pour les boursiers de l'IFS (9,5%). La principale raison en est la plus forte représentation, dans le premier groupe, des professions médicales dont la mobilité internationale est plus élevée. La grande majorité des personnes concernées par ces offres à l'étranger les ont acceptées (72,3% des boursiers de l'IFS et 60,3% des bénéficiaires INCO). Plus de la moitié des propositions de travail venait des Etats-Unis et des pays européens (principalement la France et le Royaume-Uni), mais aussi d'autres pays africains (principalement le Kenya, l'Afrique du Sud et le Botswana). Les résultats provenant des interviews conduits auprès des boursiers et les études de cas menées dans le cadre de MESIA (Tanzanie et Cameroun) suggèrent toutefois que cette mobilité est davantage une circulation qu'un exode.

9. La grande majorité des chercheurs interrogés travaillent avec des collègues ou au sein d'une équipe (93,2%). La proportion des boursiers de l'IFS travaillant seuls est de 8,3%. Sachant que la Fondation cible son aide sur les individus, ce résultat est assez inattendu et indiquerait que le travail d'équipe est plus souvent la règle que l'exception en Afrique. De même, les chercheurs travaillent dans de très fortes proportions au sein d'équipes multidisciplinaires (85,4%).

10. Les rubriques proposées par le questionnaire qui reçoivent le plus d'adhésion de la part des chercheurs africains pour caractériser la science et les scientifiques sont, par ordre d'importance: "la science contribue au développement" et "la connaissance scientifique est universelle". Cela confirme l'ambivalence que les scientifiques africains ressentent entre d'une part, pratiquer la science pour répondre aux questions locales relatives au développement de leur pays et d'autre part, faire partie de la science "mainstream" et être reconnus par leurs pairs au niveau international. De même, concernant le choix des thèmes de recherche, on observe que la rubrique proposée "les thèmes de recherche sont établis par les employeurs" reçoit le plus petit nombre d'acquiescements de la part des chercheurs interrogés. Cela suggère fortement que les priorités de recherche sont loin d'être définies par les universités et les instituts africains.

11. Malgré un développement rapide des technologies de la communication en Afrique, de nombreux chercheurs interviewés se disent toujours isolés. Lors de l'enquête, un peu plus de la moitié des personnes interrogées (53,0%) avaient accès à l'Internet et un peu moins de la moitié (46,9%) avaient accès à des bases de données bibliographiques. Le nombre moyen de conférences scientifiques auxquelles les chercheurs ont assisté depuis le début de leur carrière s'élève à 20. Plus de la moitié de celles-ci se sont déroulées dans le pays de résidence des scientifiques interrogés (55,6%), un cinquième a eu lieu dans un autre pays africain (20,1%) et 15,7% se sont tenues en Europe. L'assistance à ces réunions a été financée sur des fonds nationaux ou sur fonds propres pour les conférences qui se sont déroulées dans les pays de résidence, et grâce à des financements étrangers lorsque les conférences se

sont tenues à l'étranger. Peu de conférences ont eu lieu aux Etats-Unis (5,4%) et encore moins dans les autres pays en développement: Asie (2,4%), Amérique Latine et Caraïbes (0,8%). Depuis les cinq dernières années, la participation aux conférences semble s'accroître (un peu plus d'une par an).

12. Les contraintes les plus restrictives pour l'avancement du travail de recherche (pour IFS et INCO ensemble) sont d'abord le manque de fonds (25,2%), suivi directement par les difficultés relatives aux équipements de recherche (18,6%, comprenant le manque d'équipements de base, l'accès difficile aux équipements et les problèmes de maintenance et de réparation). Ensuite apparaissent par ordre décroissant: l'accès limité à la littérature scientifique (6,6%), la pénurie de techniciens compétents (6,2%), des salaires insuffisants et l'absence de motivations (4,0%), une part trop importante d'enseignement et d'administration (3,7%) et, en dernier, la rareté des moyens de transport (2,8%).

13. Plus de la moitié des personnes enquêtées (57,2% pour l'IFS et 64,4% pour INCO) ont signalé que leur travail de recherche était régulièrement évalué. Le critère le plus important pour la promotion scientifique est, de loin, "les publications dans les revues internationales", suivi des "publications dans les revues locales", puis de "l'ancienneté" et des "contributions au développement". D'autres critères comme la "contribution à l'enseignement", les "relations sociales stratégiques", la "contribution à l'institution" et "l'obtention de bourses de recherches" sont jugés comme étant relativement moins importants.

14. Les budgets de la recherche publique en Afrique ont été tellement réduits que, sauf exception, il est impossible d'entreprendre des activités de recherche sans aide étrangère. Pendant l'année 1999, les bénéficiaires INCO ont disposé d'un budget plus élevé que les boursiers IFS. Parmi ces derniers, 15,1% disposaient d'une somme (salaire exclu) se situant entre 1000 et 5000 USD et un tiers (33,3%) avaient de 5000 à 20 000 USD. Un nombre important d'entre eux (29,9% pour IFS et 24,0% pour INCO) indiquaient qu'ils n'avaient eu accès à aucun budget du tout pendant cette même année. La plus grande partie des financements de recherche provient des organisations internationales (52,2%). Viennent ensuite les institutions d'appartenance des chercheurs (20,2%), puis les fonds publics nationaux (13,1%); l'industrie étrangère et les fondations privées étrangères (5,9%) et enfin l'industrie nationale et les fondations privées nationales (1,5%).

15. Plus de 300 sources étrangères de financement ont été signalées. Quatre d'entre elles sont, de loin les plus importantes; ce sont par ordre décroissant: USAID, l'Union Européenne, la Coopération Française et l'OMS. Les meilleurs notes de satisfaction sont obtenues par la Fondation Rockefeller, le Centre de Recherche pour le Développement International (CRDI) canadien, ainsi que nombre d'organisations scandinaves dont NORAD (Norvège), Danida (Danemark) et Sida/SAREC (Suède).

16. Et s'ils n'avaient pu avoir accès au soutien de l'IFS et de INCO? Il n'y a pas de différence significative entre les réponses des deux populations sur ce plan. La moitié des personnes estiment qu'elles auraient pu continuer leur travail mais "à plus petite échelle" et 15,0% prétendent qu'elles l'auraient fait mais "de façon complètement différente". Cela suggérerait que le soutien de INCO ou de l'IFS est plus facilitant que décisif. Toutefois, presque un quart des chercheurs (23,3% pour l'IFS et 27,9% pour INCO) répondent qu'ils n'auraient été aucunement en mesure de poursuive leur recherche sans l'aide de ces deux organismes. Il est d'ailleurs intéressant de remarquer que, dans la population de l'IFS, la proportion de ces derniers s'accroît au fil des ans: ils étaient 12,6% durant la période 1974-1985 et 25,7% durant la période 1986-1999 à l'exprimer. Cela semble indiquer que l'aide de l'IFS est encore plus importante maintenant qu'il y a vingt ans.

17. L'aide de l'IFS ou de INCO a eu un effet catalyseur pour l'obtention d'autres financements. L'octroi des aides des deux organismes (avec une tendance plus forte en ce qui concerne l'IFS) a facilité l'accès des bénéficiaires d'abord à d'autres financements internationaux (49,5% pour IFS et 35,7% pour INCO), dans une moindre mesure aux financements de leur institution d'appartenance (36,7% pour IFS et 17,0% pour INCO) et dans une plus faible mesure encore aux autres financements nationaux (22,8% pour IFS et 17,0% pour INCO). Sur ce plan, et principalement en ce qui concerne l'accès aux financements internationaux, il semble que la reconnaissance individuelle apportée par la bourse IFS ait eu plus de poids que le soutien apporté aux équipes (le cas de INCO). Près de 60% des chercheurs indiquent qu'il leur a été plus facile d'obtenir que leur institution mette à leur disposition une assistance technique et scientifique après qu'ils ont obtenu le soutien de l'IFS ou de INCO.

18. Le fait d'être bénéficiaire de ces deux programmes a offert à la très grande majorité des chercheurs l'opportunité de collaborer avec de nouveaux partenaires (95,6% pour INCO et 85,9% pour IFS). Ce résultat est sans surprise pour INCO puisque la collaboration partenariale est au cœur de sa mission. Pour l'IFS, cela prouve que malgré une aide ciblée sur les individus, elle est aussi à l'origine (grâce à ses vastes réseaux de conseillers scientifiques, de boursiers et d'autres chercheurs associés) de nombreuses occasions de collaboration. La participation à des ateliers ou à d'autres conférences internationales organisés ou financés par la IFS a également été mentionnée, dans les interviews, comme une opportunité exceptionnelle pour rencontrer de nouveaux partenaires. La plupart des personnes qui ont répondu (87,0%) disent continuer ces collaborations une fois le soutien IFS/INCO terminé.

19. Afin d'évaluer la qualité des services de l'IFS et de INCO et afin d'identifier quelques-unes des contraintes les plus importantes de l'environnement de travail des scientifiques africains, il leur a été demandé de classer 13 activités des programmes allant du "processus de sélection" aux "activités de suivi après la fin du projet". L'IFS a obtenu des résultats sensiblement supérieurs dans neuf des 13 domaines avec des écarts significatifs dans les trois domaines d'activité où elle est considérée plus performante: "administration des bourses", "achat des équipements de recherche" et "contact avec le secrétariat". Les activités qui reçoivent les plus mauvais classements sont celles relatives à la visibilité scientifique et à la mise en réseau: "conseil scientifique", "formation à la recherche", "activités de réseau", "accès aux publications scientifiques", de même que "les activités de maintenance des équipements de recherche", "les activités de suivi", et "l'assistance à la publication des résultats de recherche".

20. Malgré les différentes contraintes professionnelles présentées dans ce rapport, les chercheurs africains se voient pour 40% d'entre eux (43,0% pour IFS et 38,6% pour INCO) continuer leur carrière dans la science nationale. Paradoxalement, les boursiers de l'IFS de la jeune génération (première bourse accordée entre 1986 et 1999) sont plus partisans d'une carrière nationale que ceux de la génération précédente (première bourse accordée entre 1974 et 1985). Le deuxième objectif professionnel énoncé est celui d'une carrière dans les programmes de développement national (30%), suivi par la création d'entreprise privée (12%). Les autres opportunités de carrière, dans l'administration, la politique, les activités de consultation pour les organisations étrangères ou internationales ou privées ne semble pas présenter un intérêt aussi important que les trois premiers.

21. La conclusion présente et discute les principaux résultats de l'enquête afin de déterminer dans quelle mesure ils peuvent influencer le mode d'intervention de l'IFS en Afrique. Elle effectue des recommandations qui proposent l'établissement de programmes spéciaux sub-régionaux. Elle préconise une plus grande collaboration avec les Organisations Membres locales afin de renforcer les engagements nationaux, une consolidation des alliances stratégiques avec les autres organisations travaillant en Afrique, la mise en place d'un nouveau système de récompenses, l'élaboration d'une stratégie pour améliorer la communication et les connexions avec Internet, et le développement de nombreux programmes dont le but serait, entre autres, d'améliorer la qualité des demandes de bourses soumises, de développer le réseau scientifique, d'améliorer l'action en faveur de la maintenance des équipements de recherche et en faveur de la publication des résultats de recherche.

1. Introduction

Setting out from what was in 1960 a very weak starting point in terms of home-based scientific potential (Eisemon, 1979), Africa went through a stage of rather intensive development of scientific institutions (research institutes and universities) during the 1970s and 1980s (Davis, 1983; Kolinsky, 1985; Gaillard et al., 1997). Associated with this was an enormous increase in the academic population and a steady growth in the number of research scientists (Gaillard and Waast, 1993). This development was underpinned by aid, the amounts varying greatly according to the country involved[1]. Such programmes took on diverse forms: fellowships for training, research grants to individuals and teams, institution building, strengthening and twinning, North/South partnership research programmes, and so on. When regarded in terms of comparable investments, such schemes have had extremely mixed results, and have been, on the whole, modest though visible. Science in Sub-Saharan Africa (excluding the Republic of South Africa) evaluated in terms of publications constituted less than 0.5% of the global production in the mid-1980s, about the same as either North Africa or the Republic of South Africa (Garfield, 1983; Gaillard and Waast, 1993).

Since that time, the situation has deteriorated in most African countries which, suffering from public budget cuts, have seen their higher education and research systems fall into decline. The national coordinating bodies, when they have not been dissolved, have lost political power and influence. Nearly no recruitment took place throughout the 1990s and salaries (if in fact they are paid) are no longer adequate to live on. The prevailing crisis conditions are reflected in many recent publications on African Research (Dahoun, 1997; Gaillard et al., 1997[2]; Lebeau and Ogunsanya, 1999). While representing 0.5% of the global production in 1985, Sub-Saharan science (excluding South Africa) only totalled 0.3% of the world production in the mid-1990s (Arvanitis et al., 2000). As confirmed by other sources, the latter reference shows that the previous decade has been one of crisis in African research. However, developments are mixed, depending on the discipline and the regions. In Northern Africa, the Maghreb is witnessing an unprecedented strengthening in scientific productivity. Nigerian science is, on the contrary, imploding: basic sciences are declining and the agricultural and medical sciences are stagnating. Conversely, the engineering sciences are growing, in particular in Northern Africa.

The overall goal of the International Foundation for Science (IFS) is to support researchers of the developing world in their early research careers, to conduct research on the management, use, and conservation of biological resources. IFS has supported more than 3000 scientists during the first 26 years of its activities (1974-99), of which 1022 were in Africa. The core of IFS support is financial, in the form of research grants renewable twice and of a maximum amount of USD 12,000. 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 are covered. IFS also provides different 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 organizes 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 with a cash component that gives recognition to grantees for noteworthy achievements associated with research projects supported by IFS. All of these efforts are intended to enhance the grantees' credibility as scientists and enable them to become established and recognized in national and international scientific circles.

To better assess the impact of IFS activities, a Monitoring and Evaluation System for Impact Assessment (MESIA) is being established at the Secretariat. The main objectives of MESIA are to assess the achievements of the grantees and the effect that the grant and other forms of support provided by IFS have had on the academic and institutional career of the grantees (Gaillard, 2000). The questionnaire survey that will be presented in the following pages was conceived and carried out as part of MESIA. Other components of MESIA include country case studies of which two have been carried out in Africa (Tanzania and Cameroon), extensive interviews of IFS grantees (close to one hundred have been carried out on the African continents i.e. Botswana, Cameroon, Egypt, Morocco, Tanzania and Zimbabwe), and a bibliometric study of their scientific output.

Given the prevailing crisis conditions, what is the reality of being a scientist in Africa today? To what extent have these conditions changed over the last three decades? How do these African scientists practise research and how do they perceive the role of science and scientists in society? What are the main factors holding back their research work? How dependent on foreign funding are they to carry out their activities? What has the impact of the IFS support been on their working environment, research practise and research career? We believe that the population of IFS grantees in Africa is a unique and valuable sample that can bring answers not only to the questions related to the impacts of IFS but also to the overall situation of science and scientists in Africa today.

While impact can certainly be ascertained, the key question is or the extent to which it can be attributed to IFS support. To answer this question, it would ideally be necessary to identify and survey a control group. However, the constitution of an appropriate control group for all of Africa proved to be too problematic. Given the heterogeneity of situations, it is very doubtful if such a control group makes sense and the idea of constructing a control group was abandoned. Instead, in order to improve the representativeness of the sample and to allow comparisons with the IFS population, it was decided to enlarge it and to include beneficiaries from other research grant schemes. For a variety of reasons, only the African beneficiaries of the STD3 and INCO-DEV1[3] programmes of the European Commission could be included. In relation to the question of representativeness of the sample and in view of the interpretation of the results, we should, however, keep in mind that IFS grantees and INCO beneficiaries are the outcome of a selection process. Thus, IFS grantees and INCO beneficiaries' working environments are supposedly better than that of "average" scientists taken from a representative group of African scientists.

Another reason to include the beneficiaries from the European Commission is that the "Questionnaire Survey of African Scientists" is also part of another study on Science and Scientists in Africa at the end of the 20th century co-funded by the European Commission (DG RTD), the French Institut de Recherche pour le Développement (IRD) and the French Ministry of Foreign Affairs. This study, coordinated by Roland Waast (IRD) and Jacques Gaillard, includes a comprehensive bibliometric study of science in Africa during the 1990s (see Arvanitis et al., 2000), country case studies carried out in 13 African countries[4] and some 400 interviews of scientists conducted in the same countries.

This "Questionnaire Survey of African Scientists" was carried out at the IFS Secretariat in Stockholm. The survey and the questionnaire[5] were conceived and prepared by Jacques Gaillard. Anna Furó Tullberg contributed to the layout of the questionnaire and its translation. She co-ordinated the mailing, reception and coding of the questionnaire. The transfer of the data from the questionnaires into a database was sub-contracted to AAA Analysexperten, a Stockholm-based company. Data analysis was made at IFS by Jacques Gaillard, Anna Furó Tullberg, Eren Zink and Henrik Hovmøller. Thomas Rosswall and Judith Furberg read a first draft and suggested improvements. Brian Porter designed the cover and did the layout for the report. Last but not least, the backbone of this report comes from the African scientists themselves (IFS grantees and INCO beneficiaries). Without their answers to the questionnaire, and the very many enlightening discussions during the interviews, this report could not have been written. Their contribution is gratefully acknowledged.

Finally, we would like to express special appreciation to IFS, the French Institut de Recherche pour le Développement (IRD), the European Commission (DG Research), and the French Ministry of Foreign Affairs for their financial backing.

2. Responses to the Questionnaire

A first draft of the questionnaire was prepared in early 1999. It was then revised after being tested with IFS grantees during visits in Morocco, Egypt and Cameroon during the same year. The questionnaire was sent out a first time in March 2000. A reminder was sent in June 2000 to those who had not responded. It was addressed to two groups of scientists in Africa:

- The IFS grantees (1974-1999)
- The beneficiaries of STD3 and INCO-DEV1 of the European Commission

The questionnaire is common for the two groups for the main parts. Apart from the fact that the European Commission is co-funding the "Science in Africa" project and requested that a questionnaire survey of their African beneficiaries be carried out[6] , including the beneficiaries of both programmes provides an opportunity to cover a somewhat larger spectrum of scientific disciplines (with a certain degree of overlap)[7] :

- IFS: biological, agricultural and environmental sciences
- INCO: agricultural, environmental and medical sciences

Given this overlap, it is not surprising that 35 of the questionnaire recipients were both IFS grantees and INCO beneficiaries, concomitantly or successively[8]. Although IFS support targets young scientists at the beginning of their career, many of the IFS grantees became well established in the scientific community during the period 1974-1999 and qualified for partnership collaboration with European colleagues within the framework of the INCO programmes at the time of this survey. In reality, there are more than 35 IFS grantees directly or indirectly involved in partnership with INCO programmes, but they are not listed as official partners in the database received from the European Commission.

Altogether, the IFS grantees tended to respond significantly better than the INCO beneficiaries (table 1). This could be partly explained by the very nature of the two programmes. Whereas IFS support is targeted at young individual scientists, the INCO programmes are aimed at supporting collaborative projects between European scientists and teams, and scientists and teams in developing countries (here Africa). Through different follow-up programmes, IFS is more closely associated to its grantees and in a better position to update its address register. Thus, half of the IFS grantees (49.8%) and close to one-third of the INCO beneficiaries (30.4%) responded to the questionnaire. Given the fact that the IFS grantees were awarded their first grants more than 25 years ago, the response rate for the IFS grantees can be considered satisfactory.

Programmes	Sent*	Received	Response rate (%)
IFS	989	493	49.8
INCO	686	209	30.4
Total	1677	702	41.8

* Excluding the questionnaires returned to IFS and other special cases (see details in Appendix)

Table 1: Overall response rates

For IFS, response rates vary according to the number of grants received. In general, the more grants the scientists received, the higher the response rate. Similarly, active grantees (scientists who continue to benefit from IFS support at the time of the survey) tended to respond much more (71.0%) than grantees for whom IFS support was completed at the time of the survey (35.4%)[9]. Not surprisingly, the response rates by country are very uneven for both sub-groups. The global response rate to both questionnaires is 41.8%. The details of response rates for both sub-groups are discussed in Appendix 2.

3. Main Characteristics of the Surveyed Population

What are the main characteristics of the population surveyed and to what extent is it representative of the African scientific community? As acknowledged earlier, given the target groups for the questionnaire survey, the surveyed population is confined to the following research areas: biological, agricultural, environmental and medical sciences. Whatever the indicators used (number of scientists, budgets, publication outputs, etc.), these areas represent by far the most important research areas in Africa today[10]. Mathematics, physics, social and engineering sciences are not represented in the population surveyed. Other characteristics including the geographical distribution of the respondents, gender, age, civil and family status, and institutional framework are discussed below.

3.1 Geographical distribution

With regard to geographical distribution, with 36 countries, most of the African countries[11] are represented in the population surveyed. However, the two major science producers in Africa, namely South Africa and Egypt, are grossly under-represented and the average or relatively modest coun-

Table 2: Countries of the respondents vs. main scientific countries in Africa

	Country	Total responses from IFS and INCO beneficiaries	PASCAL database	
			Total production of articles 1991-1997*	Rank scientific production1997*
1	Morocco	92	2 559	3
2	Nigeria	91	4 061	5
3	Cameroon	58	892	9
4	Kenya	53	1 543	6
5	Tanzania	39	688	11
6	Tunisia	37	2 770	4
7	Senegal	31	698	10
8	Burkina Faso	30	311	14
9	Ethiopia	26	617	13
10	Uganda	25	256	16
11	South Africa	23	11 813	1
12	Zimbabwe	22	757	12
13	Ghana	21	460	15
14	Benin	16	250	21
15	Madagascar	14	294	26
16	Egypt	12	8 870	2
17	Sudan	12	407	18
18	Côte d'Ivoire	11	760	8
19	Mali	11	246	22
20	Togo	10	194	23

*Source: Arvanitis, Waast and Gaillard, 2000.

tries in terms of scientific production (e.g. Burkina Faso, Cameroon, Kenya, Senegal and Tanzania) are over-represented (table 2). Furthermore, 68.7% of the respondents are concentrated in 10 countries (table 2) and 80.2% in 15 countries.

3.2 Gender (Q 5)

Not surprisingly, the large majority of IFS grantees and INCO beneficiaries are male (see Figure 1 and table A1 in appendix 4). INCO programmes support proportionally more women (20.1%) than IFS (15.4%). This can probably be attributed to the fact that a large proportion of the INCO respondents are medical and health scientists, an area in which the participation of women is clearly higher including in Africa. These mean values hide important disparities between countries. Overall they are representative of the situation in Africa today. For comparison, the overall proportion of women IFS grantees in Africa is 11.1%. In Asia and the Pacific, the figure is 21.2% and in Latin America and the Caribbean 34.1%. If all the IFS grantees are considered, the proportion of women grantees is 21.9%.

3.3 Age (Q 6)

The age distribution of the beneficiaries of the two programmes partly reflects the different granting policies of the two organizations. IFS supports young researchers at the beginning of their research career, and this is reflected in the slightly larger proportion of 30 to 40 year-olds and 40 to 50 year-olds within the IFS system compared to the INCO programmes (in spite of the fact that 35% of IFS grantees no longer receive support from the Foundation and constitute an older part of the population of IFS grantees).

Conversely, the INCO programme targets researchers already established within a research group, and the proportion of 50 year-olds and over is consequently greater within this programme than within IFS. However, the large majority of the beneficiaries of both programmes is in the 40 to 50 year-old group (Figure 2 and table A2 in appendix 4). The different country studies carried out for the "Science in Africa" project show that one of the main characteristics of the population of scientists in Africa is that it is ageing (unpublished results from the "Science in Africa" project). The age distribution of the scientists in the surveyed population is thus representative of the population of scientists

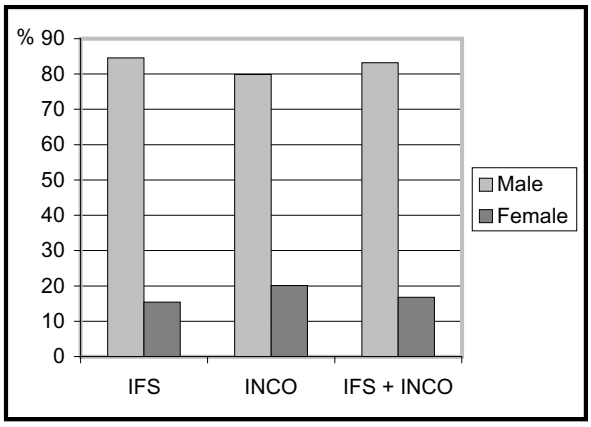

Figure 1 (Q 5)
Gender distribution

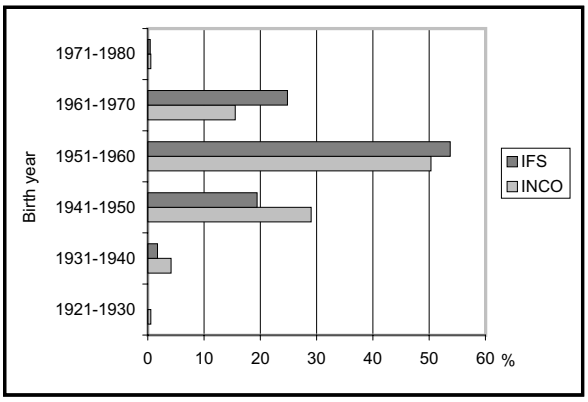

Figure 2 (Q 6)
Age distribution

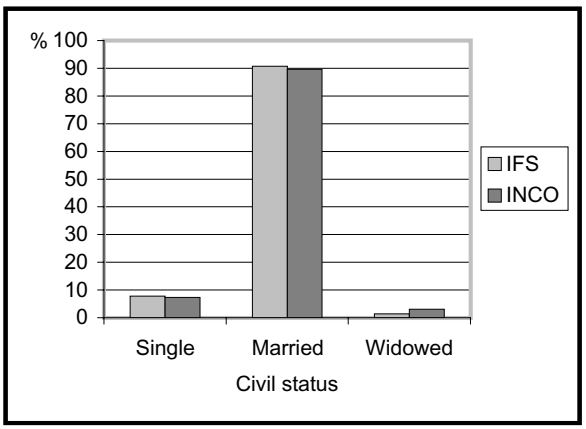

Figure 3 (Q 7)
Civil status

in Africa today. In the near absence of recruitment in many countries in Africa during the 1990s, the replacement of the ageing African scientific community is threatened.

3.4 Civil status (Q 7)

Given the overall age distribution, it is not surprising to find that the large majority of scientists are married (Figure 3 and table A3 in appendix 4). The proportions of single, married and widowed scientists are largely even between the two funding organizations.

3.5 Number of children (Q 8)

Nearly 60% (59.6% for IFS and 59.2% for INCO) of the respondents have between one and three children (Figure 4 and table A4 in appendix 4), and close to 15% of the respondents do not have any children (13.0% for IFS and 14.8% for INCO). Thus, African scientists are closer to the Western family model than the African one. Two important factors regulate birth control behaviour: education and income of the respondents. The salaries of African scientists are overall very low, and have to be supplemented to enable them to support their families and pay for their childrens' education. The choice to limit the number of children came out very strongly in the interviews (unpublished results from interviews in Cameroon, Botswana, Tanzania, and Zimbabwe), the reasons given being the low income and the cost of education for children.

3.6 Principal occupation of the spouse (Q 9)

Compared to the overall African population, African scientists' spouses are overwhelmingly skilled workers (figure 5 and table A5 in appendix 4). Comparatively few are housewives (17.0%), very few have non qualified jobs (such as shopkeepers, farming or workers) and even less are unemployed (0.5%). The spouses' occupations are characterized by a professional "endogamy"; researchers, university lecturers and school teachers accounting for about one-fourth of the total (respectively 9.1%, 4.8%, and 10.6%). This "endogamy" is however much less pronounced than in a similar survey done in 1985 (Gaillard, 1991). Today, the professions of the scientists' spouses seem to be much more dispersed over a large spectrum of professions in which middle management professions (20.4%) and "the professions"[12] (6.5%) are well represented. This may suggest that the African academic world is opening up towards the rest of society to a greater extent than it used to in the 1970s and 1980s. It also suggests that, given the grossly inadequate salaries paid to the scientists, both husband and wife must work.

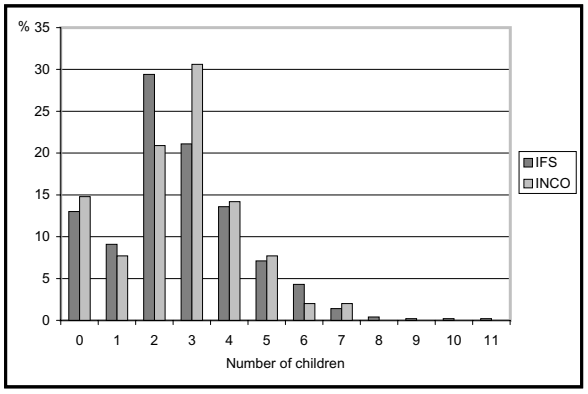

Figure 4 (Q 8)
Number of children

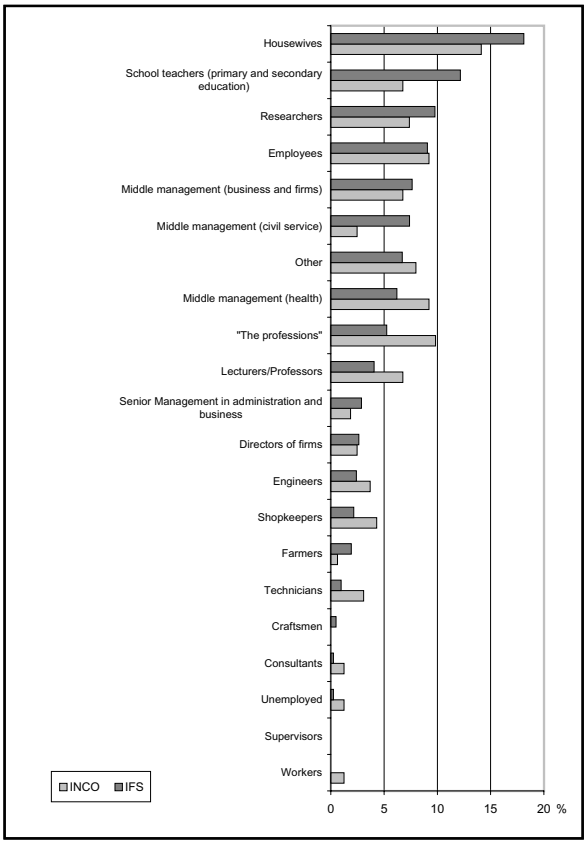

Figure 5 (Q 9)
Spouse's principal occupation

The occupations are similar in distribution between IFS grantees and INCO beneficiaries. Where they differ most is in "the professions" (medical doctors mainly) and middle management (health), where INCO beneficiaries have larger percentages, and in "school teachers" where IFS spouses are represented to a larger extent.

3.7 Institutional framework (Q 18)

Over 90% of beneficiaries of both programmes work at public universities or research institutes (figure 6 and table A6 in appendix 4). IFS grantees are more likely than their INCO colleagues to work at a public university (68% vs. 48%) and the reverse is true for public research institutes (INCO 41% and IFS 29%). INCO beneficiaries work at NGOs about twice as frequently as their IFS colleagues. For both organizations, the proportion of beneficiaries working at private universities or research institutes is very low, around 2%.

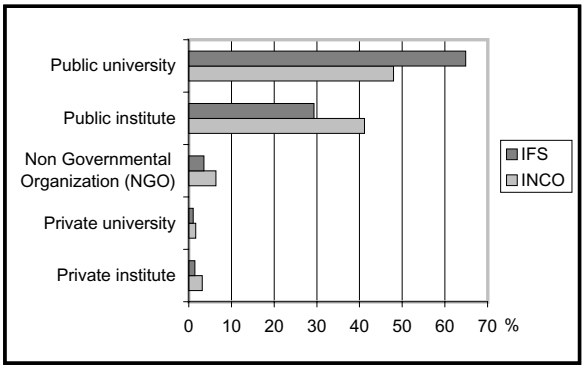

Figure 6 (Q 18)
Institutional framework

3.8 Degrees (Q 10)

The highest degrees held in 1999 by IFS and INCO respondents are PhDs (78.0%), MScs (19.2%) and BScs (2.7%). The distribution of scientists working in public universities, public research institutes, NGOs, private universities and private research institutes varies according to when the scientists completed their highest degree. The majority of the PhD holders work at public universities, but the earlier they were awarded their degree, the more likely it is that they are working at a public university (Figure 7 and table A7 a in appendix 4). In parallel, the scientists working at public research institutes are more likely to work there if they got their PhD degree late (during the 1990s) (table A7 b in appendix 4). In contrast to the PhD-holders, the MSc-holders work mainly at public research institutes, but an increasing proportion of scientists being awarded their MSc degree later are working at public universities (Figure 8). The number of scientists presently working at NGOs, private universities and research institutes is very low (Figure 6), but increasing over time (tables A7 c, d and e in appendix 4).

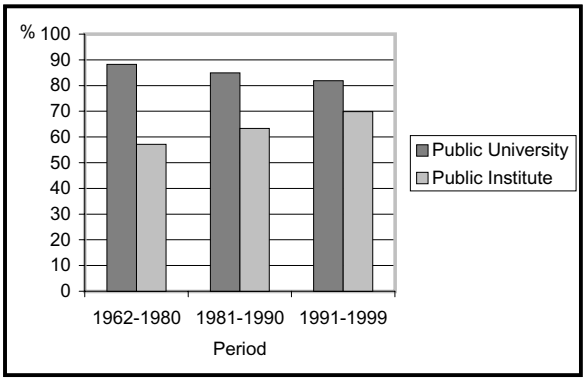

Figure 7 (Q 10 and Q 18)
Highest degree obtained PhD by time-period and present work-place

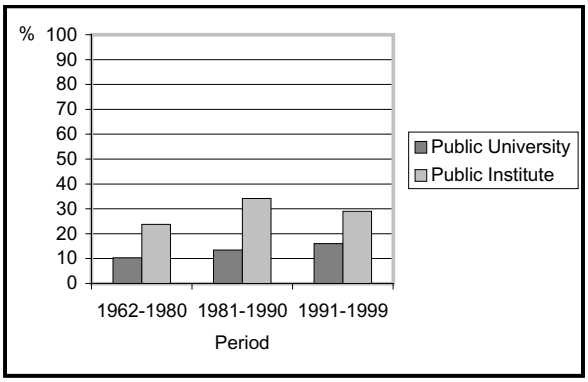

Figure 8 (Q 10 and Q 18)
Highest degree obtained MSc by time-period and present work-place

4. Research as a Profession

What is the reality of being a scientist in Africa today and how do the scientists perceive their research career as a profession? Although a lot of progress has been made over the last two decades and proper professional status has been obtained in many countries in Africa, the conditions under which the profession is performed have deteriorated (Dahoun, 1997; Chatelin et al., 1997; Lebeau and Ogunsanya, 1999) and the salaries paid are grossly inadequate (forthcoming MESIA reports 4 and 5 on Tanzania and Cameroon).

4.1. Advantages and disadvantages of being a scientist (Q 19)

With regard to the advantages and disadvantages of being a scientist in Africa, there were no major differences between IFS grantees and INCO beneficiaries (figure 9 and for more detail, tables A8 a, b and c in appendix 4). The scientists are largely satisfied with the job security and to a lesser extent the career development possibilities, but largely dissatisfied with the salary scale and the social benefits. The only somewhat larger difference between IFS and INCO is satisfaction with the retirement benefits: 60.6% of IFS grantees are satisfied with them, compared to 49.2% of INCO beneficiaries. An explanation for this could be that the latter population is slightly closer to retirement.

Both categories of beneficiaries overwhelmingly (86.1%) judge their salary to be inadequate to support them, and whenever applicable, their family (table A9a in appendix 4). One could, of course, argue that most scientists in Europe in the public sector would think that their salaries are too low. However, even taking into consideration the lower living costs in most Sub-Saharan African countries (excluding South Africa), most of the scientists in Europe have a purchasing power that is 10 to 20 times higher than their African colleagues. Variations are also big on the African continent (Figure 10 and table A9b in appendix 4). Scientists in

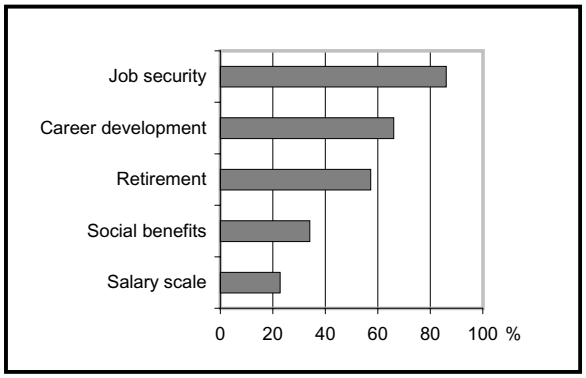

Figure 9 (Q 19)
Career: relative satisfaction rates (IFS and INCO combined)

the Republic of South Africa are less dissatisfied with their salaries (52.4%) than their colleagues in Northern Africa[13] (69.2%), and scientists in the rest of Africa are dissatisfied with their salaries to 92.1%. As commented on earlier and as can be seen in section 4.2, most Sub-Saharan African scientists (excluding South Africa) have good reasons for being dissatisfied with their salaries. The differences observed between Northern Africa, the Republic of South Africa and the rest of Africa have direct consequences on the time spent on scientific activities by the researchers. As presented in section 4.2, many of them, in particular in Sub-Saharan Africa, have extra jobs to supplement their incomes.

Salaries of scientists are on average nine times the minimum salary (figure 11 and table A10 in appendix 4). INCO beneficiaries have higher salaries than their IFS colleagues (12 times the minimum salary vs. 7.5). This is partly due to their seniority and partly due to the fact that people in the medical professions are on average better paid than their colleagues in basic sciences. Nevertheless, scientists find it necessary to supplement their income (section 4.2).

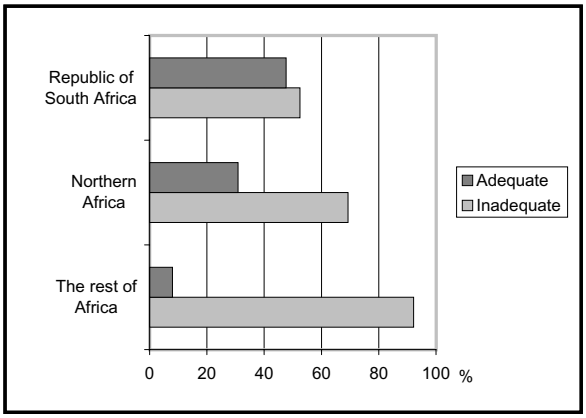

Figure 10 (Q 16)
Adequacy of scientists' salaries by region

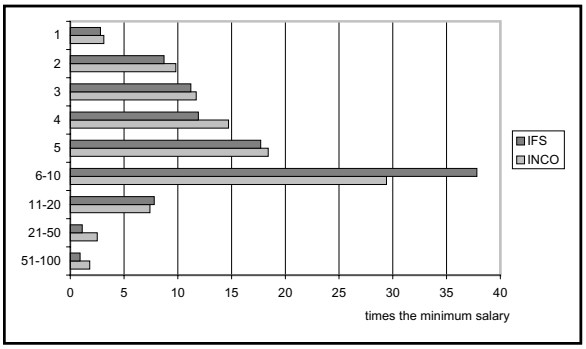

Figure 11 (Q 17)
Respondents' salary as a scientist/teacher in comparison to the country's minimum salary

4.2 Extra jobs to supplement income - extra hours worked per week (Q 20)

Although roughly half of the surveyed scientists (48% of IFS grantees and 46% of INCO beneficiaries) answered this question, it is reasonable to assume that even more have taken measures to ease their financial situation because they cannot live on their salary alone. On average, INCO beneficiaries work slightly longer hours (mean 13.9 hours a week) to supplement their income than IFS grantees (mean 12.3 hours a week) (table A11 in appendix 4). Since about half of the INCO beneficiaries have degrees in medicine, a fair number work in the private sector, on the side or in connection with performing research, thus increasing the INCO average of extra work-hours. One could also imagine that IFS grantees, if they are young and trying to get established, will try to spend as much time as possible actually doing research. Once established, the scientist has more freedom to devote time to other activities and probably also more opportunities to be involved in more lucrative consultancy work.

INCO beneficiaries earn on average 5.1 times more on their extra jobs as compared to their basic salary, which is more than IFS grantees, who earn on average 3.2 times more than their basic salary (table A12 in appendix 4). Based on interviews conducted in Tanzania, Cameroon and Zimbabwe - and given the cost of living and education in these three countries - it is estimated that scientists need to multiply their salary by three to four in order to live decently and to ensure a good education for their children; and indeed, most of them do so.

4.3 Nature of respondents' extra jobs (Q 22)

Teaching (often at newly-established private universities) is the main extra job for IFS grantees, while INCO beneficiaries mainly do consultancy work or work in a private medical practice (figure 12). This helps explain the larger extra income earned by INCO beneficiaries compared to their IFS colleagues. INCO beneficiaries are more likely to have their own consultancy firm or private medical practice than IFS grantees. IFS grantees are instead more likely to start their own private business. Beneficiaries of both organizations are employed by businesses to 15% and practice farming to about the same extent.

If one looks at the evolution over time for IFS grantees (table A13 in appendix 4), teaching and consultancies have increased, whereas starting up one's own business (or consultancy) has decreased. Being employed by someone else's business has remained constant.

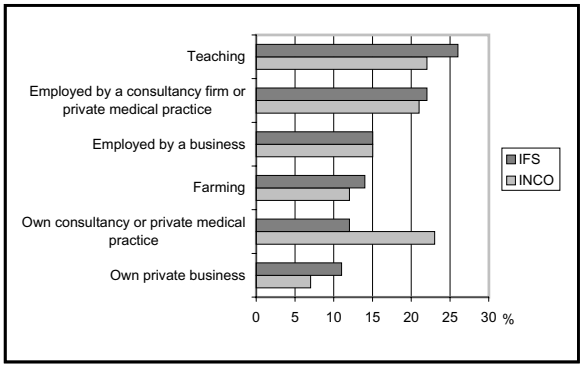

Figure 12 (Q 22)
The nature of respondents' extra jobs

Number of years abroad	IFS				INCO			
	For higher education		For all reasons		For higher education		For all reasons	
	No.	%	No.	%	No.	%	No.	%
0.1 - 2	94	23.7	79	19.8	40	23.4	32	18.6
2.1 - 4	101	25.4	91	22.8	44	25.7	35	20.3
4.1 - 6	102	25.7	106	26.6	32	18.7	36	20.9
6.1 - 8	54	13.6	60	15.0	20	11.7	23	13.4
8.1 - 10	21	5.3	26	6.5	19	11.1	15	8.7
10.1 - 12	14	3.5	15	3.8	6	3.5	13	7.6
12.1 - 14	7	1.8	9	2.3	4	2.3	4	2.3
14.1 - 16	2	0.5	7	1.8	5	2.9	6	3.5
16.1 - 18	0	0.0	1	0.3	0	0.0	3	1.7
18.1 - 20	2	0.5	4	1.0	0	0.0	2	1.2
20.1 - 30	0	0.0	1	0.3	0	0.0	2	1.2
30.1 - 50	0	0.0	0	0.0	1	0.6	1	0.6
Responses	397	100.0	399	100.0	171	100.0	172	100.0
Mean no. of years	5.0		5.5		5.6		6.7	

Table 3 (Q 12 and 13)
Time spent abroad

4.4 Time spent abroad (Q 12 and Q 13)

60% of the IFS grantees and 71% of the INCO beneficiaries spent between two and six years abroad. Most of the time spent abroad was devoted to higher education and training (table 3). On average, the IFS grantees spent 5.0 years abroad for educational purposes and 5.5 years for all reasons (including higher education and training). INCO beneficiaries spent slightly more time abroad than IFS grantees (on average 5.6 years for higher education and training and 6.7 years for all reasons).

On average, the differential between time spent abroad for higher education and training, and for all reasons is greater for INCO beneficiaries (1.1 years) than for IFS grantees (0.5 years). This suggests that INCO beneficiaries have spent relatively more time abroad for work than IFS grantees. For the IFS grantees, the mean number of years for time spent abroad for higher education purposes decreases with time (Figure 13 and table A14 in appendix 4), indicating that African countries are becoming increasingly self-sufficient in terms of higher education. The decrease is nevertheless modest (from an average of 5.5 years during the period 1974-1980 to 4.8 years during the period

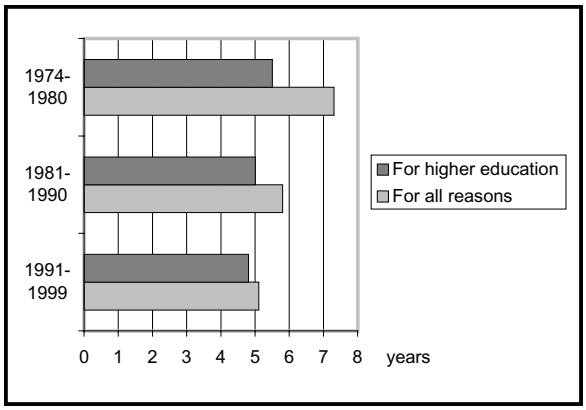

Figure 13 (Q 12 and Q 13)
Average time spent abroad by IFS grantees

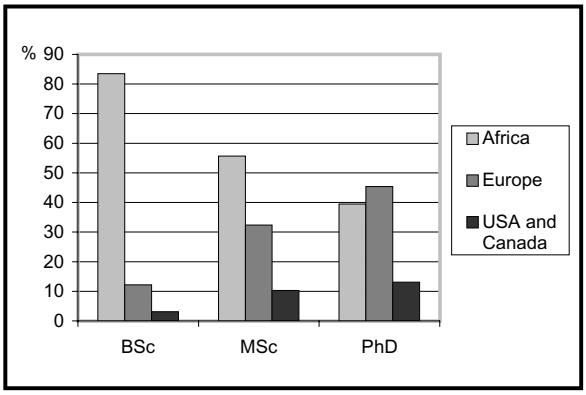

Figure 14 (Q 10)
Regions where degrees are taken (IFS and INCO together)

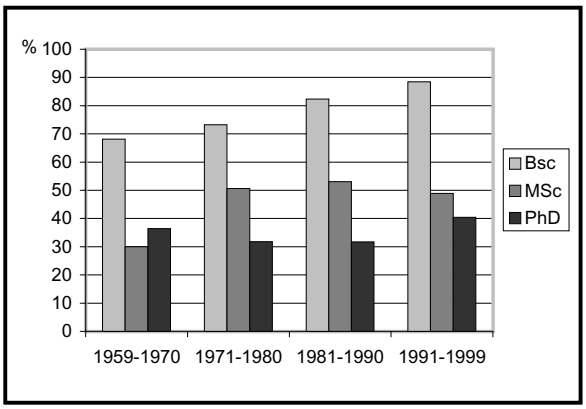

Figure 15 (Q 10)
Degrees taken in Africa by time-period

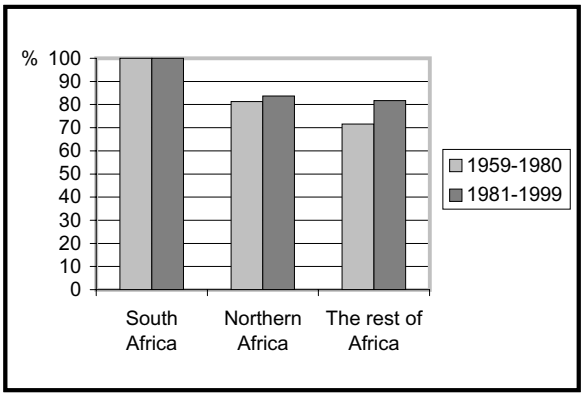

Figure 16 (Q 10)
BSc taken at home by time-period and region

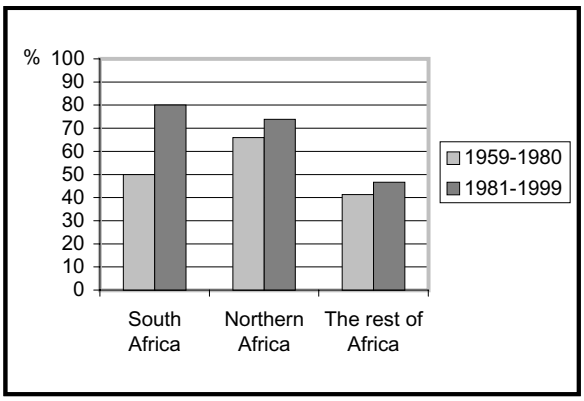

Figure 17 (Q 10)
MSc taken at home by time-period and region

1981-1999), and much remains to be done. The time spent abroad "for all reasons" by IFS grantees is also decreasing with time. This is partly due to the fact that higher education is increasingly taking place at home. One should also keep in mind that the younger scientists have probably not had as much time and/or opportunity to travel abroad as their seniors.

4.5 Degrees at home and abroad (Q 10)

The time spent abroad for higher education purposes results in degrees taken in different regions of the world (Figure 14 and tables A15 a and b in appendix 4). The first degree (BSc) is taken in Africa in 83.5% of the cases, indicating that Africa is nearly self-sufficient when it comes to the first level of higher education. In fact, this self-sufficiency is increasing over time (Figure 15 and tables A16 a, b and c in appendix 4). However, the higher the degree taken, the more likely it is that the African student will take it abroad, and in a European country (mainly France and the United Kingdom) rather than in the USA or Canada (Figure 14).

The dependency on the outside world decreases over time for MSc studies (from 70.0% during the period 1959-1970 to 46.9% during the period 1981-1990, but increases again slightly to 51.1% in the period 1991-1999). For PhD studies, the dependency was increasing slightly from 1959 to 1990 (reaching 69.3% for the period 1981-1990), then decreasing to 59.6% during the period 1991-1999, maybe signalling a change for the future.

There are also differences within the African continent (Figures 16, 17 and 18 and table A17 in

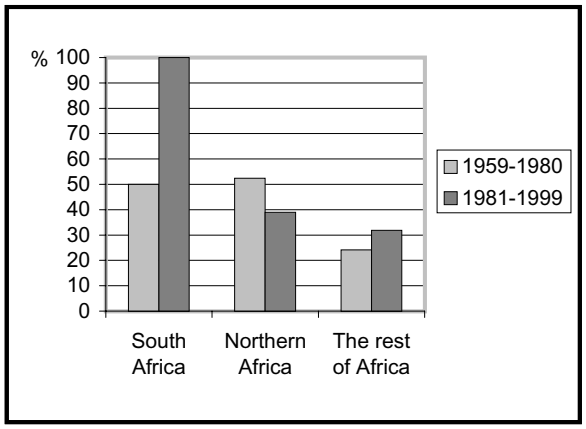

Figure 18 (Q 10)
PhD taken at home by time-period and region

appendix 4). Except for the Republic of South Africa, where all students in the survey stayed at home to take their BSc degrees, the proportion of students taking their BScs at home has increased over time, and this increase has been the greatest for "the rest of Africa" (all countries in Africa except the Republic of South Africa, Morocco, Algeria, Tunisia and Egypt, the latter four countries forming "Northern Africa" - Figure 16).

The proportion of students taking their MSc at home has increased within all regions, and the increase is the largest for South Africa, where 80.0% of the students have taken their MScs during the period 1981-1999 (as compared to 50.0% during 1959-1980). In the Northern African countries, the proportion of students taking their MScs has increased only a little, but from a higher level than in South Africa (from 66.0% to 73.6%); and the "rest of Africa" is trailing behind with more than half of the students going abroad for their Msc degrees (Figure 17).

The Republic of South Africa is again the exception when it comes to the PhD degrees, as the increase has gone from 50.0% to 100.0% between the two periods covered (Figure 18). In Northern Africa, students tended to go abroad more during the period 1981-1999 than previously (staying at home from 52.4% to 39.0%), but the reverse is true for the rest of Africa. Students took their PhD degrees mainly abroad, staying at home from 24.1% in 1959-1980 to 31.9% during the following time-period. This makes this region the most dependent on foreign education, but where the trend is going towards more self-sufficiency.

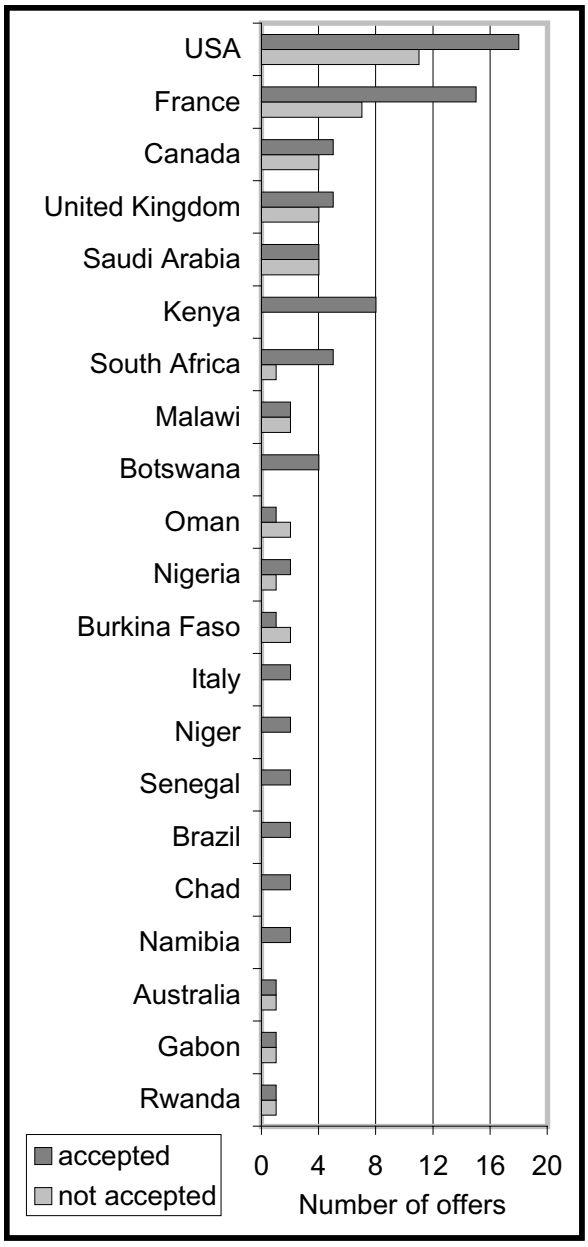

Figure 19 (Q 24)
Jobs offered abroad, accepted or not accepted (IFS and INCO together) (countries with more than two offers)

4.6 Jobs offered abroad (Q 24)

While overall one-fourth of the respondents (20.4%) has been offered jobs abroad since the beginning of their career, INCO beneficiaries are much more likely to be in such a situation (50.0%) than IFS grantees (9.5%). The difference is again due to the medical professions for which mobility is greater, assuming the job migrant has obtained a degree in the recipient country. Being involved

in collaborative programmes with European teams may also increase mobility. Not surprisingly, more than half of the offers came from the USA and European countries, but also from African countries (Figure 19 and table A18 in appendix 4). Some of these countries, such as Kenya, have traditionally been recipients countries. Others such as Botswana, Namibia, and more recently South Africa, are new recipient countries. Other countries such as Nigeria that used to be very close to the top of the list of recipient countries until the mid 1980s have today completely disappeared from the list[14]. A large majority of the scientists (72.3% for IFS and 60.3% for INCO) who were offered a job abroad accepted it.

In total, 39 IFS grantees out of 493 (7.9%) and 63 INCO beneficiaries out of 209 (30.1%) have been offered a job abroad and accepted it. As far as the IFS grantees are concerned, and based on the interviews conducted in Botswana, Cameroon, Egypt, Morocco, Tanzania and Zimbabwe[15], it is possible to conclude that very few of these mobilities are true and permanent cases of brain drain. In the case of Tanzania, out of 51 grantees, two only seemed to have migrated permanently to North America. The other five grantees working abroad were all working as scientists in countries of Southern Africa on short term contracts. Most of the latter in Tanzania and in other African countries expressed the intention to return home when their contract expired, and experience shows that they do, in most cases, return home as intended. Only a few return home at the time of retirement. Thus, mobility, in the case of the population of IFS grantees, should be perceived as circulation rather than exodus.

5. Research Practice, Communication and Perception of Research

5.1 Change of orientation (Q 25)

Approximately two-thirds (68.3%) of the beneficiaries of both funding organizations have not changed research orientation during the course of their career (table A19 in appendix 4). The main reason for changing research subject, today as well as 15 years ago, is, in most cases, related to matching research work with national needs (Gaillard, 1991; unpublished interviews). This often takes place when returning home after completing a PhD thesis, the subject of which was loosely or not at all related to the home country's needs. As PhD training is increasingly taking place in the home country, often in the framework of a so-called "sandwich" programme, the thesis field work is also most frequently related to problems of local importance.

5.2 Time allocation of work activities (Q 15)

Both IFS grantees and INCO beneficiaries spent the greatest part of their time on research activities (47.2% for IFS and 47.7% for INCO). Not suprisingly, IFS grantees spent more time teaching (28.1% for IFS and 19.8% for INCO) and less time in administration (14.2% for IFS and 20.3% for INCO) than their INCO colleagues (table A20 in appendix 4). Both sub-groups spent about the same amount of time on extension activities (slightly less than 4%) and INCO beneficiaries spent more time on consultancy activities (5.9%) than IFS grantees (3.7%).

If they were given the choice, they would like, on average, to spend slightly more time on research, teaching, extension and consultancy and less time on administration. But the difference between "present time allocation" and "ideal" is not very big (Figure 20). This suggests that they are rather satisfied with their present time allocation between different activities.

5.3 Working alone or with other scientists (Q 27)

More than 90% of IFS grantees and INCO beneficiaries work in teams (table A21 in appendix 4). Given the fact that INCO support is given to teams and IFS support to the individual scientist, one could have expected bigger differences between IFS and INCO. It turns out that the individual scientist usually collaborates with a research team, or is part of one. The proportion of IFS grantees working alone is only 8.3%.

5.4 Monodisciplinary or multidisciplinary research teams (Q 28)

The same trend can be noted here as in the preceding section: 85.4% of the scientists work in multidisciplinary teams (table A22 in appendix 4) and IFS grantees do so to a slightly lesser degree than their INCO colleagues. For IFS grantees, the trend over time is towards increased multidisciplinarity. During the period 1974-1990, 79.3% of the IFS

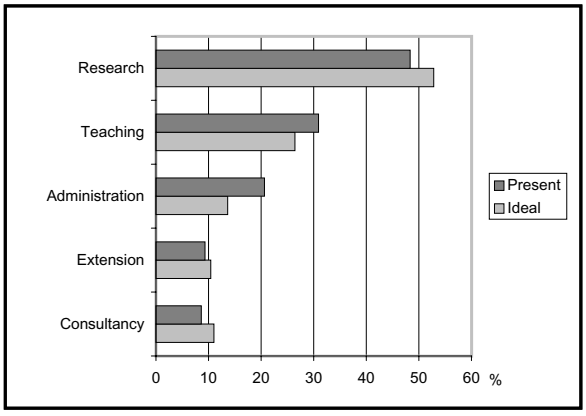

Figure 20 (Q 15)
Mean allocation of respondents' work time (IFS and INCO combined)

grantees worked in multidisciplinary teams, compared to 86.3% during the period 1991-1999.

5.5 Communication with scientists and other people (Q 29)

In the 1970s, Moravcsik (1976) described how problematic it was for scientists of developing countries in general to communicate with their peers and colleagues by drawing a comparison to birds whose wings have been clipped. Although scientific isolation is still mentioned by the scientists surveyed as one of the main reasons holding back research work today (see section 7), one may hope that the situation has changed over the recent past thanks to the introduction of new communication technologies. In particular, access to the Internet and e-mail should ease informal communications with colleagues throughout the world as well as access to scientific literature. Meeting colleagues and peers at national and international meetings is also perceived as a very important communication avenue. Many IFS grantees in fact reported during the interviews that the turning point of their career had often been a meeting with a colleague or a senior scientist at a workshop or a scientific meeting, which in turn opened new networks of contacts.

However, many African scientists interviewed during the last two years complained that they still suffer from a feeling of isolation today. To further evaluate scientific communication opportunities and access to scientific literature, questions related to these issues were included (questions 31 and 32) in the questionnaire. The scientists surveyed were also asked to indicate the number and the nature of the scientific meetings they attended during their careers (questions 33 and 34).

The highest mean frequency of communication is with scientists from one's own department, and the lowest with scientists in Asia or Latin America. Overall, scientists also communicate less with colleagues in Africa than with colleagues in Europe. This illustrates the generally low South-South level of collaboration (figure 21 and table A23 in appendix 4). On average, INCO beneficiaries tend to have higher communication frequencies with all categories of people listed, except for funding agencies. It is also interesting that scientists in Africa communicate more with their colleagues in Europe than with their colleagues in Canada and the USA. In the case of INCO beneficiaries, this is to be expected, but the same behaviour is present also for IFS grantees.

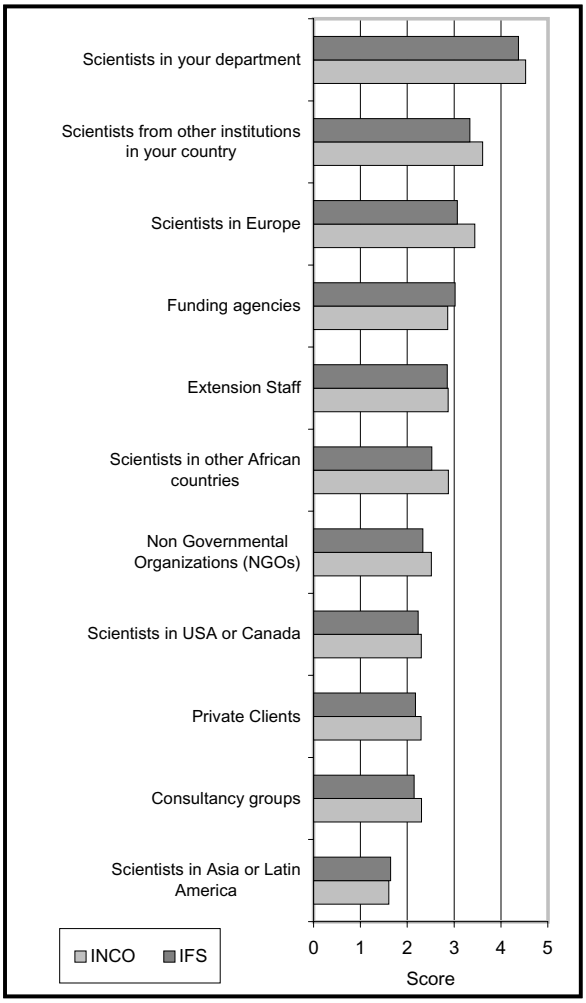

Figure 21 (Q 29)
Mean frequency of communication with scientists and other people
(1 = never, 2 = rarely, 3 = annually, 4 = monthly, 5 = more often)

5.6 Access to the Internet and bibliographic databases

Altogether, slightly more than half of the respondents (53.0%) have easy access to the Internet (see figure 22 and table A24 in appendix 4), and slightly less than half (46.9%) have easy access to bibliographic databases (table A25 in appendix 4). INCO beneficiaries are slightly better off than their IFS colleagues with respect to Internet access (61.0% for INCO and 49.8% for IFS), and access to bibliographic databases (53.0% for INCO and 44.6% for IFS grantees).

Easy access does, however, not mean that the connection exists in their office room or even at their home institutions. Very often scientists have to share access with colleagues or supervisors, or they have a private connection outside their home institution. Furthermore, easy access does not say anything about the costs involved, which in many cases are prohibitive for the scientists when they are not taken care of by the home institution.

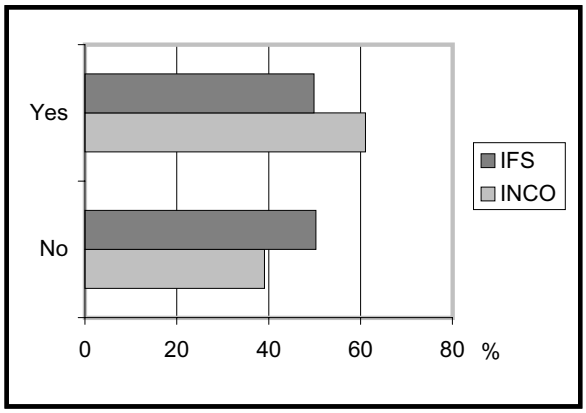

Figure 22 (Q 31)
"Do you have easy access to the Internet?"

5.7 Attendance at conferences

Respondents have attended an average of slightly more than one conference a year outside their home countries over the last five years (table A26 in appendix 4). When analysing the responses, blanks were given a zero value. Relatively few (8% for INCO beneficiaries and 18% for IFS grantees) did not attend a single conference abroad during the last five years. For IFS, those who did not attend a conference abroad are mainly to be found among the younger generation of grantees. Given the fact that conferences attended abroad are rarely self-supported, and that IFS and INCO have only supported a small proportion of them, as shown in tables 4a and 4b, it can be concluded that there are many other funding sources to apply from for African scientists who wish to attend conferences abroad.

The mean number of conferences attended by INCO respondents since the beginning of their career (tables 4a and b) is slightly higher (24.6%) than for the IFS respondents (19.6%), but the difference can easily be explained by the difference in age, a number of IFS grantees being at the beginning of their research career.

Not surprisingly, more than half of these conferences (58.2% for IFS grantees and 53.7% for INCO beneficiaries) took place in the respondent's own country and one fifth (20.4% for IFS grantees and 19.9% for INCO beneficiaries) in Africa. The following continent of conference attendance by decreasing order is Europe. Overall, and not surprisingly given the specific mandate of the INCO programme, the latter beneficiaries have participated at more conferences in Europe than their IFS colleagues (18.3% for INCO and 13.3% for IFS). Then follow by decreasing order, and roughly in the same proportion for the two populations surveyed, conferences in USA or Canada (5.7% for

Conferences	With national support	With IFS support	With foreign support**	Without support	Totals	% of total
Within your own country	5.5	0.3	0.9	4.7	**11.4**	58.2
In Africa*	0.8	0.8	2.3	0.1	**4.0**	20.4
In Europe	0.5	0.3	1.5	0.3	**2.6**	13.3
In USA or Canada	0.1	0.1	0.7	0.1	**1.0**	5.1
In Latin America and the Caribbean	0.0	0.0	0.1	0.0	**0.1**	0.5
In Asia	0.1	0.1	0.3	0.0	**0.5**	2.6
Totals:	**7.0**	**1.6**	**5.8**	**5.2**	**19.6**	**100.0**

Table 4a (Q 33)
Mean number of conferences attended since the beginning of IFS respondents' careers

* except your own country
** except IFS

Conferences	With national support	With INCO support	With foreign support**	Without support	Totals	% of total
Within your own country	7.4	0.6	1.3	3.9	**13.2**	53.7
In Africa*	0.8	0.9	2.9	0.3	**4.9**	19.9
In Europe	1.3	0.9	2.1	0.2	**4.5**	18.3
In USA or Canada	0.4	0.0	0.9	0.1	**1.4**	5.7
In Latin America and the Caribbean	0.0	0.0	0.1	0.0	**0.1**	0.4
In Asia	0.1	0.1	0.3	0.0	**0.5**	2.0
Totals:	**10.0**	**2.5**	**7.6**	**4.5**	**24.6**	**100.0**

* except your own country
** except INCO

Table 4b (Q 33)
Mean number of conferences attended since the beginning of INCO respondents' careers

INCO beneficiaries and 5.1% for IFS grantees), in Asia (2.6% for IFS grantees and 2.0% for INCO beneficiaries), and in Latin America and the Caribbean (0.5% IFS grantees and 0.4% INCO beneficiaries).

Attendance at conferences was supported mainly by national sources, especially when the venue was the scientist's home country (40.9% for INCO beneficiaries and 35.0% for IFS grantees). The other funding sources by decreasing order, excepting IFS and INCO, were foreign ones. Their support was given in particular to attend conferences in another country in Africa, in Europe, and in USA and Canada. IFS and INCO come next, their support having enabled participation in slightly less than 10% of all the conferences attended. A rather large proportion of the conferences, particularly in the scientist's own country, was attended without support at all.

5.8 Evaluation and criteria for evaluation

More than half of the respondents (57.2% for IFS and 64.8% for INCO) reported that their research work was regularly evaluated (table A27 in appendix 4). The African scientists' research work is mainly evaluated by their home institutions (37.4% for IFS and 32.4% for INCO). If evaluation by "Faculty", "Department" and "Employer" are added together, the result is that 45.2% of the respondents (48.5% for IFS and 38.7% for INCO) are regularly evaluated by their home institution (Figure 23 and Table A28 in appendix 4).

Donors come second for INCO beneficiaries (21.1%) and third for IFS grantees (11.8%). Not surprisingly, IFS grantees, being slightly younger, are more likely to be evaluated by their supervisor (15.2%) than their INCO colleagues (7.7%). Conversely, INCO beneficiaries are more likely to be evaluated by a National Scientific Committee or a Government Agency (11.9%) than the IFS Grantees (7.9%). 5.3% of the respondents (5.9% for IFS and 4.2% for INCO) are evaluated by the Comité Africain et Malgache pour l'Enseignement Supérieur (CAMES), a supra-national scientific committee evaluating careers in French-speaking African universities. The remaining responses include mainly peers (4.2%), external evaluators (2.6%), journal referees (1.4%) and foreign universities (1.2%).

The most important criterion for the promotion of scientists is by far "publications in international journals" (figure 24 and table A29 in appendix 4). This criterion gets 4.2 as a mean on a scale from 1-5 (1 = not important to 5 = very important). It is followed by publications in local journals (3.3), seniority (3.3) and contribution to development (3.1). The criteria considered slightly less important are contribution to teaching (2.9), strategic social relations (2.9), contribution to the institution (2.9), and award of research grants (2.9). The score differences between IFS and INCO are not significant except for "awards of research grants", which is slightly larger for IFS grantees than for INCO beneficiaries.

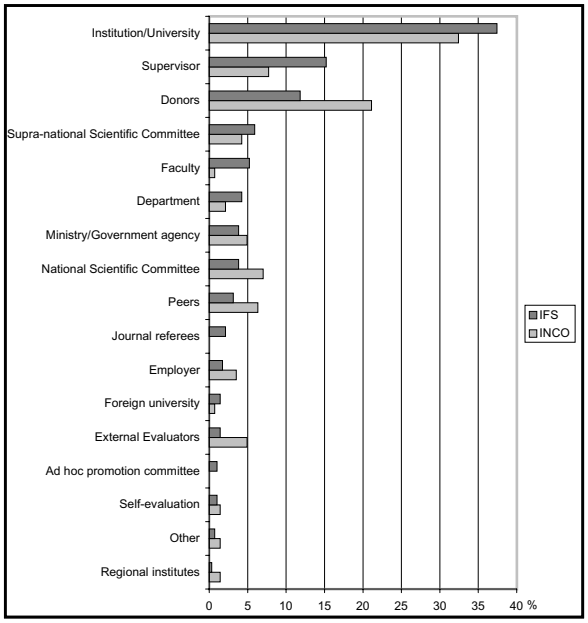

Figure 23 (Q 40)
"Who regularly evaluates your research work?"

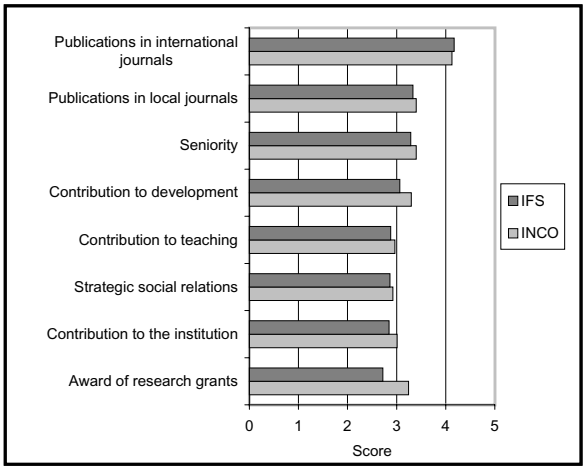

Figure 24 (Q 38)
Most important criteria for the promotion of scientists
(1 = not important to 5 = very important)

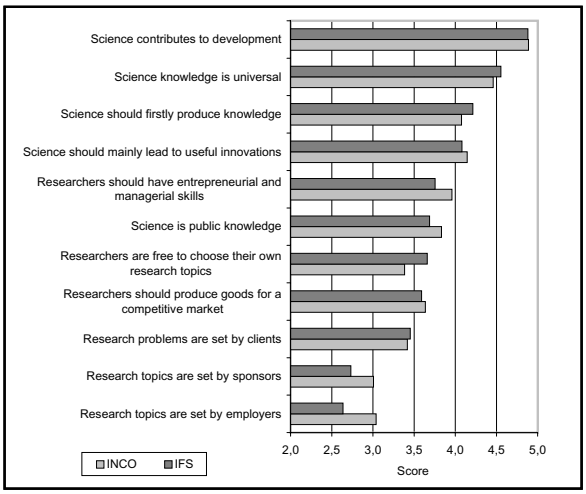

Figure 25 (Q 30)
Mean responses to value statements
(1 = disagree completely to 5 = agree completely)

5.9 Perception of research: relative importance of various criteria (Q 30)

The scientists were given 11 statements concerning the role of science and scientists in society and were asked to give them a score from 1 (disagree completely) to 5 (agree completely). Figure 25 and table A30 in appendix 4 present the mean responses to the proposed value statements. The two statements topping the list are "science contributes to development" (4.9) followed by "science knowledge is universal" (4.5). In a period of economic and social crisis in Africa, scientists reaffirm their conviction that research will contribute to solving the economic and social problems facing the continent and the importance and legitimacy of their profession towards society. The fact that the two above statements top the list (the utility of science and its universality) suggests and confirms that science cannot be defined by one statement alone. It also confirms the tension existing for the African scientist between addressing local questions relevant for the development of their societies and, at the same time, being part of mainstream science and recognized by the international scientific community. This tension between utilitarism and knowledge production is confirmed by the two following statements ranked respectively third and fourth: "science should firstly produce knowledge" (4.2) and "science should mainly lead to useful innovations" (4.1). When it comes to the choice of research topics, the fact that the statement "research topics are set by employers" is placed at the end of the list with the lowest score (2.7), strongly suggests that the research agenda is far from being driven by the African universities and research institutes. Likewise, the scientists do not strongly feel that "Research topics are set by sponsors", as this statement obtains the second lowest score (2.8)[16]. There are more scientists who agree with the assertion that "researchers are free to choose their own research topics" (3.6), and slightly more so for the IFS grantees (3.7) than for the

INCO beneficiaries (3.4). This slight difference might be partly explained by the different institutional frameworks in which scientists work: IFS grantees tend to work more at universities and INCO beneficiaries at research institutes. It could also be explained by the fact that IFS supports individuals and INCO programmes or teams in which the research agenda is often driven by the partners in the North (Gaillard, 1999).

6. Research Funding

Following a period of expansion during the 1970s and partly the 1980s during which research budgets increased by a factor of ten in most African countries (Gaillard and Waast, 1993), African science has experienced a severe crisis during the late 1980s and 1990s (Gaillard et al., 1997 and unpublished results from "Science in Africa" project). Public budgets, and in particular research and higher education budgets, have been cut to such an extent that, with a few exceptions (South Africa and a few countries in Northern Africa, in particular Morocco and Tunisia), hardly any research activities can be undertaken without foreign aid.

6.1 Annual research budget (Q 41)

The scientists surveyed were asked to specify their annual research budget for 1999 (excluding salaries) to the nearest USD 1,000. Not surprisingly, INCO beneficiaries had access to a higher budget than IFS grantees (figure 26a and table A31a in appendix 4). A large proportion of them (29.9% for IFS grantees and 24.0% for the INCO beneficiaries) had no research budget at all during 1999. The scientists having no research budget during 1999 are more likely to be found among those no longer receiving support from IFS and INCO respectively. Thus, more than a third (35.3%) of the "completed" IFS grantees had no research budget during 1999 (figure 26b and table A31b in appendix 4). However, as much as a fourth (24.8%) of the grantees still receiving support from IFS reported that they had no research budget during 1999, suggesting that they had already completely spent the budgets allocated to them by IFS during the preceding year(s).

Half of the IFS grantees (48.4%), had a research budget during 1999 between USD 1,000-20,000 and one-third (33.3%) USD 5,000-20,000. As mentioned earlier, INCO beneficiaries had access to bigger budgets: more than half (54.1%) had between USD 5,000-40,000 and close to one third (29.5%) between USD 10,000-30,000. While only 10.7% of IFS grantees had access to a budget amounting to USD 30,000 or more, 25.7% of INCO beneficiaries are found in this budget bracket.

Completed IFS grantees overwhelmingly (93.6%) had access to a lower budget than their colleagues still receiving support from IFS (see figure 26b and table A31b in appendix 4). Completed IFS grantees had access to a higher budget only for the two highest budget categories (USD 50,000 and above).

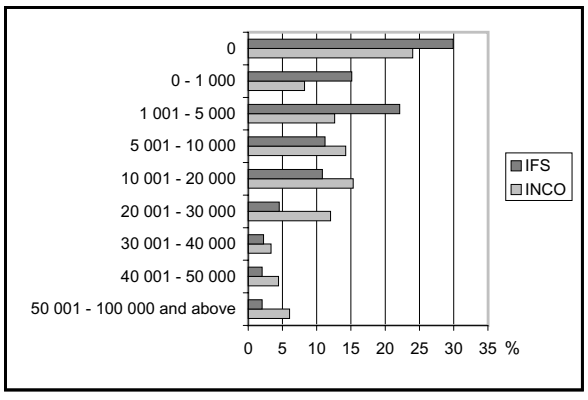

Figure 26a (Q 41)
Research budget of 1999 in USD

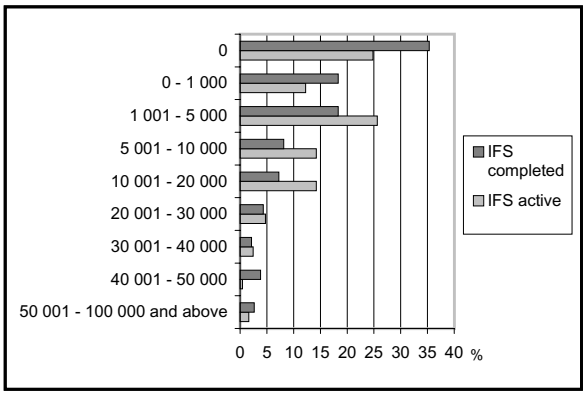

Figure 26b (Q 41)
Research budget of 1999 in USD - "active" and "completed" grantees of IFS

6.2 Sources of research funds (Q 42)

The main part of the research funding (50.7% for IFS grantees and 59.1% for INCO beneficiaries) comes from international organizations (figure 27a and table A32a in appendix 4). Next sources of funding by order of importance are the home institution (20.7% for IFS and 18.0% for INCO) followed by national public funds (13.1% overall), foreign industry and private foundations (5.9%), and national industry or private foundations (1.5%).

The sources of research funds are slightly different for the different regions in Africa (figure 27b below and table A32b in appendix 4). While interpreting the results, one should, however, keep in mind the bias of the sample, with the Republic of South Africa being grossly under-represented and Northern Africa being mainly represented by Morocco and to a lesser extent Tunisia; Egypt and Algeria being under-represented. While international organizations remain the main source of funding, the corresponding share for South Africa (41.8%) and Northern Africa (44.9%) is smaller than for the rest of Africa (54.2%). Similarly, the home institution remains the second source of research funding (except for South Africa), but its importance is significantly bigger in Northern Africa (29.5%) and to a lesser extent in South Africa (20.9%) than in the rest of Africa. National public funds (other than those from the home institution) is the second source of research funds for South Africa (25.9%) while their importance is much smaller for the two other regions (13.7% for Northern Africa and 12.4% for the rest of Africa). This can be explained by the importance of national research grant schemes including the National Research Foundation (NRF) in South Africa. In the other regions, and in particular in Northern Africa, similar schemes have been established more recently and have not yet influenced the research budget structure of the scientists to the same extent. In all regions, private funding from the industry and foundations remains low.

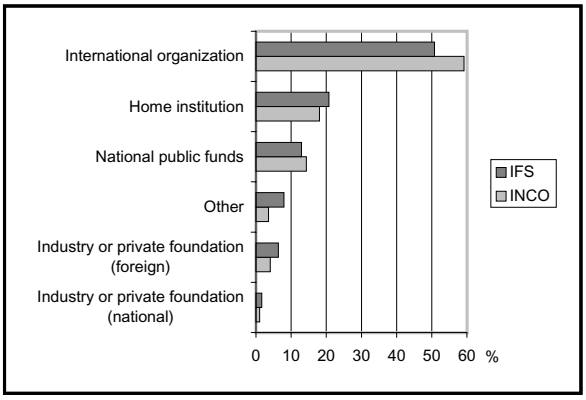

Figure 27a (Q 42)
Sources of research funds (% of total)

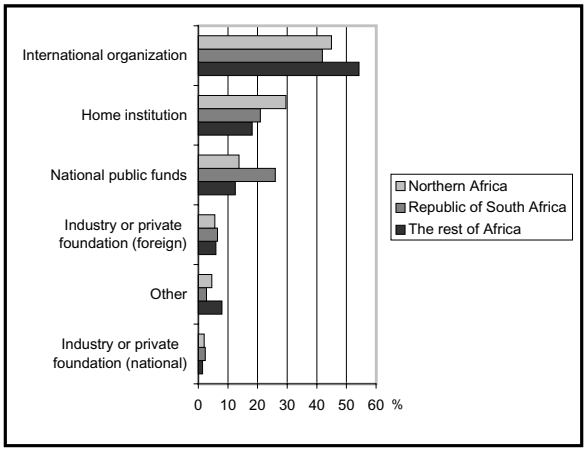

Figure 27b (Q 42)
Sources of research funds by regions in Africa

6.3 Main foreign research funding institutions (Q 43)

What are the main foreign funding sources for research in Africa? Scientists were asked to list the different funding institutions from which they received support (excluding IFS, INCO[17], and their own institutions). Altogether, more than 300 sources were reported with the large majority receiving one response only. The 30 most frequently cited funding sources are presented in figure 28a (see also table A33a in appendix 4). The four main funding sources by far are: USAID (with 100 occurrences), the European Union[18](91), the French Cooperation including the Fonds d'Aide à la Coopération[19](89), and WHO/TDR[20](87). They are followed by a group of six organizations receiving around 40 occurrences: IDRC (47), FAO (46), AUPELF-UREF (42), IAEA (37), the World Bank (36), and Unesco (35). The third group obtaining between 20 and 30 occurrences includes mainly Nordic, American, German, British and French organizations: Sida-SAREC (30), the Rockefeller Foundation (28), Danida (25), DAAD (25), DFID/ODA (25), NORAD (24), GTZ (24), TWAS (23) and IRD/ORSTOM (21).

Scientists were also asked to indicate their degree of satisfaction towards these different funding organi-

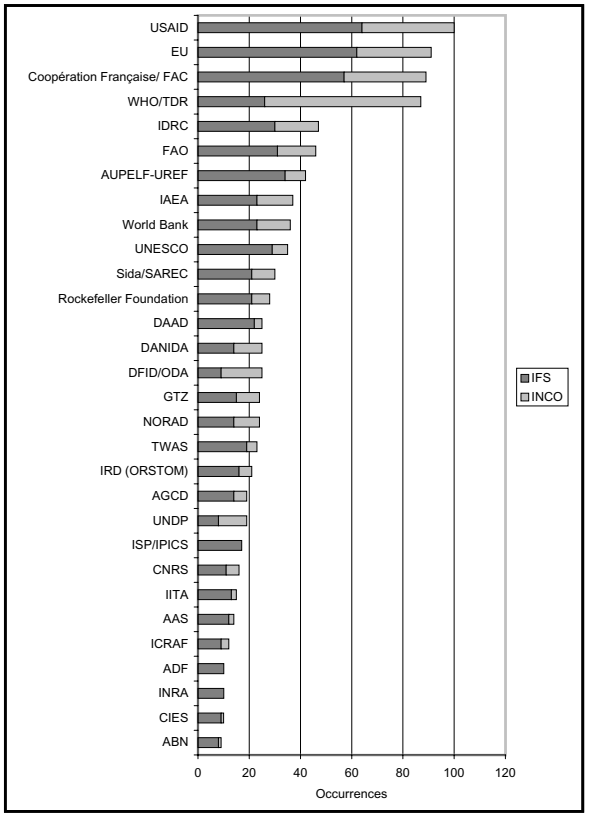

Figure 28a (Q 43)
30 main foreign funding organizations sorted by frequency of occurrence as cited by IFS and INCO beneficiaries (see also list of acronyms in Appendix 3)

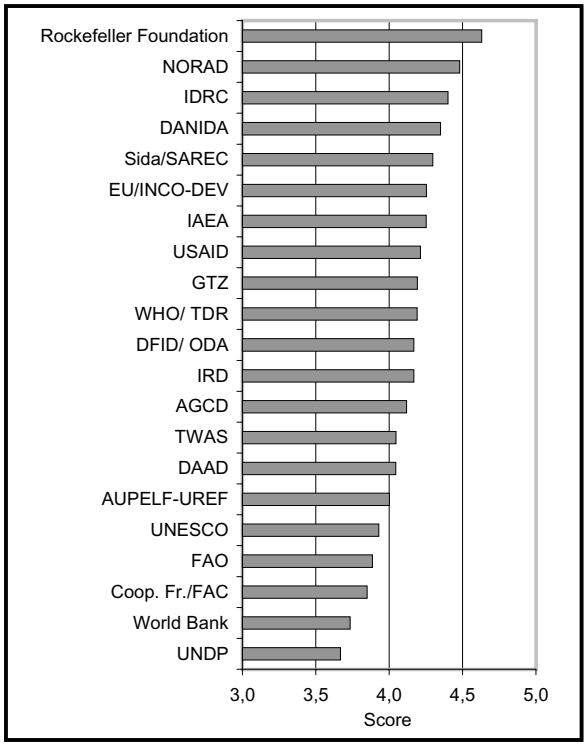

Figure 28b (Q 43)
Mean satisfaction rates for 20 most frequently occurring funding organizations of IFS and INCO beneficiaries added together (see also list of acronyms in Appendix 3)
(1 = very bad, 2 = bad, 3 = average, 4 = good and 5 = excellent)

zations on a scale from 1 (very bad) to 5 (excellent). The results are presented in figure 28b and in table A33b in appendix 4. Overall the best scores of satisfaction are obtained by the Rockefeller Foundation (4.63) and IDRC (4.40), as well as the Nordic organizations including NORAD (4.48), Danida (4.35), and Sida/SAREC (4.30). Five multilateral bodies and a bilateral one received the lowest scores of satisfaction (below the mean score): UNDP (3.63), the World Bank (3.73), the French Cooperation (3.85), FAO (3.88), and Unesco (3.93).

7. Main Factors Holding Back Research Work

The scientists were asked what, according to them, are the three main factors holding back their research work by order of importance (figure 29 and in Table A34 in appendix 4).

Not surprisingly, the main constraint is the lack of funds. It is of course a very generic constraint. Clearly, if more money were available for research in Africa, a number of more specific constraints might be, at least partly, solved. Immediately following the lack of funds comes the main specific constraint: research equipment (which includes lack of basic research equipment, access to equipment and equipment maintenance and repair).

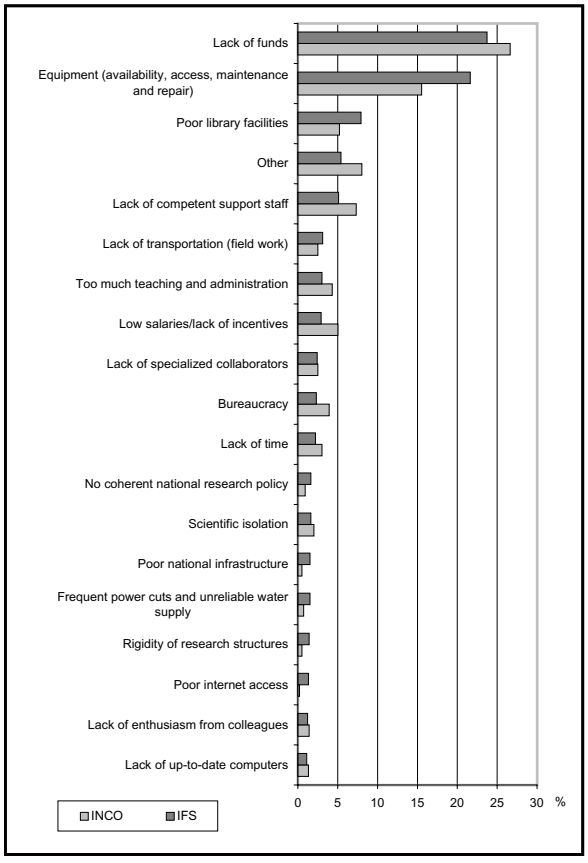

Figure 29 (Q 35)
Main reasons holding back research work

Then come by order of decreasing importance poor library facilities, lack of competent support staff, lack of transportation, too much teaching and administration, and low salaries/lack of incentives.

When a number of recurring difficulties are listed and the scientists are asked to rank them by order of importance using a four number scale (1 = insignificant, 2 = tolerable, 3 = serious, and 4 = obstructive), the two difficulties getting an average above 3 are related to equipment: namely equipment repairs and purchase of equipment. These first two difficulties are followed by a third one also related to equipment: access to equipment. This difficulty is in turn followed by access to scientific documentation, access to a vehicle, and access to supplies (figure 30 and Tables A35 a, b and c in appendix 4).

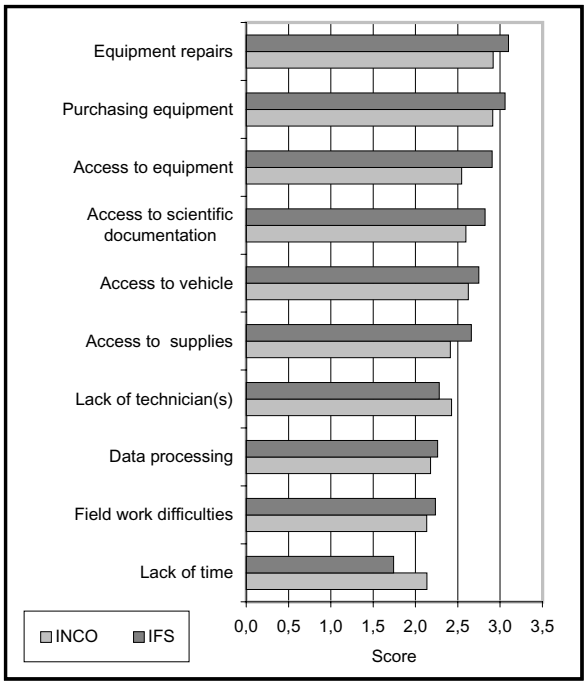

Figure 30 (Q 36)
Recurring difficulties and their seriousness - average scores (1 = insignificant, 2 = tolerable, 3 = serious, and 4 = obstructive)

8. Relative Importance of IFS/INCO Mode of Work

What would have happened if IFS or INCO support had not been available? Would the scientists have pursued their research without funding from IFS or INCO? Have the two programmes had any catalytic effect and to what extent? How do the scientists perceive the mode of work of these two organizations and the support they give to their research?

8.1 Research opportunities with and without IFS/INCO support (Q 44)

Nearly half of the respondents (50.7% IFS and 48.6% INCO) report that they would have been able to pursue their research work "but on a reduced scale", and about 15.0% (15.6% IFS and 14.5% INCO) claim that they would have done it "in a substantially different form" if IFS or INCO funding had not been available, suggesting that IFS and INCO support were more enabling than decisive (figure 31 and table A36 in appendix 4). However, approximately one fourth (23.3% IFS and 27.9% INCO) reports that they would not have been able to pursue their research work at all without IFS and INCO support. Interestingly, the proportion of IFS grantees who answered "no" to this question is increasing over time: 12.6% for the period 1974-1985 and 25.7% for the period 1986-1999 (table A36 in appendix 4), thereby suggesting that IFS support is even more important today than 20 years ago.

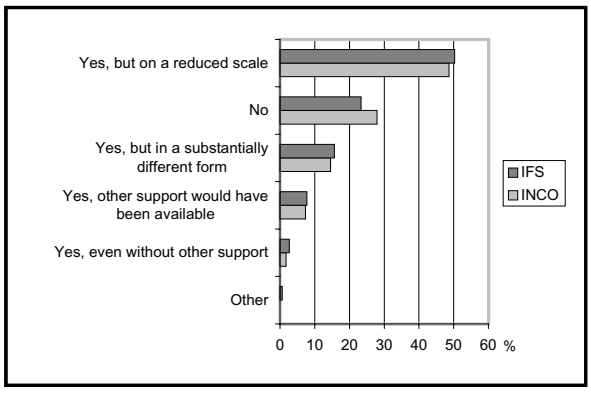

Figure 31 (Q 44)
"Would you have pursued your research if IFS or INCO funding had not been made available?"

Very few responded that they would have been able to pursue their research work "even without other support" (2.6% IFS and 1.7% INCO) and some more report that they would have been able to do so since "other support would have been available" (7.7% IFS and 7.3% INCO). Interestingly again, the proportion of IFS grantees who answered "yes" to the two latter questions decreases significantly over time, thereby suggesting that it is more difficult to obtain funding for research in Africa today as compared to 15 years ago.

8.2 IFS and INCO catalytic effects (Q 45)

Has IFS and INCO support had any catalytic effect on obtaining funding from additional sources? The answers demonstrate clearly (figure 32 and tables A37a and A37b in appendix 4) that it has been easier for the recipients of both programmes to get additional funding from an international institution, but more so for IFS grantees (49.5% IFS and 35.7% INCO), somewhat less from their home institution (36.7% IFS and 32.0% INCO), and even less from a national funding institution (22.8% IFS and 17.0% INCO). The individual reward (in the case of the IFS grant) seems to have carried more weight than team support (in the case of INCO) in order to obtain additional funding, particularly from foreign sources. These sources are largely the same as those already mentioned earlier.

Close to 60% of the respondents, with no significant differences between the two populations surveyed, reported that it has become easier for them to obtain scientific and technical assistance from their home institution after receiving support from IFS/INCO (table A38 in appendix 4).

INCO support provided opportunities to collaborate with new partners for most of the respondents (95.6%) (figure 33 and table A39 in appendix 4). Promoting collaborative research between European teams and teams in developing countries being one of the central objectives of the INCO programme, this result - while very satisfactory - is not completely unexpected. Interestingly, nearly as many IFS grantees (85.9%) report that IFS support provided opportunities to collaborate with new partners. While IFS support is targeted to individual scientists, it clearly also provides - through its extensive network of scientific advisers, grantees and other experts - many opportunities for new partnerships. Participation at IFS organized workshops and other international conferences with IFS support, was also reported in many interviews carried out for the MESIA study in Botswana, Cameroon, Egypt, Morocco, Tanzania and Zimbabwe, as unique opportunities to meet new partners. The large proportion of opportunities to collaborate with new partners has to be seen, in the case of IFS, as a very encouraging and satisfactory outcome.

Most of the respondents claimed that they continued to collaborate with the new partners once the IFS/INCO support was terminated. Only 12.1% of the INCO beneficiaries and 13.4% of the IFS grantees reported that they did not continue to collaborate.

8.3 Assessment of IFS and INCO mode of work

To assess the IFS and INCO mode of work and support, the scientists were asked to rate 13 activities from "selection process" to "follow-up activities once support was terminated" using a five number scale (figure 34 and table A40 in appendix 4). Even if some of these activities are not directly central to the mandate of the two programmes (e.g. assistance in the publication of research results for IFS and purchase of research equipment for INCO), and even if some of these activities were discontinued (e.g. maintenance of research equipment for IFS), the comparison between the different activities should still be valid to pinpoint comparative strengths and weaknesses of the two pro-

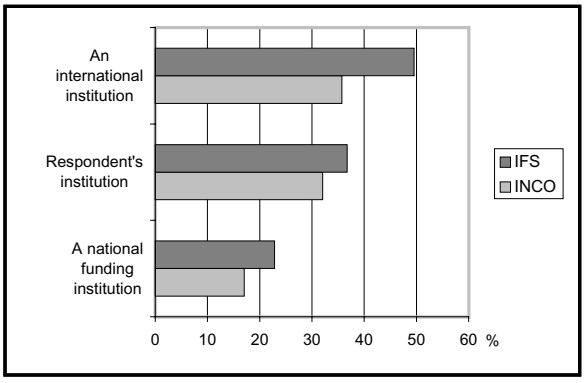

Figure 32 (Q 45)
Additional funding has been easier to obtain from:

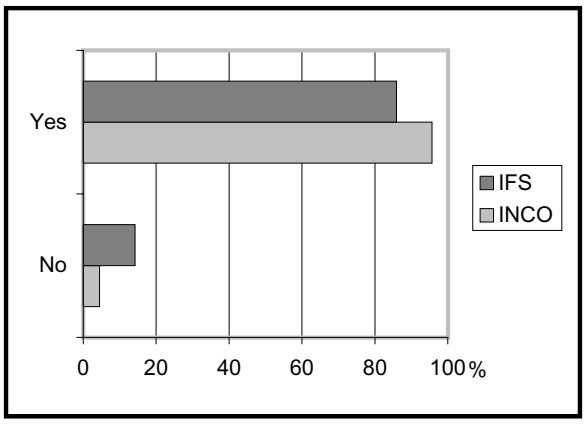

Figure 33 (Q 47)
"Has the IFS/INCO support provided opportunities to collaborate with new partners?"

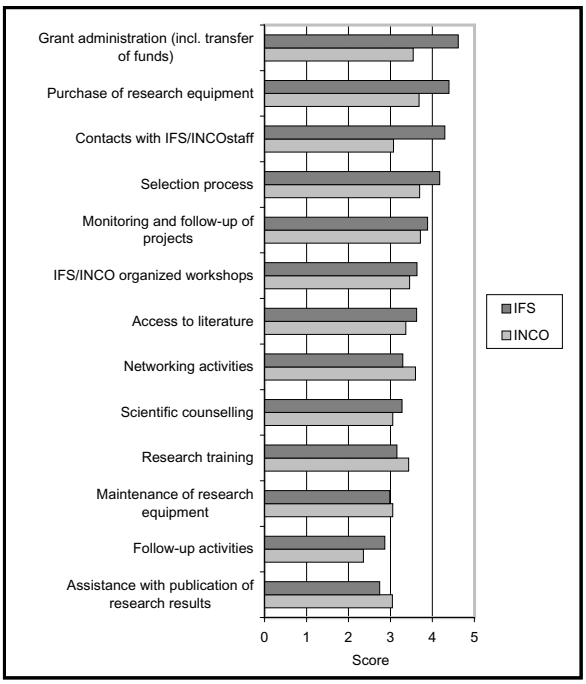

Figure 34 (Q 49)
Mean satisfaction with IFS/INCO mode of work (1 = unacceptable, 2 = poor, 3 = satisfactory, 4 = good and 5 = excellent)

grammes. More generally, the comparison contributes to identifying some of the main constraints of the working environments of the African scientists. Some of these activities should be strengthened in the future.

IFS obtains higher mean scores of satisfaction than INCO for all activities except for "assistance with publication of research results", "research training", and "networking activities", but the differences for these three activities are not very big (figure 34 and table A40 in appendix 4). IFS gets significantly higher scores for the three most highly ranked activities, namely "grant administration", "purchase of research equipment" and "contacts with staff". However, these activities are not central to the INCO programme. For INCO, a more relevant activity to be assessed (instead of "contacts with staff") would have been "contacts with the project coordinator", who in most cases is located in Europe. In general, activities getting the lowest scores are related to scientific visibility and networking (scientific counselling, research training, networking activities, access to literature), maintenance of research equipment, as well as follow-up activities including the assistance with publication of research results.

9. Future Career Goals of African Scientists

Despite the different professional constraints presented in this report (inadequate working environments, inadequate salaries and limited incentives to carry out research activities, multiple professional dependency, etc.), the future career goal of African scientists is for about 40% of them (43.0% for IFS and 38.6% for INCO) a national scientific career (see figure 35a and table A41 in appendix 4). This is followed by a career within national development programmes which is better paid and often offers some additional advantages including free or low-cost housing, access to a car and free education for the children. Working for national development programmes, which in most cases are sponsored by foreign funding agencies, normally also provides a greater opportunity for mobility.

Slightly more IFS grantees (43.0% for IFS and 38.6% for INCO) have a national scientific career as a future career goal. Conversely, slightly more INCO beneficiaries (32.5% for INCO and 29.1% for IFS) have a career within national development programmes as a future career goal. This difference can probably be explained by the fact that INCO beneficiaries tend to work more at research institutes, and that mobility between the latter institutes and national development programmes is easier. The third career goal is, for about 12% of IFS and INCO respondents, private business. The other career opportunities, including administration, politics, foreign or international organizations and one's own consultancy or medical practice do not seem to be as attractive as the former three ones.

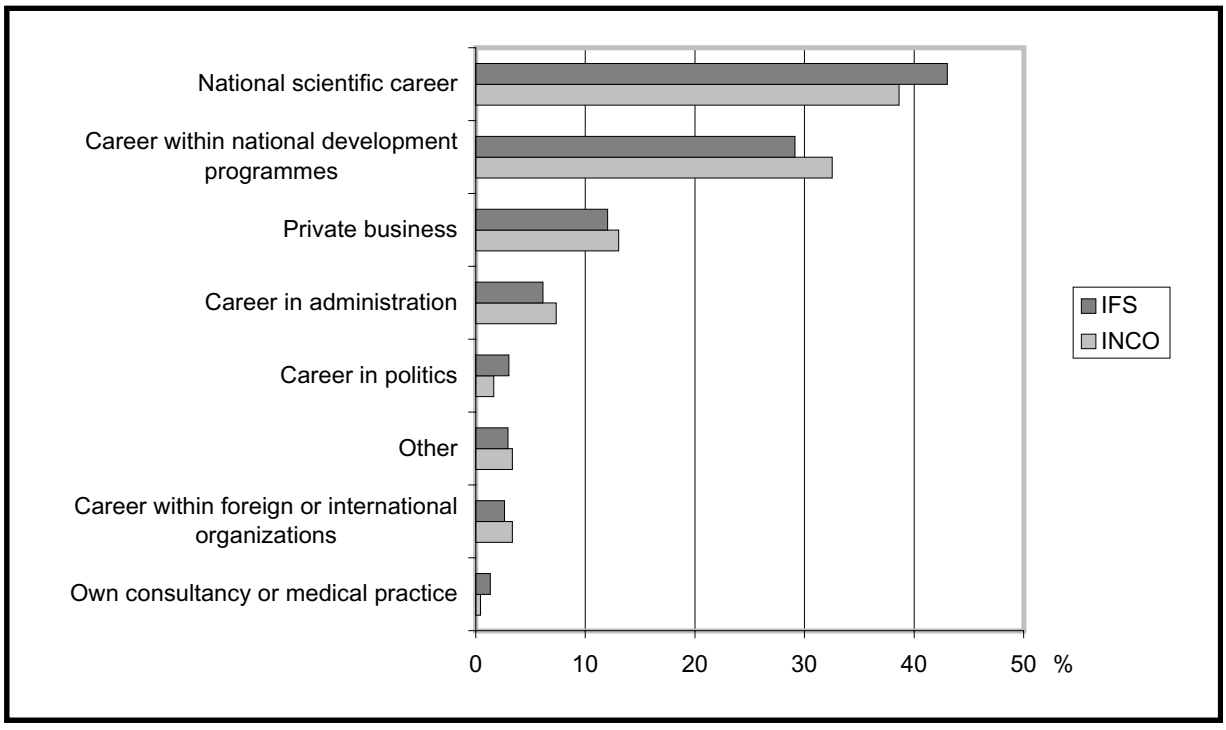

Figure 35a (Q 50)
Future career goal (IFS vs. INCO)

Interestingly, the relative attraction for these career goals seems to have changed slightly over the last twenty-five years. In particular, there are many more IFS grantees among the younger generation who favour a national scientific career (45.8% for the IFS grantees whose first grant was awarded during 1986-1999) as compared to the older generation (32.2% for the IFS grantees whose first grant was awarded during 1974-1985) (figure 35b and table A41 in appendix 4). Given the fact that the younger generation of scientists is the generation of the crisis in African science, this may seem paradoxical. On the other hand, the frustration of working today in a national institute may be greater for the older generation who started their career in the 1970s or early 1980s when national research careers were more attractive and carried a higher social status.

While there is no difference over time in attractiveness for careers within national development programmes, careers in administration, international organizations, politics, and one's own consultancy and medical services are significantly more appealing to scientists of the older generation. Conversely, a career in private business is slightly more attractive for a scientist of the younger generation.

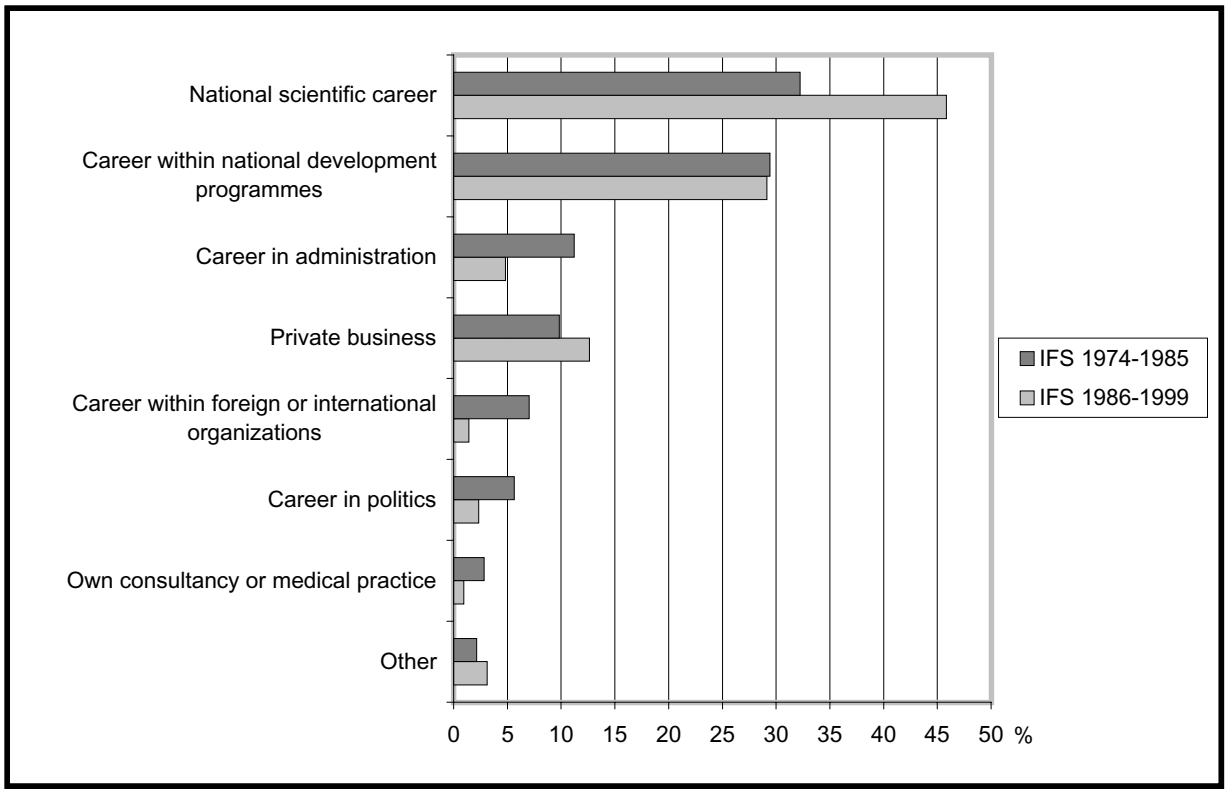

Figure 35b (Q 50)
Future career goal (IFS 1974-1985 vs. IFS 1986-1999)

10. Conclusions and Recommendations

There is a relative abundance of literature on science and technology in Africa scattered through numerous journals, seminar reports, and proceedings. One of the latest is the symposium on Science and Technology in Africa organized by UNESCO (UNESCO, 1994)[21]. Most often, these reports document past developments, pinpoint priorities for the future, include official speeches, and highlight "Plans of Action"; but there are far too few empirical studies assessing the state of science in Africa and the conditions under which African scientists are carrying out their research activities. It is hoped that this report will contribute to filling this gap.

Although the "Questionnaire Survey of African Scientists" is based on scientists who received research support from IFS and INCO only, it is believed that many characteristics of the population surveyed are representative of the African scientific community today as observed in the country case studies of MESIA. Most of them were awarded their highest degree abroad. They are active in research areas representing the largest share of science in Africa today: biological, agricultural, environmental and medical sciences. Over 90% of the scientists surveyed work at public universities (60.0%) and public research institutes (32.7%). Whereas the scientists are largely satisfied with job security, they are largely dissatisfied with the salary scale and the social benefits. Although they earn on average nine times the minimum salary, they cannot live on their salary alone. Half of them supplement their family income with extra jobs providing on average four times more income than their salary.

Most of the African countries are part of the survey. However, the two major science producers in Africa, namely South Africa and Egypt, are under-represented, and the middle or rather small-sized countries in terms of scientific production are over-represented. Apart from the geographical distribution, the representativeness of the sample is biased for another reason. Being the result of a selection process at an international level, the sample features a group of African scientists which is likely to be better off than the "average" African scientist. This is probably even more true for the population of IFS grantees. Through its competitive research grant scheme, IFS has selected African scientists at the beginning of their research careers who had already decided to get established in their respective countries at the time when they applied for the first grant. While IFS has no doubt enabled them to fulfill that goal, very few were planning to get established abroad. Thus, compared to the African continent as a whole, few cases of true brain drain were found in the surveyed population and in the country case studies. In spite of these biases, it is believed that the main findings obtained will be useful not only to the IFS and INCO programmes but more generally contribute to the reader's understanding of how, by whom and under which conditions research is actually conducted in Africa.

Highlights of the main findings

Before putting the main findings (see summary) into perspective and discussing the extent to which they may call for an adaptation or a revision of the IFS mode of work in Africa, some of the main points are highlighted below.

1. African scientists are highly dependent on foreign funding to carry out their research activities and claim that the lack of funds is the main reason holding back their research. The proportion of IFS grantees answering that they could not have been able to pursue their research work at all without IFS support is increasing over time, thereby suggesting that IFS support is even more important today than 15 or 20 years ago.

2. While foreign dependency is a rule across the continent, important differences exist between Northern Africa, South Africa, and the rest of Africa. The latter group of countries (itself far from being homogenous) shows the highest degree of depend-

ency. Other characteristics, such as relative adequacy of salaries, confirm that it is not possible to reduce the African continent to a single entity: there is not one Africa but several, and IFS support is most needed in the weakest countries in Sub-Saharan Africa.

3. Even if they occupy specific niches, IFS and INCO are far from being the only ones in the club of scientific capacity strengthening organizations in Africa. More than 300 research funding sources were reported by the respondents. Interviews conducted with IFS grantees revealed that, very often, support received from other sources came after IFS support or during the second or third grant period, but in a non-negligible number of cases it came before IFS support. Over the years, IFS has been entering into formal and informal collaborating agreements with a number of like-minded organizations. Some of these agreements are briefly reviewed below. Suggestions are also made to strengthen already existing collaborations and to establish new ones.

4. Apart from direct funding of the African scientists, the IFS and INCO programmes had a number of catalytic effects including obtaining additional funding and collaborating with new partners. As repeatedly pointed out during the interviews, IFS support is more than a grant. The IFS grant brings recognition nationally and internationally and opens new avenues and contacts; the turning point of a grantee's career has often been an invitation to participate in a workshop or scientific meeting, or a meeting with a senior scientist which in its turn opened new networks of contacts and participation in networking activities. This leads to the recurrent discussion about the proper balance to be found between research grants vs. other kinds of support including networking activities. While the two are clearly inter-linked, IFS ought to do more in the direction of networking activities, and should in particular involve more former IFS grantees in those activities.

5. In general the mode of work of IFS and INCO has been favourably assessed by the respondents. Activities getting the lowest scores are related to scientific training and networking (scientific counselling, research training, networking activities, access to literature), maintenance of research equipment, as well as follow-up activities including the assistance with publication of research results. Suggestions are made below to strengthen these activities.

6. Despite the different professional constraints, the future career goal of African scientists is for 40% of them a national scientific career. Paradoxically, there are many more IFS grantees among the younger generation (first grant awarded during 1986-99) who favour a national scientific career as compared to the older generation (first grant awarded during 1974-85). Following the African survey, a similar questionnaire was sent to the IFS grantees in Mexico. Some 50 interviews of IFS grantees were also conducted in Mexico during 2000. A rapid comparison of the results of the two surveys shows clear differences not only in the working environment, the salaries received and the research funding structure, but also in the career goals of the respondents to the advantage of the Mexican scientists. Not surprisingly, whereas 40% of the African scientists had a national scientific career as a career goal, 85% of the Mexican grantees opted for such a career goal (forthcoming MESIA report No.3). The results from the Mexican survey are just an exemple of the growing disparities between an increasing number of countries in Latin America and in Asia and Africa. These disparities in working environment and level of scientific development certainly call for differentiated strategies. They are taken into account for developing, within the IFS workplan, specific regional sub-programmes for Africa in the near future.

Revisiting IFS work in Africa

To what extent should the main findings affect the IFS mode of work in Africa? Among the recommendations proposed below, a few have already been introduced in the IFS workplan for 2001, others are being discussed within the IFS Secretariat for possible introduction in the future medium term workplan.

1. National ownership and the role of IFS Member Organizations. Given the growing importance of external sources in the research funding structure (including IFS) of African research, there is a risk of by-passing national institutions (including national co-ordinating bodies such as IFS Member Organizations). In the framework of the IFS workplan 2001, a strategy is being prepared to collaborate more closely and more efficiently with the IFS Member Organizations to better ensure national ownership. Whenever felt necessary, additional national institutions including national grant schemes (see below) should be involved in this strategy.

2. The emergence of national grant schemes. An increasing number of African countries have established or are establishing competitive research grant schemes at the national level (South Africa, Tanzania, Cameroon, Egypt, Senegal, Morocco etc.) often with support from funding organizations in the North (e.g. Sida/SAREC and Danida in Tanzania). This is a positive move for science development in these countries and should have an impact in the future on the number of potential applicants for an IFS grant. In such a context, the role of IFS may need to be revisited and adapted in close consultation with these national grant schemes.

3. Partnership programmes and strategic alliances. IFS is already collaborating with a number of organizations working in or based in Africa. The most important ones include the Institute for Natural Resources in Africa (INRA/UNU), the centres of the Consultative Group for International Agricultural Research (CGIAR), and the African Academy of Sciences (AAS). Collaborations can take on different forms: cost-sharing of grants awarded to young African scientists (e.g. INRA/UNU), co-organization of scientific workshops and scientific advice (e.g. CGIAR centers), promotion of networking activities (e.g. AAS). These partnership programmes have so far proved to be successful and there is scope for added or renewed opportunities. While the Special Programme for African Agricultural Research (SPAAR) - for which IFS administered a small research grant programme in Africa for many years - is being transformed into the Forum for Agricultural Research in Africa (FARA), opportunities for renewed collaborations should be found with FARA and its constitutive sub-regional organizations: the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA), the West and Central African Council for Agricultural Research and Development (WECARD/CORAF), and the Southern Africa Centre for Co-operation in Agricultural Research and Training (SACCAR). Similarly, as the World Bank is developing a S&T strategy, IFS should advise the World Bank that competitive research grant schemes targeted at young scientists remain one of the most efficient models for strengthening research capacity in Africa.

4. Salary and other rewards. Although a lot of progress has been made over the last two decades and improved professional status has been obtained in many countries in Africa, the conditions under which the profession of scientist is carried out have deteriorated and salaries granted today to most scientists are grossly inadequate in Sub-Saharan African countries (excluding South Africa). Many scientists need to supplement their income with extra jobs, and time devoted to research activities shrinks away. For many African scientists, getting a research grant is part of their survival strategy. While IFS cannot supplement the scientists' salaries, it could, together with reputable like-minded organizations, such as the Third World Academy of Sciences (TWAS), try to influence policy makers in Africa to set up reward systems for active scientists based on their productivity. As far as the IFS is concerned, additional awards could be introduced to encourage the grantees to spend more time on writing their research results. For example, IFS could introduce a new award (amounting to approx. USD 500) to be given to grantees submitting satisfactory Final Reports.

5. Criteria for eligibility: age limit. Very few recruitments took place in the public sector during the 1990s, thus threatening the replacement of the ageing African scientific community. As a consequence, it is already difficult in some countries to find potential applicants below 40 years of age (e.g. Cameroon and Tanzania where country case studies were conducted). On average, the age of post-graduation is also often postponed, and it is more and more frequent that African scientists (particularly women with children) are getting their PhD (and sometimes their MSc) after 40 years of age. This calls for a more flexible interpretation of the age limit. It is proposed to link it to the year when the highest diploma is delivered: up to five years after a MSc or PhD.

6. Getting connected. Access to the Internet and e-mail worldwide has greatly improved informal communications with colleagues throughout the world as well as access to scientific literature. The situation has also improved in Africa over the recent past, but not as rapidly as on the other continents. The costs involved are in many cases prohibitive to the scientists and/or their institutions. A specific questionnaire is circulated to African grantees of IFS by the Secretariat to determine the main constraints and to better understand the situation. Based on the responses of the latter questionnaire, IFS will develop a strategy aiming at improving Internet connections of IFS grantees in Africa and develop communication within e-mail groups around clusters of successful IFS grantees. An application for funding these activities could be submitted to the Info/Dev funding programme of the World Bank.

7. Other supporting and networking activities. The assessment of the mode of work and support of the IFS and INCO programmes highlighted a number of activities that need to be further strengthened and reactivated or for which new support programmes need to be created. Most of these activities are related to scientific training and networking, maintenance of research equipment, as well as follow-up activities including the assistance with publication of research results. A comparison of research applications submitted to IFS also shows that success rates obtained by African scientists are overall lower than those obtained by their colleagues in Asia and Latin America. This is most often due to their lack of experience in preparing research grant applications. These constraints and shortcomings have already been taken in consideration while preparing the IFS workplan for 2001. Examples of programmes to be strengthened, reactivated or created include: 1) organizing training courses on how to prepare successful research grant applications and writing scientific articles for peer-reviewed journals, 2) promoting the creation of new scientific networks (e.g. based on the success of NAPRECA in East Africa, IFS could contribute to the creation of a network for natural products chemistry in West Africa), and 3) improving the maintenance of research equipments (based on the success of the Network of Users of Scientific Equipment in Eastern and Southern Africa (NUSESA), a project could be designed for a similar network to be established in West Africa).

Footnotes

1 In some African countries, external "aid" to research and scientific co-operation reached up to 75% or more of the national research budget, like in Senegal (Gaillard, 1997).

2 See in particular the chapters on Egypt, Kenya, Nigeria and Senegal.

3 In the rest of the text the African beneficiaries of the STD3 and INCO-DEV1 programmes of the European Commission are called INCO beneficiaries.

4 Algeria, Burkina Faso, Cameroon, Egypt, Côte d'Ivoire, Madagascar, Morocco, Nigeria, Senegal, South Africa, Tanzania, Tunisia and Zimbabwe.

5 Four versions of the questionnaire were used: a version in French and English for IFS grantees; a slightly different version in French and English for INCO beneficiaries. Only the IFS version in English is reproduced in this report (see Appendix 1).

6 Out of the overall contribution from the European Commission amounting to 635.000 FF, 75.000 FF were used for the questionnaire survey.

7 It was hoped at some point to also include the grantees of the Third World Academy of Sciences (TWAS), thereby adding an even larger spectrum of scientific disciplines i.e. basic sciences other than biology (mathematics, physics and chemistry), but TWAS finally decided to conduct its own survey. An attempt to also include social sciences involving CODESRIA in the survey finally did not materialize.

8 Out of them, 16 responded to the questionnaire, but 4 did not send back part VII related to INCO support "Relative importance of INCO support and future research goals". For simplicity, these questionnaires were taken into consideration for the calculation of the response rates, but in the rest of the data analysis, they were attributed to IFS grantees only.

9 From now on, the terms "active" and "completed" grantees will be used to qualify scientists who benefited from IFS support at the time of the survey, and scientists for whom IFS support was terminated, respectively.

10 Yet a recently published paper shows that agricultural and medical sciences are stagnating. Conversely, engineering sciences are growing, in particular North of the Sahara (Arvanitis, Waast and Gaillard, 2000).

11 Except Equatorial Guinea, Eritrea, Gabon, Lesotho, Liberia, Libya, Rwanda, Seychelles, Somalia and Swaziland that can hardly be considered as major science producers in Africa.

12 Professions libérales, i.e. medical doctors, dentists, lawyers etc.

13 Morocco, Algeria, Tunisia and Egypt

14 In the survey conducted in 1985 (Gaillard, 1991: p.81), USA occupied the first place (21%) immediately followed by Nigeria (11%).

15 A few interviews of IFS grantees being abroad at the time of the study were also conducted by e-mail.

16 This result slightly contradicts the largely held opinion that research in Africa is donor driven. A distinction should probably be made here between social sciences and biological and other basic sciences. Interviews conducted with social scientists (particularly in Cameroon, Tanzania, and Zimbabwe) overwhelmingly revealed that their choice of research topics were heavily driven by the research agenda of donor organizations (gender issues, governance, poverty alleviation, etc.). This seems to be much less the case for biological and agricultural scientists.

17 For IFS grantees and INCO beneficiaries respectively.

18 Most of the occurrences (62) are due to IFS grantees receiving support from INCO programmes as well as other programmes.

19 The relative position of the French Cooperation might be slightly overestimated due to the bias introduced by the over-representation of Morocco in the sample. The same could be said about USAID, which has been actively involved in Morocco over the last decades.

20 The relative importance of WHO/TDR might also be slightly overestimated given the large proportion of medical scientists in the INCO population.

21 The first Conference of Ministers responsible for the Application of Science and Technology for Development in Africa (CASTAFRICA I) was held in Dakar, Senegal in 1974. The second conference (CASTAFRICA II) took place in Arusha, Tanzania in 1987.

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Appendix 1

Four versions of the questionnaire were used: a version in French and English for IFS grantees; a slightly different version in French and English for INCO beneficiaries. The IFS version in English is reproduced below.

Questionnaire for IFS Grantees in Africa N° .....

(leave blank)

This questionnaire is intended for all IFS grantees. Even those grant recipients no longer receiving support from the Foundation for their research work are invited to participate in this survey.
To answer, use the space provided, tick the box ☐, or circle the relevant number (1, 2, 3 ...).

I Civil status, education and mobility

1. Family name: _____ Middle name: _____ First name: _____ (underline the name under which you publish)	2. Name and address of your home institution: _____ _____ _____ _____
3. E-mail address:	
4. Citizenship:	5. Sex: ☐ male ☐ female
6. Year of birth: 19 ___	7. Civil status: ☐ single ☐ married ☐ widowed
8. How many children do you have?	9. If you are married, what is your spouse's principal occupation?

10. Academic degrees obtained

Degrees	Area of specialisation	Year degree awarded	Educational establishment	Fellowship/study grant obtained from
BSc/Licence				
MSc/Maîtrise/Ingénieur				
PhD/thèse de 3ème cycle/Docteur Ingénieur				
Post-Doc/Doctorat d'Etat				

11. List your academic visits abroad (stay of at least 2 months) since you were awarded your highest degree

Year	Institution	Country	Duration (x months)

12. How many years have you spent outside your country for higher education and training, including postdoctoral studies and academic visits abroad? _____ years

2

II Career

14. List all the positions you have held since the beginning of your career

Position	Employing institution	Country	Starting date	% of research time

15. In your present position give the approximate amount of time devoted to the different activities listed below and indicate in the second column what, according to you, it should ideally be.

Activities	Present %	Ideal %
Teaching		
Research		
Administration		
Extension		
Consultancy		
Other (specify)		

16. Do you consider that the salary you receive as a scientist is adequate to support you and, if applicable, your family? ☐ Adequate ☐ Inadequate

17. How many times higher than the minimum salary in your country is your salary as a scientist/teacher ?
_____ times more

18. In which institutional framework do you work today?

☐ Public University ☐ Private University
☐ Public Institute ☐ Private Institute
☐ Non Governmental Organization (NGO)
☐ Others (specify) _____

19. Given the institutional framework in which you work, would you consider the following elements as relative advantages or disadvantages ?

	Advantage	Disadvantage
Salary scale	☐	☐
Career development	☐	☐
Job security	☐	☐
Social benefits	☐	☐
Retirement	☐	☐
Others (specify) _____	☐	☐

3

20. If you have extra jobs to supplement your income and, if applicable, your family, indicate how many additional hours you spend working per week. _____hours

21. If you have extra jobs, how many times more income do they provide you with in comparison to your basic salary as a scientist ? _____ times more

22. Specify the nature of your extra jobs

☐ Teaching
☐ Own consultancy or medical private practice
☐ Own private business
☐ Other (specify) _____
☐ Farming
☐ Somebody else's consultancy or medical private practice
☐ Somebody else's business

23. Compare your total family income with your salary as a scientist/teacher or and, if applicable, indicate how many times more it corresponds to: _____ times more

24. Have you been offered employment abroad? ☐ Yes ☐ No

If yes, in which country (ies)? _____

Did you accept the offer(s)? ☐ Yes ☐ No

III Research Choice and perception of research

25. Since the beginning of your research career, have you substantially changed your scientific orientation/research subjects? Yes ☐ No ☐

26. What is your main field of science at present, e.g., agronomy, zoology, parasitology, etc.?
_____

27. To carry out your research activities, do you usually work alone or with other scientists?
☐ Alone ☐ With other scientists

28. Whenever you work with other scientists do you usually work in monodisciplinary or multidisciplinary research teams ? ☐ monodisciplinary ☐ multidisciplinary

29. How often do you communicate with the following people regarding your research? (1 = never, 2 = rarely, 3 = annually, 4 = monthly, 5 = more often.)

1 2 3 4 5 Scientists in your department
1 2 3 4 5 Scientists from other institutions in your country
1 2 3 4 5 Scientists in other African countries
1 2 3 4 5 Scientists in Europe
1 2 3 4 5 Scientists in USA or Canada
1 2 3 4 5 Scientists in Asia or Latin America
1 2 3 4 5 Funding agencies
1 2 3 4 5 Non Governmental Organizations (NGOs)
1 2 3 4 5 Private clients
1 2 3 4 5 Consultancy groups
1 2 3 4 5 Extension staff
1 2 3 4 5 Others (specify) _____

30. Indicate whether you agree with the following assertions by circling a number from 1 = "disagree completely" to 5 = "agree completely".

1 2 3 4 5 Science is public knowledge
1 2 3 4 5 Scientific knowledge is universal
1 2 3 4 5 Science contributes to development
1 2 3 4 5 Science should firstly produce knowledge
1 2 3 4 5 Science should mainly lead to useful innovations
1 2 3 4 5 Researchers are free to choose their own research topics
1 2 3 4 5 Research topics are set by sponsors
1 2 3 4 5 Research topics are set by employers
1 2 3 4 5 Research problems are set by clients
1 2 3 4 5 Researchers should produce goods for a competitive market
1 2 3 4 5 Researchers should have entrepreneurial and managerial skills

IV Access to scientific literature and attendance of conferences

31. Do you have easy access to the Internet ? ☐ Yes ☐ No

32. Do you have access to bibliographic databases? ☐ Yes ☐ No
If yes, which one(s)? _____

33. How many scientific conferences have you attended since the beginning of your research career?

Conferences	With national support	With IFS support	With foreign support**	Without support
Within your country				
In Africa*				
In Europe				
In USA or Canada				
In Latin America & Caribbean				
In Asia				

*Except your own country **Except IFS

34. How many scientific conferences have you attended outside your country during the last five years?
_____ conferences

V Main Factors holding back your research work and evaluation

35. What are, according to you, the three main factors holding back your research work in order of importance?
1. _____
2. _____
3. _____

36. Certain recurring difficulties have been listed below. Indicate by circling the relevant number (1, 2, 3, 4) whether they are 1 = insignificant, 2 = tolerable, 3 = serious, or 4 = obstructive, according to you, in your research work.

1 2 3 4	Access to equipment	Lack of technician(s)	1 2 3 4
1 2 3 4	Purchasing equipment	Field work difficulties	1 2 3 4
1 2 3 4	Equipment repairs	Access to vehicle	1 2 3 4
1 2 3 4	Access to supplies	Access to scientific documentation	1 2 3 4
1 2 3 4	Lack of time	Data processing	1 2 3 4
1 2 3 4	Others (specify) _____		

5

37. How do you perceive your government's attitude toward research? Indicate the attitude by circling one number between "very negative" (1) and "very positive" (7).

1 2 3 4 5 6 7

38. Which criteria are the most important for the promotion of scientists in your country? Circle one number from 1 = not important at all to 5 = very important

1 2 3 4 5	Seniority	Contribution to teaching	1 2 3 4 5
1 2 3 4 5	Contribution to development	Contribution to the institution	1 2 3 4 5
1 2 3 4 5	Publications in local journals	Publications in international journals	1 2 3 4 5
1 2 3 4 5	Award of research grants	Strategic social relations	1 2 3 4 5
1 2 3 4 5	Others (specify) _____		

39. Is your research work evaluated regularly? ☐ Yes ☐ No

40. If yes, by whom? _____

VI Research Funding

41. What was your annual research budget (excluding salaries) last year, to the nearest U.S. $1,000 ?
U.S. $ _____

42. What were your sources of research funds as percentages (excluding salaries) last year ?

Sources	%
Home institution	
National public funds	
Industry or private foundation (national)	
Industry or private foundation (foreign)	
International organization	
Other (specify)	
Total	100

43. List the different funding institutions from which you have received financial support for your research activities since the beginning of your research career, excluding IFS and your own institution. Indicate your degree of satisfaction (1 = very bad, 2 = bad, 3 = average, 4 = good and 5 = excellent)

Years	Name of funding organizations	Country	Amount in US $	Degree of satisfaction
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5
				1 2 3 4 5

6

VII Relative importance of IFS support and future research goal

44. Would you have pursued your research if IFS funding had not been made available?

☐ Yes, other support would have been available
☐ Yes, but in a substantially different form
☐ Yes, even without other support
☐ Yes, but on a reduced scale
☐ No
☐ Other (specify) _____

45. Since becoming an IFS grantee, has it become easier for you to obtain:

	Yes	No
1. Additional funding from your institution	☐	☐
2. Additional funding from a national funding institution	☐	☐
3. Additional funding from an international institution	☐	☐

If yes to 3, give name _____

46. After receiving support from IFS, did it become easier for you to obtain scientific and technical assistance from your institution?

☐ Yes ☐ No

47. Has the IFS support provided opportunities to collaborate with new partners ?

☐ Yes ☐ No

48. Whenever applicable, did you continue to collaborate with them once the support was terminated ?

☐ Yes ☐ No ☐ Not applicable

49. How would you assess the IFS mode of work and support to your research work ? (1 = unacceptable, 2 = poor, 3 = satisfactory , 4 = good and 5 = excellent)

1 2 3 4 5 Selection process
1 2 3 4 5 Grant administration (including transfer of funds)
1 2 3 4 5 Monitoring and follow-up of projects
1 2 3 4 5 Contacts with IFS staff
1 2 3 4 5 Purchase of research equipment
1 2 3 4 5 Maintenance of research equipment
1 2 3 4 5 Access to literature
1 2 3 4 5 Research training
1 2 3 4 5 Scientific counselling
1 2 3 4 5 IFS organized workshops
1 2 3 4 5 Networking activities
1 2 3 4 5 Assistance in the publication of your research results
1 2 3 4 5 Follow up activities once the supported project is terminated
1 2 3 4 5 Other (specify) _____

50. What is your future career goal?

☐ National scientific career
☐ Career in administration
☐ Career in politics
☐ Private business
☐ Own consultancy or medical practice
☐ Career within national development programs
☐ Career within foreign or international organisations
☐ Other (specify) _____ _____

Thank you for your co-operation. Please return the completed questionnaire together with a complete list of publications (articles, books, papers in proceedings, reports, etc…) in the original language of publication, including names of co-authors, full titles of articles, books, papers,scientific journals, volume(s), first and last pages, date of publication, etc…, and **mark with an asterisk in the margin the ones which are directly derived from IFS support**.

Appendix 2

Responses to the Questionnaire

1 IFS grantees :

The IFS questionnaire was sent out to 1022 present and former IFS grantees in Africa (it was sent to grantees who received their first IFS grant in Africa, irrespective of their nationality; e.g. a scientist of Rwandese nationality was given a grant to carry out a project in Tanzania). Efforts were made to update the address information in the IFS database for the Foundation's grantees in Africa, especially those who no longer benefit from IFS support. In particular former grantees from Tanzania and Cameroon were tracked down in connection with the country case studies within the MESIA project. Out of 1022 questionnaires sent out to IFS grantees in Africa, 31 were returned by post undelivered (however, 15 of those were returned after the mailing of the reminder from Sierra Leone, where IFS has 19 grantees, after the outbreak of civil war). Also, two grantees were deceased.

493 grantees responded to the questionnaire, making the response rate 48.2% in total and 49.8% if we exclude the questionnaires returned to IFS undelivered. After the deadline an additional 23 questionnaires were received.

As shown in the following table, close to two thirds of the questionnaires were received following the first mailing (table 1).

In the past, IFS grantees could receive up to four grants (today three grants only). The more grants they received, the higher the response rate, except for the grantees having received four grants (table 2). Similarly active grantees (scientists who continue to benefit from IFS support at the time of the survey) tend to respond much more (71.0%) than grantees for whom IFS support was completed at the time of the survey (35.4%).

Not surprisingly, the response rates by country are very uneven (table 3). If we remove the questionnaires returned to IFS and the countries involved in conflict or suffering from natural disasters during the period (Congo, Mozambique, Rwanda and Sierra Leone), we reach a response rate of 51.4%.

	Number of replies	% of total
First mailing	310	62.9
Reminder	183	37.1
Total	493	100.0

Table 1: Response rates of IFS grantees: first mailing and reminder

	Number of replies	% of total
Active	262	71.0
Completed	231	35.4
1 grant	300	44.2
2 grants	120	52.6
3 grants	61	65.6
4 grants	12	54.5

Table 2 Response rates of IFS grantees according to status of support and number of grants received

2. Beneficiaries of the STD/INCO-DEV programmes

The address list of beneficiaries of the STD/INCO-DEV programmes of the European Commission (from now on referred to as INCO beneficiaries) was sent to us as two separate files, INCO-DEV1 and INCO-DC2. These were merged and the duplicate information taken away. This left 675 addresses, some of which still had to be checked and corrected before sending away the questionnaires. Out of the 675 addresses, 10 were disguised duplicates in that the postal addresses or the names were slightly different in the two lists of origin. Five postal addresses were incomplete.

Country	Total IFS grantees with 1st grant in Africa	Number of replies	%
Algeria	6	5	83
Benin	22	11	50
Botswana	3	2	66
Burkina Faso	40	22	55
Burundi	6	1	17
Cameroon	66	48	72
Central African Republic	1	1	100
Chad	4	2	50
Congo	28	6	21
Congo, D R	15	6	40
Côte d'Ivoire	26	4	15
Egypt	21	4	19
Ethiopia	38	19	50
Gabon	2	0	0
Gambia	2	2	100
Ghana	28	13	46
Guinea	3	1	33
Kenya	66	36	55
Lesotho	1	0	0
Liberia	3	0	0
Madagascar	24	12	50
Malawi	14	4	29
Mali	16	4	25
Mauritania	3	3	100
Mauritius	5	1	20
Morocco	148	76	51
Mozambique	5	3	60
Niger	10	6	60
Nigeria	153	79	52
Rwanda	5	0	0
Senegal	38	19	50
Seychelles	1	0	0
Sierra Leone	19	4	21
Somalia	5	0	0
South Africa	5	4	80
Sudan	18	6	33
Swaziland	2	0	0
Tanzania	48	25	52
Togo	11	6	55
Tunisia	44	23	52
Uganda	33	17	58
Zambia	12	4	33
Zimbabwe	22	14	64
Total	1022	493	48.2

Table 3: Response rates of IFS grantees by country

In addition, 35 INCO beneficiaries support were at the same time IFS grantees and received letters urging them to respond to both questionnaires. Lastly, nine questionnaires were filled in by non-Africans, and should not be considered. Therefore the response rates should be calculated on 686 INCO beneficiaries.

Out of the 686 INCO beneficiaries, full replies were received from 209 people. As the INCO grants are not personal, there have been other people replying in place of their colleagues on the list: in one instance, four people replied instead of their colleague (one of them from a different department!) and in another, one person replied though he is not an INCO beneficiary. In another case, an extra person replied to one questionnaire and in yet another, three persons replied to one questionnaire intended for a colleague, who did not reply. In addition, four different people replied to one questionnaire but not the person it was intended for. Moreover, six questionnaires were returned by post unanswered, one reply came from a listed beneficiary organisation that doesn't carry out research and another from an institution that doesn't receive funds from INCO. Lastly, one person had retired and didn't answer the questionnaire and one was deceased.

For simplicity, we will consider that the response rate should be calculated on the amount of filled-in questionnaires, even though five people replied in place of a colleague and six extra people replied.

The total response rate is therefore 30.5%. Divided between replies from the first mailing and replies after the reminder, we get a fifty-fifty result (table 4):

As in the case of the IFS questionnaire, the response rates are uneven from country to country (table 5). If we take away the countries in various forms of conflict or natural disaster situations during the period, namely Congo, Mozambique and Sierra Leone, we reach a marginally higher response rate of 31.1%.

After the close of the deadline, we received an additional six completed questionnaires and six unfilled questionnaires returned by post.

3. Global response rates (IFS and INCO questionnaires)

The global response rate to both questionnaires is 41.1%. If one doesn't consider Congo, Mozambique, Rwanda and Sierra Leone, the response rate reaches 41.8%.

The global response rates by country are listed in table 6.

	Number of replies	% of total
First mailing	103	49.3
Reminder	106	50.7
Total	209	100.0

Table 4: Response rates of beneficiaries of INCO-DEV support: First mailing and reminder

Countries	Number of Beneficiaries	Number of Replies	%
Algeria	9	2	22
Angola	3	1	33
Benin	10	5	50
Botswana	7	0	0
Burkina Faso	38	8	21
Cameroon	33	10	30
Central African Republic	0	0	0
Chad	1	0	0
Congo	3	0	0
Côte d'Ivoire	24	7	29
Egypt	28	8	29
Ethiopia	28	7	25
Gabon	7	0	0
Gambia	4	0	0
Ghana	19	8	42
Guinea	5	0	0
Guinea-Bissau	2	1	50
Kenya	57	17	30
Lesotho	2	0	0
Madagascar	4	2	50
Malawi	7	1	14
Mali	28	7	25
Mauritania	2	2	100
Mauritius	1	0	0
Morocco	52	16	31
Mozambique	15	2	13
Namibia	6	3	50
Niger	3	1	33
Nigeria	25	12	48
Senegal	42	12	29
Sierra Leone	2	0	0
Somalia	1	0	0
South Africa	42	19	45
Sudan	11	6	55
Swaziland	2	0	0
Tanzania	44	14	32
Togo	8	4	50
Tunisia	43	14	33
Uganda	17	8	47
Zambia	12	4	33
Zimbabwe	39	8	21
Total	686	209	31

Table 5: Response rates of INCO beneficiaries by country

Country	Total IFS and INCO beneficiaries	Replies from IFS and INCO beneficiaries	%
Algeria	15	7	47
Angola	3	1	33
Benin	32	16	50
Botswana	10	2	20
Burkina Faso	78	30	38
Burundi	6	1	17
Cameroon	99	58	59
Central African Republic	1	1	100
Chad	5	2	40
Congo	31	6	19
Congo, D R	15	6	40
Côte d'Ivoire	50	11	22
Egypt	49	12	24
Ethiopia	66	26	39
Gabon	9	0	0
Gambia	6	2	33
Ghana	47	21	45
Guinea	8	1	13
Guinea-Bissau	2	1	50
Kenya	123	53	43
Lesotho	3	0	0
Liberia	3	0	0
Madagascar	28	14	50
Malawi	21	5	24
Mali	44	11	25
Mauritania	5	5	100
Mauritius	6	1	17
Morocco	200	92	46
Mozambique	20	5	25
Namibia	6	3	50
Niger	13	7	54
Nigeria	178	91	51
Rwanda	5	0	0
Senegal	80	31	39
Seychelles	1	0	0
Sierra Leone	21	4	19
Somalia	6	0	0
South Africa	47	23	49
Sudan	29	12	41
Swaziland	4	0	0
Tanzania	92	39	42
Togo	19	10	53
Tunisia	87	37	43
Uganda	50	25	50
Zambia	24	8	33
Zimbabwe	61	22	36
Total	1708	702	41

Table 6: Global response rates by country

Appendix 3

List of Acronyms:

AAS	African Academy of Sciences
ABN	African Biosciences Network
ADF	African Development Foundation
AGDF	Administration Générale de la Coopération au Développement (Belgium)
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AUPELF/UREF	Association des Universités Partiellement ou Entièrement de Langue Francaise
CAMES	Comité Africain et Malgache pour l'Enseignement Supérieur
CGIAR	Consultative Group on International Agricultural Research
CIES	Council for International Exchange of Scholars
CNRS	Centre National de la Recherche Scientifique (France)
CODESRIA	Council for the Development of Social Sciences in Africa
CTA	Technical Centre for Agricultural and Rural Co-operation
DAAD	Deutscher Akademischer Austauschdienst (Germany)
DANIDA	Danish International Development Assistance (Denmark)
DFID	Department for International Development (formerly ODA)
DG RTD	Directorate General for Research and Technological Development of the European Commission
EC	European Commission
EU	European Union
FAC	Fonds d'Aide à la Coopération (France)
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
GTZ	Gesellschaft für Technische Zusammenarbeit (Germany)
IAEA	International Atomic Energy Agency
ICRAF	Internal Center for Research on Agroforestry
IDRC	International Development Research Center (Canada)
IFS	International Foundation for Science
IITA	International Institute for Tropical Agriculture
INCO-DEV	Research for Development programme of the International Co-operation programme (EU)
INRA/UNU	Institute for Natural Resources in Africa (United Nations University)
IRD	Institut de Recherche pour le Développement (formerly ORSTOM, France)
ISP/IPICS	International Science Programme/International Programme in the Chemical Sciences (Sweden)
MAE	Ministère des Affaires Etrangères (Ministry of Foreign Affairs, France)
MESIA	Monitoring and Evaluation System for Impact Assessment
NAPRECA	Natural Products Research Network for Eastern and Central Africa
NORAD	Norwegian Agency for Development Cooperation (Norway)
NRF	National Research Foundation (South Africa)
NRI	Natural Resources Institute
NUFFIC	The Netherlands Organization for International Co-operation in Higher Education
NUSESA	Network of Users of Scientific Equipment in Eastern and Southern Africa

ODA	Overseas Development Administration (ODA, now DFID)
ORSTOM	Office de la Recherche Scientifique et Technique Outre Mer (now IRD)
PASCAL	Bibliographic Database (France)
SACCAR	Southern African Center for Cooperation in Agricultural and Natural Resources Research and Training
SAREC	Swedish Agency for Research Cooperation with Developing Countries
SCI	Science Citation Index
SIDA	Swedish International Development Co-operation Agency
SPAAR	Special Programme for African Agricultural Research (now FARA)
STD	Science, Technology and Development Programme (EU)
TDR	Special Programme for Research and Training in Tropical Diseases (WHO)
TWAS	Third World Academy of Sciences
UNDP	United Nations Development Programme
UNESCO	United Nations Educational Scientific and Cultural Organization
UNU	United Nations University
USAID	Agency for International Development (USA)
WECARD	West and Central African Council for Agricultural Research and Development
WHO	World Health Organization
World Bank	The International Bank for Reconstruction and Development (IBRD)

Appendix 4

Additional Tables

Table A1: Gender distribution (Question 5)

Gender	IFS		INCO		IFS + INCO	
	Responses	%	Responses	%	Responses	%
Male	411	84.6	155	79.9	566	83.2
Female	75	15.4	39	20.1	114	16.8
Total responses	486	100.0	194	100.0	680	100.0

Table A2: Age distribution (Question 6)

	IFS		INCO		IFS + INCO	
	Responses	%	Responses	%	Responses	%
1921-1930	0	0.0	1	0.5	1	0.1
1931-1940	8	1.7	8	4.1	16	2.4
1941-1950	94	19.4	56	29.0	150	22.2
1951-1960	260	53.7	97	50.3	357	52.7
1961-1970	120	24.8	30	15.5	150	22.2
1971-1980	2	0.4	1	0.5	3	0.4
Total	484	100.0	193	100.0	677	100.0

Table A3: Civil status (Question 7)

Civil status	IFS		INCO		IFS + INCO	
	Responses	%	Responses	%	Responses	%
Single	38	7.8	14	7.3	52	7.6
Married	442	90.7	173	89.6	615	90.4
Widowed	7	1.4	6	3.1	13	1.9
Responses	487	100.0	193	100.0	680	100.0

Table A4: Number of children (Question 8)

Number of children	IFS		INCO	
	No.	%	No.	%
0	64	13.0	29	14.8
1	45	9.1	15	7.7
2	145	29.4	41	20.9
3	104	21.1	60	30.6
4	67	13.6	28	14.2
5	35	7.1	15	7.7
6	21	4.3	4	2.0
7	7	1.4	4	2.0
8	2	0.4	0	0.0
9	1	0.2	0	0.0
10	1	0.2	0	0.0
11	1	0.2	0	0.0
Total	493	100.0	196	100.0
Mean	2.7		2.6	

Table A5: Spouse's principal occupation (Question 9)

Occupation	IFS		INCO		IFS + INCO	
	Responses	%	Responses	%	Responses	%
Housewives	76	18.1	23	14.1	99	17.0
Craftsmen	2	0.5	0	0.0	2	0.3
Shopkeepers	9	2.1	7	4.3	16	2.7
Directors of firms	11	2.6	4	2.5	15	2.6
Researchers	41	9.8	12	7.4	53	9.1
Lecturers/Professors	17	4.0	11	6.7	28	4.8
Consultants	1	0.2	2	1.2	3	0.5
"The professions"	22	5.2	16	9.8	38	6.5
Senior Management in administration and business	12	2.9	3	1.8	15	2.6
Engineers	10	2.9	6	3.7	16	2.7
School teachers (primary and secondary education)	51	12.1	11	6.7	62	10.6
Middle management (health)	26	6.2	15	9.2	41	7.0
Middle management (civil service)	31	7.4	4	2.5	35	6.0
Middle management (business and firms)	32	7.6	11	6.7	43	7.4
Technicians	4	1.0	5	3.1	9	1.5
Supervisors	0	0.0	0	0.0	0	0.0
Employees	38	9.0	15	9.2	53	9.1
Workers	0	0.0	2	1.2	2	0.3
Farmers	8	1.9	1	0.6	9	1.5
Unemployed	1	0.2	2	1.2	3	0.5
Other	28	6.7	13	8.0	41	7.0
Total	420	100.0	163	100.0	583	100.0

Table A6: Institutional framework in which respondents are working today (Question 18)

Institutional framework	IFS		INCO		IFS + INCO	
	responses	%	responses	%	responses	%
Public university	318	64.8	92	47.9	410	60.0
Public institute	144	29.3	79	41.1	223	32.7
Non Governmental Organization (NGO)	17	3.5	12	6.3	29	4.2
Private university	5	1.0	3	1.6	8	1.2
Private institute	7	1.4	6	3.1	13	1.9
Total	491	100.0	192	100.0	683	100.0

Tables A7 (a, b, c, d and e):
Degrees by period and by institution (Questions 10 and 18)

a)

Institution	Public University						
Degree	BSc		MSc		PhD		Total
Period	No.	% of total	No.	% of total	No.	% of total	
1962-1980	1	1.5	7	10.3	60	88.2	68
1981-1990	3	1.6	25	13.4	158	84.9	186
1991-1999	3	2.1	23	16.0	118	81.9	144
Total	7	1.8	55	13.8	336	84.4	398

b)

Institution	Public Institute						
Degree	BSc		MSc		PhD		Total
Period	No.	% of total	No.	% of total	No.	% of total	
1962-1980	4	19.0	5	23.8	12	57.1	21
1981-1990	2	2.5	27	34.2	50	63.3	79
1991-1999	1	1.1	27	29.0	65	69.9	93
Total	7	3.6	59	30.6	127	65.8	193

c)

Institution	NGO						
Degree	BSc		MSc		PhD		Total
Period	No.	% of total	No.	% of total	No.	% of total	
1962-1980	0	0.0	0	0.0	2	100.0	2
1981-1990	0	0.0	0	0.0	4	100.0	4
1991-1999	2	18.2	3	27.3	6	54.5	11
Total	2	11.8	3	17.6	12	70.6	17

d)

Institution	Private University						
Degree	BSc		MSc		PhD		Total
Period	No.	% of total	No.	% of total	No.	% of total	
1962-1980	0	0.0	0	0.0	1	100.0	1
1981-1990	0	0.0	0	0.0	1	100.0	1
1991-1999	0	0.0	0	0.0	1	100.0	1
Total	0	0.0	0	0.0	3	100.0	3

e)

Institution	Private Institute						
Degree	BSc		MSc		PhD		Total
Period	No.	% of total	No.	% of total	No.	% of total	
1962-1980	0	0.0	0	0.0	0	0.0	0
1981-1990	0	0.0	1	25.0	3	75.0	4
1991-1999	1	14.3	2	28.6	4	57.1	7
Total	1	9.1	3	27.3	7	63.6	11

Table A8 (a, b and c):
Advantages and disadvantages of respondents' institutional framework (Question 19)

a)

IFS					
Elements	Advantage		Disadvantage		Responses
	No.	%	No.	%	
Salary scale	107	22.8	362	77.2	469
Career development	299	65.3	159	34.7	458
Job security	419	88.6	54	11.4	473
Social benefits	146	33.6	289	66.4	435
Retirement	264	60.6	172	39.4	436

b)

INCO					
Elements	Advantage		Disadvantage		Responses
	No.	%	No.	%	
Salary scale	42	22.5	145	77.5	187
Career development	122	67.8	58	32.2	180
Job security	147	79.5	38	20.5	185
Social benefits	62	35.2	114	64.8	176
Retirement	89	49.2	92	50.8	181

c)

IFS + INCO					
Elements	Advantage		Disadvantage		Responses
	No.	%	No.	%	
Salary scale	149	22.7	507	77.3	656
Career development	421	66.0	217	34.0	638
Job security	566	86.0	92	14.0	658
Social benefits	208	34.0	403	66.0	611
Retirement	353	57.2	264	42.8	617

Table A9a: Adequacy of scientists' salaries to support themselves and their family (Question 16)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Adequate	64	13.1	31	16.0	95	13.9
Inadequate	424	86.9	163	84.0	587	86.1
Total	488	100.0	194	100.0	682	100.0

Table A9b: Adequacy of scientists' salary by region (Question 16)

Region	Adequate		Inadequate		Total No.
	No.	%	No.	%	
Republic of South Africa	10	47.6	11	52.4	21
Northern Africa	44	30.8	99	69.2	143
The rest of Africa	41	7.9	475	92.1	516
Total	95	100.0	585	100.0	680

Table A10: Respondents' salary as a scientist/teacher in comparison to the country's minimum salary (Question 17)

Number of times the minimum	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
1	12	2.8	5	3.1	17	2.8
2	38	8.7	16	9.8	54	9.0
3	49	11.2	19	11.7	68	11.4
4	52	11.9	24	14.7	76	12.7
5	77	17.7	30	18.4	107	17.9
6-10	165	37.8	48	29.4	213	35.6
11-20	34	7.8	12	7.4	46	7.7
21-50	5	1.1	4	2.5	9	1.5
51-100	4	0.9	3	1.8	7	1.2
101-500	0	0.0	2	1.2	2	0.3
Responses	436	100.0	163	100.0	599	100.0
Mean	**7.5X the minimum**		**12X the minimum**		**8.7X the minimum**	

Table A11: Number of additional hours worked per week to supplement respondents' science/teaching salaries (Question 20)

Hours	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
0.1 - 5	57	30.0	23	25.3	80	28.5
5.1 - 10	66	34.7	26	28.6	92	32.7
10.1 - 15	21	11.1	9	9.9	30	10.7
15.1 - 20	21	11.1	17	18.7	38	13.5
20.1 - 40	21	11.1	14	15.4	35	12.5
40.1 - 60	1	0.5	1	1.1	2	0.7
60+	3	1.6	1	1.1	4	1.4
Responses	190	100.0	91	100.0	281	100.0
Mean	12.3 hours		13.9 hours		12.8 hours	

Table A12: Size of extra income as compared to respondents' basic salary as a scientist (Question 21)

Number of times the basic salary	IFS	INCO	IFS + INCO
0.1 - 1	63	19	82
1.1 - 2	41	19	60
2.1 - 3	17	12	29
3.1 - 4	8	4	12
4.1 - 5	11	6	17
5.1 - 6	2	1	3
6.1 - 7	1	1	2
7.1 - 8	1	2	3
8.1 - 9	0	0	0
9.1 - 10	11	4	15
10+	4	5	9
Responses	159	73	232
Mean	3.2 times more	5.1 times more	3.8 times more

Table A13: The nature of respondents' extra jobs (Question 22)

Extra jobs	IFS + INCO		INCO		IFS		IFS 1974 - 1985		IFS 1986 - 1999	
	No.	%	No.	%	No.	%	No.	%	No.	%
Teaching	118	24.5	33	21.9	85	25.8	13	21.0	72	26.9
Own consultancy or private medical practice	76	15.8	35	23.2	41	12.4	11	17.7	30	11.2
Own private business	45	9.4	10	6.6	35	10.6	10	16.1	25	9.3
Farming	64	13.3	18	11.9	46	13.9	8	12.9	38	14.2
Employed by a consultancy firm or private medical practice	106	22.0	32	21.2	74	22.4	11	17.7	63	23.5
Employed by a business	72	15.0	23	15.2	49	14.8	9	14.5	40	14.9
Responses	481	100.0	151	100.0	330	100.0	62	100.0	268	100.0

Table A14: Average time spent abroad by IFS grantees, by purpose and by period (Questions 12 and 13)

Number of years abroad	1974-1980				1981-1990				1981-1990			
	For higher education		For all reasons		For higher education		For all reasons		For higher education		For all reasons	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0.1- 2	6	18.8	3	9.4	40	22.5	31	17.4	49	25.9	46	24.1
2.1 -4	6	18.8	6	18.8	46	25.8	42	23.6	49	25.9	43	22.5
4.1 -6	9	28.1	7	21.9	45	25.3	47	26.4	48	25.4	52	27.2
6.1-8	6	18.8	6	18.8	25	14.0	27	15.2	23	12.2	27	14.1
8.1 -10	2	6.3	2	6.3	11	6.2	14	7.9	8	4.2	10	5.2
10.1-12	3	9.4	4	12.5	7	3.9	7	3.9	5	2.6	5	2.6
12.1-14	0	0.0	1	3.1	3	1.7	5	2.8	4	2.1	3	1.6
14.1-16	0	0.0	3	9.4	0	0.0	2	1.1	2	1.1	2	1.0
16.1-18	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5
18.1-20	0	0.0	0	0.0	1	0.6	2	1.1	1	0.5	2	1.0
20.1-30	0	0.0	0	0.0	0	0.0	1	0.6	0	0.0	0	0.0
Responses	32	100.0	32	100.0	178	100.0	178	100.0	189	100.0	191	100.0
Mean no. of years	5.5		7.3		5.0		5.8		4.8		5.1	

Table A15a: Degrees taken by region (IFS and INCO separately) (Question 10)

Region	BSc				MSc				PhD			
	IFS	%	INCO	%	IFS	%	INCO	%	IFS	%	INCO	%
Africa	342	85.5	118	78.1	248	60.0	70	44.3	159	42.4	43	31.6
Asia and the Pacific	6	1.5	0	0.0	1	0.2	2	1.3	2	0.5	2	1.5
Europe	41	10.3	26	17.2	122	29.5	63	39.9	161	42.9	71	52.2
Latin America and the Caribbean	1	0.3	0	0.0	2	0.5	2	1.3	0	0.0	0	0.0
Oceania	0	0.0	0	0.0	1	0.2	1	0.6	5	1.3	1	0.7
USA and Canada	10	2.5	7	4.6	39	9.4	20	12.7	48	12.8	19	14.0
Total Responses	400	100.0	151	100.0	413	100.0	158	100.0	375	100.0	136	100.0

Table A15b: Degrees taken by region (IFS and INCO together) (Question 10)

Region	BSc		MSc		PhD	
Africa	460	83.5	318	55.7	202	39.5
Asia and the Pacific	6	1.1	3	0.5	4	0.8
Europe	67	12.2	185	32.4	232	45.4
Latin America and the Caribbean	1	0.2	4	0.7	0	0.0
Oceania	0	0.0	2	0.4	6	1.2
USA and Canada	17	3.1	59	10.3	67	13.1
Total Responses	551	100.0	571	100.0	511	100.0

Table A16a: BSc degrees by period, taken at home or abroad (Question 10)

BSc	IFS					INCO				
Period	Home	% of total	Abroad	% of total	Total	Home	% of total	Abroad	% of total	Total
1959-1970	16	66.7	8	33.3	24	16	69.9	7	30.4	23
1971-1980	123	76.4	38	23.6	161	46	65.7	24	34.3	70
1981-1990	156	83.0	32	17.0	188	35	79.5	9	20.5	44
1991-1999	17	94.4	1	5.6	18	6	75.0	2	25.0	8
Total	312	79.8	79	20.2	391	103	71.0	42	29.0	145

Table A16b: MSc degrees by period, taken at home or abroad (Question 10)

MSc	IFS					INCO				
Period	Home	% of total	Abroad	% of total	Total	Home	% of total	Abroad	% of total	Total
1959-1970	4	36.4	7	63.6	11	2	22.2	7	77.8	9
1971-1980	59	59.6	40	40.4	99	19	34.5	36	65.5	55
1981-1990	126	55.8	100	44.2	226	29	43.9	37	56.1	66
1991-1999	38	53.5	33	46.5	71	8	34.8	15	65.2	23
Total	227	55.8	180	44.2	407	58	37.9	95	62.1	153

Table A16c: PhD degrees by period, taken at home or abroad (Question 10)

PhD	IFS					INCO				
Period	Home	% of total	Abroad	% of total	Total	Home	% of total	Abroad	% of total	Total
1959-1970	2	41.0	3	60.0	5	2	33.3	4	66.7	6
1971-1980	13	28.9	32	71.1	45	8	38.1	13	61.9	21
1981-1990	60	36.6	104	63.4	164	10	17.5	47	82.5	57
1991-1999	64	42.7	86	57.3	150	16	33.3	32	66.7	48
Total	139	38.2	225	61.8	364	36	27.3	96	72.7	132

Table A17: Degrees taken at home by time-period and region (Question 10)

Region	South Africa				Northern Africa				The rest of Africa				Overall total			
BSc	Home	Abroad	Total	% home	Home	Abroad	Total	% home	Home	Abroad	Total	% home	Home	Abroad	Total	% home
1959-1980	8	0	8	100.0	39	9	48	81.3	154	61	215	71.6	201	70	271	74.2
1981-1999	12	0	12	100.0	41	8	49	83.7	161	36	197	81.7	214	44	258	82.9
Total	20	0	20	100.0	80	17	97	82.5	315	97	412	76.5	415	114	529	78.4

Region	South Africa				Northern Africa				The rest of Africa				Overall total			
MSc	Home	Abroad	Total	% home	Home	Abroad	Total	% home	Home	Abroad	Total	% home	Home	Abroad	Total	% home
1959-1980	3	3	6	50.0	31	16	47	66.0	50	71	121	41.3	84	90	174	48.3
1981-1999	8	2	10	80.0	48	17	65	73.8	145	166	311	46.6	201	185	386	52.1
Total	11	5	16	68.8	79	33	112	70.5	195	237	432	45.1	285	275	560	50.9

Region	South Africa				Northern Africa				The rest of Africa				Overall total			
PhD	Home	Abroad	Total	% home	Home	Abroad	Total	% home	Home	Abroad	Total	% home	Home	Abroad	Total	% home
1959-1980	1	1	2	50.0	11	10	21	52.4	13	41	54	24.1	25	52	77	32.5
1981-1999	14	0	14	100.0	41	64	105	39.0	95	203	298	31.9	150	267	417	36.0
Total	15	1	16	93.8	52	74	126	41.3	108	244	352	30.7	175	319	494	35.4

Table A18: Employment offered abroad; accepted or not (Question 24)

Countries	IFS accepted	INCO accepted	Total accepted	IFS not accepted	INCO not accepted	Total not accepted	Total
Argentina	0	1	1	0	0	0	1
Australia	0	1	1	0	1	1	2
Austria	1	0	1	0	0	0	1
Belgium	0	1	1	0	0	0	1
Botswana	3	1	4	0	0	0	4
Brazil	1	1	2	0	0	0	2
Burkina Faso	1	0	1	2	0	2	3
Cameroon	0	0	0	1	0	1	1
Canada	1	4	5	0	4	4	9
Chad	1	1	2	0	0	0	2
Côte d'Ivoire	0	1	1	0	0	0	1
Czech Republic	0	0	0	0	1	1	1
Ethiopia	0	1	1	0	0	0	1
France	1	14	15	1	6	7	22
Gabon	1	0	1	0	1	1	2
Gambia	0	0	0	0	1	1	1
Ghana	0	0	0	1	0	1	1
Greenland	0	1	1	0	0	0	1
Italy	0	2	2	0	0	0	2
Jamaica	0	1	1	0	0	0	1
Japan	1	0	1	0	0	0	1
Kenya	5	3	8	0	0	0	8
Kuwait	0	0	0	0	1	1	1
Lebanon	0	0	0	0	1	1	1
Libya	1	0	1	0	0	0	1
Malawi	1	1	2	1	1	2	4
Mozambique	0	0	0	0	1	1	1
Namibia	1	1	2	0	0	0	2
Niger	0	2	2	0	0	0	2
Nigeria	1	1	2	0	1	1	3
Norway	0	0	0	0	1	1	1
Oman	1	0	1	0	2	2	3
Palestine	1	0	1	0	0	0	1
Papua New Guin	1	0	1	0	0	0	1
Rwanda	1	0	1	0	1	1	2
Saudi Arabia	2	2	4	2	2	4	8
Senegal	1	1	2	0	0	0	2
Seychelles	0	0	0	1	0	1	1
South Africa	1	4	5	0	1	1	6
Spain	0	1	1	0	0	0	1
Sudan	0	0	0	0	1	1	1
Tanzania	0	0	0	1	0	1	1
The Netherlands	1	0	1	0	0	0	1
United Kingdom	1	4	5	1	3	4	9
USA	5	13	18	1	10	11	29
Yemen	0	0	0	1	0	1	1
Zimbabwe	0	0	0	0	1	1	1
Total	35	63	98	13	41	54	152

Table A19: Respondents that have substantially changed their scientific orientation/research subject since the beginning of their career (Question 25)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Changed	132	27.6	56	31.1	188	28.3
No change	333	69.5	120	64.5	454	68.3
No reponse	14	2.9	10	5.4	23	3.5
Responses	479	100.0	186	100.0	665	100.0

Table A20: Mean allocation of respondents' work time (IFS and INCO together) (Question 15)

Activity	Present allocation of time (%)	Ideal allocation of time (%)
Research	48.3	52.8
Teaching	30.9	26.4
Administration	20.6	13.6
Extension	9.3	10.4
Consultancy	8.6	11.0

Table A21: Working alone vs. working with other scientists (Question 27)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Alone	39	8.3	6	3.1	45	6.8
With other scientists	432	91.7	187	96.9	619	93.2
Total	471	100.0	193	100.0	664	100.0

Table A22: Multidisciplinary vs. monodisciplinary teams (Question 28)

	IFS		IFS 1974-1990		IFS 1991-1999		INCO		IFS + INCO	
	No.	%	No.	%	No.	%	No.	%	No.	%
Mono	77	17.1	45	20.7	32	13.7	16	8.6	93	14.6
Multi	374	82.9	172	79.3	202	86.3	171	91.4	545	85.4
Responses	451	100.0	217	100.0	234	100.0	187	100.0	638	100.0

Table A23: Mean frequency of communication with scientists and other people (Question 29)
(1 = never, 2 = rarely, 3 = annually, 4 = monthly, 5 = more often)

Group	IFS	INCO	IFS + INCO
Scientists in your department	4.4	4.5	4.4
Scientists from other institutions in your country	3.3	3.6	3.4
Scientists in other African countries	2.5	2.9	2.6
Scientists in Europe	3.1	3.4	3.2
Scientists in USA or Canada	2.2	2.3	2.2
Scientists in Asia or Latin America	1.6	1.6	1.6
Funding agencies	3.0	2.9	3.0
Non Governmental Organizations (NGOs)	2.3	2.5	2.4
Private Clients	2.2	2.3	2.2
Consultancy groups	2.1	2.3	2.2
Extension Staff	2.9	2.9	2.9

Table A24: Easy access to the Internet (Question 31)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Yes	242	49.8	119	61.0	361	53.0
No	244	50.2	76	39.0	320	47.0
Responses	486	100.0	195	100.0	681	100.0

Table A25: Easy access to bibliographic databases (Question 32)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Yes	206	44.6	97	53.0	304	46.9
No	256	55.4	86	47.0	344	53.1
Total	462	100.0	183	100.0	648	100.0

Table A26: Mean number of conferences attended outside the scientists' home country during the last five years (Question 34)

	Respondents	All questionnaires*
IFS	5.4	4.5
INCO	6.9	6.3
IFS + INCO	5.8	5.0

* When a number was not provided, it was deemed to be a zero.

Table A27: "Is your research work evaluated regularly?" (Question 39)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Yes	273	57.2	127	64.8	400	59.4
No	204	42.8	69	35.2	273	40.6
Responses	477	100.0	196	100.0	673	100.0

Table A28: "Who evaluates your research work?" (Question 40)

Evaluator(s)	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Institution/University	108	37.4	46	32.4	154	35.7
Donors	34	11.8	30	21.1	64	14.8
Supervisor	44	15.2	11	7.7	55	12.8
Supra-national Scientific Committee	17	5.9	6	4.2	23	5.3
National Scientific Committee	11	3.8	10	7.0	21	4.9
Ministry/Government agency	11	3.8	7	4.9	18	4.2
Peers	9	3.1	9	6.3	18	4.2
Faculty	15	5.2	1	0.7	16	3.7
Department	12	4.2	3	2.1	15	3.5
External Evaluators	4	1.4	7	4.9	11	2.6
Employer	5	1.7	5	3.5	10	2.3
Journal referees	6	2.1	0	0.0	6	1.4
Foreign university	4	1.4	1	0.7	5	1.2
Self-evaluation	3	1.0	2	1.4	5	1.2
Other	2	0.7	2	1.4	4	0.9
Ad hoc promotion committee	3	1.0	0	0.0	3	0.7
Regional institutes	1	0.3	2	1.4	3	0.7
Totals	289	100.0	142	100.0	431	100.0

Table A29: Mean importance of criteria affecting the promotion of scientists in Africa (Question 38)
(1 = not important to 5 = very important)

Criteria	IFS	INCO	IFS +INCO
Publications in international journals	4.2	4.1	4.2
Publications in local journals	3.3	3.4	3.3
Seniority	3.3	3.4	3.3
Contribution to development	3.1	3.3	3.1
Contribution to teaching	2.9	3.0	2.9
Strategic social relations	2.9	2.9	2.9
Contribution to the institution	2.8	3.0	2.9
Award of research grants	2.7	3.2	2.9

Table A30: Mean responses to value statements (Question 30)
(1 = disagree completely, 5 = agree completely)

Statements	IFS	INCO	IFS + INCO
Science contributes to development	4.9	4.9	4.9
Science knowledge is universal	4.6	4.5	4.5
Science should firstly produce knowledge	4.2	4.1	4.2
Science should mainly lead to useful innovations	4.1	4.1	4.1
Researchers should have entrepreneurial and managerial skills	3.8	4.0	3.8
Researchers are free to choose their own research topics	3.7	3.4	3.6
Science is public knowledge	3.7	3.8	3.7
Researchers should produce goods for a competitive market	3.6	3.6	3.6
Research problems are set by clients	3.5	3.4	3.4
Research topics are set by sponsors	2.7	3.0	2.8
Research topics are set by employers	2.6	3.0	2.7

Table A31a: Research budget in USD 1999 (Question 41)

Research budget (USD)	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
0	146	29.9	44	24.0	190	28.3
0 - 1 000	74	15.1	15	8.2	89	13.2
1 000 - 5 000	108	22.1	23	12.6	131	19.5
5 000 -10 000	55	11.2	26	14.2	81	12.1
10 000 - 20 000	53	10.8	28	15.3	81	12.1
20 000 - 30 000	22	4.5	22	12.0	44	6.5
30 000 - 40 000	11	2.2	6	3.3	17	2.5
40 000 - 50 000	10	2.0	8	4.4	18	2.7
50 000 - 100 000	10	2.0	11	6.0	21	3.1
Total	489	100.0	183	100.0	672	100.0

Table A31b: Research budget of 1999 in USD - active and completed grantees (Question 41)

Research budget (USD)	IFS active		IFS completed	
	No.	%	No.	%
0	63	24.8	83	35.3
0 - 1 000	31	12.2	43	18.3
1 000 - 5 000	65	25.6	43	18.3
5 000 - 10 000	36	14.2	19	8.1
10 000 - 20 000	36	14.2	17	7.2
20 000 - 30 000	12	4.7	10	4.3
30 000 - 40 000	6	2.4	5	2.1
40 000 - 50 000	1	0.4	9	3.8
50 000 - 100 000	4	1.6	6	2.6
Total	254	100.0	235	100.0

Table A32a: Sources of research funds (% of total) (Question 42)

Source	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Home institution	88	20.7	31	18.0	119	19.9
National public funds	55	12.9	24	14.3	79	13.2
Industry or private foundation	7	1.6	2	1.2	9	1.5
Industry or private foundation	27	6.3	7	4.0	34	5.7
International organization	216	50.7	102	59.1	318	53.2
Other	33	7.8	6	3.5	39	6.5
Total	426	100.0	172	100.0	598	100.0

Table A32b: Sources of research funds by regions in Africa (Question 42)

Source	Northern Africa		Republic of South Africa		The rest of Africa	
	No.	%	No.	%	No.	%
Home institution	30	29.5	4	19.0	85	18.1
National public funds	14	13.7	5	23.8	58	12.4
Industry or private foundation (national)	2	1.9	1	4.8	7	1.4
Industry or private foundation (foreign)	6	5.5	1	4.8	28	5.9
International organization	46	44.9	9	42.9	255	54.2
Other	5	4.5	1	4.8	37	7.9
Total	103	100.0	21	100.0	470	100.0

Table A33a: IFS and INCO satisfaction rates for the 30 most cited funding institutions (Question 43) (1 = very bad, 2 = bad, 3 = average, 4 = good and 5 = excellent)

Funding Institution	IFS		INCO	
	Mean satisfaction	Frequency of occurrence	Mean satisfaction	Frequency of occurrence
AAS	4.3	12	5.0	2
ABN	3.5	8	5.0	1
ADF	4.4	10	no data	0
AGCD	4.3	14	3.8	5
AUPELF-UREF	4.0	34	3.9	8
CIES	3.7	9	4.0	1
CNRS	3.5	11	1.6	5
Coopération Française/ FAC	3.8	57	3.9	32
DAAD	4.0	22	4.3	3
DANIDA	4.4	14	4.3	11
DFID/ODA	4.3	9	4.1	16
EU	4.2	62	4.3	29
FAO	4.0	31	3.7	15
GTZ	4.1	15	4.3	9
IAEA	4.3	23	4.2	14
ICRAF	3.5	9	5.0	3
IDRC	4.4	30	4.4	17
IITA	3.8	13	4.5	2
INRA	4.3	10	no data	0
IRD (ORSTOM)	4.4	16	3.6	5
ISP/IPICS	4.8	17	no data	0
NORAD	4.3	14	4.6	10
Rockefeller Foundation	4.6	21	4.7	7
Sida-SAREC	4.4	21	4.1	9
TWAS	3.9	19	4.8	4
UNDP	3.6	8	3.7	11
UNESCO	4.0	29	4.3	6
USAID	4.4	64	3.9	36
WHO/TDR	4.4	26	4.1	61
World Bank	3.8	23	3.4	13

Tables A33b: Best satisfaction rates for funding institutions (IFS and INCO together) (Question 43)

Satisfaction	EU / INCO-DEV		USAID		WHO/ TDR		Coop. Fr./FAC		IDRC		FAO		AUPELF-UREF		IAEA		World Bank		UNESCO		Sida/ SAREC	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Very Bad (1)	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	3	0	0	0	0
Bad (2)	3	3	3	3	2	3	3	4	0	0	3	7	1	2	0	0	1	3	1	4	1	4
Average (3)	14	14	20	22	13	16	22	28	5	11	11	26	11	27	4	13	12	40	7	25	4	15
Good (4)	37	37	22	24	32	41	34	43	17	38	17	40	16	39	16	50	7	23	13	46	8	30
Excellent (5)	45	45	45	50	32	41	19	24	23	51	12	28	13	32	12	38	9	30	7	25	14	52
Mean score	4.25		4.21		4.19		3.85		4.40		3.88		4.00		4.25		3.73		3.93		4.30	
Deviation from overall mean	0.21		0.17		0.15		-0.19		0.36		-0.16		-0.04		0.21		-0.31		-0.11		0.26	
Total No. of scores	99		90		79		79		45		43		41		32		30		28		27	
Total No. of questionnaires	87		70		44		62		39		39		33		25		25		24		26	

Satisfaction	Rockefeller Foundation		DANIDA		DAAD		DFID/ ODA		GTZ		NORAD		TWAS		IRD		AGCD		UNDP		All	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Very Bad (1)	0	0	0	0	1	4	0	0	0	0	0	0	1	5	0	0	0	0	0	0	19	1
Bad (2)	0	0	0	0	1	4	0	0	0	0	1	4	0	0	0	0	1	6	0	0	76	5
Average (3)	2	7	3	13	4	17	5	21	3	14	1	4	6	27	4	22	3	18	5	42	348	21
Good (4)	6	22	9	39	7	30	10	42	11	52	7	30	5	23	7	39	6	35	6	50	583	35
Excellent (5)	19	70	11	48	10	43	9	38	7	33	14	61	10	45	7	39	7	41	1	8	623	38
Mean score	4.63		4.35		4.04		4.17		4.19		4.48		4.05		4.17		4.12		3.67		4.04	
Deviation from overall mean	0.59		0.31		0.00		0.13		0.15		0.44		0.01		0.13		0.08		-0.37		0.00	
Total no. of scores	27		23		23		24		21		23		22		18		17		12		1649	
Total no. of questionnaires	25		21		17		23		21		21		20		13		16		10		566	

Table A34: Main reasons holding back research work (Question 35)

Reason	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Lack of funds	356	23.7	149	26.6	505	23.1
Equipment (availability, access, maintenance and repair)	326	21.7	87	15.5	413	18.9
Poor library facilities	119	7.9	29	5.2	148	6.8
Other	81	5.4	45	8.0	126	5.8
Lack of competent support staff	76	5.1	41	7.3	117	5.3
Lack of transportation (field work)	46	3.1	14	2.5	60	2.7
Too much teaching and administration	45	3.0	24	4.3	69	3.2
Low salaries/lack of incentives	44	2.9	28	5.0	72	3.3
Lack of specialized collaborators	36	2.4	14	2.5	50	2.3
Bureaucracy	35	2.3	22	3.9	57	2.6
Lack of time	33	2.2	17	3.0	50	2.3
Scientific isolation	24	1.6	11	2.0	35	1.6
No coherent national research policy	24	1.6	5	0.9	29	1.3
Frequent power cuts and unreliable water supply	22	1.5	4	0.7	26	1.2
Poor national infrastructure	22	1.5	3	0.5	25	1.1
Rigidity of research structures	21	1.4	3	0.5	24	1.1
Poor internet access	19	1.3	1	0.2	20	0.9
Lack of enthusiasm from colleagues	18	1.2	8	1.4	26	1.2
Lack of up-to-date computers	16	1.1	7	1.3	23	1.1
Not shown	141	9.4	48	8.6	189	8.6
Total responses	1504	100.0	560	100.0	2064	100.0

Table A35a: Recurring difficulties and their seriousness (IFS) (Question 36)

Factor	Insignificant (1)		Tolerable (2)		Serious (3)		Obstructive (4)		Total	Mean
	No.	%	No.	%	No.	%	No.	%		
Access to Equipment	42	8.9	121	25.6	151	31.9	159	33.6	473	2.9
Purchasing equipment	32	6.7	86	18.0	182	38.2	177	37.1	477	3.1
Equipment repairs	27	5.7	94	19.8	160	33.7	194	40.8	475	3.1
Access to supplies	60	12.7	142	30.1	170	36.0	100	21.2	472	2.7
Lack of time	230	49.1	156	33.3	56	12.0	26	5.6	468	1.7
Lack of technician(s)	123	25.8	169	35.5	112	23.5	72	15.1	476	2.3
Field work difficulties	99	20.8	211	44.4	120	25.3	45	9.5	475	2.2
Access to vehicle	67	14.1	121	25.5	153	32.2	134	28.2	475	2.7
Access to scientific documentation	39	8.2	128	26.9	188	39.6	120	25.3	475	2.8
Data processing	105	22.1	202	42.4	109	22.9	60	12.6	476	2.3

Table A35b: Recurring difficulties and their seriousness (INCO) (Question 36)

Factor	Insignificant		Tolerable (2)		Serious (3)		Obstructive		Total	Mean
	No.	%	No.	%	No.	%	No.	%		
Access to Equipment	29	15.6	63	33.9	58	31.2	36	19.4	186	2.5
Purchasing equipment	16	8.4	48	25.3	63	33.2	63	33.2	190	2.9
Equipment repairs	20	10.5	37	19.4	73	38.2	61	31.9	191	2.9
Access to supplies	40	21.1	67	35.3	48	25.3	35	18.4	190	2.4
Lack of time	72	38.1	51	27.0	35	18.5	31	16.4	189	2.1
Lack of technician(s)	47	24.6	52	27.2	56	29.3	36	18.8	191	2.4
Field work difficulties	51	26.8	76	40.0	50	26.3	13	6.8	190	2.1
Access to vehicle	44	23.0	43	22.5	45	23.6	59	30.9	191	2.6
Access to scientific documentation	25	13.2	68	36.0	55	29.1	41	21.7	189	2.6
Data processing	50	26.6	74	39.4	45	23.9	19	10.1	188	2.2

Table A35c: Recurring difficulties and their seriousness (IFS + INCO) (Question 36)

Factor	Insignificant (1)		Tolerable (2)		Serious (3)		Obstructive (4)		Total	Mean
	No.	%	No.	%	No.	%	No.	%		
Access to Equipment	71	10.8	184	27.9	209	31.7	195	29.6	659	2.8
Purchasing equipment	48	7.2	134	20.1	245	36.7	240	36.0	667	3.0
Equipment repairs	47	7.1	131	19.7	233	35.0	255	38.3	666	3.0
Access to supplies	100	15.1	209	31.6	218	32.9	135	20.4	662	2.6
Lack of time	302	46.0	207	31.5	91	13.9	57	8.7	657	1.9
Lack of technician(s)	170	25.5	221	33.1	168	25.2	108	16.2	667	2.3
Field work difficulties	150	22.6	287	43.2	170	25.6	58	8.7	665	2.2
Access to vehicle	111	16.7	164	24.6	198	29.7	193	29.0	666	2.7
Access to scientific documentation	64	9.6	196	29.5	243	36.6	161	24.2	664	2.8
Data processing	155	23.3	276	41.6	154	23.2	79	11.9	664	2.2

Table A36: "Would you have pursued your research if IFS vs. INCO support funding had not been available?" (Question 44)

Answer	IFS		IFS 1974-1985		IFS 1986-1999		INCO	
	No.	%	No.	%	No.	%	No.	%
Yes, other support would have been available	36	7.7	12	13.8	24	6.3	13	7.3
Yes, but in a substantially different form	73	15.6	15	17.2	58	15.2	26	14.5
Yes, even without other support	12	2.6	5	5.7	7	1.8	3	1.7
Yes, but on a reduced scale	235	50.2	42	48.3	193	50.7	87	48.6
No	109	23.3	11	12.6	98	25.7	50	27.9
Other	3	0.6	2	2.3	1	0.3	0	0.0
Responses	468	100.0	87	100.0	381	100.0	179	100.0

Table A37a: "Since becoming an IFS grantee/beneficiary of INCO support, has it become easier for you to obtain additional funding?" (Question 45)

Additional funding from:	IFS					INCO					IFS + INCO				
	Yes		No		Total	Yes		No		Total	Yes		No		Total
	No.	%	No.	%		No.	%	No.	%		No.	%	No.	%	
Respondent's institution	150	36.7	259	63.3	409	49	32.0	104	68.0	153	199	35.4	363	64.6	562
A national funding institution	83	22.8	281	77.2	364	24	17.0	117	83.0	141	107	21.2	398	78.8	505
An international institution	198	49.5	202	50.5	400	56	35.7	101	64.3	157	254	45.6	303	54.4	557

Table A37b: Name the international organizations from which you have received funding since becoming an IFS grantee/INCO beneficiary (Question 45)

Organization	Occurrences IFS	Occurrences INCO
EU	20	5
USAID	19	2
AUPELF-UREF	16	3
IDRC	11	0
Sida/SAREC	10	2
FAO	10	1
AGCD	8	3
Coopération française	8	3
ISP/IPICS	7	0
Rockefeller Foundation	7	1
IAEA	7	1
UNESCO	7	0
NRI	6	0
IITA	6	1
World Bank	6	1
African Development Foundation	5	0
AAS	5	0
WHO/TDR	5	5
TWAS	5	0
Government of Morocco	5	0
FAC	4	0
DAAD	4	0
GTZ	4	1
NUFFIC	4	0
DFID/ODA	4	1
DANIDA	3	3
IRD (ORSTOM)	3	0
NORAD	3	0
CTA	3	0
STD/INCO-DEV	3	1
Government of Cameroon	3	0
Government of Tunisia	3	0
Occurrences	214	34
Total occurrences	309	40

Table A38: "After receiving support from IFS/INCO, has it become easier for you to obtain scientific and technical assistance from your institution?" (Question 46)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Yes	265	58.9	102	58.6	367	58.8
No	185	41.1	72	41.4	257	41.1
Total	450	100.0	174	100.0	624	100.0

Table A39: "Has the IFS/INCO support provided opportunities to collaborate with new partners?" (Question 47)

	IFS		INCO		IFS + INCO	
	No.	%	No.	%	No.	%
Yes	395	85.9	174	95.6	569	88.6
No	65	14.1	8	4.4	73	11.4
Total	460	100.0	182	100.0	642	100.0

Table A40: Mean satisfaction of IFS/INCO mode of work (Question 49)
(1 = unacceptable, 2 = poor, 3 = satisfactory, 4 = good and 5 = excellent)

Activities	mean IFS	IFS Responses	mean INCO	INCO Responses
Grant administration (incl. transfer of funds)	4.61	468	3.54	164
Purchase of research equipment	4.39	441	3.68	150
Contacts with IFS/INCO staff	4.29	464	3.07	149
Selection process	4.17	444	3.69	160
Monitoring and follow-up of projects	3.88	440	3.71	166
IFS/INCO organized workshops	3.63	371	3.45	139
Access to literature	3.62	424	3.36	142
Networking activities	3.29	376	3.59	150
Scientific counselling	3.27	396	3.05	136
Research training	3.15	382	3.43	146
Maintenance of research equipment	2.98	335	3.05	131
Follow-up activities	2.86	298	2.35	101
Assistance with publication of research results	2.74	334	3.04	138

Table A41: Future career goal (Question 50)

Career goals	IFS		IFS 1974-1985		IFS 1986-1999		INCO		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
National scientific career	301	43.0	46	32.2	255	45.8	95	38.6	396	41.9
Career in administration	43	6.1	16	11.2	27	4.8	18	7.3	61	6.4
Career in politics	21	3.0	8	5.6	13	2.3	4	1.6	25	2.6
Private business	84	12.0	14	9.8	70	12.6	32	13.0	116	12.3
Own consultancy or medical practice	9	1.3	4	2.8	5	0.9	1	0.4	10	1.1
Career within national development programmes	204	29.1	42	29.4	162	29.1	80	32.5	284	30.0
Career within foreign or international organizations	18	2.6	10	7.0	8	1.4	8	3.3	26	2.7
Other	20	2.9	3	2.1	17	3.1	8	3.3	28	3.0
Total	700	100.0	143	100.0	557	100.0	246	100.0	946	100.0

Appendix 5

List of all Tables and Figures in this Document

Tables in the main text

Figures in the main text

Figures in the main text (cont.)

Figures	Title	Question number in questionnaire	Page
Figure 15	Degrees taken in Africa by time-period	10	28
Figure 16	BSc taken at home by time-period and region	10	28
Figure 17	MSc taken at home by time-period and region	10	28
Figure 18	PhD taken at home by time-period and region	10	29
Figure 19	Jobs offered abroad, accepted or not accepted (IFS and INCO together) (countries with more than two offers)	24	29
Figure 20	Mean allocation of respondents' work time (IFS and INCO combined)	15	31
Figure 21	Mean frequency of communication with scientists and other people	29	32
Figure 22	"Do you have easy access to the Internet?"	31	33
Figure 23	"Who regularly evaluates your research work?"	40	35
Figure 24	Most important criteria for the promotion of scientists	38	35
Figure 25	Mean responses to value statements	30	35
Figure 26a	Research budget of 1999 in USD	41	37
Figure 26b	Research budget of 1999 in USD - "active" and "completed" grantees of IFS	41	37
Figure 27a	Sources of research funds (% of total)	42	38
Figure 27b	Sources of research funds by regions in Africa	42	38
Figure 28a	30 main foreign funding organizations sorted by frequency of occurrence as cited by IFS and INCO beneficiaries	43	39
Figure 28b	Mean satisfaction rates for 20 most frequently occurring funding organizations of IFS and INCO beneficiaries added together	43	39
Figure 29	Main reasons holding back research work	35	41
Figure 30	Recurring difficulties and their seriousness - average scores	36	41
Figure 31	"Would you have pursued your research if IFS and INCO had not been made available?"	44	43
Figure 32	Additional funding has been easier to obtain from:	45	44
Figure 33	Has the IFS/INCO support provided opportunities to collaborate with new partners?	47	44
Figure 34	Mean satisfaction with IFS/INCO mode of work	49	44
Figure 35a	Future career goal (IFS vs. INCO)	50	47
Figure 35b	Future career goal (IFS 1974-1985 vs. IFS 1986-1999)	50	48

Tables in Appendix 2

Tables in Appendix 4

Tables in Appendix 4 (cont.)

IFS MESIA Impact Studies

Report No. 1	*Monitoring and Evaluation System for Impact Assessment (MESIA), Conceptual Framework and Guidelines* Gaillard J. Stockholm: IFS, 2000. 38 pages.
Report No. 2	*Questionnaire Survey of African Scientists* (this document) Gaillard J. and A. Furó Tullberg Stockholm: IFS, 2001. 92 pages.

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