IFS And Its Programme In Dryland Forestry Research

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1. The International Foundation for Science (IFS)

A small international group of scientists who were concerned about the problem of building indigenous science capacity in developing countries founded IFS in 1972. Their idea was to support young researchers of merit at the beginning of their scientific career in order to encourage them to stay in research and to establish themselves as members of the scientific community so that they might become leading scientists in their nations. IFS aims at the advancement of good scientists who can do relevant research of high quality in agricultural and related natural resources management sciences. Even if IFS puts the individual scientist at the centre of its focus, it encourages and supports team work and interdisciplinary research.

IFS is an international, nongovernmental, nonprofit organization. Its Secretariat is located in Stockholm, Sweden. The Foundation has a membership of some 92 national academies of sciences and research councils from 79 countries, whereof two-thirds are in developing countries. IFS is governed by an international Board of Trustees.

The yearly budget of IFS is approximately 40 million SEK, equivalent to around 5,5 million USD. In 1995 core contributions came from governmental sources or through IFS Member Organizations in Australia, Belgium, China R, Denmark, Finland, France, Germany, Japan, Netherlands, Norway, Sweden, and Switzerland. In addition contributions to the granting and supporting programme come from a number of national and international development agencies, including the World Bank, UNDP, UNEP, UNESCO, ISESCO, CTA-EEC, ODA, and SIDA.

2. The Granting And Supporting Programme

2.1 IFS Research Grants

The kind of support that IFS provides is mainly financial and in the form of research grants for specific research projects. The grants amount up to USD 12,000 per research period. The duration of a research period is normally between one to three years, depending on the kind of project. The grant may be renewed two times.

The grant is intended for the purchase of equipment, expendable supplies and literature, and, in well justified cases, for local travel and extra manpower. This implies that the applicant's salary, the basic infrastructure for the experimental work and technical assistance are made available by the researcher's institution.

Equipment purchased from the grant money becomes the property of the grantee's institution once the project is terminated.

2.2 Additional Support

Besides financial support, IFS can assist its grantees in the following ways:

- **The purchase of equipment, supplies and literature on behalf of grantees can be taken care of by the IFS Purchasing Department when grantees opt for leaving all or part of the grant with IFS. This service is of particular importance for grantees in countries where it is**

difficult to make purchases in foreign currency. Moreover, grantees will benefit from IFS's contacts to suppliers all over the world and the discounts IFS has with its major suppliers.

- **Travel grants may be awarded for participation in relevant scientific meetings and conferences.**

- **Scientific contacts can be arranged with IFS Scientific Advisers and other scientists working in the field of the grantee's project.**

- **Workshops and training courses are organized by IFS for its grantees. These provide the opportunity to present research results, to share experiences, to keep up-to-date with new techniques, and to establish new working contacts.**

- **IFS's project, "Service and Maintenance of Scientific Equipment," organizes training courses to assist grantees in Southern Africa Development Community (SADC) countries in the management and repair of laboratory equipment and connects them to the Network of Users of Scientific Equipment in southern Africa (NUSESA).**

2.3 Research Areas

IFS accepts applications from scientists in the following research areas: Aquatic Resources, Animal Production, Crop Science, Food Science, Forestry/Agroforestry, and Natural Products. A small pilot project was started in 1994 in selected environmental sciences that considers proposals dealing with water resources, biodiversity, and global climatic change.

Research on most aspects of the above areas is considered. It should be pointed out, however, that the projects should be relevant to developing countries, and they have to be research-oriented and not a transfer of technology. The proposals should aim at contributing to ecologically, socially, and economically sustainable development.

2.4 Criteria for Grants

Applicants for an IFS grant have to be native to a developing country in Latin America, Africa, or Asia[1]. They have to have an academic degree of not less than an MSc, or the equivalent. At the time they submit their first proposal to IFS, they have to be younger than 40 years[2] and at the beginning of their research career. Applicants must be employed at a university or research institution in a developing country.

The proposed research has to be carried out in a developing country and must fall within the IFS research areas as listed above.

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[1] **Countries of the former Soviet Union and in eastern and southeastern Europe do not fall within the IFS programme.**

[2] **Chinese applicants have to be younger than 30.**

2.5 The Selection Process

About 900 applications reach the IFS Secretariat every year. Available funds do not allow for funding of more than 200 grants per year—a situation which calls for a rigorous selection process. IFS relies on a worldwide network of around 1,000 Scientific Advisers to review the proposals and provide scientific advice and guidance to the grantees. The Advisers are specialists in their respective fields and assist IFS on a voluntary and nonpaid basis. The IFS programme could not exist without this contribution. I take this opportunity to thank all IFS Advisers for their valuable work.

The criteria that are applied for evaluating the applications are the candidate's qualification, the feasibility and scientific quality of the proposed research, and the relevance of the expected results to the needs of the country or region. Each application is evaluated by five to eight reviewers and discussed at the Scientific Advisory Committee meetings that take place twice a year for each research area. The final decision is taken by the IFS Board of Trustees, based upon the recommendations of the Scientific and Grants Committee.

2.6 Grantees and Grants

Since the IFS granting programme started in 1974 some 2,500 young scientists in 95 countries have received IFS support. Some 38% of the grantees work in Africa, 35% in Asia/Pacific, and 27% in Latin America. Almost 4,000 grants have been awarded so far.

About 55% of the total expenditures of IFS goes directly to the grantees in the form of grant money, 30% is spent on supporting activities (workshops, courses, recruitment, purchasing), 10% on administration, and 5% on other costs such as publications.

3. The IFS Forestry/Agroforestry Research Area

Forestry/Agroforestry is among the smaller areas in the IFS programme, considering the number of grantees. This is a reflection of the neglect of forestry research in many countries. We are trying to assist in changing this attitude and to encourage the researchers.

The programme covers all aspects of forestry and agroforestry research, both basic and applied, and thus concerns itself with the parts of the world's land area covered with forests and also with the use of trees and other woody perennials in all of the various different types of land use systems.

Even if all aspects of forestry and agroforestry research are considered, there are a number of subjects that we would like to emphasize, and we wish to concentrate the research activities of the IFS grantees on some key areas that are summarized in Annex 1.

4. Forestry in Dry Regions

Research on aspects of forestry in dry regions has been supported by IFS over many years. In 1992, the Swedish International Development Cooperation Agency (Sida) started to emphasize this area and, in the second half of 1993, they provided special funds to IFS for capacity-building efforts. It was realized that dryland forestry research is not given the attention that it should have when taking into consideration the land and forest area and the percentage of the population that is affected by dry conditions. This point was also strongly stressed during the IUFRO/IFS Workshop and the IUFRO World Congress in Finland last year. The prestige connected to research in these areas and the funds available for it are considerably lower than for research in more productive areas. Relatively few researchers, in particular, young researchers, are, therefore, willing and able to devote their time to projects in these areas. The special attention that the Sida initiative through the IFS programme is giving to research on aspects of forestry in dry regions means a lot to the scientists, and it is very encouraging for efforts in these areas in general.

Funding of SEK 5.2 million has been made available for three years, and we expect that the contract will be renewed. These funds have enabled us so far to award 31 research grants within this programme. A number of grantees have obtained travel grants to attend conferences, and two scientific meetings have been financed.

In June 1994 an international symposium was held in Nairobi on Supporting Capacity Building in Forestry Research in Africa. It was jointly organized and sponsored by IFS and the African Academy of Sciences (AAS), in technical cooperation with FAO. Some 80 participants included grantees of IFS and AAS, researchers from many African forestry research institutions and faculties, as well as from international institutions and organizations such as IUFRO, CIFOR, ICRAF, CIRAD-Forêt, Oxford Forestry Institute, and CABI.

The IUFRO/IFS workshop on Dryland Forestry Research took place in Finland in connection with the IUFRO World Congress beginning in August 1995. Some 55 participants from 30 countries shared their experiences regarding subjects such as ecology and silviculture in different dryland ecotones, dryland afforestation, utilization of indigenous knowledge, and application of research results for local-level development planning. The resolution of the workshop is available here. The proceedings have been published.

5. IFS Grantees' Research on Aspects of Forestry in Dry Regions

The projects supported by IFS in the field of dryland forestry research cover a wide range of subjects: genetic resources; adaptation of tree species to different ecological zones; reactions to drought stress; plant-soil relationships including aspects of water use efficiency and nutrient cycling; the role of rhizobium and mycorrhiza associations; control of pests and diseases; selection for use in agroforestry systems; potential for different purposes such as fuelwood or poles; productivity; propagation, regeneration, and afforestation; changes of vegetation due to human or animal impact; but also projects with more socioeconomic focus, e.g., about the role of nontimber forest products as sources of income. Grantees and their project titles are available from IFS.

Let me present to you a few of the grantees and their projects that IFS has supported or is still supporting. The projects are in different stages; some have started only recently and may not have given results yet; others are more advanced or have been terminated and results have been published in reports to IFS and in articles in scientific journals.

One of the projects has been presented to you earlier during this workshop—Dr. Ousman Diagne reported about his work with *Prosopis* in Senegal. Yet, *Prosopis* species have not been the subject of many IFS grantees' projects. I hope that this will change after this workshop, and I invite you to spread information about the IFS programme.

In Ethiopia, Mr. Tesfaye Abebe at the Awassa College of Agriculture has investigated the growth performance of some multipurpose trees and shrubs in the semiarid areas of southern Ethiopia to select those suitable for agroforestry purposes. He found *Acacia nilotica*, *A. cyanophylla*, *A. seyal*, *Cassia siamea*, and *Prosopis juliflora* to have the best performance in terms of rates of survival and growth rates (height and diameter growth) indicating a great potential for large biomass production in these areas. Studies of the potentials of these species for soil fertility improvement and agroforestry management techniques suitable for each species and desired products were suggested.

In Argentina, Dr. Marta de Viana at the Universidad Nacional de Salta investigates the cactus *Trichocereus pasacana* in order to find out what role dispersal and predation have for distribution and recruitment of this species. This columnar cactus grows in high altitudes and arid regions of northwestern Argentina. It is exploited as one of the main sources of wood in building, for furniture making, and for art and crafts. Dr. de Viana studies the distribution of the species in relation to the

available space and the seed bank at two sites that differ with regard to the density of this species, their plant diversity and altitude. Dr. de Viana noticed that 96% of the cacti were associated with other shrub species.

Dr. Oscar Eyog Matig, soil scientist and ecophysiologist with the Institute of Agricultural Research in Cameroon, has been supported by IFS for his work on the 'Hardé' soils at Maroua with respect to the relation of soil to plants and in view of establishing plantations. During the rainy season these compacted, denuded, and sterile soils take up water only in the upper 40 cm, the rest of the water runs off. The effect of different soil preparation techniques on the water reserve in the soil were tested. Dr. Eyog Matig found that the soil profile's water recharge was very small throughout the rainy season in the treatment where the digging of planting holes was not associated with any other soil preparation technique. It was also noted that the effects of bulldozer ploughing very quickly disappeared with time. The technique of using dikes to retain water made it possible for an important quantity of water to be stored in the soil, up to and above the depth of 1.70 m. This method is acceptable for farmers, and it has shown to be most efficient also with respect to the establishment of a herbaceous cover and the tree growth. Species showing potential under these conditions were *Eucalyptus camaldulensis*, *Azadirachta indica*, **and** *Acacia nilotica* **ssp** *adstringens*. **Also,** *Acacia senegal* **developed well and was considered of interest for the production of gum arabic.**

In Peru, Dr. Niels Valencia is studying regeneration and phenology of a dry cloud forest on the steppe, like western slopes of the Peruvian Andes. The study areas are at altitudes of 2500S3500 m where isolated patches of evergreen forest occur depending on locally favourable moisture conditions caused by persistent clouds in the wet season. The floristic composition differs largely between forests in the north and the south, but Dr. Valencia found the structure and the physiognomy of the forests to be the same. Inventories of the vascular flora of the dry-cloud forests have indicated 119 families, 392 genera, and 801 species. Trees and shrubs were represented by 40 families: for trees, in particular Araliaceae and Proteaceae; for shrubs, in particular Melastomataceae, Cactaceae, Ericaceae, Berberidaceae, Celastraceae, and Sapindaceae. The rate of regeneration of trees and shrubs species is decreasing from north to south. In northern Peru most species were found to regenerate, with trees having notably better rates than shrubs. In central Peru regeneration was very poor, a result probably of higher grazing pressure and the drier climatic conditions. The present phase of the project aims at using the native trees and shrubs of the dry-cloud forests for afforestation in order to prevent soil erosion.

A final report has recently been submitted to IFS by Dr. Emmanuel Rincon of Mexico concerning his research on the ecophysiology of tropical dry forest legumes. In the tropical dry forest at the Pacific Coast of Mexico legumes are very abundant and diverse. Dr Rincon carried out a screening programme on 10 species that were considered to have potential as sources of tubers, timber, forage, or fruits, and to reduce soil erosion. The germination, growth, and establishment of woody seedlings, as well as the influence of mycorrhizae on seedling growth were studied. The project has resulted in a number of publications. Dr. Rincon also looked at *Pachycereus pecten-aboriginum*, **an arborescent cactus of arid and tropical dry forests in Mexico that is associated with vesicular-arbuscular mycorrhizal fungi. The mycorrhiza infected seedlings had significantly higher dry-matter production, root/shoot ratios, and specific root length than noninfected seedlings. This suggests a more efficient exploitation of soil resources by the mycorrhiza cacti, and indicates an important role of the mycorrhiza fungi in the establishment, growth, water relations, and nutrition of cacti in the arid tropics.**

"Miombo trees and mycorrhiza" is the title of an IFS supported project carried out by Dr. Esron Munyanziza in Tanzania. Miombo woodlands are the largest type of vegetation in Tanzania and widely occur in several other African countries. The project focuses on the main miombo tree species, namely, *Afzelia quanzensis*, *Brachystegia microphylla*, *Brachystegia spiciformis*, *Julbernardia globiflora*, **and**

Pterocarpus angolensis **and aims at contributing to a proper management of miombo woodlands, to the silviculture of miombo tree species, and to afforestation of dry areas. Aspects included in the project are natural and artificial regeneration, fertilization, artificial inoculation of seedlings, and natural occurrence of mycorrhizae on field-grown seedlings. One of the objectives of the studies was to understand the constraints and ecological strategies of the miombo trees. Dr. Munyanziza mentioned as the main constraints the harsh climate, poor soils, and wildfires. Irregular and insufficient rains following seed dispersal constitute major constraints to natural regeneration. Bush fires not only result in erosion that washes away nutrients, but also kill seeds and damage most seedlings under 4 meters and even mature trees. Miombo trees have different strategies to improve their chance of survival and to reduce risks. The number of seeds produced, the way they are dispersed and the time of germination play an important role, as does the association with mycorrhiza fungi.**

Annex 1

The IFS Forestry/Agroforestry Research Area

IFS will consider applications for projects dealing with research on all aspects of forestry and agroforestry. We wish, however, to concentrate the research activities of the IFS grantees on the following key areas[3]:

1. Exploration, conservation and utilisation of biological diversity

- **Quantitative resource assessment ranging from remote sensing to field-based studies**
- **Characterisation of the soil environment in forestry systems (physical, chemical, and biological)**
- **Definition of minimal areas for effective** *in situ* **conservation and management for conservation**
- **Characterisation of genetic diversity using classical methods together with advanced techniques of molecular and biochemical techniques**
- **Development of** *ex situ* **conservation management and practices, including seed banks (where appropriate), cryopreservation, and tissue-culture genebanks**

2. Sustainable forest management (silvics)

2.1 Natural forest systems

- **Botany and ethnobiology of indigenous forests**
- **Edaphic factors and their interactions including nutrient cycling, physical structure, dynamics of nutrient, carbon partitioning and water movement and the biological functioning of forest rhizospheres**
- **Local knowledge of management of forest resources**
- **Autecology and synecology of important species of the forest including studies on phenology, seed recalcitrance, and whole-tree physiology**
- **Dryland ecology and range management**
- **Natural forest dynamics (succession, regeneration patterns in relation to site factors)**
- **Development of methods for forest management planning, especially for multiple use of forests**

2.2 Plantation forest systems

- **Silvics of indigenous and exotic species for use in plantations including mixed plantations**

[3]Many thanks to Peter Wood, Sinclair Mantell, François LeTacon, Olavi Luukkanen, and Ivan Nielsen for setting up this list.

- **Development of plantation technology for production of nontimber forest products**
- **Population genetics of plantation species**
- **Tree planting patterns for watershed management**
- **Genetic improvement of plantation species using integrated conventional and advanced** *in vitro* **transformation methods**
- **Assessment of weediness with introduced species**
- **Enhancing cost effectiveness in plantation systems**
- **Studies on improved budding, grafting and propagation techniques to take advantage of genetic gains**
- **Appropriate phenology studies in indigenous fruit and other trees**

3. Agroforestry

- **Above- and below-ground interactions between tree and crop excluding simplistic research on alley cropping but emphasising more the interactions between soil microorganisms in the rhizosphere**
- **Development of symbiotic microbial associations which will improve sustainability**
- **Impact of agroforestry systems on physical soil properties and control of soil erosion on sloping lands**
- **Genetic improvement of fruit and multipurpose trees using integrated traditional and advanced modern methods**
- **Improved modified orchard systems for agroforestry**
- **Rationalisation of the use of chemical inputs for sustained yield and adequate pest and disease control leading to increased use of integrated pest and disease management, using biological control where possible**
- **Improvement of range management practices**
- **Rural appraisal for developing research programmes and on-farm research**
- **Evaluation of factors in the uptake of stabilisation practices including windbreaks, shelterbelts, etc.**

4. Forest products

- **Increasing added value to nontimber products from managed natural forests**
- **Increasing added value to timber products from natural and plantation forests**
- **Improvements and harvesting technologies for all forest products**
- **Marketing studies for small-scale rural producers**
- **Improved utilisation, coupled with sustainability, of underutilised forest products**
- **Improved postharvest handling of forest products**

Other cross-cutting issues which must be emphasized include:

- **Need for rural people to participate in the planning and management of research**
- **The need for some social and economic studies to be incorporated in any scientific research activity on tropical forestry systems**
- **It is expected that in choosing research topics national needs are taken into account**

Special funding is available for research proposals on aspects of forestry in dry regions.