



Evaluation of IFS Food Science Area

J R N Taylor

IFS

The International Foundation for Science, IFS, is an international, non-governmental organisation, founded in 1972. The mission of IFS is to contribute to strengthening the capacity of developing countries to conduct relevant and high quality research on the sustainable management of biological resources. This may involve the study of physical, chemical, and biological processes, as well as relevant social and economic aspects, important in the conservation, production, and renewable utilisation of the natural resources base.

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 researcher can be supported in many other ways - invited to workshops, purchasing services, travel grants, training, scientific contacts, participation in networks, publishing reports, etc. More information about the activities of IFS, as well as research grant application forms, are available at www.ifs.se.

To date, more than 4,000 researchers in Africa, Asia and the Pacific, and Latin America and the Caribbean have been awarded research grants by IFS.

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Preface

Over the 35 years during which IFS has operated close to 6,000 research grants have been awarded to young scientists in some 100 developing countries in Africa, Asia and Latin America. Thematically the projects cover scientific disciplines dealing with the sustainable management of biological and water resources.

In order to measure the impact of IFS support, a monitoring programme was established in the late 1990's. The Monitoring and Evaluation System for Impact Assessment (MESIA) is linked to the IFS database. MESIA produces data on Grantees and undertakes surveys of the conditions of young scientists in developing countries. It has been specially designed for the evaluation of the capacity strengthening efforts of IFS: to assess the impact of IFS support to Grantees and their career development over time.

MESIA has so far produced 6 reports (see inside back cover). They have all been based on IFS Grantees in specific countries and regions. In 2003 IFS decided to also include evaluation of the Grantees' accomplishments in those research fields for which IFS provides support. Studies were initiated for the research areas "Natural Products" and "Food Science".

This report deals with "Food Science". It was conducted in 2005/06. The author is John Taylor, Professor at the Department of Food Science at the University of Pretoria, South Africa.

Stockholm, October 2006



Dr. Michael Ståhl
Director
IFS

Summary

The International Foundation for Science (IFS) is an international science council that supports the research development of promising young scientists in developing countries. The support is primarily through the provision of small grants for the purchase of equipment and supplies for experimental research work.

At the request of IFS, Prof John Taylor, professor in Food Science at the University of Pretoria, South Africa, undertook an evaluation of IFS's Food Science Area. This evaluation formed part of IFS's ongoing Monitoring and Evaluation System for Impact Assessment (MESIA) to assess IFS's impact on recipients (Grantees) of IFS grants.

The major evaluation methodology employed was questionnaires to Food Science Area Grantees and to Advisers and Stakeholders in the area. Data were also obtained from IFS records and some Grantees and Advisers/Stakeholders were interviewed via e-mail. Completed questionnaires were received from 88 Grantees (a 37% reply rate) and 62 Advisers/Stakeholders (a 20% reply rate). Analysis of the replies indicated that they were representative of the two groups.

Ninety six percent of Grantees considered that IFS support was crucial or of considerable value to their personal development as scientists and 84% considered that IFS support was crucial or considerable value in respect of their impact on science/technology in their region/country. Of particular significance is that 73% of Grantees are still active in research today and of those not active 60% are in research-related positions. The Grantees have been responsible for a very considerable volume of outputs.

These include:

- Obtaining higher qualifications during the period of their IFS support – 34% of Grantees
- Involvement in international scientific communities - 47% of Grantees
- Involvement in local scientific communities – 66% of Grantees
- Involvement in education and training activities – 47% of Grantees
- Involvement in science/technology implementation activities – 45% of Grantees
- Papers in scientific journals – an average of 23 per Grantee
- Book chapters – an average of 0.85 per Grantee
- Published conference proceedings – an average of 8.4 per Grantee
- Post-graduate student supervision – an average of 13.8 students per Grantee

However, in certain areas outputs by the Grantees have been quite low:

- Books – an average of 0.18 per Grantee
- Patents – an average of 0.16 per Grantee
- Scientific and technical reports – an average of 1.4 per Grantee
- Entrepreneurial activities arising from their research – 6% of Grantees

Concerning the need for and research priorities of an IFS Food Science Area, essentially all Grantees and Advisers/Stakeholders considered that the IFS Food Science Area was relevant in terms of the needs of developing countries. Virtually all respondents also agreed with IFS's priority to help develop scientists in low income countries with vulnerable scientific infrastructures. Most also thought that the focus of the Food Science Area should continue to be broad, although a significant percentage of Grantees (16%) and Advisers/Stakeholders (22%)

suggested that there should be a change of emphasis to more applied research.

Identified priority research topics for the different geographical regions were as follows:

- Sub-Saharan Africa
Food technology and preservation, Value addition to agricultural produce
- North Africa
Food safety and quality
- Middle East
Nutrition, Value addition to agricultural produce, Food safety and quality
- Asia
Food safety and quality, Post-harvest physiology and technology
- Latin America
Food biotechnology, Prevention of lifestyle diseases, Value addition to agricultural produce, Food safety and quality, Food technology and preservation

Considering IFS activities, services and working modes, the Grantees and Advisers/Stakeholders identified the following priority issues for grant support:

- Purchase of inexpensive equipment (< \$5000), expendable supplies, and scientific literature.
- Other purposes that should be given consideration are funds for attendance of scientific conferences, travel for fieldwork, and travel and subsistence to undertake research at regional centres of excellence.

The purchasing service provided by IFS was well utilised by Grantees, with 58% having received assistance in the purchasing of supplies. The most common suggestions as to how the service can be of most value were in terms of rapid action and providing lower cost equipment and consumables.

Concerning other types of scientific support provided by IFS, more than 80% of Grantees considered these to be of significant value. Scientific contacts and feedback from Advisers were singled out. IFS has also sponsored attendance at conferences etc. by some 31% of Food Science Area Grantees.

Grantees and Advisers were generally well satisfied with the IFS process of evaluation and selection of Grantees. The peer-review system was especially

commended. The major negative comment was the slowness of the process.

The most popular suggestion for improving the impact of the IFS grant and for post-grant support from IFS was that networks of Grantees should be created. There were a number of suggestions as to what these networks should do. Most commonly, it was suggested that they should be involved with implementation of research findings and that they should be a mechanism for promoting collaborative research projects.

Concerning the possibility that IFS should provide assistance to Grantees in protection and exploitation of intellectual property, only 52% of Grantees and 26% of Adviser/Stakeholders thought IFS should be involved in this type of activity.

Regarding IFS's profile relative to programmes of other organisations active in research development support, the majority of Grantees (54%) rated IFS very high and 37% rated it high. The rating of Advisers/Stakeholders was not so quite so high. Twenty six percent rated it very high and 49% rated it high. None of the respondents rated it poor or very poor. The most common comment was that IFS support was unique and critical for helping young scientists. A common negative comment concerned the small size of the grant. However, notwithstanding this the number of applications for grants is increasing rapidly.

It is concluded that IFS and its Food Science Area are addressing a real and important need and that it is largely being very successful in terms of impact. The one area of weakness seems to be in implementation of the research work, as indicated by the low number of technical reports, patents and the low proportion of Grantees involved in entrepreneurial activities arising from their research.

It is recommended that:

1. The IFS Food Science Area should continue essentially as is
2. As grant applications are still increasing, for the immediate future if more funds for grants become available, grants should be given to more applicants rather than larger grants to the same number or fewer applicants

3. To better improve Grantee research skills, increase outputs, reduce developing country scientist isolation and foster research collaboration, an expert in the Grantee's research area should be assigned to the Grantee to act as a volunteer mentor
4. To achieve more in-country impact in terms of economic development, applied research projects should be given higher priority, but this should not be at the cost of downgrading the quality of science
5. There should be some regional research priorities as set out above, but good research proposals in other areas should not be excluded
6. The purposes for which the grant is used should be as set out above
7. To help accelerate the grant application and selection process, consider eliminating the category of Conditionally Rejected (Postponed) applications but instead inform the applicants that their proposal has been rejected but has some merit and that they may, if they so wish, submit a completely new application
8. IFS should not become involved in providing intellectual property support to Grantees, unless funding can be found specifically for this purpose
9. National and regional networks of Grantees and former Grantees comprising Grantees from all IFS research areas should be set up. What the networks should do is up to the members, but would probably include the suggestions mentioned above. To set up and run the networks economically, they could simply be e-communities

1. Introduction

The International Foundation for Science (IFS) is an international science council. It was established in 1972 and is based in Stockholm, Sweden. The mission of IFS is that "IFS shall contribute towards strengthening the capacity of developing countries to conduct relevant and high quality research on the sustainable management of biological resources. This will involve the study of physical, chemical and biological processes, as well as relevant social and economic aspects, important in the conservation, production, and renewable utilization of the natural resource base" (IFS, 2004).

IFS's strategy is that "IFS shall identify, through a careful selection process, promising young scientists from developing countries with potential to become future lead scientists and science leaders. They shall receive support in their early careers to pursue high quality research in developing countries on problems relevant to the mission, which will help them to become established and recognized nationally and internationally" (IFS, 2004). IFS also provides additional supporting services to researchers in scientifically weaker institutions and countries.

The primary mechanism through which IFS fulfils its mission and strategy is by the provision of small grants, up to USD 12,000, to identified young researchers (normally younger than 40 years), for the purchase of scientific equipment and supplies for experiments and laboratory analysis. The grants are applied for competitively and the applications are evaluated on behalf of IFS expert scientific Advisers who are volunteers and many of whom are former Grantees. The grants are normally for a research project of up to three years duration and are renewable twice, i.e. up to three grants may be awarded (IFS, 2006). Renewal is through the same competi-

tive grant application process. IFS provides other support to developing country researchers in the form of travel grants, Adviser feedback on proposals, a purchasing service for equipment and supplies, arrangement of thematic and training workshops, support of networks of scientists and awards for scientific achievement (IFS, 2004). The funding for IFS's activities is received from a wide range of governmental and non-governmental agencies (Schjøler, 2002).

IFS provides some 180-240 grants per year, with an average of 70% first grants and 30% renewals (IFS, 2003). In 2004, for example, IFS provided 253 research grants, of which 216 were first grants and 37 were renewals (IFS, 2004). IFS awards grants in different discipline areas. There are 8 scientific areas: Aquatic Resources, Animal Production, Crop Science, Food Science, Forestry/Agroforestry, Natural Products, Social Sciences and Water Resources, plus three interdisciplinary programmes: Agriculture for Peace, CORAF (Conseil Oueste Centre Africain pour la Recherche et le Développement Agricole)/WECARD (West and Central African Council for Agricultural Research and Development) and CODESRIA/Sustainable Agriculture. In the latter areas grants are provided to teams rather than individuals. In 2004, in the 8 scientific areas the most grants (50) were awarded in the Crop Science Area and the least (14) in the Social Sciences Area (IFS, 2004). In the other 6 areas between 20 and 35 grants were awarded for each area.

In recent years, IFS has prioritised its support to scientists from least developed countries, low income and lower middle income countries, with vulnerable research infrastructure and deficient national funding mechanisms (IFS, 2003). To this end, IFS is making a concerted effort to address the situa-

tion facing young scientists in Sub-Saharan Africa (IFS, 2003), the region with the majority of low and lower middle income countries.

To better evaluate the impact of IFS activities, IFS established a Monitoring and Evaluation System for Impact Assessment (MESIA) (Gaillard, 2000). The main objectives of MESIA are to assess the achievements of the Grantees and the effect that grants provided by IFS have had on Grantees' academic and institutional careers. Scientists in Africa have been surveyed (Gaillard and Tullberg, 2001) and country case studies have been undertaken for Mexico (Gaillard et al., 2001), Tanzania (Gaillard et al., 2002) and Cameroon (Gaillard and Zink, 2003). Evaluations are also being undertaken of the IFS scientific areas themselves. The Natural Products Area was evaluated by Prof Hermann Niemeyer of the University of Chile's Faculty of Science in 2004-2005 (Niemeyer, 2005).

In May 2005 Prof John Taylor, professor in Food Science at the University of Pretoria, South Africa

was commissioned by IFS to evaluate the Food Science Area. The terms of reference of the evaluation are set out in full in Appendix 1.

In brief, they were that the format of the evaluation should be tri-partite:

1. An evaluation of the Grantees in terms of (a) Grantees' career progress, and b) the scientific/development output of the Grantees research
2. An evaluation of the IFS Food Science Area in terms of the needs of developing countries/regions
3. A proposal for the future

The goals of this and other evaluations are two-fold:

1. To determine the future course of the various scientific areas supported by IFS
2. To set in motion the mechanisms of a continuing and sustainable process for future evaluations

2. Methodology

1.2 Questionnaires

The main methodology used was the development by the author in collaboration with IFS, of two questionnaires, their completion by recipients and their evaluation by the author. One questionnaire was to IFS Food Science Area Grantees and the other was to Advisers and Stakeholders. The questions in the questionnaires were based on the requirements of the terms of reference of the evaluation and similar questionnaires used in the MESIA Tanzania (Gaillard et al., 2002) and Cameroon (Gaillard and Zink, 2003) surveys and the Natural Products area evaluation (Niemeyer, 2005). The Grantees questionnaire is given in Appendix 2 and the Advisers/Stakeholders questionnaire in Appendix 3.

The Grantees questionnaire dealt with the following issues:

Biographical information

- Type of institution where research is carried out
- Country
- Food Science Research Area
- Qualifications and qualifications gained
- Job title and advancement
- Current involvement in research

Publications and other outputs

- Education/training activities
- Implementation activities
- Food entrepreneurial activities
- Students supervised
- Papers of various types published
- Patents and technical reports published
- Roles in national and international scientific communities
- Meritorious awards received

Questions about the Food Science Area

- Relevance
- Need for re-focus of area
- Geographical priority areas
- Priority IFS grant expenditure items
- Maximisation of IFS grant impact
- Other IFS support, including purchasing service and workshops/symposia/conferences
- Protection and exploitation of intellectual property and IFS's role
- Post grant support from IFS
- Rating of IFS in comparison with other funding organisations
- Value of IFS support to Grantee and country/region

The Advisers/Stakeholders questionnaire was somewhat less comprehensive and dealt with the following issues:

Biographical information

Questions about the Food Science Area (these comprised most of the questions in the Grantees questionnaire)

- Relevance
- Need for re-focus of area
- Geographical priority areas
- Priority IFS grant expenditure items
- Maximisation of IFS grant impact
- Protection and exploitation of intellectual property and IFS's role
- Post-grant support from IFS
- Rating of IFS in comparison with other funding organisations

The questionnaires were designed to provide quantitative data, comments and suggestions.

The Grantee questionnaire was sent out to a total of 236 current and former Grantees. To maximise the relevance of the responses the questionnaire was sent almost exclusively to Grantees who had received support during the period 1990 to 2005 (226 Grantees). Ten questionnaires were sent to Grantees who had received support earlier.

The Advisers/Stakeholders questionnaire was sent to three groups of people: active scientific Advisers to the Food Science Area, IFS Stakeholders and country representatives of the International Union of Food Science and Technology (IUFoST) and the International Union of Nutritional Sciences (IUNS). The Advisers/Stakeholders questionnaire was sent out to a total of 308 persons.

All the questionnaires were sent by e-mail and the responses received by e-mail.

2.2 Other Methodologies

Three additional methodologies were used:

1. Analysis of IFS records for further information about the Grantees and information about other modes of IFS support such as the purchasing service and support for conferences
2. Independent computation of Grantees publications through the use of FSTA (Food Science and Technology Abstracts) and CAB International abstracting systems
3. Interviews by e-mail
 - Clarification on some respondents' answers were obtained
 - Interviews of 6 selected Grantees about the IFS grant system in general. The interview questions were very simple in order to encourage open, "free-thought," responses:
 - What is good about the IFS grant system?
 - What is bad about the IFS grant system?
 - What should IFS do differently in order to maximise impact?
 - Interviews of 5 selected Grantees and Advisers about the process of evaluation/selection of the Grantees. Again the interview questions were very simple, in order to encourage open, "free-thought," responses:
 - What is good about the Grantee evaluation/selection process?
 - What is bad about the Grantee evaluation/selection process?
 - What should IFS do differently to make the process better?

3. Findings

3.1 Questionnaire Response

There were 88 respondents to the Grantees questionnaire out of the 236 it was sent to, i.e. a 37% reply rate. Eighty five were Grantees who had received IFS support during the period 1990-2005 and only 3 were Grantees who had received earlier support. According to IFS records there have been nearly 400 Grantees in the Food Science Area, of which 387 took up their grants. Thus, the reply rate based on total Grantees was approx. 22%, which is still a substantial proportion. Thirty five percent of the Grantee respondents were female. In comparison, according to IFS records the percentage female Grantees in the Food Science Area is as follows: 1990-2004 – 32%, 1999-2004 – 36% and 1974-2004 – 33% (the entire period of IFS support for this area).

Concerning the Advisers/Stakeholders questionnaire, there were 62 respondents out of the 308 it

was sent to, i.e. a 20% reply rate. Of the respondents, two were former IFS Food Science Area Grantees.

An important question is whether the respondents are representative of the whole target groups. Concerning the Grantees, the percentage of female respondents was very similar to that in the whole group. Also, the Grantee respondents were well representative of all the support target geographical regions and reasonably representative of the whole Food Science Area Grantee group (the figures in brackets), with the exception of North Africa which was over represented. Thirty five percent of respondents were from Sub-Saharan Africa (32% of Grantees), 15% North Africa (6% of Grantees), 23% Asia (35% of Grantees), 28% Latin America (27% of Grantees) and only one respondent (1 Grantee) from the Middle East.

Figure 1 shows that the research areas of the respondents were, with the possible exception of

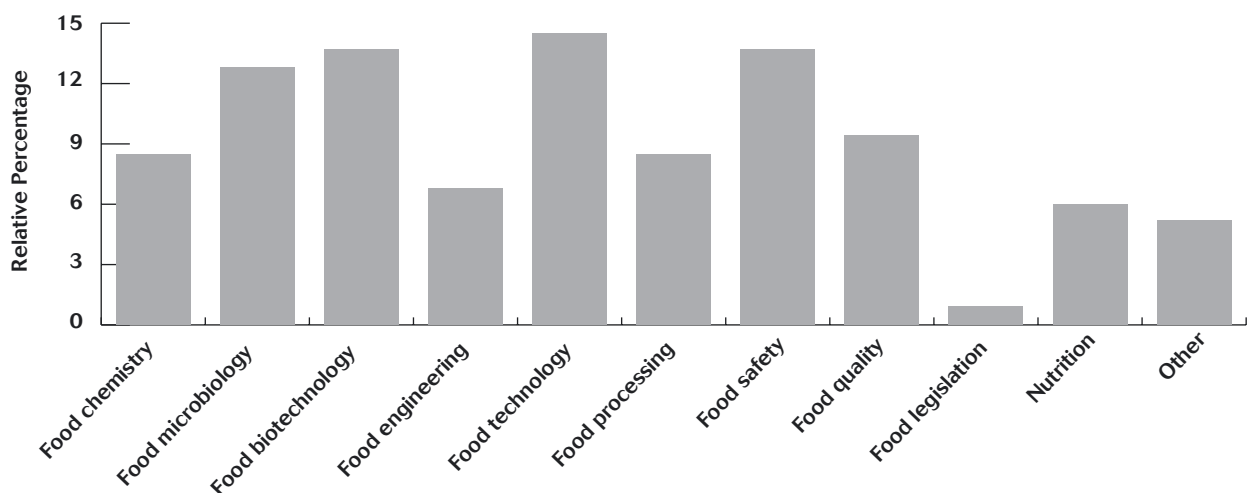


Figure 1: Food Science Research Areas in which the Grantees were/are active

food legislation, also well representative of the various disciplines in the Food Science Area.

It is also important that the respondents were representative in terms of their outputs. A tool for assessing this is the number of publications produced by them relative to the total number of publications produced by the total Food Science Area Grantee group. This can be estimated. Our survey of international publications by the IFS Food Science Grantees to whom the questionnaire was sent gave a figure of 858 publications, of which 305 were from the respondents, i.e. 36%. This figure is very similar to the 37% reply rate, indicating that the respondents were indeed representative of the whole Food Science Area Grantee group.

Concerning the Advisers/Stakeholders respondents, there was a wide range, with the exception of business persons. Thirty eight percent Scientists/Technologists, 11% Professional Scientific Association Representatives, 7% IFS Partner Representatives, 5% Science/Technology Policy Makers or Administrators, 4% IFS Donor Representatives but no persons who considered themselves as primarily Business Persons. The Advisers/Stakeholders resided in all the regions of the world. However, there was some lack of balance with 66% residing in North America, Europe and the predominantly well-developed Australasia/Oceania region, while only 34% resided in the predominantly less developed regions of the world. Notwithstanding this, a good feature was that 19% of the Advisers/Stakeholders resided in Sub-Saharan Africa. With regard to whether the respondents were representative of the relevant Adviser/Stakeholder group, it is perhaps simply important that they were sufficiently interested to respond, since the questionnaires were sent to a very large number of persons who should be knowledgeable about the importance of the food science and nutrition disciplines in their respective countries and/or are knowledgeable about how IFS functions.

3.2 Impact of IFS Support on Grantees' Career Progress and Role of Grantees in National and International Communities

3.2.1 Career progress

Thirty four percent of Grantees reported that they had obtained higher academic qualifications during the period of their support by IFS and 13%

reported that they had obtained higher academic qualification subsequently. The most common advancement was from Masters to Doctorate.

Sixty eight percent of Grantees reported that they had advanced their job position during the period of their IFS support. In one case this was most spectacularly from teaching assistant to professor. Normally the advancement was from assistant professor to associate professor, or lecturer to senior lecturer. In many cases there was a concomitant increase in managerial/administrative responsibility, e.g. promotion to head of department or team leader.

In terms of impact, it is particularly significant that 73% of Grantees are still active in research today and of those not active 60% are in research-related occupations. However, it should be noted these high percentages are perhaps in part a reflection of the fact that virtually all the Grantees were recipients of IFS support within only the past 15 years and thus a relatively low proportion have moved into other work spheres. Of those still involved in research spend 53% of their time in research, 31% in teaching and training and surprisingly only 13% in administration.

In terms of reducing the "brain drain" of scientists from developing countries, it is also significant that 97% of Grantees are still working in developing countries. Similar figures were obtained in the MESIA survey of Cameroonian (Gaillard and Zink, 2003) and Tanzanian IFS Grantees (Gaillard et al., 2002).

Forty percent of Grantees reported being recipients of meritorious awards since receiving IFS support. These awards were varied greatly in nature and level of prestige, a reflection of the fact that some Grantees were at the start of their careers, whereas others were considerably more mature. Types of awards reported included: conference paper and poster awards, scientific society awards, university research and science awards, membership of national academies of science, national government awards (including science and business awards) and regional scientific awards.

3.2.2 Involvement in national and international scientific communities

Forty Seven percent of Grantees reported involvement in international scientific communities since the start of their IFS support. The involvement in-

Table 1: Scientific papers reported by IFS Food Science Area Grantees, since receiving IFS support

Scientific paper type	Number of papers	Number of Grantees publishing	Percentage of Grantees publishing	Average number of papers per Grantee	Average number of papers per Grantees who published
International	1328	61	69	15	22
Asia	277	14	70	14	20
Latin America	720	22	88	29	33
North Africa and Middle East	114	9	75	10	13
Sub-Saharan Africa	217	16	51	7	14
Regional	354	37	42	4	10
Asia	120	7	35	6	17
Latin America	140	17	68	6	8
North Africa and Middle East	68	5	42	6	14
Sub-Saharan Africa	26	8	26	<1	3
Local	380	27	31	4	14
Asia	279	5	25	14	56
Latin America	48	10	40	4	5
North Africa and Middle East	34	3	25	3	11
Sub-Saharan Africa	19	9	29	<1	2
Total	2062	63	72	23	33

cluded: refereeing for and editing of international scientific journals, advising, consulting and membership of regional food-related organisations, advising international scientific councils such as IFS and membership of United Nations organisations committees, such as those of the FAO, WHO and UNIDO and consulting to these organisations.

Surprisingly, only 66% of Grantees reported involvement in national scientific communities since the start of their IFS support. This is almost certainly a case of under-reporting, perhaps because the respondents did not regard the fact of their involvement as being sufficiently noteworthy. The involvement reported included: editing of local scientific journals, membership and presidency of local scientific societies, advising, membership and chairing of local agriculture- and food-related governmental bodies, reviewing of research proposals and advising of local scientific institutions.

3.3 Scientific and Development Outputs from IFS Supported Grantees/Projects

3.3.1 Scientific papers, books, conference proceedings, patents and technical reports

From Table 1 it can be seen that 69% Grantees reported authoring papers in international scientific

journals from the start of their IFS support, with a total of 1328 papers, an average of 15 per Grantee. In an attempt to verify these data, we undertook a survey of those Grantees that could be found through searching abstracting systems and computed 305 papers in international scientific journals compared to 633 papers reported by the Grantees. This does not mean that the Grantees' figures for publications are incorrect. Abstracting systems do not cover all journals and it is sometimes difficult to accurately identify authors who have common names, or where the names of the individual are transposed in accordance with local practice.

Forty two percent of Grantees reported publishing papers in regional scientific journals, with a total of 354 papers (4 per Grantee). Thirty one percent of Grantees reported publishing papers in local journals, with a total of 380 papers (4 per Grantee). This gives a grand total of 2062 papers in all types of scientific journals, with an average of 23 per Grantee, or 33 per Grantee who had published. It is interesting that the highest proportion of Grantees published in international scientific journals and lowest in local scientific journals. Similarly, most papers were published in international scientific journals. This is perhaps an indication of the high quality of research being carried out, but it is also

possibly an indication of peer group and organizational pressure to publish in so-called “high-impact” journals.

The more detailed analysis of the data in Table 1 according to region has to be treated with some caution, as it is subject to considerable distortion. For example, one Grantee from Latin America reported 251 papers in international scientific journals and another from Asia reported 201 papers in local journals. Thus, perhaps, the most meaningful detailed data are the percentage Grantees per region who had published and not the average number of publications per Grantee. It can be seen that the region with highest percentage of Grantees who had published in international scientific journals was Latin America (88%), with an average of 33 papers per Grantee who had published. Conversely, and probably significantly, the region with the lowest percentage of Grantees who had published in international scientific journals was Sub-Saharan Africa, only 51%. Further, the Grantees from Sub-Saharan Africa who had published, had published the second fewest number of papers per Grantee (14), just one more than North Africa and the Middle East (13). The situation was similar with regard to publishing in regional scientific journals, with the highest proportion of Grantees publishing coming from Latin America (68%) and the lowest proportion from Sub-Saharan Africa (26%). With local scientific journals, the situation was somewhat different with the highest percentage of Grantees publishing (40%) still coming from Latin America, but with the other three regions being similar to each other. Together, these data seem to suggest that Grantees from Sub-Saharan Africa are less likely to publish their research than those from the other regions.

It is of significance that of the 58 Grantees (66% of respondents) who gave details of their most recent papers published, 51 (58% of respondents) had published in the previous two years (2004-2005).

This shows that a majority of Grantees established themselves as active research scientists. In the author’s experience, this is very different from the normal situation with regard to scientists in low income countries with vulnerable scientific infrastructures. Normally the scientist will produce one or two scientific papers during the course of their masters or doctoral studies, often carried out at a centre of excellence overseas or in the region. Thereafter, they will cease to publish, which is often synonymous with them ceasing to be active research scientists. This is due to a variety of reasons that are discussed below (see sections 3.7.1 and 4.2).

Regarding books published by the Grantees from the commencement of their IFS support, the numbers were relatively low, with only 13% of Grantees reporting that they had published books. Concerning the books, 13 were locally published and only 3 were internationally published books. Not surprisingly, the number of chapters in books was somewhat higher. Twenty six percent of Grantees reported that they had published book chapters and a total of 75 chapters were recorded.

Published conference proceedings reported by the Grantees from the start of their IFS support was very much higher. Sixty six percent of Grantees reported published conference proceedings. The total number of published conference proceedings was 743 (an average of 8.4 per Grantee).

Concerning patents granted from when IFS support started, the numbers were very low. Only 7 Grantees (8% of respondents) reported that they were patent authors. Most had a single local patent. One respondent had 4 local patents, and another 5. One respondent only, had a single international (US) patent.

Surprisingly and disappointingly with regard to the socio-economic impact of their research, only

Table 2: Post-graduate students supervised by IFS Food Science Area Grantees, since receiving IFS support

Post-graduate degree	Percentage of Grantees supervising	Number of graduates	Average number of graduates per Grantee
Honours	63	632	7.2
Masters	70	453	5.2
Doctorates	43	132	1.5
Total		1217	

56% of Grantees reported that they had authored scientific and technical reports for their own institution or for external organisations, from when their IFS support started. Although a relatively large number of reports were reported, 284 (an average of 3.2 per Grantee), one respondent was responsible for 161. If this person and her reports are not included, the average falls to only 1.4 reports per Grantee. These low numbers appear to be in line with the very low number of Grantees patenting and patents granted.

3.3.2 Education and training outputs

A substantial proportion of Grantees have supervised post-graduate students (Table 2). A total of 1217 post-graduate degrees were obtained under the supervision of the Grantees, a very high average of 13.8 students per Grantee. Not surprisingly, however, the proportion of Grantees that supervised doctoral students was the lowest, but still 43% of Grantees. Also not surprisingly, the average number of students per Grantee declined from 7.2 for honours to 1.5 for doctoral students.

Just less than half the Grantees (47%) reported that they had also played a significant role in education/training activities for the community, arising from their research activities, since receiving IFS support. The range of community education/training activities was very wide: talks on radio and TV, training courses for farmers, women's groups, environmental and extension officers, street vendors, entrepreneurs, food industry and national food safety courses.

A similar proportion of Grantees (40%) reported that they had also played a significant role in scientific/technological training type activities in their own or other institutions, arising from their research activities, since receiving IFS support. However, it was clear that several respondents misunderstood the question and thought that it referred to their regular teaching responsibilities and these responses were discounted. Activities included: informal training, presentations to staff and short courses on subjects such as: scientific developments, data handling, microbiological, biotechnological and post-harvest pathology techniques, methods of chemical, physico-chemical analysis and operation of instrumentation.

3.3.3 Science/technology implementation and entrepreneurial activities

Slightly less than half the Grantees (45%) reported that they had played a significant role in science/technology implementation activities for the community, arising from their research activities, since receiving IFS support. A wide range of activities was reported: direct technology transfer to industry, advice and consultancy to industry (including techno-economic assessments), advice and short courses to farmers and women's groups (particularly in the area of safe food handling), food analysis, development of new analytical techniques and provision of food processing equipment.

However, perhaps not surprisingly in the light of the low number of Grantees authoring scientific and technical reports and holding patents, only 5 respondents (6%) reported significant entrepreneurial activities arising from their research activities, since receiving IFS support. Two of these were Grantees involved in companies, apparently started and run by others. The other three are more significant and involve the employment of at least 130 people:

- Creation of a spin-off high tech company, the Centro de Aromas, with expertise on chemical and sensory analysis as well as process optimisation of aromatic compounds in foods and beverages. Today, 15 persons work in the company. (www.centroaromas.cl)
- Started and now manage microprocessing centres in Ogun, Abia, Akwa Ibom Cross Rivers and Bayelsa with employment of 78 workers, and Fufu SME factories at UNAAB, Abia State, and Akwa Ibom State with a staff force of 40, during the period 2000 to 2005.
- Initiated the production and commercialization of dried cassava grates, and (factory) is continually producing the dried cassava grates to support the home industry production of food products from the dried cassava grates. Initial year of production (last year) reached more than 2 tons dried grates.

These are not the only examples of Food Science Area Grantees starting their own business based on research undertaken with the support of IFS. Perhaps the greatest success story is that of Dr Kok Kheng Tan who received two grants in the late 1970s while he was a lecturer at the National University

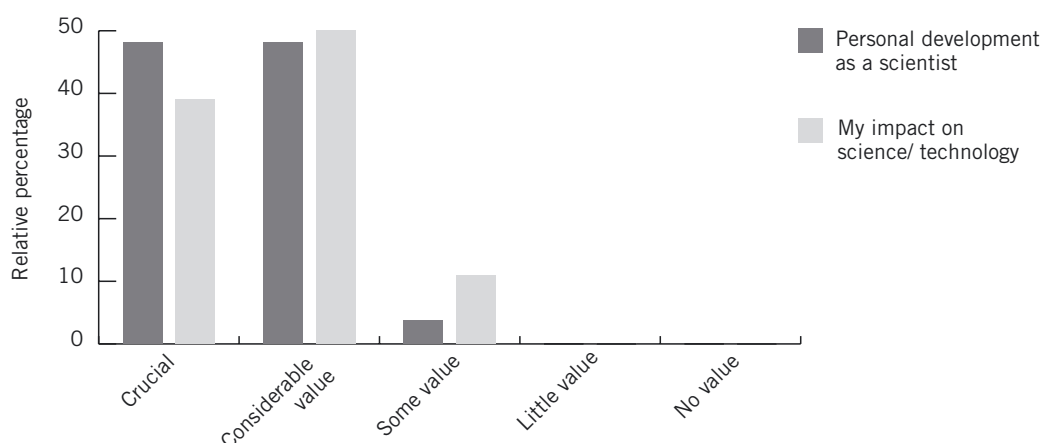


Figure 2: Grantees' evaluation of the value of IFS support in respect of their personal development as scientists and their personal impact on science/technology in their country/region

of Singapore. Dr Tan developed a process to shorten the cultivation period for Shiitake mushrooms, the Everbloom process. With this process Shiitake mushrooms can be produced in six weeks instead of the year needed for the traditional process. Dr Tan is CEO of the company Mycobiotech Inc., which he founded in 1980 (www.mycobiotech.com). Mycobiotech has pioneered research and development in the biotechnology-based production of Shiitake and other exotic mushrooms. The company produces Shiitake and other exotic mushrooms in Singapore, Indonesia and the United Kingdom and has laboratories in several other countries. Dr Tan was recently awarded four US patents on fermenta-

tion produced mushrooms, cholesterol reduction and anti-diabetes. He also holds US, European and Australian patents in many aspects of mushroom production.

3.4 Grantees' Evaluation of Impact of IFS Support

As can be seen in Figure 2, 48% of Grantees considered that IFS support was crucial for their personal development as a scientist and the same percentage thought that IFS support was of considerable value in this respect. None thought that IFS support was of little or no value in respect of their development

Table 3: Analysis of Grantee comments on how IFS support has impacted in their personal development as scientists

Comment	Number	Relative percentage
Enabled materials and equipment to be purchased so that research could be carried out	18	26
Enabled Grantee to do better research (promoted development as a scientist)	15	22
Enabled other grants to be obtained by teaching Grantee how to write research proposals	9	13
Catalyst for doing research	7	10
Enabled contacts to be made with other scientists in the research field	4	
Enabled Grantee to do research of importance to his/her country	4	
Lead to international recognition of research	3	
Provided basis for supervision of students	3	
Enabled Grantee to publish	2	
Enabled focussed, applied research to be undertaken	2	
Enabled basic research to be undertaken	1	
Total	68	

Table 4: Analysis of Grantee comments on how IFS support has impacted in their personal impact on science/technology in their region/country

Comment	Number	Relative percentage
Assisted food industry, including food export industry	15	37
Grantee became source of expertise in subject area	7	17
Helped improve food safety and quality	6	16
Facilitated training of post-graduate students	5	12
Assisted in setting up of university courses	2	
Contributed to improved nutritional status	1	
Helped develop standard methods	1	
Total	37	

as a scientist. An analysis of Grantees' evaluations on how IFS support impacted on their development as a scientist reveals that support for purchase of materials was the most important, followed by promoting their development as scientists, teaching them how to write grant proposals and acting as a catalyst to do research (Table 3).

Typical comments were:

- "It allowed me to start my own research group with a new research line after returning from my post doctoral training in the USA."
- "The support of IFS was very important to my personal development as a scientist because I have been carrying out research without any financial or material assistance from any donor organisation except the assistance that has been provided by my family and at times by Ministry of Higher Education, which has been largely insufficient for my research activities. This resulted in a very slow advancement of my research work. The assistance from the IFS has therefore been a great blessing to me because the IFS has enabled me to purchase most of the basic needs for my research which has led to a rapid advancement in my research work."
- "The support from IFS enabled me to do quality work that won me awards of academic excellence. It enhanced my academic/research image. I now review articles for many international scientific journals."

Thirty seven percent of Grantees considered that IFS support was crucial to their personal impact on science/technology in their region/country and 47% considered it to be of considerable value (Fig. 2). None considered it to be of no value.

An analysis of Grantees evaluation on how IFS support influenced their personal impact on science/technology in their region/country (Table 4) reveals that the single most important effect was that it facilitated them to assist the food industry, including the export food industry (37% of respondents). Other effects considered significant were that the Grantee became a source of expertise in the subject area, improve food safety and quality has resulted and IFS support has aided the Grantee's training of post-graduate students.

Typical comments were:

- "With the outputs from IFS grants, I was able to get the basic information, particularly the drying characteristics of cassava grates that also helped in the development of the root crop grates processing system which promotes the utilization of cassava in the food industry. The system is very functional and is now continually producing good quality dried cassava grates."
- "My IFS grants were instrumental in understanding the biological and chemical mechanisms of fish spoilage, developing appropriate preventative approaches and control methods. The findings enriched several training programs and used by industry to reduce spoilage and quality defects for a commodity that is of importance for export."

3.5 Relevance of the IFS Food Science Area to the Needs of Developing Regions/Countries

Perhaps not surprisingly in view of the fact that they have received support from IFS in this area, 98% of the Food Science Area Grantees considered that the Food Science Area to be relevant in terms

Table 5: Analysis of Grantee suggestions for change of focus of research topics or type and suggestions for phasing out

Suggestion	Number	Relative percentage
Applied research	7	39
Basic and applied research	3	17
Local food products	2	11
Food safety and quality	2	11
Research for development	1	
Basic research	1	
Food security	1	
Natural (environment-related) problems	1	
Total	18	

Table 6: Analysis of Stakeholder/Adviser suggestions for change of focus of research topics or type and suggestions for phasing out

Focus category	Number in category	Relative percentage
Applied research	10	53
Nutrition	3	16
Consumer needs and lifestyle	2	10
Supply chain management	2	10
Food safety and risk assessment	1	
IFS should not accept biomedical research projects	1	
Total	19	

of the needs of developing regions/countries. Probably of more significance is the fact that all the Advisers/Stakeholders considered that the Food Science Area was relevant.

These were typical comments from Grantees:

- “The agricultural sector employs over 50% of the labour force in most developing countries and the economic development of these countries hinges very much on this sector. Enhancing the capabilities of food scientists in developing countries will therefore impact directly on the economic development of their respective countries.”
- “Most developing countries are based on agriculture. Processing of agricultural products is a promising approach to increase the value of those products. Also, the market of food products is expanding worldwide. Therefore, food products can be the important income generators for the developing countries.”

An Adviser, Prof Lloyd Rooney of Texas A&M University, USA, commented “Food science cuts across

many disciplines and should pull together information that provides for improved production and processing of commodities into value-added processed foods for urban areas. It should and must include some scientists that recognize the importance of the supply chain for commodities and how to influence it to produce high quality foods that urban consumers want and will buy.”

3.6 Scientific Topics and Research Priorities for different Geographical Regions

3.6.1 Topics that should be supported

Concerning the future of the IFS Food Science Area, a clear majority of Grantees (70%) and Advisers/Stakeholders (65%) thought that the focus should continue to be broad. The most significant research focus redefinition suggested was that the emphasis should be on applied research. Sixteen percent of Grantees suggest this and it accounted for 39% of their suggestions for a change of focus (Table 5). Similarly, 22% of Advisers/Stakeholders suggested

Table 7: Analysis of Grantee suggestions for research topics and priority areas for regions

Suggestion	Number (Relative percentage)					
	Sub-Saharan Africa	North Africa	Middle East	Asia	Latin America	Total
Food safety and quality	7 (21)	3 (23)	1	4 (22)	4 (15)	19 (19)
Nutrition	2	3 (23)	3 (33)	3 (17)	4 (15)	15 (15)
Food technology and preservation	9 (27)			2	3	14 (14)
Food biotechnology	2	2	2	2	5 (19)	13 (14)
Indigenous food technologies	5 (15)	1	1	1	1	9 (9)
Post-harvest physiology and technology	3		1	2	1	7 (7)
Prevention of lifestyle diseases					5 (19)	5 (5)
Functional foods				3 (17)	2	5 (5)
Diet diversification	1	1				2
Food product development	1					1
Emerging technologies				1		1
Food microbiology	1					1
Food chemistry					1	1
Food security	1					1
Value addition to agricultural produce		1				1
High value local foods			1			1
Dairy		1				1
Quality management for international market		1				1
Everything	1					1
Total	33	13	9	18	26	99

this and it accounted for 53% of their suggestions for a change of focus (Table 6).

An interesting Grantee comment in favour of this change was "I would like the research focus to be more of an applied nature because due to limitation of facilities and other socio-economic constraints, the reality is that hardly anybody in developing countries can do research that can seriously advance "Science". The type of research that can best be done in Africa is the type that will adopt the methodology in use in developed countries to our own local foods." An Adviser commented "To meet urgent needs of action, it seems most appropriate to focus on applied research and collaboration with other universities to fulfil the need for basic research. With available resources, it does not

seem feasible with a primary goal to establish top-class basic research in all developing countries, at least not in a short-medium term perspective."

With specific regard to research topics for priority support overall (i.e. not taking into account the special needs of the regions), Grantees proposed the following topics in descending order of priority: Food safety and quality, Nutrition, Food technology and preservation, Food biotechnology (Table 7).

The priority list was somewhat different for the Advisers/Stakeholders: Value addition to agricultural produces, Food safety and quality and Post-harvest physiology and technology (equal priority), and Food technology and preservation (Table 8). The greater emphasis on applied topics by the Advis-

Table 8: Analysis of Stakeholder/Adviser suggestions for research topics and priority areas for regions

Priority area	Number (Relative percentage)					
	Sub-Saharan Africa	North Africa	Middle East	Asia	Latin America	Total
Value addition to agricultural produce	8 (24)	2 (18)	2 (20)	2 (18)	2 (15)	16 (21)
Food safety and quality	3 (9)	3 (27)	2 (20)	2 (18)	2 (15)	12 (15)
Post-harvest physiology and technology	3 (9)	2 (18)	1	3 (27)	1	10 (13)
Food technology and preservation	3 (9)	1	1	1	2 (15)	8 (10)
Mycotoxins	3 (9)	1	1	2 (18)		7
Waste utilisation	1	1	1	1	1	5
Nutrition	3 (9)				1	4
Food biotechnology	1				1	2
Food microbiology	1		1			2
Emergency intervention programmes	1				1	2
Basic research			1		1	2
Development of small-scale food processing equipment	1					1
Food engineering					1	1
Constraints to food product	1					1
Micronutrients		1				1
Consumer acceptability	1					1
Applied research	1					1
Technology transfer from more successful regions	1					1
Build teams – Broad based approach	1					1
Total	33	11	10	11	13	78

ers/Stakeholders is in agreement with the slightly higher percentage of this group that suggested a change in priority to applied research compared with the Grantee group.

A significant Grantee comment with respect to research priorities was “Each country or region usually has one or more product/s that it can export to other countries. IFS can focus on these products, such as pistachio and saffron in Iran, or dates in Arabic countries.”

One Adviser made a rather radical suggestion which deserves note “Production of animal foods needs greater emphasis. There should be less em-

phasis on grain production. I know this is not the conventional view but the current emphasis on grain production has not solved the problems of malnutrition or overnutrition.”

A dissenting point of view calling for emphasis on basic research came from one Grantee who commented “Basic research is poorly supported by the government in developing countries. Scientists in developing world often lag behind because of this regard.” When interviewed about how basic research could be financed with additional support to that provided by IFS he stated “The only thing is that IFS should relax its criteria of requirements like “beneficiary” or “target group”. In order to perform more

costly project I would propose that IFS to promote collaboration between Grantee and researchers from developed countries working in the same field. Some additional funding could be provided for short term visits. I believe that by removing financial burden for collaboration, IFS could find enough number of scientists from developed countries that are willing to offer helping hand. It is rather difficult to stay as a scientist (in its real sense) in developing countries and thus the support is worthy."

3.6.2 Research Priorities and needs for the different geographical regions

From Tables 7 and 8 it can be seen that the identified research priority topics for each of the regions were as follows:

Sub-Saharan Africa

- Food technology and preservation (Grantees)
- Value addition to agricultural produce (Advisers/Stakeholders)

North Africa

- Food safety and quality, Nutrition (Grantees)
- Food safety and quality (Advisers/Stakeholders)

Middle East

- Nutrition (Grantees)
- Value addition to agricultural produce, Food safety and quality (Advisers/Stakeholders)

Asia

- Food safety and quality (Grantees)
- Post-harvest physiology and technology (Advisers/Stakeholders)

Latin America

- Food biotechnology, Prevention of lifestyle diseases (Grantees)
- Value addition to agricultural produce, Food safety and quality, Food technology and preservation (Advisers/Stakeholders)

Some caution is advisable with regard to the identified priority topics for all the regions except Sub-Saharan Africa, as they are based on very few suggestions (Tables 7 and 8). In fact, it is interesting to observe that the Grantees and Advisers/Stakeholders both made by far the most research priority proposals for the Sub-Saharan Africa region, 33% and 42%, respectively. This is a clear indication that both groups identify Sub-Saharan Africa as being the region of highest priority, confirming the value of IFS's concerted effort in this region (IFS, 2003).

Related to this, 90% of Grantees and 94% of Advisers/Stakeholders agreed that, bearing in mind budgetary constraints, it was the correct approach that IFS gives the most attention to help develop scientists in low income countries with vulnerable scientific infrastructures. By far the most comments from Grantees (63% of comments) and Advisers/Stakeholders (61% of comments) were to the effect that this approach is essential to address the issues of lack of critical scientific mass and lack of scientific infrastructure.

Dr Walter Spiess, former president of IUFoST commented "I think it is a good approach (the approach of IFS) but the term "scientists" should be used not so much in the classical first/second world definition. What we feel is important is that the technical side of Food Science should be strengthened in the developing countries, the understanding of contamination pathways, deterioration potentials, hazards in production processes. All this does not require "scientists"; it requires scientifically well educated technical people, people who are able to understand underlying problems." When interviewed, he further clarified this comment by stating that he considered that persons trained in Food Science and executing technical tasks based on scientific knowledge could still be accepted as Food Scientists, and not "technicians".

The other relatively common comment from Grantees was that this approach of IFS helps socio-economic development in these low income countries with vulnerable scientific infrastructures. Other relatively common comments from Advisers/Stakeholders were that mentoring and collaboration with other scientists is needed, and that developing country scientists should be trained in developed countries. This latter suggestion runs counter to the way that IFS has operated up until now, where support is only provided to young scientists working outside their country, if it is another developing country.

3.7 Activities, Services and Working Modes of IFS

3.7.1 IFS grant system

According to IFS records, a total of 613 grants have been awarded in the Food Science Area, an average for the 387 Grantees, or 1.6 per Grantee. During the

period 1999 to 2004, there were some 600 applications with 111 Grantees receiving 154 grants, i.e. an approximate application success rate of 25%. This figure seems to be similar to that for the Natural Products Area (Niemeyer, 2005). Application success rates have also been investigated on a country basis in the MESIA studies. Here the picture is somewhat different. Also, the success rate varies quite widely between countries, from 35% in Cameroon with a 50% success rate for the Food Science Area (Gaillard and Zink, 2003), to 30.8% in Mexico with a 42% success rate for the Food Science Area (Gaillard et al., 2001), to only 21.5% in Tanzania but with a 60% success rate in the Food Science Area (Gaillard et al., 2002). Thus it appears that overall the success rate for obtaining grants in the Food Science Area, whilst not particularly high is generally better than that for the other subject areas.

Caution should, however, be exercised when looking at these data. There are several factors which

affect application success rate. The major ones are quality of applications, funds available and the number of applications. In recent years there has been a large increase in the number of applications from 893 in 2002 to 1456 in 2004 (IFS, 2004). This is attributable mainly to the application forms now being available electronically on the IFS website. The downside is that funds available have not increased at the same rate so that the application success rate has had to decline.

With regard to the system of grants and the purposes that they should be used for, the questionnaires revealed that a clear majority of Grantees (76%) and Advisers/Stakeholders (62%) agreed that, bearing in mind budgetary constraints, IFS's approach of providing small grants for the purpose of purchase of small capital equipment items, expendable supplies, literature and information, local travel and extra manpower is the correct approach. Only 1% of Grantees and 11% of Ad-

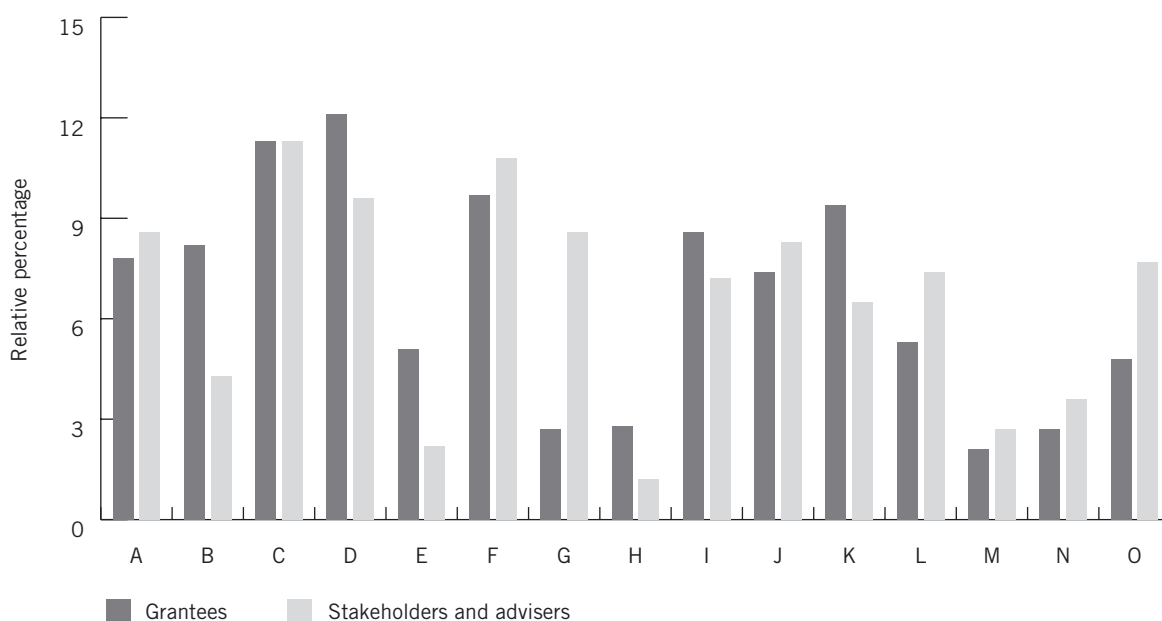


Figure 3: The issues considered by Grantees and Advisers/Stakeholders to be of highest importance for IFS to support based on the selection of the seven highest ranked issues

- | | |
|--|---|
| A Computers, | J Travel and subsistence to centres of excellence, |
| B Expensive equipment (>\$5000), | K Attendance of scientific conferences, |
| C Inexpensive equipment (<\$5000), | L Attendance of IFS scientific thematic workshops, |
| D Expendable supplies, | M Attendance of IFS workshops of writing grant proposals, |
| E Extra manpower, | N Attendance of IFS workshops on scientific/technical publication/report writing, |
| F Scientific literature, | O Helping setting up regional networks of scientists in a research area |
| G Provision of fast and reliable internet service, | |
| H Patenting and intellectual property assistance, | |
| I Travel for fieldwork, | |

visers/Stakeholders stated that a radical change in approach was needed.

Regarding the most important issues to be supported in the IFS grant, from a list of 15 issues, both Grantees and Advisers/Stakeholders selected similar issues that they considered as being of the highest importance for IFS support (Fig. 3). There were three clear most important issues, in descending order of importance these were: Inexpensive equipment (< \$5000), Expendable supplies, and Scientific literature. The three somewhat less important issues were: Attendance of scientific conferences, Travel for fieldwork, and Travel and subsistence to undertake research at centres of excellence.

These priorities are in general agreement with the MESIA surveys. In the MESIA questionnaire survey of African scientists (Gaillard and Tullberg, 2001) equipment was also identified by the scientists as the main specific restraint holding back their

research work.. Similarly, the MESIA Cameroon (Gaillard and Zink, 2003) and Tanzania (Gaillard et al., 2002) surveys found that equipment, materials and facilities limitations were the major specific constraints limiting Grantees research. In the case of Tanzania this was followed by poor library facilities and access to relevant literature (Gaillard et al., 2002). Interestingly in the case of Mexico, it was found that lack of time was considered as a marginally more important constraint than lack of equipment, materials and facilities (Gaillard et al., 2001). This is probably a reflection of the greater wealth of that country.

In Figure 4 it can be seen that the Grantees and Advisers/Stakeholders also selected similar issues that they considered least important for IFS support. The clear six least important issues, listed in order of least important first were: Patenting and intellectual property assistance, Attendance of IFS organised workshops on writing grant proposals, Extra

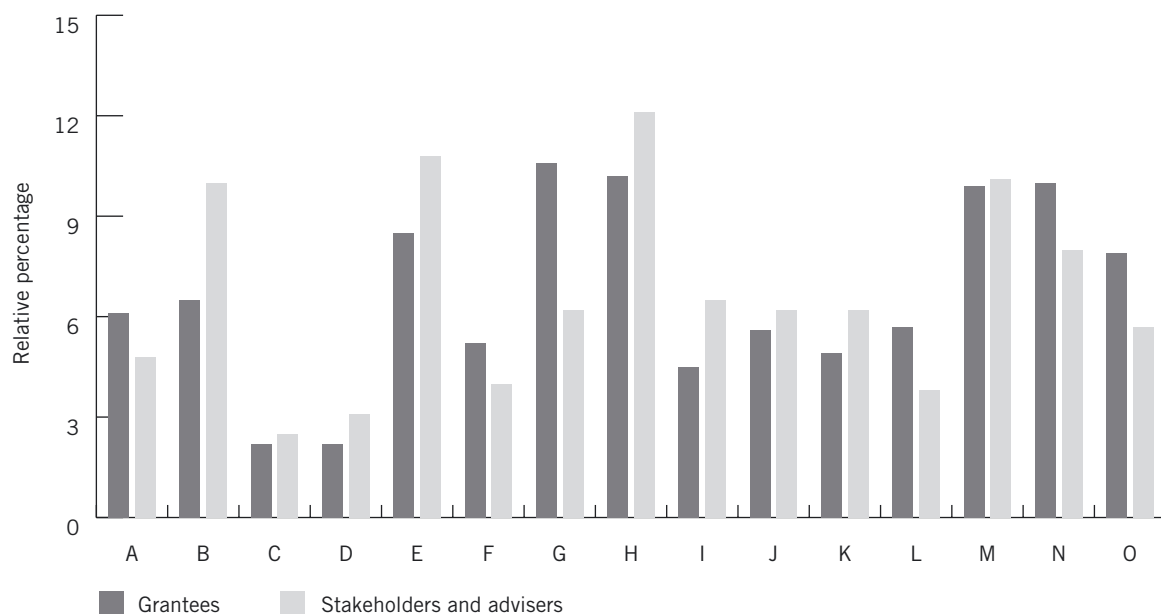


Figure 4: The issues considered by Grantees and Advisers/Stakeholders to be least important for IFS to support based on the selection of the seven lowest ranked issues

- | | |
|--|---|
| A Computers, | J Travel and subsistence to centres of excellence, |
| B Expensive equipment (>\$5000), | K Attendance of scientific conferences |
| C Inexpensive equipment (<\$5000), | L Attendance of IFS scientific thematic workshops, |
| D Expendable supplies, | M Attendance of IFS workshops of writing grant proposals, |
| E Extra manpower, | N Attendance of IFS workshops on scientific/technical |
| F Scientific literature, | publication/report writing, |
| G Provision of fast and reliable internet service, | O Helping setting up regional networks of scientists in a |
| H Patenting and intellectual property assistance, | research area |
| I Travel for fieldwork, | |

Table 9: Analysis of the common Grantee suggestions as to how IFS support should be allocated to provide optimised use of the available funds so that the impact of the IFS grant can be improved

Suggestion	Number	Relative percentage
Good as is	8	19
Set up regional networks of scientists	4	10
Give more funds to second and third grant	3	7
Give priority for running materials	3	7
Give priority for equipment	3	7
Remunerate Grantee	2	5
Gauge relevance of proposals by involving local scientists in review	2	5
Total number of suggestions given	42	

Table 10: Analysis of Stakeholder/Adviser suggestions as to how IFS support should be allocated to provide optimised use of the available funds so that the impact of the IFS grant can be improved

Suggestion	Number	Relative percentage
Terminate travel grants	3	11
Choose Grantees more carefully	3	11
Provide fewer but larger grants	3	11
Address country-specific applied research problems	3	11
Provide tutors and mentors	2	7
Create regional networks of Grantees and collaborators	2	7
IFS to co-fund projects	2	7
Total number of suggestions given	27	7

manpower, Attendance of IFS organised workshops on scientific/technical publication/report writing, Provision of reliable and fast internet connection and Expensive equipment (> \$5000).

Of significance is that there were no major contradictions between issues that were considered to be important and those which were considered not to be important. It is also noteworthy that at the IFS consultation with African partners workshop held in 2005, the participants considered that the present components of the grant remain fully relevant (IFS, 2005).

Tables 9 and 10, respectively, show analyses of Grantees and Advisers/Stakeholders suggestions for optimising the impact of the IFS grant. It is noteworthy that the highest number of comments from Grantees was that the grant allocation was good as it is. However, as can be seen the most popular novel suggestion from the Grantees was concerning setting up regional networks of scientists. Typical of the comments was "In many Sub-Saharan countries, the

conditions of research in particular in the laboratories are not very good. It is then important that the IFS should work to set up regional networks. According to the region (Sub-Saharan Africa, Asia etc.), IFS may identify some excellent laboratories in which Grantees may work." When interviewed, this Grantee explained how he thought such a system might work and stated "I suggest that IFS may identify some excellent laboratories in which current IFS Grantees can do some of their work (IFS projects) they cannot do in their local laboratories. This means that current IFS Grantees can do their work in both laboratories (local laboratories and the identified laboratories). If the reception (identified) laboratories need more materials or funds for the work, the Grantee should receive a small proportion to allow him to accomplish his work". Of note is the fact that participants in the IFS consultation with African partners workshop held in 2005 also proposed that part of the grant should be used for short visits to nearby centres of excellence, in cases where the grant is insufficient to purchase sophisticated items of equipment required in the research project (IFS, 2005).

Other common suggestions were to give more funds for subsequent grants and remunerate the Grantee. A Grantee when interviewed about his suggestion that Grantees should be remunerated stated "If some remuneration for time, energy and intellectual input is made the impact could be large. It can keep the Grantee on the positive track, it will encourage others to apply, more probably with more innovative proposals, and it can also keep the third world country scientists at their home institution to do better." Interestingly, Gaillard et al. (2002) in their MESIA study on strengthening science in Tanzania recommended that IFS should consider providing a small honorarium to Grantees in combination with the IFS grant, or alternatively request the local institution to provide a research honorarium for the length of the IFS supported project.

Another Grantee was concerned about the issue of Grantee institutions misappropriating the Grantee's IFS grant, resulting in him/her receiving reduced, or worse, no funding. When interviewed on how he proposed that this could be prevented he suggested that this "can be done through the Swedish Embassy, with the knowledge of the institution, while a supervisory officer from the embassy will monitor the project and all retirements (expenditures) of funds".

The Advisers/Stakeholders suggestions for optimising grant impact were generally somewhat more far reaching (Table 10), in line with the somewhat higher proportion of recommendations for radical changes in the grant system. Suggestions included: Termination of travel grants, Providing fewer but larger grants (to more carefully chosen applicants), Providing tutors and mentors for the Grantees, Setting up regional research networks of Grantees and collaborators, and Co-funding of projects by IFS and other organisations. In fact, this latter concept is already starting to take place. For example, IFS co-funds projects on Sustainable Agriculture together with CODESRIA, the Council for Development of Social Science Research in Africa (CODESRIA and IFS, 2003).

One Adviser summed up the view of many of the Advisers/Stakeholders with his statement that "Considering that research in food science should be applied in local food industries, it should be important to add as a requirement for applying

a grant proposal to be closely linked to a local industry that can be potentially interested in the results of the project. A local industry should be part of the proposal from the beginning and it should provide the scientist with some real help (raw material, travel and subsistence for example). This should give to IFS a guarantee that research results will be at least considered for application in a local industry. Particularly, because of budget constraints, IFS support should be allocated to research project with co-financing. A kind of international scientific tutor should be proposed to every research project. He should advise the young researcher during his research and at his turn, he should make regular written report to his international Adviser."

3.7.2 Other scientific support from IFS

Concerning scientific support provided by IFS other than the grants, 81% of Grantees stated that IFS support resulted in scientific contacts, including contacts with scientific Advisers. Sixty six percent of Grantees received comments on their proposals and research from the scientific Advisers and 20% received advice from them in the writing of the research proposal. Mostly this was in terms of improvements in technical issues in the project, but also in terms of writing proposals and updating literature. Other scientific support provided by IFS included: Advice on feasibility of project, Provision of laboratory facilities, and Provision of wider picture of research internationally.

3.7.3 IFS purchasing service

Fifty eight percent of Grantees reported receiving assistance from IFS in purchasing of supplies. According to IFS records, the nature of the assistance that has been made to Food Science Area Grantees is as follows:

- Laboratory equipment – 90 items
- Laboratory chemicals – 39 orders
- Expendable supplies – 36 items
- Literature and journal subscriptions – 24
- Computer hardware and software – 14 items
- Freight and insurances charges – 6
- Other – 6

This distribution of types of assistance is in line with the expressed needs of the Grantees. Table 11 shows clearly that Grantees considered rapid provi-

Table 11: Analysis of Grantee suggestions as to how IFS can be of most value to Grantees in respect of purchasing

Suggestion	Number	Relative percentage
Rapidly provide of consumables and equipment	26	46
Provide lower cost equipment	19	34
Provide of lower cost consumables	7	13
Find materials that are not available locally	3	
Provide of letter to avoid taxation on consumables and equipment	1	
Total	56	

Table 12: Conferences, symposia and workshops sponsored by IFS in the Food Science Area

Year	Type of meeting	Title	City and Country
1985	Workshop	Development of Indigenous Fermented Foods and Food Technology in Africa	Douala Cameroon
1991	Workshop	Traditional Foods in Africa – Quality and Nutrition	Dar es Salaam Tanzania
1997	Workshop	Application of Biotechnology Research in Latin America and the Caribbean	Rio de Janeiro, Brazil
1998	Conference	4th Asia Pacific Food Analysis Conference	Chiang Mai Thailand
1999	Conference	Small Scale Food Industry of a Healthy Nutrition in West Africa	Ouagadougou Burkina Faso
2001	Congress	11th World Congress of Food Science and Technology	Seoul South Korea
2002	Conference	Food and Nutrition for Sustainable Livelihood of People in Africa	Dar es Salaam Tanzania
2003	Conference	Food Africa: Improving Food Systems in Sub-Saharan Africa	Yaounde Cameroon
2003	Congress	IV Ibero American Food Congress of Food Engineering	Valparaiso Chile
2005	Workshop	Information Technology for the Advancement of Nutrition in Africa, IITANA	Tygerberg South Africa

sion of equipment and consumables and obtaining lower priced equipment to be the areas that IFS can be of most value in respect of purchasing.

3.7.4 Sponsorship of workshops/symposia and conferences and support for attendance by Grantees

IFS has sponsored 10 conferences in the Food Science Area (Table 12). As can be seen these have covered a wide range of topics in the food science discipline, but at least six have specifically concerned developing country issues. Concerning support provided to Grantees by IFS for conference attendance, there was a mixed picture. According to IFS records, IFS has sponsored 121 attendees at conferences in the Food Science Area, i.e. some 31% of Grantees. The figure obtained from the

questionnaire is somewhat higher. Forty two percent of Grantees stated that they had attended a scientific conference with a travel grant provided by IFS. This latter figure includes conferences that were not sponsored by IFS. However, only 15% and 3%, respectively of Grantees stated that they had attended an IFS thematic workshop/symposium or an IFS research proposal writing workshop. The major reasons furnished for not participating in this area of IFS activity were lack of information and that thematic workshops in the Grantee's field had not been organised.

3.7.5 Process of evaluation/selection of the applications

Interviews of current Grantees, a grant applicant and a member of the IFS Food Science Area Sci-

Table 13: Grantees and Advisers answers to the question “What is good about the Grantee evaluation/selection process?”

Interviewee	Answer
Dr John Muyonga, Makerere University, Uganda – A Grantee	Candidates normally advised on how to improve proposals to make them acceptable.
Prof John van Camp, University of Ghent, Belgium – An IFS Adviser and member of the Food Science Area Scientific Advisory Committee (SAC)	It's a free call, so Grantees can submit freely their topics of interest. The evaluation is done by peer review using both SAC (Scientific Advisory Committee) members as well as external Advisers. There is a real discussion on pro's and contra's from each proposal. Candidates get feedback from the SAC, especially when they were postponed/refused. The use of successful former Grantees in the review process is important, as they bring in valuable experiences from the candidate side.
Mrs Agnes Mwangwela, Bunda College of Agriculture, Malawi – A Grantee	It is good that application can be submitted throughout the year and that research conducted as part of PhD programmes do qualify. The contributions from the project reviewers contribute to enhance the quality of the research work.
Mrs Nomusa Dlamini, National University of Science and Technology, Zimbabwe – A grant applicant	Peer review: The Grantee selection process is good in that the research proposals have the opportunity to be peer reviewed, that way the research to be done remains current, instead of repeating what has been done. Critical evaluation of research: The selection process is also a time for a research to be evaluated critically, for example in terms of relevancy to a particular area.
Dr Gyebi Duodu, University of Pretoria, South Africa – A Grantee	The Grantee evaluation/selection process ensures that research proposals are of the highest quality and have the potential to produce good and meaningful results that can be applied.

entific Advisory Committee (SAC) revealed general satisfaction with the process of evaluation and selection of the applications (Table 13). The peer-review system was especially commended in respect of the feedback given which helps ensure research projects of the highest standard. In this context, it is interesting that according to IFS records there are 125 officially designated Scientific Advisers for the Food Science Area, 36 of whom are former Grantees with all but three of these being Grantees in the Food Science Area.

There were two significant negative comments (Table 14). Two interviewees complained about the slowness of the evaluation/selection process. It should be noted that the apparent slowness can often be as a result of a decision on a project appli-

cation being conditionally rejected (also referred to by IFS as Postponed). This occurs when the application appears to have merit but is inadequate and has to be revised in accordance with the points raised by the IFS Scientific Advisory Committee (SAC) and resubmitted. Another interviewee felt that insufficient cognisance was taken by the evaluators of local realities; this related to lack of infrastructure for doing for certain types of research work. In this context, it should be pointed out that IFS makes considerable effort to include scientists from developing countries in the SACs. Although IFS recognises that SACs may not have in-depth knowledge of the situation in every country, the members have knowledge of the situation at the regional level.

Table 14: Grantees and Advisers answers to the question "What is bad about the Grantee evaluation/selection process?"

Interviewee	Answer
Dr John Muyonga, Makerere University, Uganda – A Grantee	There seems to be insufficient consideration given to local realities.
Prof John van Camp, University of Ghent, Belgium – An IFS Adviser and member of the Food Science Area Scientific Advisory Committee (SAC)	<p>On the whole I think the review and selection process by IFS is thorough and of good quality.</p> <p>Some points for improvement:</p> <p>Candidates who resubmit their proposals should in all cases and in a separate letter indicate clearly which changes have been made compared to the previous proposal, and motivate these choices. You can see this as being similar to a peer review process for scientific publications – authors should give motivated replies to the remarks of the reviewer.</p> <p>In some cases the situation of the candidate in his home institute is not well known, and it is difficult to understand why a proposal is not well written or why not sufficient reply to comments made earlier is given. A motivated reply from the candidate should therefore be asked.</p>
Mrs Agnes Mwangwela, Bunda College of Agriculture, Malawi – A Grantee	No answer
Mrs Nomusa Dlamini, National University of Science and Technology, Zimbabwe – A grant applicant	<p>The Grantee has limited space on the application form, and as such this puts him/her at a disadvantage with peer reviewers who might require detailed explanations for some concepts, especially if they do not seem to be familiar with the field of research.</p> <p>The length of time between submitting the research proposal and response is also too long, because most of the time the research will be going on, and it is possible that several changes might have taken place to the research.</p>
Dr Gyebi Duodu, University of Pretoria, South Africa – A Grantee	The length of time taken for the whole process seems rather long. Though this may be unavoidable in certain situations, it will help if the process could be speeded up.

The interviewees had some suggestions for improving the evaluation/selection process (Table 15). These related directly to the negative comments. The use of local reviewers was suggested so that there could be a better appreciation of local research infrastructure. To shorten the evaluation time, it was suggested that applicants be put in direct contact with the evaluators in order that the meaning of their comments could be clarified more rapidly. In this context it should be pointed out that IFS asks each reviewer whether they wish to be contacted directly by the application. Most reviewers wish to. However, some, generally due to time constraints, do not.

3.8 Possible Future IFS Supported Activities

3.8.1 Assistance to Grantees in protection and exploitation of intellectual property

Twenty percent of Grantees stated that they had tried to protect their research findings and of these most (62%) had experienced problems. A slightly higher percentage of Grantees stated that they had tried to commercially exploit their research findings (26%), and of these most again (64%) had experience problems. With respect to these experiences, perhaps slightly surprisingly only 52% of Grantees thought that, bearing in mind budgetary constraints, IFS should play a role with respect to

Table 15: Grantees and Advisers answers to the question “What should IFS do differently to make the evaluation/selection process better?”

Interviewee	Answer
Dr John Muyonga, Makerere University, Uganda – A Grantee	Include local reviewers for projects to assess relevance of proposals to local needs and to advise on local realities pertinent to the research.
Prof John van Camp, University of Ghent, Belgium – An IFS Adviser and member of the Food Science Area Scientific Advisory Committee (SAC)	I would not change much in the selection/evaluation process. It is rather a high work load for the SAC (Scientific Advisory Committee) members but I believe that this is the best way to have high quality screening of project proposals. The combination of external and SAC member review guarantees that a fair and complete review is possible. Candidates get the chance to resubmit if they want to, and enough feedback is given to improve their proposal.
Mrs Agnes Mwangwela, Bunda College of Agriculture, Malawi – A Grantee	No answer
Mrs Nomusa Dlamini, National University of Science and Technology, Zimbabwe – A grant applicant	I think the IFS should allow for an extra page of notes, so some points can be clarified, since the application form only has limited space. IFS should also shorten the time between submission of the application and response, in terms of the success or failure of the application.
Dr Gyebi Duodu, University of Pretoria, South Africa – A Grantee	For applications that are regarded suitable for funding but require improvement, it may be a good idea to put the applicant in contact with the reviewers or evaluators of the application. In my own case for instance, some of the comments from the evaluators were not easy to understand. Perhaps direct communication with the evaluators of my application during the correction phase may have been useful.

assisting Grantees to protect and exploit their research findings. For the Advisers/Stakeholders the picture was even clearer, with 74% of respondents indicating that IFS should not be involved in this activity. These figures, however, do agree with the fact that both groups considered that patenting and intellectual property assistance was the least important issue for grant support (Fig. 4).

It can be seen from Table 16 that Grantees thought that assistance from IFS to help Grantees protect and exploit their intellectual property should be in the areas for provision of advice, meeting the cost of patenting and help with preparation of documentation. The few suggestions from Advisers/Stakeholders were to the effect that IFS should provide training and advice.

A Grantee comment specifically illustrating the need from advice on protection and exploitation of intellectual property was “I do not really know

(what is needed), but assistance in that field is really necessary. In my own experience I had an offer from a Company from South Africa to produce at high scale the yeast we have isolated and to develop a biocontrol commercial product using them. I told them that my studies are not enough. But I really do not know when they are going to be enough to pass them to the industry. I have another offer from a company from my own country and I could not decide what is the right thing to do.”

Another Grantee commented “The procedure is in general complex, expensive and unknown by a number of scientists.” When interviewed with regard to the role that IFS could play in solving this problem, he stated “I think one of the objectives of IFS is to carry out research that can help populations ... One of the most important problems is the gap between laboratory results and application in small scale industries. For the application step to start, the scientific results have to be protected. IFS

Table 16: Analysis of Grantee suggestions as to how IFS could assist Grantees to protect and exploit their intellectual property

Suggestion	Number	Relative percentage
Provide information, guidelines and general advice	15	37
Meet cost of patenting	11	27
Help with preparation of documentation	8	20
Hold training workshops	4	
Share of experiences	2	
Promote invention	1	
Total	41	

can pay for the copyright (*sic*) (patenting), help the Grantee to start a production at a small scale, and follow the market of the developed product, maybe under other financing opportunities. But at this step a real follow-up should operated. IFS could send an expert to follow up and help the Grantee in this venture."

3.8.2 Post-grant support

A clear majority of Grantees (76%) and a slight majority of Advisers/Stakeholders (54%) suggested that IFS should provide some form of post-grant support to Grantees. By far the most popular suggestion was that IFS should set up networks of Grantees (55% of Grantees suggestions) (Table 17).

There were a number of suggestions as to what the networks should do. Several comments were around the issue of implementation of research

findings. For example, a Grantee stated "Post-grant support to promote the research findings would be more appropriate. This could be done through networking of Grantees and manufacturers. If not most of the research findings would be limited to publications." When interviewed on this issue she made the following proposals:

1. Arrange a conference or a symposium which can be used by the researchers as a formal forum to present their research findings. This will be a platform to meet researchers with similar interests and also to share their views. It is not necessary to be an annual event but as a biennial or with a lower frequency event
2. IFS can start a publication in which the IFS Grantees can publish the progress of their ongoing research. This can be circulated as an e-document through the Grantees and relevant sectors (e.g. chemical companies, policy makers etc.)."

Table 17: Analysis of Grantee suggestions as to the type of post-grant support IFS should provide

Suggestion	Number	Relative percentage
Set up networks of Grantees	42	55
Provide financial support for publishing	8	10
Fund conference attendance	7	9
Financial support for Grantees to work at centres of excellence in the developed world	5	7
Provide information on job opportunities	3	
Hold workshops	3	
Provide scientific literature	2	
Provide lists of useful contact people	2	
Provide financial support for continuing research	2	
Provide financial support for purchase of equipment to be shared	1	
Provide technical support	1	
Provide financial support for equipment spares	1	
Total	77	

It was also suggested that networks could be a mechanism for promoting collaborative research projects. For example, a Grantee commented “The contacts within the network could lead to writing of important research projects and experience exchange.” An Adviser commented “Post-grant support of Grantees is very important. This will help IFS to monitor its own success, as well as motivate the Grantees to keep on contributing. A network of Grantees is a very good idea. This will keep the Grantees together and also provide an opportunity to meet once a year or so to exchange notes, discuss progress and come up with new projects. Successful Grantees should also be encouraged to mentor new researchers who can be grant-holders of the future. Since these meetings will be held in the regions, the costs could be very reasonable.

Table 17 also shows that there were several other suggestions as to what type of post-grant support IFS should provide. The more popular suggestions were: Financial support for publication, Funding conference attendance, Encouraging research collaboration, and Financial support for Grantees to work at centres of excellence in the developed world. The implications of this latter suggestion have already been discussed in section 3.6.2 Priorities and needs for the different geographical regions.

As with the Grantees, by far the most common suggestion from Advisers/Stakeholders was that

IFS should set up networks of Grantees. However, throughout the Advisers/Stakeholders questionnaire responses there was a recurring theme that IFS should not lose sight of its primary mission. A typical comment was “Stay in what you are doing and do it well – do not expand or shift direction without extra money coming in – you will lose effectiveness very quickly.”

An Adviser, Prof Lloyd Rooney of Texas A&M University, USA, was concerned that some Grantees did not fully understand the development needs of their own countries and suggested that IFS should run training courses on issues such as the Supply Chain for commodities and how to influence it to produce high quality foods that urban customers will want to buy. When asked in an interview to provide more concrete details on how this could be done he stated “Would it be possible to find some success stories where foods from local commodities have been successfully introduced into the market place and to use some of those people to demonstrate that it is necessary to have the whole system considered and not just some magic process or chemical analysis? This could be business people who can give these young scientists a broad overview of what is necessary. It could be a case study in a way as to how the system developed and the importance of understanding the whole system and showing what is really needed which often is more practical stuff and less biochemical studies. Work in support of new products development

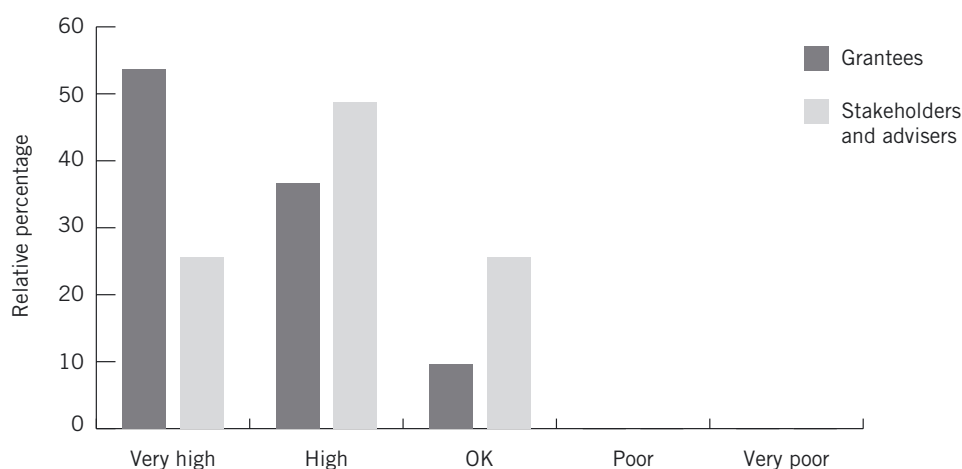


Figure 5: Grantees and Advisers/Stakeholders evaluations of the IFS programme in relation to programmes of other organisations providing research development support

within a team of scientists should be considered important as part of the grant”.

The IFS workshop to consult with African partners, held in 2005, also determined that there was a need for IFS to provide support in addition to grants (IFS, 2005). It was determined that weaknesses among African graduates were in conceptualizing and planning research projects, and synthesizing their research findings into scientific papers. To address these weaknesses, it was suggested that IFS holds courses in science communication.

3.9 The IFS Programme in relation to Programmes of other Organisations

The majority of Grantees (54%) rated the IFS programme very high in relation to the programmes of other organisations providing research development support. Thirty seven percent rated it high and 10% rated it OK (Fig. 5). None rated it poor or very poor. The rating the IFS programme by Advisers/Stakeholders was not quite so high. Although none rated the programme poor or very poor, only 26% rated it very high, 49% rated it high and 26% rated it OK (Fig. 5).

Analysis of the comments on the IFS programme relative to other programmes by Grantees (Table 18) and by Advisers/Stakeholders (Table 19) reveals some common themes, most of which, with one exception, were highly positive. The most common comment from Grantees was that IFS support was critical for helping young scientists develop (26% of comments). Other positive comments from Grantees were that IFS is flexible, rapid and it trusts Grantees to spend grants wisely (11% of comments), and that it is internationally recognised (8% of comments). Similarly, the most common comments from Advisers/Stakeholders were that IFS was unique in giving assistance to scientists in their own countries (26% of comments) and that there was a unique focus on young scientists (21% of comments).

Typical Grantees comments were:

- “I consider the IFS research programmes as very researcher-friendly and flexible programmes. They understand the practical problems in developing countries. At the same time they trust the Grantee. They give the full freedom for the Grantee to handle the programme while pro-

viding adequate guidelines by the expertise. The most important thing is the opportunity given to the Grantee for two more extensions of the grant. This will provide ample time to the Grantee to get established in his/her research field. Furthermore, handling of logistics (i.e. transfer of extra money, helping in purchasing) is also very rapid and convenient. I would like to make a point at this stage. I feel that it would be more helpful for many scientists if the age limit for application could be extended up to 42 years or so, especially considering the situation of women scientists.

- “IFS has contributed to the capacity of low income countries through helping young scientists in these countries. For many of us we would not have been able to carry out graduate studies at Ph.D. level without the support of IFS.”
- “IFS is a very helpful and “friendly” institution. What I mean is that its concern is on the Grantee and the success of the research project and of the development of science in third world countries. As a former Grantee I felt that the IFS staff were extremely helpful, more so than the members of my own institution, and that they were always willing to help and to solve problems. In addition they were very efficient and easy to contact. Although funding for science is never enough, I found more support for my initial work from IFS than from local institutions. I have met several former Chilean IFS Grantees and they share this view”.

The age limit for Grantees was a concern of several Grantees. When interviewed on this issue one Grantee stated “I mentioned this with a special concern on female applicants. At the early stage of their research career most of the female scientists are struggling with the establishment of their families as well. So we should give them a chance.” In this context it must be pointed out that now, in line with IFS’s prioritising its support to scientists from low income and lower middle income countries with vulnerable research infrastructure and deficient national funding mechanisms, the age limits for Grantees are now also differentiated. Although the general age limit remains 40, researchers from Sub-Saharan Africa are eligible for IFS support up to the age of 45, provided they have completed their highest academic degree in the previous 5 years (IFS, 2006). In contrast, however, the applicants from China have to be under the age 30.

Table 18: Analysis of Grantee comments on the IFS programme in relation to programmes of other organisations supporting research development

Comment	Number	Relative percentage
Critical for helping young scientists develop	23	26
Flexible, rapid and trusts Grantees to spend grants wisely	10	11
Grants are too small	10	11
IFS is internationally recognised	7	8
Contact with and feed back from reviewers and Advisers is valuable	5	
IFS uses donor funds efficiently, i.e. has low overheads	4	
Focuses on high quality research	4	
Provides travel grants	4	
Provides support for equipment	3	
Has well organised application system	3	
Provides scientific literature	2	
Supports applied research	2	
Really helps scientists to research	2	
Is a caring organisation	2	
Should provide remuneration for Grantees	2	
Support should be provided to older researchers	2	
Should provide grants to middle income country scientists	1	
Total	86	

Table 19: Analysis of Advisers/Stakeholders comments on the IFS programme in relation to programmes of other organisations supporting research development

Comment	Number	Relative percentage
Unique in giving assistance to scientists in their own countries	9	26
Unique focus on young scientists	7	21
Grants are too small	5	15
IFS is cost-effective	3	
Good mentoring of Grantees	3	
Flexible in approach	1	
User friendly	1	
Close monitoring of projects is as good feature	1	
Team approach is needed	1	
Issue of basic versus applied research should be addressed	1	
Should give support to older scientists from Sub-Saharan Africa	1	
Number of grants should be reduced and size of grants should be increased	1	
Total	34	

Typical Advisers/Stakeholders comments were:

- “IFS is doing very well but the level of the grants is somewhat of a constraint. The age limit is not appropriate for Sub-Saharan Africa where people go to school very late. Considering experience in research would be more appropriate that fixing an age limit.”
- “I think that the IFS program is extraordinary in its dedication and mission. The only reason that I rate it “ok” is due to the small size of individual grants.”
- “The IFS program is a very original initiative which makes clear the involvement of different donors for building and consolidating capacities in developing countries and is a well identi-

fied open gate to research funds for developing country young researchers. It is a very accessible funding agency which takes into account their own specific context and requirements.”

Interviews with current and former Grantees revealed that they also considered the support given by IFS to scientists in developing countries at the start of their research careers to be a major point that is good about the IFS grant system (Table 20). The fact that the grants can be renewed was also commented on favourably, as was the relatively small amount of paperwork involved for IFS grants.

Table 20: Grantees answers to the question “What is good about the IFS grant system?”

Interviewee	Answer
Dr John Muyonga, Technology, Makerere University, Uganda – A Grantee	Wide subject coverage, targeting of young scientist in developing countries and emphasis on science and not just contribution to socio-economic development.
Prof Juscelino Tovar, Instituto de Biología Experimental, Universidad Central de Venezuela, Venezuela – Former Grantee	IFS promotes the activities of scientists in developing countries precisely when they need more support, i.e. at the beginning of their academic career. Very few international institutions undertake such a task.
Prof Amanda Minnaar, University of Pretoria, South Africa – Former Grantee	It is one of the few grant systems that support young researchers at the beginning of their research careers.
Mrs Agnes Mwangwela, Bunda College of Agriculture, Malawi – A Grantee	The IFS grant system provides an opportunity for upcoming scientists to build capacity in writing research proposals and accessing funding. At the same time most of the scientists working in developing countries have extremely limited resources for research due to reduced government funding and the fact that most of the industries found in these countries are not involved in research. The system of disbursement of funds and acquisition of equipment is really good. There is just enough paper work to be done during the application and initial administrative work. The provision for renewing the grant, allows the Grantee to follow up on some of the developments made during the 1st grant.
Dr Gyebi Duodu, University of Pretoria, South Africa – A Grantee	The IFS grant system gives researchers from developing countries a chance to grow in their chosen fields of research. Funding is very scarce (if at all) in developing countries. Not a lot of money is invested by governments in scientific research. For many scientists in developing countries, the IFS grant system may be the only source of funds they may have for research. In addition, the support services within the system try to ensure that Grantees do not feel isolated.
Dr Bassirou Ndoeye, Institut de Technologie Alimentaire de Dakar (ITA), Senegal – Former Grantee	The IFS Grant system allows new scientists to develop individually their competence and manage powerfully financial support

The one major common negative comment about the IFS programme relative to others was that the grants are too small (11% of Grantees and 15% of Advisers/Stakeholders' comments). This was also one of the issues raised when current and former Grantees were interviewed and asked about what was bad about the IFS grant system (Table 21). Another negative issue that came out of the interviews concerned the slowness of the system from time of application to receiving funds. With reference to this issue it is worth pointing out that the project proposal evaluation system is similar in its rigour to the peer review system for publishing a scientific paper. This also takes a period of up to several months.

Other negative comments were that there are certain restrictions with regard to what types of equipment can be purchased and that the system did not cater for collaborative research. With reference to what types of equipment can be purchased, it should be pointed out that question 11.6 of the IFS grant application form in fact specifically asks "List the items you request funding for in the budget, describing their function and justify their use in the research project". Concerning the issue about collaborative research, as explained above, there are actually some IFS supported collaborative research projects.

Table 21: Grantees answers to the question "What is bad about the IFS grant system?"

Interviewee	Answer
Dr John Muyonga, Makerere University, Uganda – A Grantee	Does not cater for collaborative research.
Prof Juscelino Tovar, Instituto de Biología Experimental, Universidad Central de Venezuela, Venezuela – Former Grantee	Rigidity in keeping the predetermined fund limit per grant is somewhat bothersome. It should be possible to increase such a limit in cases where the applicant has been evaluated positively in previous IFS grants. In my opinion, there are also some restrictive rules that may be smoothed in order to give productive Grantees more opportunities to adapt the use of granted funds to their actual needs.
Prof Amanda Minnaar, University of Pretoria, South Africa – Former Grantee	The monies provided is not really enough to provide IFS grantees with adequate infrastructure for research.
Mrs Agnes Mwangwela, Bunda College of Agriculture, Malawi – A Grantee	The fact that there is limitation on the type of laboratory equipment that can be purchased. Especially what is thought to be basic laboratory equipment in some cases it may not exist. It would help if the applicant could be given a chance to explain why they are requesting seemingly basic lab equipment.
Dr Gyebi Duodu, University of Pretoria, South Africa – A Grantee	Nothing really stands out as being bad about the IFS grant system. However, if something could be done to shorten the time applicants have to wait to receive feedback about their applications, it would be helpful.
Dr Bassirou Ndoye, Institut de Technologie Alimentaire de Dakar (ITA), Senegal – Former Grantee	However, what is bad in this system is the slowness procedure from accepting to receiving the fund.

The interviews with current and former Grantees yielded many suggestions as to how IFS could maximise impact (Table 22). These included: funding collaborative research projects, flexible grant renewal rules for high productive Grantees, ideas for mentoring such as linking Grantees with developed

country scientists and workshops to bring together the young scientists with more experienced scientists, travel grants to institutions with specialist equipment, and the setting up of local (regional) IFS offices.

Table 22: Grantees answers to the question “What should IFS do differently to maximise impact?”

Interviewee	Answer
Dr John Muyonga, Makerere University, Uganda – A Grantee	Fund collaborative research, with bigger budget so that different aspects related to a problem can be handled in a single project, with different people contributing.
Prof Juscelino Tovar, Instituto de Biología Experimental, Universidad Central de Venezuela, Venezuela – Former Grantee	I would suggest to consider more flexible rules to be applied to fellows seeking a grant renewal, particularly when it comes to highly productive and responsible Grantees.
Prof Amanda Minnaar, University of Pretoria, South Africa – Former Grantee	Allocate mentors to young scientists as well as to maximise regional forums/seminars/workshops where these young scientists can interact with each other but also with experienced researchers.
Mrs Agnes Mwangwela, Bunda College of Agriculture, Malawi – A Grantee	Due to unavailability of some equipment in developing countries it is difficult for upcoming scientists to conduct research that would contribute towards the advancement of knowledge in the field. For example the IFS reviewers of my proposal recommended calorimetric analysis of some of my samples. As to my knowledge there is no DSC in Malawi. Hence it would help if IFS could assist such scientists to have access to such type of assays that would improve the case for their studies. This could be done through linking the scientists in developing countries with scientists in developed countries, where samples could be sent for analysis at a cost.
Dr Gyebi Duodu, University of Pretoria, South Africa – A Grantee	It is good that the IFS provides travel support to Grantees to visit other institutions for training and I think this should be intensified. The IFS grant may provide funding for the purchase of basic equipment. However some Grantees may be involved in research that requires the use of more sophisticated equipment that may not be available at the Grantee’s institution. Financial support to enable the Grantee travel to an overseas institution to use such equipment would be very helpful and in the long run, maximise impact. My research for instance, would be greatly enhanced if I had access to LC-MS equipment.
Dr Bassirou Ndoye, Institut de Technologie Alimentaire de Dakar (ITA), Senegal – Former Grantee	To maximize impact, IFS should set up local agencies to develop easier and faster their activities.

4. Conclusions and Recommendations

4.1 Achievements, Strengths and Weaknesses of the IFS Food Science Area

4.1.1 Achievements

As seen, 96% of Grantees consider that IFS support was crucial or of considerable value to their personal development as scientists and 84% considered that IFS support was crucial or of considerable value in respect of their impact on science/technology in their region/country (Fig. 2). Therefore it is reasonable to attribute their achievements as an achievement of the IFS Food Science Area. Since the Grantees who responded to the questionnaire seem to be representative of the Food Science Area as a whole (Section 3.1 Questionnaire Response) the data on their outputs can with confidence be extrapolated to the whole group of Food Science Area Grantees. Thus, in simple numerical terms the approximate impact of the IFS Food Science Area on the personal development of developing scientists and their impact on science/technology in their own region/country is very large indeed (Table 23).

It was not part of the terms of reference of this evaluation to look at cost-benefit ratios. Nevertheless, a simple calculation shows that these achievements were very inexpensive in terms of grant cost. If one assumes that every one of the 387 Grantees received the maximum grant of \$12 000 and using the figure of 1.6 grants per Grantee, the total grant cost was approximately \$7.4 million.

The less tangible, but important achievements include:

- Helping to reduce the “brain drain” of scientists from developing countries to developed countries.
- Enabling developing country scientists to do

better research, i.e. promoting their development as scientists.

- Enabling developing country scientists to obtain other research grants by teaching them how to write research proposals.

4.1.2 Strengths

The IFS Food Science Area has several very strong features:

- The major strength of IFS, including its Food Science Area, is its unique focus on individual, young developing country scientists in terms of supporting their experimental research work financially, in order to assist them to become active and productive researchers in the own country/region.
- Regarding IFS's operation it has a very thorough and fair system of evaluation and selection of Grantees and projects for support.
- It also has a highly effective purchasing service, which has been used by well over half the Food Science Area Grantees.

Important less tangible strengths of IFS include:

- Its great experience in ongoing support for developing country scientists, with track record of more than 30 years (Schiøler, 2002).
- The invaluable asset of a very wide network of committed, expert subject area Advisers. This especially applies to the Food Science Area where many of the leading scientists and science administrators in this discipline are involved.
- Its international recognition and high standing. This can be seen from the fact that 90% of Grantees rate IFS very highly or highly in relation to programmes of other organisations active in the same or related fields of research (Fig. 5) and that there is a large network of expert Advisers who support IFS, purely voluntarily.

Table 23: Approximate numerical impact of IFS Food Science Area support on Grantees' personal development as scientists and on science/technology in their regions/countries*

Category	Number
Scientists active in research	244
Scientist active in research related positions but not in research itself	63
Scientists advancing their qualifications	132
Scientists advancing their job positions	263
Scientists involving in international scientific communities	182
Scientists involved in local scientific communities	255
Publications in international scientific journals	5840
Publications in regional scientific journals	1557
Publications in local scientific journals	1671
Books	70
Book chapters	330
Conference proceedings	3268
Patents	62
Scientific and technical reports	542**
Doctoral students trained	581
Masters students trained	1992
Honours students trained	2779
Scientists undertaking training activities in their own or other institutions	182**
Scientists undertaking training activities in their communities	155
Scientists undertaking science/technology implementation activities	174
Enterprises created	44**
Jobs created	572**

* Figures obtained by assuming that the questionnaire respondents were representative of the whole Grantee group

** These particular figures are very approximate and should be treated with considerable caution

- Its working mode of flexibility, rapid action and trust in Grantees judgement on spending.

4.1.3 Weaknesses

Two grant system weaknesses identified are:

- The small size of the grant,
- The relatively low rate of success of Grantees in obtaining grants.

The former issue was highlighted by both the Grantees (Table 18) and the Advisers/Stakeholders (Table 19). It was also brought up at the IFS consultation with African partners workshop held in 2005 (IFS, 2005). As explained, however, both of these issues are related to the level of donor funding that IFS itself receives.

The one area of weakness in terms of the IFS Food Science Area's impact seems to be implementation of research findings, as indicated by:

- The relatively low number of scientific and technical reports produced by Grantees,
- The low number of patents produced by the Grantees,
- The low proportion of Grantees involved in entrepreneurial activities arising from their research.

All these issues could be to some extent related to the high emphasis that has been placed on "science excellence", which can be seen from the high number of papers in international scientific journals, 15 per Grantee.

4.2 Recommendations

It is abundantly clear that IFS, and the IFS Food Science Area in particular, are largely doing the right things. This can be judged from several indicators:

- Virtually all Grantees and Advisers/Stakeholders believed that the IFS Food Science Area was relevant to needs of developing regions/countries.
- Ninety six percent of Grantees considered that IFS support was crucial or of considerable value to their personal development as scientists and 84% considered that IFS support was crucial or of considerable value in respect of their impact on science/technology in their region/country (Fig. 2).
- The outputs of Grantees, especially in terms of publications, seem to be considerably higher than non-Grantees.
- A clear majority of Grantees and Advisers/Stakeholders supported the current system of small grants.

Thus, the first and foremost recommendation is:

1. **The IFS Food Science Area should continue essentially as is**

A second general recommendation is:

2. **For the immediate future, if more funds for grants become available, give grants to more applicants rather than larger grants to the same number or fewer applicants**

Despite the fact that many Grantees and Advisers/Stakeholders were critical of the relatively small size of the grant, the reality is that the number of applications for grants is increasing substantially. If the size of the grant was a major problem this would not be happening. Further, overwhelmingly Grantees (90%) and Advisers/Stakeholders (94%) support IFS's policy of giving priority to helping develop scientists in low income countries with vulnerable scientific infrastructures. Because these countries have vulnerable scientific infrastructures grant applications may be of a generally lower standard than from higher income countries with less vulnerable scientific infrastructures. Hence, giving more grants will help the priority countries most. Obviously, when inflation erodes the value of the grant to the degree that it is insufficient to purchase the required resources for research, the size of the grant will have to be reviewed.

Concerning how IFS supports the Grantees:

3. **An expert in the Grantee's research area should be assigned to the Grantee to act as a volunteer mentor**

It is clear that the Grantees (more than 80% of respondents) considered the "other scientific support" provided by IFS was of significant value. The questionnaires revealed that Grantees experience problems with issues such as writing grant proposals and scientific papers, and seeing their work in a wider, developmental context. The author has observed that scientists in many countries in Africa are extremely isolated, often being the only scientist in their field in an institute (part of the vulnerable scientific infrastructure problem). More formal mentoring of the Grantees would, I believe, better improve the Grantees' research skills, increase their outputs and implementation of their research and foster research collaborations. As explained, I think that mentoring would be especially valuable to Grantees from countries with vulnerable scientific infrastructure. The mentoring could be done by e-mail and would thus be at minimal cost and minimal effort, as volunteer mentors would also benefit if research collaboration took place.

Possibly, there should be some slight changes in emphasis with regard to projects supported:

4. **Applied research projects should be given higher priority**

This was the single most supported suggestion for a change of focus, made by 16% of Grantees and 22% of Advisers/Stakeholders. An emphasis on applied research seems essential in order to achieve more in-country impact in terms of economic development. As identified, this seems to be the one area of weakness in terms of impact of the IFS Food Science Area.

To address this issue, I suggest that the project reviewers, including local reviewers, more carefully evaluate aspects such as local relevance of the project and the contacts between the applicant and other local Stakeholders (industry, farmers, community groups, NGOs, other researchers and government organisations). The latter is essential if implementation of research is to take place. Notwithstanding the emphasis on applied research projects, I believe it is also essential that this should not be at the cost of downgrading the quality of science. As the world

is now a global village, this means that world-class standards have to be applied in many situations in developing countries, e.g. standards and methods of analysis for ensuring the safety and quality of food, especially food for export.

5. There should be some regional research priorities

The suggestions from the Grantees and Advisers/Stakeholders were as follows:

Sub-Saharan Africa: Food technology and preservation, Value addition to agricultural produce

North Africa: Food safety and quality

Middle East: Nutrition, Value addition to agricultural produce, Food safety and quality

Asia: Food safety and quality, Post-harvest physiology and technology

Latin America: Food biotechnology, Prevention of lifestyle diseases, Value addition to agricultural produce, Food safety and quality, Food technology and preservation

However, notwithstanding these priority areas, I believe that good proposals not in these areas should not be excluded.

Regarding purposes for which the grant is used, it was clear that Grantees and Advisers/Stakeholders were happy with the present priorities:

6. The grants should primarily be used for the purchase of inexpensive equipment (< \$5000), expendable supplies, and scientific literature. Other purposes that should be given consideration are funds for attendance of scientific conferences, travel for fieldwork, and travel and subsistence to undertake research at regional centres of excellence.

Concerning the grant application and selection process, efforts should be made to streamline it to help address the issue of its apparent slowness:

7. Consider eliminating the category of Conditionally Rejected (Postponed) applications. Rather the applicants should be informed that their application has been rejected but has some merit and that they may, if they so wish, submit a new application which addresses the criticisms, with the understanding that it would be categorised as a completely new application

With regard to new support activities:

8. Unless funding can be found specifically for this purpose, IFS should not become involved in providing intellectual property support to Grantees

This was the clear message from both the Grantees and Advisers/Stakeholders in terms of how they thought the grant should be allocated. Perhaps, IFS could post general information on the IFS website about intellectual property protection and exploitation, and provide links to useful websites.

9. National and regional networks of Grantees and former Grantees should be set up

This was by far the most popular proposal from Grantees and Advisers/Stakeholders for post-grant support. With regard to the format of the networks, in my opinion the networks should comprise Grantees from all the IFS areas. There should not be separate networks for each area. Interdisciplinary collaboration is essential to implement research. In recognition of this, today many research project calls are for multidisciplinary teams with complimentary skills in all the aspects of the "farm to fork" food pipeline. What the networks should do is really up to the members since local and regional needs differ. Topics will probably include: assisting each other with research proposal and publication writing, making joint research project proposals, running training workshops and holding local/regional technical and scientific meetings, and undertaking research and development implementation activities. Networks also seem to be an important vehicle for addressing the issue of scientist isolation in countries with vulnerable scientific infrastructure.

A major potential problem with regard to setting up networks is cost. Using funds that would otherwise been used for grants to set up the networks must be avoided. Probably the most economical way of setting up and running networks is to make them simply e-communities, either just using e-mail, or if required real time meetings could be held via the IFS website. For face to face meetings, Grantees could make use of the opportunities afforded for networking when they attend regional scientific meetings.

5. References

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Appendix 1

Terms of Reference for the IFS Food Science Area Evaluation

The format of the evaluation shall be tri-partite:

- An evaluation of the Grantees in terms of: (a) Grantees' career progress, and (b) the scientific/development output of the Grantees' research
- An evaluation of the relevance of the Food Science Area in terms of the needs of developing countries/regions
- A proposal for the future.

An important goal of the IFS evaluations is to determine the future course of the various scientific areas supported by IFS.

A second goal is to set in motion the mechanisms of a continuing and sustainable process for future evaluations.

The methodology shall take into consideration:

- Questionnaire(s) to selected Grantees, Advisers, representatives of organisations and institutions affiliated with IFS and/or knowledgeable of development and scientific issues
- Interviews with the above people (when feasible)
- Documents available at IFS secretariat
- The collaboration of developing country scientists and the exposition of their views is essential with respect to the evaluation
- The Food Science Area Evaluation (FSAE) is to take into account findings of previous evaluations of the IFS and the Food Science Area
- The FSAE should be prepared to contribute to the design of questionnaires to be sent to selected Grantees, Advisers, institutions/organisations. The questionnaires are to be designed in a standardized format that will permit computerized processing and storage. IFS will assist in setting up the questionnaires
- The FSAE can expect the support of IFS staff members for discussions and for providing relevant data and information available at the secretariat
- The FSAE may request the assistance of external persons if necessary and agreed to by IFS.

1. The FSAE is to assess the following:

- 1.1 The impact of IFS support on Grantee's careers, including what role IFS Grantees play in relevant national and international scientific communities
- 1.2 The scientific and development outputs from IFS supported Grantees/projects
- 1.3 The relevance of the area of Food Science in the context of the IFS programme, and whether the subject area should be continued, redefined, otherwise modified or phased out

2. On the basis of the above the FSAE is to make recommendations on the following:
 - 2.1 The scientific topics that should be supported within the area of Food Science
 - 2.2 Research priorities and needs for the different geographical regions
 - 2.3 Activities, services, working modes of IFS to be given priority
 - 2.4 The process of evaluation/selection of the applications
 - 2.5 The profile of the IFS programme in relation to programmes of other organisations active in the same or related fields of research.
3. The FSAE is to assess the problems related to patenting of new products and applications, and make recommendations on the role that IFS can play with regard to assisting Grantees in the protection and exploitation of intellectual property.
4. The FSAE is to undertake and provide an analysis of the achievements, strengths and weaknesses of the Food Science Area.
5. The FSAE shall provide the Director of IFS with an outline of the evaluation by 22 July 2005.
6. The FSAE shall provide a draft evaluation report of 30-50 pages to the Director of IFS by 31 March 2006.
7. The FSAE shall make an illustrated oral presentation on the main findings of the evaluation to an invited audience during an IFS seminar arranged by the IFS Secretariat during the first half of 2006.
8. On the basis of feedback received from IFS management the FSAE will revise the draft report and submit a final report within one calendar month of the FSAE receiving the written feedback.

The contents of the evaluation is the property of IFS and shall be treated as confidential material if IFS so requests.

Appendix 2

Questionnaire to IFS Food Science Area Grantees

QUESTIONNAIRE TO INTERNATIONAL FOUNDATION FOR SCIENCE (IFS) FOOD SCIENCE AREA GRANTEEES

INTRODUCTION

As you are aware, the International Foundation for Science (IFS) is a non governmental organisation founded in 1972, supported by contributions from the different governments of some 8 countries and a number of international donor agencies. Besides these donors, the IFS has a membership of scientific academies and research councils in 83 countries. The annual budget is approximately USD 5 million.

The mandate of IFS is to support developing country scientists through small research grants. The scientific programme comprises 8 scientific areas, Aquaculture, Animal Production, Crop Science, Forestry, Food Science, Natural Products, Social Science, and Water. Over a 33 year period, the IFS has given small grants and additional supports to nearly 3700 Scientists in 100 developing countries.

In order to assure that the IFS programme is effectively focused on the actual needs and priorities of developing countries, it has been decided that research areas should be evaluated.

IFS has requested Professor John Taylor of the University of Pretoria's Food Science department to undertake the evaluation of IFS Food Science area. It would be very much appreciated indeed if you took a little time to fill in and return this questionnaire. The results of the questionnaire will be the major input into the evaluation and help shape the future of our support for developing country food scientists and technologists.

Information and comments from the participants in the questionnaire will be treated discreetly and confidentially.

QUESTIONNAIRE

Title:

Surname:

First names (in full):

Work address (Physical address)

Post address, if different)

Telephone number:

Fax number:

E-mail:

Full job title:

1. Type of institution in which you performed/are performing the research when you received/are receiving IFS support. Please tick 1 only

- Tertiary education institute
 Government/statutory research institute
 Private research institute
 Private industry
 Other

If you ticked Other, please define Other in no more than 5 words.

2. Country in which you are working now

3. Please tick one of the boxes that best describes the Food Science research area in which you were/are active as a recipient of the IFS grant.

- Food chemistry
- Food microbiology
- Food biotechnology
- Food engineering
- Food technology
- Food processing
- Food safety
- Food quality
- Food legislation
- Nutrition
- Other

If you ticked Other, please define Other in no more than 5 words.

4. Highest academic qualification at start of period(s) of IFS support (e.g. Honours, Masters, Doctorate) :

Highest academic qualification at end of period(s) of IFS support:

Current highest academic qualification:

5. Full job title (position) held at start of first period of IFS support:

Full job title (position) held at end of last period of IFS support:

6. If you are a former IFS grantee, are you still active in research today?

- Yes
- No

If No, please tick one of following reasons:

- Retired
- Other research related occupation
- Non-research related occupation

If Yes, how much of your time do you use for?

- Research (%)
- Administration (%)
- Teaching and training (%)
- Other (%)

If you ticked Other, please define Other in no more than 5 words: .

PUBLICATIONS AND OTHER OUTPUTS

7. List Education/Training type activities for the community that you have played a significant role in, that have arisen from your research activities since you first received support from IFS, e.g. *Presentation of a food safety course for street food vendors.*

8. List Scientific/Technological Training type activities for your own or other institutions that you have played a significant role in, that have arisen from your research activities since you first received support from IFS, e.g. *Training of staff in own institution and two other institutions in electrophoresis.*

9. List Science/Technology Implementation type activities for the community that you have played a significant role in, that have arisen from your research activities since you first received support from IFS, e.g. *Provided technology input for a women's group community bakery.*

10. List any Personal Food Entrepreneurial type activities that you have played a significant role in, that have arisen from your research activities since you first received support from IFS, e.g. *Started and now manage a company employing 20 people that manufactures sweets and chocolates for the local and export market.*

11. List the Honours, Masters and Doctoral students supervised/co-supervised by you to graduation from start of first period of IFS support until present. *Give the numbers of students only.*

Honours graduates
Masters graduates
Doctoral graduates

12. State how many papers you have published in international scientific journals from start of first period of IFS support until present. Please list the five most recent papers.

13. State how many papers you have published in regional scientific journals from start of first period of IFS support until present. Please list the five most recent papers.

14. State how many papers you have published in local scientific journals from start of first period of IFS support until present. Please list the five most recent papers.

15. List patents awarded from start of first period of IFS support until present.

16. List books published from start of first period of IFS support until present.

17. List book chapters published from start of first period of IFS support until present.

18. State how many conference proceedings you have published from start of first period of IFS support until present. Please list the five most recent papers.

19. State how many scientific and technical reports for your institution(s) and external organizations (not IFS) you have produced from start of first period of IFS support until present. Please list the five most recent reports.

20. Give details of roles played by you in international scientific communities since the start of first period of IFS support, e.g. *Chair of international food science and technology society, Advisor to international organizations etc.,*

21. Give details of roles played by you in national scientific communities since the start of first period of IFS support, e.g. *Chair of local food science and technology society, Advisor to minister of science and technology.*

22. State how many meritorious awards you have obtained from the start of your first period of IFS support. Please list the five most important awards. (IFS Awards do not have to be entered)

QUESTIONS ABOUT IFS FOOD SCIENCE AREA

1. The IFS Food Science area is broad, encompassing Food Science, Food Technology, Food Biotechnology and Nutrition. Do you think a Food Science area is relevant in terms of the needs of developing countries/regions?

- Yes a Food Science area is relevant
 No a Food Science area is not relevant

Please give reasons for your answer

2. Concerning the future of the IFS Food Science area, do you think that?

- The food science topics focus should continue to be broad
 The food science topics focus should be redefined
 The research focus should be redefined and the emphasis should be on basic research
 The research focus should be redefined and the emphasis should be on applied research
 It should be phased out

If you have suggested that the focus of research topics or research type should be redefined, outline the changes of focus you would like to see, giving your reasons. Similarly, give reasons for phasing out.

3. Please identify any specific research priority areas in the Food Science area that you think IFS should give priority to and link them to one or more of these geographic regions: Sub-Saharan Africa, Middle East and North Africa, Asia, Latin America.

4. The IFS Food Science area, in common with the other IFS areas, is now giving most attention to helping develop scientists in low income countries with a vulnerable scientific infrastructure. Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, what do you think of this approach?

- Yes it is the correct approach
 No it is not the correct approach

Please give reasons for your answer.

5. Currently, IFS provides small grants (up to US\$12 000) for research projects for periods up to 3 years to competent and promising individual scientists who have already shown research potential. The grants are renewable and up to 3 grants can be awarded. The grants can be used for purposes such as small capital equipment items, expendable supplies, literature and information, local travel, and extra manpower.

Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, what do you think of this system of small grants for these purposes?

- It is the correct approach
 Some detailed changes are required
 Radical changes in the approach are needed

Select the 7 issues you consider as least important for IFS to support:

- Computers
 Expensive equipment (>\$5000)
 Inexpensive equipment (<\$5000)
 Expendable supplies
 Extra manpower
 Scientific literature
 Provision of reliable and fast Internet connection
 Patenting and intellectual property protection assistance
 Travel for fieldwork
 Travel and subsistence to undertake research at centres of excellence
 Attendance of scientific conferences
 Attendance of IFS organised scientific thematic workshops and symposia
 Attendance of IFS organised workshops on writing grant proposals
 Attendance of IFS organised workshops on scientific/technical publication/report writing
 Helping to set up regional networks of scientists in a research area

Select the 7 issues you consider of highest importance for IFS to support:

- Computers
 Expensive equipment (>\$5000)
 Inexpensive equipment (<\$5000)
 Expendable supplies
 Extra manpower
 Scientific literature
 Provision of reliable and fast Internet connection
 Patenting and intellectual property protection assistance
 Travel for fieldwork
 Travel and subsistence to undertake research at centres of excellence
 Attendance of scientific conferences
 Attendance of IFS organised scientific thematic workshops and symposia
 Attendance of IFS organised workshops on writing grant proposals
 Attendance of IFS organised workshops on scientific/technical publication/report writing

- Helping to set up regional networks of scientists in a research area

Please give suggestions as to how IFS support should be allocated to provide optimised use of the available funds so that the impact of the IFS grant can be improved.

6. IFS provides grantees other support in addition to the grant.

SCIENTIFIC SUPPORT

Did IFS provide support that resulted in?

- Contacts provided by IFS
 Comments from Scientific Advisers
 Advice from Scientific Advisers in the writing proposal

Did the comments or advice from the Scientific Advisers contribute to an improvement of?

- Writing research proposals
 Technical issues within the research project
 Update with the literature

Other, please specify

PURCHASING SERVICE

Did IFS assist you with purchasing?

- Yes
 No

If Yes, please comment on what which areas IFS can be most of value to grantees in respect of purchasing, *e.g. avoidance of financial problems in own institute, lower costs of equipment/consumables, rapid action.*

WORKSHOPS/SYMPOSIA AND CONFERENCES

Have you participated in any of following IFS activities?

- IFS thematic scientific workshop/symposium
 Scientific conference with a travel grant by IFS
 IFS proposal writing workshop
 None of the above mentioned

If you have not participated, why not?

- Lack of information that it was possible
 Not interested
 No results to present
 No thematic workshop in my field has been organised
 I applied but there was no travel grant available
 Other

If you ticked Other, please specify

7. The protection and commercial exploitation of intellectual property is regarded by some people as being important for economic development and support of continued scientific research.

Have you ever tried to protect any of your research findings?

Yes No

If you answered Yes, did you experience problems protecting the research findings?

Yes No

Have you ever tried to commercially exploit any of your research findings?

Yes No

If you answered Yes, did you experience problems exploiting the research findings?

Yes No

Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, do you think that IFS should play a role with respect to assisting grantees protect and exploit their intellectual property?

Yes No

If you answered Yes, please make specific suggestions as to how IFS could assist grantees to protect and exploit their intellectual property.

8. Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, do you think that IFS should provide any form of post-grant support for grantees?

Yes No

If you answered Yes, please state what form you think this should take, *e.g. networks of grantees, alumni association*. Please justify your suggestions.

9. How do you rate the IFS Programme in relation to programmes of other organisations providing research development support?

Very high
 High
 OK
 Poor
 Very poor

Please give reasons for your answer

10. Evaluate the value of the support given to you by IFS by ticking one of these statements

The support from IFS was crucial to my personal development as a scientist
 The support from IFS was of considerable value to my personal development as a scientist
 The support from IFS was of some value to my personal development as a scientist
 The support from IFS was of little value to my personal development as a scientist
 The support from IFS was of no value to my personal development as a scientist

Please comment on the evaluation you have given, with respect to the issue of your personal development.

11. Evaluate the value of the IFS support to your personal impact on science/technology in your region/country.

Tick the boxes where you agree.

- The support from IFS was crucial to my impact on science/technology
- The support from IFS was of considerable value to my impact on science/technology
- The support from IFS was of some value to my impact on science/technology
- The support from IFS was of little value to my impact on science/technology
- The support from IFS was of no value to my impact on science/technology

Please comment on the evaluation you have given, with respect to the issue of your impact on science/technology in your country/region.

Please provide the name and contact details, including e-mail and fax, of another person in your country who could also give his/her views on IFS support for the development of scientists in the Food Science area.

Thank you for the time you have devoted to completing this questionnaire. The information will be of great value in assisting IFS to support the development of future food scientists and technologists in developing countries.

Appendix 3

Advisers/ Stakeholders Questionnaire

QUESTIONNAIRE ABOUT THE INTERNATIONAL FOUNDATION FOR SCIENCE (IFS) FOOD SCIENCE AREA

INTRODUCTION

The International Foundation for Science (IFS) is a non governmental organisation founded in 1972, supported by contributions from the different governments of some 8 countries and a number of international donor agencies. Besides these donors, the IFS has a membership of scientific academies and research councils in 83 countries. The annual budget is approximately USD 5 million.

The mandate of IFS is to support developing country scientists through small research grants. The scientific programme comprises 8 scientific areas, Aquaculture, Animal Production, Crop Science, Forestry, Food Science, Natural Products, Social Science, and Water. Over a 33 year period, the IFS has given small grants and additional supports to nearly 3700 Scientists in 100 developing countries.

In order to assure that the IFS programme is effectively focused on the actual needs and priorities of developing countries, scientific areas should be evaluated.

IFS has requested Professor John Taylor of the University of Pretoria's Food Science department to undertake the evaluation of IFS Food Science area. It would be very much appreciated indeed if you took a little time to fill in and return this questionnaire. The results of the questionnaire will be the major input into the evaluation and help shape the future of our support for developing country food scientists and technologists.

Information and comments from the participants in the questionnaire will be treated discreetly and confidentially.

QUESTIONNAIRE

Your name:

1. Please give your affiliation (tick the category that is most relevant)

- Scientific advisor to IFS
- Representative of IFS partner organization
- Representative of a Donor organization
- Representative of professional scientific association
- Scientist or technologist
- Science or technology policy maker or administrator
- Business person

2. My country of residence is in

- Sub-Saharan Africa
- Middle East and North Africa
- Asia
- Latin America
- North America
- Europe
- Australasia/Oceania

3. The IFS Food Science area is broad, encompassing Food Science, Food Technology, Food Biotechnology and Nutrition. Do you think a Food Science area is relevant in terms of the needs of developing countries/regions?

- Yes a Food Science area is relevant
 No a Food Science area is not relevant

Please give reasons for your answer

4. Concerning the future of the IFS Food Science area, do you think that?

- The food science topics focus should continue to be broad
 The food science topics focus should be redefined
 The research focus should be redefined and the emphasis should be on basic research
 The research focus should be redefined and the emphasis should be on applied research
 It should be phased out

If you have suggested that the focus of research topics or research type should be redefined, outline the changes of focus you would like to see, giving your reasons. Similarly, give reasons for phasing out.

5. Please identify any specific research priority areas in the Food Science area that you think IFS should give priority to and link them to one or more of these geographic regions: Sub-Saharan Africa, Middle East and North Africa, Asia, Latin America.

6. The IFS Food Science area, in common with the other IFS areas, is now giving most attention to helping develop scientists in low income countries with a vulnerable scientific infrastructure. Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, what do you think of this approach?

- Yes it is the correct approach
 No it is not the correct approach

Please give reasons for your answer.

7. Currently, IFS provides small grants (up to US\$12 000) for research projects for periods up to 3 years to competent and promising individual scientists who have already have shown research potential. The grants are renewable and up to 3 grants can be awarded. The grants can be used for purposes such as small capital equipment items, expendable supplies, literature and information, local travel, and extra manpower.

Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, what do you think of this system of small grants for these purposes?

- It is the correct approach
 Some detailed changes are required
 Radical changes in the approach are needed

Select the 7 issues you consider as least important for IFS to support:

- Computers
 Expensive equipment (>\$5000)
 Inexpensive equipment (<\$5000)
 Expendable supplies

- Extra manpower
- Scientific literature
- Provision of reliable and fast Internet connection
- Patenting and intellectual property protection assistance
- Travel for fieldwork
- Travel and subsistence to undertake research at centres of excellence
- Attendance of scientific conferences
- Attendance of IFS organised scientific thematic workshops and symposia
- Attendance of IFS organised workshops on writing grant proposals
- Attendance of IFS organised workshops on scientific/technical publication/report writing
- Helping to set up regional networks of scientists in a research area

Select the 7 issues you consider of highest importance for IFS to support:

- Computers
- Expensive equipment (>\$5000)
- Inexpensive equipment (<\$5000)
- Expendable supplies
- Extra manpower
- Scientific literature
- Provision of reliable and fast Internet connection
- Patenting and intellectual property protection assistance
- Travel for fieldwork
- Travel and subsistence to undertake research at centres of excellence
- Attendance of scientific conferences
- Attendance of IFS organised scientific thematic workshops and symposia
- Attendance of IFS organised workshops on writing grant proposals
- Attendance of IFS organised workshops on scientific/technical publication/report writing
- Helping to set up regional networks of scientists in a research area

Please give suggestions as to how IFS support should be allocated to provide optimised use of the available funds so that the impact of the IFS grant can be improved

8. The protection and commercial exploitation of intellectual property is regarded by some people as being important for economic development and support of continued scientific research.

Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, do you think that IFS should play a role with respect to assisting grantees protect and exploit their intellectual property?

- Yes No

If you answered Yes, please make specific suggestions as to how IFS could assist grantees to protect and exploit their intellectual property.

9. Bearing in mind budgetary constraints that are affecting all donor organisations in the science field, do you think that IFS should provide any form of post-grant support for grantees?

- Yes No

If you answered Yes, please state what form you think this should take, *e.g. networks of grantees, alumni association*. Please justify your suggestions.

10. How do you rate the IFS Programme in relation to programmes of other organisations providing research development support?

- Very high
- High
- OK
- Poor
- Very poor

Please give reasons for your answer

Thank you for the time you have devoted to completing this questionnaire. The information will be of great value in assisting IFS to support the development of future food scientists and technologists in developing countries.

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*
Gaillard J. and A. Furó Tullberg
Stockholm: IFS, 2001. 92 pages.
- Report No. 3 *IFS Impact in Mexico: 25 years of support to scientists*
Gaillard J., J.M. Russell, A. Furó Tullberg, N. Narvaez-Berthelemot and E. Zink
Stockholm: IFS, 2001. 152 pages.
- Report No. 4 *Strengthening Science Capacity in Tanzania: An Impact Analysis of IFS Support*
Gaillard J., E. Zink and A. Furó Tullberg
Stockholm: IFS, 2002. 104 pages.
- Report No. 5 *Science Research Capacity in Cameroon: An Assessment of IFS Support*
Gaillard J. and E. Zink
Stockholm: IFS, 2003. 72 pages.
- Report No. 6 *Summary of IFS Impact Studies Nos. 1-5*
Zink E. and Gaillard J (ed.) S. Major
Stockholm: IFS, 2006. 28 pages.
- Report No. 7 *Evaluation of IFS Food Science Area*
J R N Taylor
Stockholm: IFS, 2006. 64 pages.
(this document)

These reports are available in pdf format on the IFS website:
www.ifs.se



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