



INTERNATIONAL
FOUNDATION FOR
SCIENCE



IFS ANNUAL REPORT 2014

IFS – DEVELOPING SCIENCE, SCIENCE FOR DEVELOPMENT

The IFS Annual Report has a style which is designed to match our ten-year strategy and includes sections relating to the specific objectives to improve planning of research by early-career scientists, increase production of relevant, quality research in low and lower middle-income countries, and increase the use of quality research results produced by IFS.

We hope you enjoy the report!

IFS Annual Report 2014

Produced by IFS, 2015

Production and Graphic Design by Global Reporting Sweden

Cover photo by Sibonani Mlambo. Research in Lake Manyame, Zimbabwe is a source of livelihood, tourism, fisheries and drinking water to Harare and the surrounding low-income communities.

Photos by IFS.

Printed by Ineko AB, Sweden, 2015

TABLE OF CONTENTS

Foreword	4
Mission statement	6
<i>Résumé en français</i>	7
IMPROVING PLANNING OF RESEARCH BY EARLY-CAREER SCIENTISTS	8
Research clusters	10
Research planning workshops 2014	10
INCREASING PRODUCTION OF RESEARCH	14
Individual grants approved in 2014	16
Collaborative research	17
A selection of new individual research grants given in 2014	18
INCREASING USE OF RESEARCH RESULTS PRODUCED BY IFS	24
Putting research into use	26
Travel grants	27
Identifying phyto medicines in sub-Saharan Africa	30
Understanding food borne illnesses in Burkina Faso	31
Identifying eco-friendly sources of larvicides to reduce mosquitos	32
Finding a stable source of anti-oxidants and Vitamin C in Africa	33
Developing a region-specific climate adaptation policy	34
An innovating way to clean up toxic metals and dyes from water	35
IFS Alumni Association highlights	36
SUPPORT OF IFS	40
Swedish International Development Agency	41
Atta-ur Rahman: Impact of IFS on my life	43
PEOPLE, AFFILIATES, GRANTS AND FINANCES	44
IFS Board of Trustees	45
IFS Staff	45
Audited financial statement	46
Affiliated organisations	50
Individual research grants awarded 2014	52

FOREWORD

IFS in 2014: Alumni, Partnerships and Facilitated Advocacy



PHOTO: BRIAN PORTER

Olanrewaju Smith
Chair of the IFS
Board of Trustees



PHOTO: BRIAN PORTER

Graham Haylor
IFS Director

The International Foundation for Science (IFS) is well known for the competitive provision of small research grants, skills development, equipment purchasing support, and facilitated networking. The popularity and relevance of the foundation was underscored by the high level of applications for individual and collaborative research grants that it received in 2014 from young scientists across the developing world and the high level of engagement with alumni and partners.

RE-ENGAGING WITH OUR ALUMNI

A special feature of this year has been the efforts of IFS to continue to pursue its plans to identify how best to support and to work with its alumni to benefit the next generation of early-career scientists. Through meetings of IFS Grantees, former Grantees, Secretariat staff and Advisers, a number of new IFS Alumni Associations have been formed and galvanized to support research planning with early-career scientists. In Kenya during February, following a meeting held at the Nairobi campus of the, International Centre of Insect Physiology and Ecology the IFS Alumni Association of Kenya (IFSAAK) was officially launched. The following month the Burkina Faso Alumni Association was officially launched. Then in April, following a meeting at Sarem International Hotel in Addis Ababa, IFS Alumni Ethiopia was catalysed to begin activities. On the same day, in Accra, the Ghana Alumni Association was officially launched. Then later in Togo, Togo Alumni Association joined the group of newly formed Alumni Associations. With existing alumni associations in Cameroon, Madagascar, Mali and Uganda this brings the number of active IFS Alumni Associations now to nine.

The IFS Secretariat recognises that there are many more individuals who could perhaps play a more active role in, for example, building links with national research councils or providing advice to potential applicants. Therefore, IFS will continue to work together with our valued alumni colleagues in support of the next

generation of researchers. In this regard we plan to link national alumni associations through opportunities to meet at IFS workshops, to co-facilitate forthcoming capability building events, notably in Nairobi in 2015, and also through building social networking links amongst alumni through dedicated spaces on our web-based Podio platform. Do contact the Head of Programme to see how the IFS Secretariat can help you to help the next generation of scientists where you are.

FURTHER PARTNERSHIP BUILDING IN PILOTING OUR NEW APPROACHES

IFS together with the Africa Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE), the Laboratory of Agricultural Biodiversity and Tropical Plant Breeding (LAAPT), the University of Nairobi, and the Africa University began in January this year to collaborate with Bioversity International in a 36 month European Union Africa, Caribbean and Pacific Group of States (EU-ACP) research project. (See page 11).

The main aims of the US\$ 1.168 million project are to strengthen national and regional capacities for research, development and education on neglected and underutilized species (NUS) value chains, and to inform policy actors about the potential role for NUS in strategies relating to agriculture, nutrition and adaptation to climate change.

This topic and approach relates closely to the current IFS strategy. IFS has played a role in research into neglected and underutilized species for a number of years. In addition to this EU-ACP funded project, IFS is also this year supporting collaborative research teams investigating NUS in Africa. The policy influence agendas encompassed by this project fall within the IFS 'Contributing Innovation' Approach.

One of the elements of the Contributing Innovation Approach of our 10-year strategy is to advocate with IFS grantees towards policy influence. In this regard, IFS and African Academy of Sciences (AAS) have begun a process of

Facilitated Advocacy around the effectiveness of science equipment policies of key organisations and mapping the national and regional research and policy landscape. This followed from the “Conference on Getting and Using Equipment for Scientific Research in Africa”, held in Nairobi in 2012.

IFS and AAS are continuing this collaboration through the implementation of the MacArthur Foundation-funded project on scientific equipment policy development and change, along with partner organisations in Ethiopia, Ghana and Kenya. Building on the outcomes of a workshop held in Nairobi in 2013, and in collaboration with national facilitators in Ethiopia, Ghana and Kenya, country case studies were carried out between January and March 2014, to review the effectiveness of science equipment policies of key organisations in relation to organisational structures and systems; and to map the national and regional research and policy landscape. Another set of workshops on National Scientific Equipment Policies were carried out in the three countries back-to-back from March to April 2014. Information on these various activities is available on our increasingly information rich website and on-line workspaces.

In April this year Graham Haylor (IFS) and Berhanu Abergaz (AAS) met with Dr Mahama Ouedraogo, the Head of the Science and Technology Division of the African Union Commission and Mr Hambani Masheleni, Senior Policy Officer Human Resources, Science and Technology Department. Dr Mahama Ouedraogo highlighted the relevance of this issue to Africa and the AUC and suggested that the role for the AU was in policy aspects and the scalability of operations. It was agreed that developing an enabling Scientific Equipment Policy in Africa was an important subject to boost and support science across Africa and that it was very appropriate to collaborate with the AUC to highlight this issue, which Dr. Mahama Ouedraogo said “was needed yesterday not tomorrow”.

Mahama Ouedraogo suggested that the key messages emerging from the project might justifiably receive follow up as a Pan-African Parliamentary Agenda Item to promote an Enabling Scientific Equipment Policy in Africa in the constituencies of the Member States, and that it may be appropriate to take this to the Ministerial level in due course.

A full description of the background to this year-long project can be read in the widely distributed Briefing Document from IFS and



AAS: ‘Addressing Equipment challenges in Development-related Scientific Research in Africa’ which can also be found on the documents page of the IFS website.

December 2014 proposal writing workshop at the botanical garden of the University of Abomey-Calavi, Benin. PHOTO BY BRIAN PORTER, IFS.

Through the Facilitated Advocacy approach, with alumni and partners, IFS has an emerging role as a trusted “neutral” global partner in advocating with early-career scientists and their institutions for positive changes in support of science in low-income countries. We are not aiming to speak for early-career scientists but to make the process easier for them to speak for themselves, to give, in this case, potential recipients of scientific equipment a voice in shaping the processes which can impact the practical benefits which accrue from their research grants.

As in 2013, we are delighted to once again bring you news and information about how IFS is trying to help early-career scientists to plan, produce and put their science into use. It has been a pleasure in 2014 to share this task with such an engaged Board of Trustees, an efficient and dedicated Secretariat, drawing on a wealth of selfless and experienced Scientific Advisers, and a generous and committed Alumni.

Olanrewaju Smith
Chair

Graham Haylor
Director

Mission statement

The need

The current low level of scientific support to the developing world, as well as the substantial need for location specific research in the south means that now, more than ever, science in developing countries needs to expand. Scientists in the developing world are well placed to identify the challenges they face, and able to propose transformational research, to build their resilience to global volatility, to engage in global negotiations, and to innovate for sustainable futures.

We believe that a sound basis for investment in expanding developing country science is to select and support the best early-career scientists who are based in the developing world.

Young people today constitute the largest youth cohort in human history, with the vast majority in developing countries. The scientists of tomorrow must contribute to securing affordable food, water and energy to a rising population, where their scope for action is constrained by the urgent challenge of environmental sustainability.

In the next decade, individual and collaborative research conducted by developing coun-

try scientists needs to contribute to a global endeavour to reduce poverty and support sustainable development. Support by the International Foundation for Science will strengthen the possibilities for early-career scientists to productively engage in this enterprise and for their research to find utility in innovation and policy domains.

The mission

IFS shall contribute towards strengthening the capability of young men and women scientists in developing countries to conduct relevant and high quality research and their individual agency to put it into use.

The strategy

IFS shall identify through a careful selection process, promising young scientists from developing countries to become future lead scientists and science leaders. They will receive support early in their careers to produce new research findings, relevant to developing countries and of assured quality according to current academic principles.



Résumé en français

En 2014, lors des deux mois d'appel à projets, l'IFS a reçu 1250 soumissions auxquelles il a été répondu individuellement. Après un processus de sélection rigoureux, ce sont 235 projets de recherche individuels, issus de 38 pays, qui ont été retenus pour financement.

Nous avons offert des soutiens scientifiques confortatifs (CES) à environ 450 jeunes chercheurs pour différentes méthodologies ou composantes de la recherche. Cela a été fait avec plusieurs partenaires nationaux ou internationaux, et les anciens boursiers de l'IFS qui ont organisé 14 ateliers, sur la prise en compte effective des plantes négligées et sous-utilisées (NUS), sur la communication scientifique, sur la rédaction de projets de recherche, sur la gestion des données dans le domaine de la biodiversité, sur le management des recherches collaboratives et sur la politique des équipements scientifiques.

Une seconde session sur le pilotage des projets de recherche collaboratifs a été organisée, 730 jeunes scientifiques se sont portés candidats. Les 440 postulants retenus ont été invités à participer à un réseau collaboratif en ligne utilisant le logiciel de gestion de projet PODIO. Les participants ont ainsi défini 45 groupes dont 26 ont pu proposer finalement des projets collaboratifs bien construits incluant 104 scientifiques en début de carrière.

LE SITE INTERNET de l'IFS a développé sa plateforme interactive avec les outils du Web-2 qui a permis des collaborations, des échanges et le développement d'un blog régulier. Au cours de cette année, 82 638 visiteurs ont été enregistrés dont 4 417 pour nos publications. Parallèlement, le réseau collaboratif en ligne basé sur PODIO a continué son développement et il est de plus en plus utilisé.

Nous avons collaboré avec les partenaires suivants: l'Académie des Sciences africaines (AAS), la Commission de l'Union Africaine (AUC), l'Institut International de Biotechnologies Est- et Centrafricain (BeaCA), le Centre International sur la Physiologie et l'Ecologie des Insectes (ICIPE) et BIOVERSITY International ; l'IFS a continué à œuvrer au côté du Comité Ministériel pour la Coopération Scientifique et Technique des pays de l'OIC (COMSTECH), de l'Institut de Recherche pour le Développement (IRD), du Programme international pour la Science (ISP) de l'Université d'Uppsala, (Suède), du Ministère Français des Affaires Etrangères (MAEDI), de la Fondation Vietnamiennne pour le Développement de la Science et de la Technologie (NAFOSTED), du Conseil National pour la Recherche Thaïlandais (NRCT), de l'Organisation pour l'Interdiction des Armes Chimiques (POCW), de l'Université Suédoise de Sciences Agronomiques (SLU) et du Fonds de la Recherche Thaïlandais (TRF)

Nous avons aussi travaillé avec les anciens boursiers et leurs associations au Bénin, au Burkina Faso, au Cameroun, en Ethiopie, au Ghana, au Kenya, au Mali, à Madagascar, au Togo et en Ouganda en contribuant à leur engagement actif à mettre au service de la nouvelle génération de scientifiques en début de carrière, leur expérience et leur soutien.

Improving planning of research

by early-career scientists

It is a declared objective of IFS to improve planning of research by early-career scientists in low- and lower middle-income countries that is relevant to those countries.

We aim to do this by:

- Providing un-bureaucratic granting opportunities and capability building support to young scientists to do research in the developing world;
- Recruiting and using numerous independent reviewers;
- Attracting large numbers of applicants;
- Providing all applicants with detailed feedback;
- Holding dedicated training and supporting alumni to associate and support others planning science, and through empowering other research councils to do the same.

IFS contributes to improved planning of research by early-career scientists in low- and lower middle-income countries that is relevant to those countries. However this is an enormous global challenge and the efforts that are currently dedicated to this cause around the world so far are unlikely to be sufficient to achieve this.

Training workshop on proposal writing on 12 December 2014 at the botanical garden of the University of Abomey-Calavi. The training workshop brought together 25 young researchers at MSc and PhD levels from the Faculty of Agronomic Sciences, Faculty of Sciences and Techniques, Faculty of law, economic and politic sciences, School of polytechniques, National Institute of Water and Faculty of Letter and Art.

PHOTO BY BRIAN PORTER, IFS.



Research clusters

In our 2013 Annual Report (p.10-11) we introduced how IFS has begun to describe the way in which it funds research as clusters of topics instead of research disciplines. This has important implications for how applicants think about and plan their research.

IFS investment in support of research on biological, water and energy resources, both through the natural and the social sciences, is a contribution to the larger agenda for meeting global challenges and exploiting future opportunities, such as building human capability, investing in an enabling research environment including infrastructure, promoting innovation, stimulating entrepreneurship and improving the governance of innovations on a sustainable basis. IFS believes that research is an essential precursor to innovation and to the policies and institutional changes needed, as a foundation for promoting sustainable development and helping realise the economic, social and cultural rights of all groups of people under changing ecological, socio-economic and political circumstances.

Following this change in the way we seek applications (for more detail please visit ifs.se/ifs-programme/research-areas-funded-by-ifs.html) we asked some of our Scientific Advisory Committee (SAC) members to provide feedback regarding their overall impression of the applications they had encountered. A number of SAC members and Advisers had noticed attempts to plan rather broad ranging research by individual applicants, as if they were interpreting the clustering of disciplines to require them to undertake much broader research projects with their grants. We want to point out that this is not our intention. Within our guidance document we highlight the following:

A major challenge for those doing research on biological, water and energy resources is how to address the interactions amongst these areas that shape the natural world and the actions of societies that wish to exploit them. Thus, even if specific research tasks

must be narrowed to manageable proportions, IFS believes it is important to highlight how research fits into broader scientific and development contexts and how its application can benefit people. This is reflected in the way IFS' new calls for applications are now structured according to three larger clusters of issue areas, rather than according to separate disciplines, as was the case earlier. Excellent disciplinary skills of individuals will continue to be necessary, but so will the ability to identify how a given research input can point to interventions that can serve societal or human needs on a sustainable basis, through more holistic and cross-disciplinary thinking and actions.

We would therefore reiterate to applicants that it is important to highlight how your research fits into broader scientific and development contexts, but not necessarily to try to broaden the scope of your specific investigation, beyond what is rational with the resources provided.

RESEARCH PLANNING WORKSHOPS IN 2014

IFS research planning workshops are built around participants' own proposed research. They highlight key principles and elements of good practice in designing a research proposal, and try to capture and, whenever possible, to address the common problem areas identified by participants and resource persons, suggesting follow-up actions to the participants. Consequently, the workshop programmes are flexible and adaptive, adjusting content and methods to best meet the needs of the participants. The workshops are highly interactive and participatory, including plenary lectures, group discussions and presentations, as well as providing opportunities to work on individual proposals.



Left: Grain amaranth producer Patrick Otieno, BaFam Cooperative, Bondo, Kenya. Upper right: Group at work on their IFS proposals on Neglected and Underutilized Species (NUS) research, proposal writing training in Kenya. Lower right: The group at the Zimbabwe NUS proposal writing training course. PHOTO BY PER RUDEBJER.

European Union – Africa, Caribbean, Pacific (EU-ACP) Courses on Research Proposal Writing

IFS, together with the African Network for Agriculture, Agroforestry and Natural Resources Education (ANAPE), the Laboratory of Biotechnology, Genetic Resources and Animal and Plant Breeding (BIORAVE, formerly known as Laboratory of Agricultural Biodiversity and Tropical Plant Breeding, LAAPT), the University of Nairobi, and the Africa University is collaborating with Bioversity International in a 36 month EU-ACP research project.

The main aims are to strengthen national and regional capacities for research, development and education on neglected and underutilized species (NUS) value chains, and to inform policy actors about the potential role for NUS in strategies relating to agriculture, nutrition and adaptation to climate change.

As part of this project we delivered three research proposal writing workshops during this year:

- Mutare, Zimbabwe 27–31 October (23 participants),
- Nairobi, Kenya 3–7 November (22 participants) and
- Lome, Togo 17–21 November (26 participants).

The course exercises gave participants the opportunity to make gallery presentations of key sections of their IFS model application. Comparing what they had written prior to the workshop with modifications made during the workshop demonstrated clear improvement during the courses.



The 2013 collaborative research cohort coordinators. Top row: Aliyu Ibrahim Dabai (Ximenia), Christopher Antwi (Campnut), Gabriel Ddamulira (Bambaranut), Middle row: John Igoli (Multinus), Martin Mutambuka (Amaranths), Olatunde Kofoworola Amudat (SSACRT), Bottom row: Patrick Kobina (Nanomed), Paul Bosu (Tete), Terry Ansah (Diamond).

Research Proposal Writing Workshop conducted at the University of Abomey-Calavi in Benin

The African Water Facility (AWF), administered by the African Development Bank (AfDB), signed a Grant Agreement with Benin PROTOS for the implementation of a project called ‘Support for the Decentralization of Services for Potable Water, Sanitation and Hygiene’, jointly financed by AWF, the Dutch WASH Alliance and PROTOS. One part of the project is to provide capability enhancing support in the form of good proposal writing to young researchers in the field of water supply and

sanitation. Because of the IFS’ strong research capability building mandate, PROTOS outsourced this part of the project to IFS.

A Research Proposal Writing Workshop was conducted at the University of Abomey-Calavi in Benin in December for applicants with an interest in water supply and sanitation. The workshop included 25 participants with no – or very limited – experience of research grant applications. See photo on p.8–9 from this workshop.



Left: A volume of the bilingual book 'Biodiversity Atlas of West Africa (Volume 1: Benin)', by Brice Sinsin & Dorothea Kampmann (eds), 2010, was made available to a delegate of each of the eight countries represented at the workshop. The books had generously been made available by Prof Achille Assobadjo. Top right: Each team deliberated and presented their collaborative research. Bottom right: This region was referred to as the Slave Coast from as early as the 17th century due to the large number of people being trafficked to the New World many passing through this spot on the Benin coast at Ouidah. PHOTO BY BRIAN PORTER, IFS.

Carnegie Corporation and Belgian Science Policy Office (BELSPO) workshop on collaborative research planning on Biodiversity

In addition to individual proposal writing workshops, our efforts to improve planning of research now include workshops to improve the quality and effectiveness of collaborative research. The collaborative research theme of 2014 is biodiversity. We invited all research teams passing our initial pre-screening to a workshop building capability of early-career scientists in collaborative research design and analysis in Ouidah, Benin. The participants came from eight countries in Sub-Saharan Africa, both French- and English-speaking, i.e. Benin, Burkina Faso, Côte d'Ivoire and Ghana, Nigeria, South Africa, Tanzania, and Uganda, respectively.

The workshop shared concepts and approaches of working together in collaborative research, and current key concepts and issues in biodiversity related to research proposals. The participants became familiar with key concepts and procedures in the preparation and assessment of research applications. We facilitated opportunities for learning lessons from researchers already actively involved in IFS collaborative research from 2013. (See photos on p 12 and lessons shared on p 17.)

As well as capability building, we aimed to broadening the scientific networks of the workshop participants and strengthening their research collaboration potential.

Increasing production of research

in low- and lower-middle-income countries

It is a declared objective of IFS to improve production of research by early-career scientists in low- and lower middle-income countries that is relevant to those countries.

We aim to do this by:

- IFS providing competitive research grants and capability enhancing support;
- IFS-funded researchers being supported with equipment procurement services;
- Well qualified IFS-advisors and reviewers evaluating and feeding back to researchers;
- IFS grantees receiving travel grants to increase international exposure, networking and collaboration;
- IFS Alumni Associations nurturing and supporting research with early-career scientists.

IFS contributes to increased production of research through supporting of the research by early-career scientists in low- and lower middle-income countries, and by building capability to conduct research and engage with others their research.

The objectives of the project featured in this picture (see p 21 for details) are to assess the climatic impacts and sustainable adaptation strategies, and identify obstacles to adaptation in fishery-dependent communities in Bangladesh to secure their livelihoods sustainably.

PHOTO: MD MONIRUL ISLAM

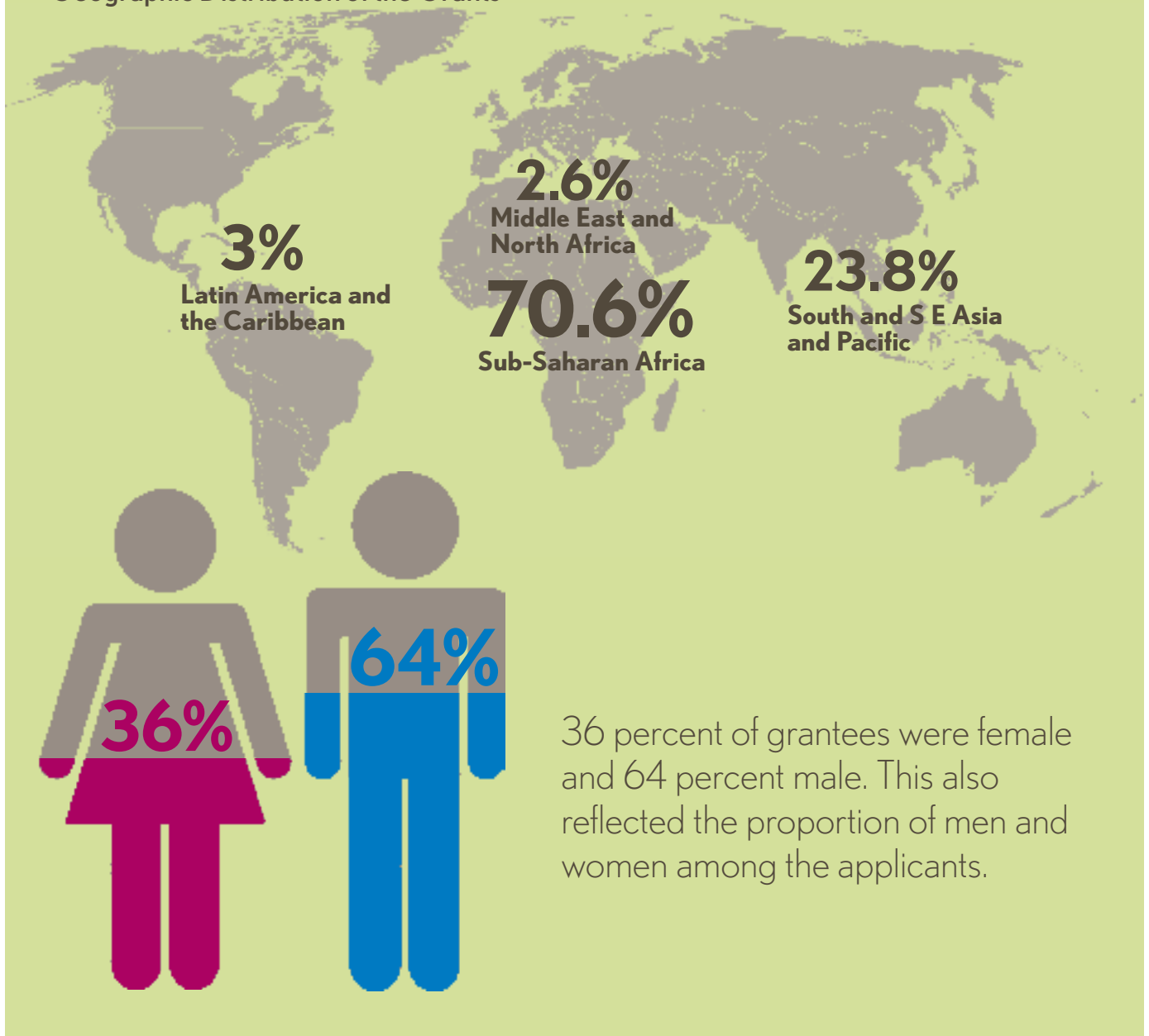




Individual grants approved in 2014

IFS received 1,250 applications for individual research grants during a two month open call and responded to all applicants. Following a rigorous selection procedure, a total of 235 individual applications from 38 countries were approved for funding.

Geographic Distribution of the Grants



36 percent of grantees were female and 64 percent male. This also reflected the proportion of men and women among the applicants.

Collaborative research

In December 2014, IFS together with University of Abomey Calavi (UAC) Benin, hosted a Collaborative Research Workshop with support from the Carnegie Corporation and the Belgian Science Policy Office (BELSPO). The workshop, entitled “Sharing our Progress”, was a follow up with the Team Coordinators from the ten teams which received IFS Collaborative Research Grants in 2013 to investigate Neglected and Underutilized Species.

SHARING LEARNING BETWEEN IFS COLLABORATIVE RESEARCH COHORTS

The coordinators of the 1st IFS Collaborative Research Pilot discussed their experiences as a group and drew up the following table of the six lessons they would share with others when considering their research collaborations. These lessons were then presented to the 2014 cohort of IFS collaborative research teams at the collaborative research workshop.

This table provides an insight into the opportunities, challenges and skills required for research collaboration. IFS will host an international conference on research collaboration in February 2016.

Lessons learnt	Tips for those conducting collaborative research	Tipsters
Use your networking opportunities	<p>You can work with/rely on colleagues outside of your team.</p> <p>Link in collaborators and mentors outside of the group.</p> <p>Bring in colleagues within your department/ including building their capacity.</p>	<p>Aliyu Ibrahim Dabai</p> <p>Patrick Arthur</p> <p>Olatunde Kofoworola Amudat</p>
Use your interpersonal skills	<p>Be open to new ideas.</p> <p>Show mutual respect/Value expertise of others.</p> <p>Deal with unresponsive partners to manage deadlines.</p> <p>Manage quiet partners.</p> <p>The Co-ordinator must 'go the extra mile'.</p> <p>Manage expectations of others (such as: difficult bosses /supervisors, conflict between PhD and research project).</p>	<p>Christopher Antwi</p> <p>Patrick Arthur</p> <p>John Igoli</p> <p>Olatunde Kofoworola Amudat</p> <p>Aliyu Ibrahim Dabai/ Gabriel Ddamulira Martin Mutambuka/ Terry Ansah</p>
Take care of handling finances	<p>Take care to deal with costs incurred by team members that are lost to the group.</p> <p>Take care to manage the waiver of indirect costs with your institution and delays in institutions releasing funds as well as lending/sourcing funds from collaborators.</p>	<p>Aliyu Ibrahim Dabai</p> <p>Terry Ansah</p> <p>Martin Mutambuka</p> <p>John Igoli</p>
Handling cross border shipments within Africa is difficult	<p>Handling shipping agents and customs is complex. Getting the right information is key. (See also the proceedings of the IFS conference on Getting and Using Equipment for Scientific Research in Africa 2012 on the IFS website)</p>	<p>Gabriel Ddamulira</p> <p>Olatunde Kofoworola Amudat</p>
Learn to rely on others	<p>For: Sample identification e.g. plant species,</p> <p>Setting realistic goals/scope/sample size.</p>	<p>John Igoli/Aliyu Ibrahim Dabai/ Paul Bosu</p>
Look beyond the IFS grant	<p>Aim at leveraging additional funds as a team.</p>	<p>Paul Bosu/Aliyu Ibrahim Dabai</p>

1 A selection of new individual research grants given in 2014

Biological Resources in Terrestrial Systems

Researching Biological Resources in Terrestrial Systems helps us to explore sustainable management of such systems. That is not just focused on exploiting nature for the benefit of mankind, but doing so in a way which will not jeopardise the well-being of future generations. Natural resource and ecological management is a complex and difficult issue to balance with social and economic demands and is about managing people as much as nature.

DR CARLA FABIANA CRESPO

MELGAR, Bolivia. *Bio-flavour production from citrus waste through fermentation technology.*

Dr Crespo will investigate the utilisation of citrus waste products (peel and pulp from oranges and tangerines), with the aim of producing volatile esters with flavouring properties (such as ethyl acetate and amyl acetate). The yeast, *Candida maltosa*, will be used to ferment the waste products, and the kinetic behaviour (cell growth, substrate uptake and products formation) and volatile ester production will be studied. Additionally, biofilm-forming capacity and bio-flavour production will be evaluated and enhanced by optimising cultivation conditions. This project will constitute a baseline for large-scale bio-flavour production. It is intended that this project will ultimately reduce Bolivia's dependency on importing artificial food additives.

DR FARHA MASOOD, Pakistan. *Synthesis and characterisation of biodegradable nanocomposites for commercial food packaging applications.*

Without question, the challenges surrounding plastic waste treatment are multifaceted and complex. Dr Masood will study the development of novel biodegradable nanocomposites with better thermo-mechanical and excellent barrier properties for the food packaging industry. To achieve these goals, first the cost-effective production of poly-3-hydroxy-

butyrate-co-3-hydroxyvalerate (PHBV) will be carried out on a pilot scale using *Bacillus cereus* (strain FA11) with molasses as a cheap carbon source. Additionally, gamma irradiation and cross-linking will improve the thermo-mechanical and barrier properties of PHBV. Then, biodegradation studies of these nano-composites will be conducted *in vitro* and in soil to understand the degradation mechanism in such multiphase systems before commercialisation. Hopefully, this modelled biodegradable nanocomposite will be used in the food packaging industry to help generate a pollution-free environment.

DR TRUONG DINH BAO

Vietnam. *Méthodes participatives dans la surveillance et la lutte de la fièvre Aphteuse (foot and mouth disease): comment mieux impliquer les éleveurs à l'échelle locale?*

The objective of our project is to analyse the contribution of participatory approaches in the improvement of surveillance and of combating foot and mouth disease, particularly by involving farmers at a local level. Case studies using classical and participatory epidemiological methods will be carried out in two provinces (Long An and Tay Ninh) in the south of Vietnam. The validation of participatory tools will be performed using the Bayesian method. Data collected with participatory tools serve to better estimate the real prevalence of disease and vaccine cover by means of a capture-recapture

model. Companion modelling will be used to better understand the coordination process between actors (farmers, veterinary agents, authorities) and collective decision processes. Some expected results are 1) estimation of relative health, and economic impacts of diseases in ruminants; 2) evaluation of foot and mouth prevalence – reliability, specificity and predictive value of farmer declarations; 3) estimation of decision factors in health practice choices that are adopted by farmers facing foot and mouth disease; 4) validation of the participative approach in disease surveillance and control, and 5) recommendations to integrate qualitative data to improve surveillance and control methods used by veterinary services.

MR ENANGNON OSCAR DORÉ

AHOSSOU, Benin. *Country-wide responses to climate change of socio-economically important indigenous fruit species in Benin.*

The study aims to identify and predict the present and future distribution of suitable areas for cultivation and conservation of relevant species for livelihood enhancement and income diversification for the rural poor. The study method will use environmental niche models, namely the Maximum Entropy Modelling System in combination with GIS for spatial analysis of plant diversity and distribution. Geographical coordinates of species locations will be assembled from herbarium

records, floral, and previous field surveys. Additional field surveys will be undertaken to compare records from Benin with those outside the country. At least 172 food plants species are regularly used by local populations in Benin and a total of 121 indigenous fruit tree species have been recorded, some of which are still underutilised. The data will help to plan and optimise future conservation and agroforestry strategies in the context of global change in Benin.

MR YIHEW BIRU WOLDEGIORGIS, Ethiopia. *Studying the interaction between livestock and wildlife in Awash National Park, Eastern Ethiopia.*

Ethiopia is endowed with huge wildlife and domestic livestock resources. However, livestock holders live in conditions of extreme poverty. Most wildlife is maintained within protected areas but these are threatened with deforestation, charcoal production and overgrazing. This research will be conducted in Awash National Park, which is important for the conservation of oryx, Grevy's zebra, and diverse avian fauna. The savanna woodland type ecosystem of the park is suitable for pastoralists' livestock and so there is competition with wild herbivores for resources. During resource-scarce drought seasons, the pastoralists move their animals into the park, resulting in conflict between wildlife rangers and pastoralists. This research aims to study the interactions between livestock and wildlife. It will examine feed preference and nutrient quality, and model the feed resource budget across seasons so that a sound land-use strategy can be designed, whereby the livelihoods of pastoralists can be improved and biodiversity be sustainably maintained.

DR SYED SIKANDER AZAM, Pakistan. *Exploring the effectiveness of natural products against druggable targets from pathogenic bacterial genomes.*

Most of the classes of anti-bacterial drugs have natural products as their source. Natural products generally have complex yet unique structural features that have evolved with time to support their activity. Thus, they represent valuable pharmaceutical leads which can be used to modulate the metabolic pathways of organisms. Proteins are one of the basic components of the cellular machinery that constitute these pathways



Dr Farha Masood is looking at synthesis and characterization of biodegradable nanocomposites for commercial food packaging applications in Pakistan. PHOTO BY FARHA MASOOD.

giving rise to the phenomena of inter- and intra-cell signalling. Targeting this communicative mechanism, through chemical entities, could significantly alter the biological functioning of an organism. The pathogenic activity of microorganisms, usually stems from their ability to adhere to the host cell surface receptors, facilitating their entry and subsequent propagation. This inter-cellular interaction between host and the pathogen could be disrupted in order to elucidate a potential drug. The current project aims to identify chemical compounds, particularly focusing on natural products which can modulate the bacterial protein interaction network. In the current study, the essential druggable candidates belonging to unique metabolic pathways would be identified which would provide an insight into the virulence potential of the cell. The relevant proteins would then be targeted by natural chemical compounds to alleviate the disease phenotype.

DR HUY THUAN NGUYEN, Vietnam. *Biosynthesis and optimisation for production of two flavonoid glycosides by statistical algorithms (Plackett-Burman and Response Surface Methodology – Central Composite Design).*

Flavonoids, widely found in vascular plants, have been used as significant anti-tumour and anti-oxidant agents, for many years. Flavonoid glycosides have been proven to show more solubility, stability and biotransformation over their parent molecules (without attached sugar) so they have great potential and available applications in clinical and cosmetic uses. Taxifolin-3-O-rhamnoside and Rhamnetin-3-O-rhamnoside are well-known inhibitors of peroxidase and scavenging of reactive oxygen species agents. However, chemical synthesis and direct extraction of these glycosides from plants are still very difficult and yields are low. Due to the development of biotechnological techniques such as *in vitro* enzyme reactions or whole-cell bioconversion, biosynthesis of flavonoid glycoside has become achievable. Based on previous publications including strategies and experimental techniques, Dr Nguyen and colleagues intend to biologically synthesize these significant glycosides. Furthermore, process optimisation will also be monitored to achieve the maximum yield of products using statistical algorithms (Plackett-Burman and Response Surface Methodology – Central Composite Design).

2 A selection of new individual research grants given in 2014

Water and Aquatic Resources

According to the World Bank, 2.8 billion people live in areas of high water stress. Water stress takes many forms. At least 1.2 billion people do not have access to safe water, and pollution of water affects not just people but whole biological communities. Some of IFS' projects that relate to good water management are highlighted here as well as projects which relate to sustainable exploitation of natural aquatic resources.

DR SIBONANI SANDRA MLAMBO, Zimbabwe. *Use of integrated biomarker responses in the fish, largemouth bass (*Micropterus salmoides*), to determine endocrine disruptive activity and health risks in the Manyame catchment area.*

Dr Mlambo will study endocrine disruption in the largemouth bass fish, (*Micropterus salmoides*), in Lake Manyame, Zimbabwe. Endocrine disrupting chemicals are natural or synthetic substances from e.g. plastics, that have the ability to mimic, block or compete with hormones, causing the disruption of normal functions. Endocrine-disrupting chemical contamination may cause a decline in fish populations over time, whilst human exposure to such chemicals may reduce fertility in men. Lake Manyame provides a livelihood for surrounding low-income communities, a source of drinking water to the city of Harare, and a major contributor to the country's tourism and fisheries industries. It has, however, been subjected to industrial, agricultural and untreated sewage contamination over many years. Initial *in vitro* screening assays will be done to assess levels of these chemicals in the water. The study will then focus on fish gonadal histopathology linked to endocrine disruption in *M. salmoides*, such as lesions and apoptosis (the process of programmed cell death), and assess the possible occurrence of sex transformation in this fish, as well as evaluating biomarker responses. A spatial and temporal assessment of

the fish response will give an indication of endocrine disruption and possible health risk implications.

DR HAU TRAN DUC, Vietnam.

Importance of the Kalong Estuary in northern Vietnam as a nursery for fish.

To clarify the characteristics of Ichthyoplankton communities in a Vietnamese estuary, monthly collections using a larval net in the centre of the current and a small seine net along the bank waters will be conducted in the Kalong Estuary, northern Vietnam, from September 2014 to August 2015. The Kalong River (ca. 60 km in length) flows into the northernmost Vietnamese coast on the Gulf of Tonkin. The present study will firstly describe the structure of species composition and seasonal assemblages of larval and juvenile fish in the prevailing water conditions in the estuary. To understand hatching periods and growth rate of abundant species, otolith (ear stone) analyses will be made, and a comparison of size and developmental stages of these fishes will be included. These relative abundance patterns will indicate seasonal and spatial variation in estuarine use and potentially extended residence periods for some species. Consequently, this study will examine the importance of the estuary as a nursery habitat for commercially and ecologically significant fishes, and spawning grounds of some commercially important fishes will be identified. Because early life history knowledge is

key for conservation, this will provide precise evidence for conservation of fisheries in this area. Together with previous results from nearby estuaries in Vietnam, a conservation zone of the northern Vietnamese estuary could be considered to manage water and aquatic resources. If the project succeeds, it will be a model for the study of early life histories of fishes in Vietnam, about which little is known.

MS FATUMA ALI MZINGIRWA, Kenya. *Connectivity of *Lutjanus argentimaculatus* in Marine Protected Areas and the adjacent open fishing zones of the Kenyan coast.*

The study aims to determine the genetic population structure, connectivity (gene flow) and the relationship between size and age of Marine Protected Areas (MPAs) and the level of genetic diversity of the fish, Mangrove Red Snapper, on the Kenyan coast. Ms Mzingirwa will collect samples from the Kisite Mpunguti Marine Park and the Shimoni fishing ground on the south coast of Mombasa Marine Park, and the Bamburi fishing ground on the mid-coast. Measurements of length, weight, sex, and maturity stages will be recorded; fin clips will be obtained from the pectoral fins and preserved in absolute ethanol which will be transferred to Biosciences eastern and central Africa-International Livestock Research Institute (Beca-ILRI) laboratory for subsequent analysis. Mitochondrial DNA and microsatellite markers will be used as genetic markers. The results will be used

to evaluate the seascape scales of the network of MPAs in Kenya in relation to genetic connectivity of populations and hence the possible fisheries re-seeding roles of the MPAs. The results will also be used as baseline information for designing MPAs in the Western Indian Ocean region.

DR OLOLADE OLATUNJI, Nigeria.

Application of fish scale biopolymers for micro-needle production.

This project aims to investigate the applicability of fish scale biopolymers for micro-needle production. Biopolymers from fish scales are potential alternatives to porcine- or bovine-based biopolymers with advantages such as lower possibility of disease transfer and lower cost/complexity of production. Micron-sized micro-needles partially pierce the upper layer of the skin creating micro-channels through which e.g. drugs, vaccines and cosmetics can be delivered more effectively and painlessly into the body. A major advantage includes ease of dry storage of drug- and vaccine-formulated micro-needles at room temperature, unlike when such drugs or vaccines are stored in liquid form, thereby potentially reducing the cost of healthcare, especially in countries with limited or unreliable electricity supply. This project aims to investigate production of micro-needles from fish scales through studies on skin permeation and release kinetics of compounds from arrays of micro-needles. A particular focus will be on reproducibility of biopolymer and microneedle production, skin insertion tests and permeation studies. The project is expected to contribute to value addition in the fish industry and innovative development in cosmetics and pharmaceuticals industries.

DR MD MONIRUL ISLAM, Bangladesh.

Adaptation strategies and sustainable livelihoods: addressing the impacts of climate variability and change on inland fishery-dependent communities in Bangladesh.

The objectives of this project are to assess the climatic impacts and sustainable adaptation strategies, and identify obstacles to adaptation in fishery-dependent communities in Bangladesh to secure their livelihoods sustainably. The project will select three inland fishing communities in Bangladesh and collect data using a questionnaire (80 in each), oral history interviews (20 in each) and participatory



Ouidah lagoon, Benin. Colleagues from the Benin IFS Alumni Association are engaged in improving local livelihoods including increased income or higher yields in fish production, agriculture or ecotourism. PHOTO BY BRIAN PORTER, IFS.

rural appraisal (3 in each). This project will permit the understanding of the specific impacts of climatic shocks (such as extreme events) and stresses (e.g. variations in temperature and rainfall) on livelihoods of the above people and their short- and long-term adaptation strategies. Among various strategies, this project will identify the ones which are successful or sustainable, i.e. which do not harm other sectors or people and which can provide benefits in the longer term. Finally, this project will be able to identify both natural and human constraints to these sustainable adaptation strategies.

MS PINNARA KET, Cambodia. *Soil water flow simulation of surface drip irrigation using the combination of water budget and soil measurement-based scheduling methods.*

Water shortages arising from climate change are critical constraints for poor Cambodian farmers in crop production. For sustainable water management, research on water-saving technology and sound agricultural management practices are essential to optimise yields. Drip irrigation is the most suitable tool to increase crop productivity and water

use efficiency. The objectives of this project are to evaluate the effect of crop rotation irrigated with drip systems on soil physico-chemical properties and water use efficiency during the summer monsoon. Three trial experiments will be conducted on drip irrigation at Kva Village, Khan Dong Kor, Sangkat Dong Kor, a suburb of Phnom Penh, with a total area of 1,000 m² in combination with crop rotation and plastic mulch. Crop water irrigation will be simulated using 'Crop-Wat' (an FAO-sponsored crop growth model). The irrigation rate will be based on soil moisture status using soil moisture sensors. The climate, crop and physical soil data will be used as the input data of the model. Daily climate data will be collected from the meteorological station at the Institute of Technology of Cambodia in Phnom Penh. Physico-chemical soil characteristics will be determined by standard laboratory tests before and after the irrigation experiment. Crop yield will be predicted using 'AquaCrop' and compared with actual crop yield during two years of experimentation.

3 A selection of new individual research grants given in 2014

Food Security, Dietary Diversity and Healthy Livelihoods

Food security exists when people have access at all times to sufficient, nutritious food in order to be able to lead an active and healthy life. There are many angles to food security – food safety, nutritional aspects, and simply securing entitlement to food. Below are some of IFS' projects from 2014 which deal with these aspects.

DR AMENAN CLÉMENTINE

KOUAKOU, Côte d'Ivoire. *Diversités moléculaires et phénotypiques des souches de *Saccharomyces cerevisiae* isolées des boissons traditionnelles fermentées de Côte d'Ivoire (Molecular and phenotypic diversity of *Saccharomyces cerevisiae* strains isolated from traditional fermented Ivory Coast beverages).*

Food quality is an essential dimension of food security. So to help ensure the quality of traditional fermented foods, standardised, quality starter cultures can be used. Dr Kouakou will use molecular and phenotypic tools to assess *Saccharomyces cerevisiae* strain diversity in traditional fermented beverages (sorghum beer and palm wine) of Côte d'Ivoire. To do so, she will examine first phenotypic diversity, focusing on physiological and technological parameters of *Saccharomyces cerevisiae* strains isolated from beverages and these will be identified using molecular methods, before selecting those with useful technological properties for the formulation of the starter. Using efficient and standardised starters will enable small agri-food producers to offer products with consistent quality, and create added value. Furthermore, it is hoped that this will also benefit food companies with the ultimate aim of industrial production of fermented foods.

MR GEORGES DJOHY, Benin. *Appropriation socio-économique du téléphone portable dans les sociétés pastorales du Nord-Bénin (Socioeconomic ownership*

of mobile phones in pastoral societies of North Benin).

Pastoralism in northern Benin is carried out by Fulani herders who are mostly illiterate, landless and live in remote areas. They have been affected in recent years by a number of factors – population growth, agricultural expansion, climate change, obstruction of animal corridors, pollution of water resources and the expropriation of land. All of these factors have conspired to threaten their status and livelihoods. In addition, the 'trekking' of animals for grazing has become difficult. The situation has been aggravated by an upsurge in robberies and other aggressive acts towards the pastoralists and their herds. Mr Djohy hypothesises that the advent of mobile phones in this context, has been a driver of change. His study aims to analyze the determinants of mobile phone use and how this helps the Fulani herders. A mixed approach will be used: quantitative data through questionnaires will be subjected to a partial least squares regression, and qualitative material from individual and group interviews will be analysed. The findings will put into sharp relief the usefulness of mobile telephony to agro-pastoralists and how this relates to food security.

MR HERMÓGENES NEVES

MUCACHE, Mozambique. *Immunopathology of *Trypanosoma vivax* infections in cattle: Cytokine profiles and cellular responses.*

Animal trypanosomiasis limits live-

stock development in Africa and better understanding of host-parasite interactions is crucial for vaccine development. In this project, it is proposed to undertake immuno-pathological studies of *Trypanosoma vivax* in cattle. *T. vivax* isolates from Mozambique will be characterised before determining the cytokine profile during infection, the leukocyte subset changes and assessing cytokine production by macrophages after infection. *T. vivax* characterisation will be carried out for isolates by amplifying and sequencing the SSU and ITS regions by polymerase chain reaction (PCR) and comparisons will be made with sequences in the GeneBank. Cytokine profiles will be assessed by amplifying the target genes using real-time PCR at 0, 14, 22, 29 and 36 days post-infection. Subsets of lymphocytes will be determined using flow cytometry. The project will provide important data on host-interactions in trypanosome infections and help to understand pathogenesis and consequently contribute to future studies in vaccine development.

MS THAO SUONG NGUYEN, Vietnam.

*Impact of host stress hormones on virulence factors of *Vibrio parahaemolyticus* – the infectious agent of shrimp early mortality syndrome in the Mekong Delta, Vietnam.*

Shrimp culture plays a major economic role in the Mekong Delta. However, its intensification is often associated with disease problems. Currently, Shrimp Early Mortality Syndrome or Acute Hepato-



Development of rice and coffee husk briquettes as sustainable fuel sources for domestic cooking applications in Uganda. PHOTO BY MICHAEL LUBWAMA.

pancreatic Necrosis Syndrome has caused large-scale die-offs of cultivated shrimp with mortality that can exceed 70%. Since the mechanisms by which the bacterial pathogen, *Vibrio parahaemolyticus*, causes disease are obscure, strategies to control the bacterium are greatly hampered by a lack of scientific information. Ms Thao Suong Nguyen aims to address this problem by investigating the impact of catecholamine stress hormones and stress hormone inhibitors on disease clinical endpoints. It is expected that uncovering the role of these substances in the pathogenicity of *Vibrio parahaemolyticus* will lay the foundation for understanding the disease process and provide insights into host responses to infection that could yield innovative solutions to the problem.

MR MICHAEL LUBWAMA, Uganda. *Development of rice and coffee husk briquettes as sustainable fuel sources for domestic cooking applications in Uganda.*

Firewood accounts for over 90% of domestic fuel used for cooking in Uganda, resulting in deforestation and clearance of bushes and shrubs. This has led

to negative environmental consequences, and it is thought, climatic changes. The project aims to develop briquettes from rice and coffee husks as sustainable fuel sources for domestic cooking. Surface analysis will be carried out and the chemical composition of the husks will be determined by ultimate and proximate analyses. Briquettes will be developed using mechanical piston press technology. Factors affecting briquette performance will be optimised and will include die pressure, ratio of rice/coffee husk to binder (with and without starch binder) in the briquette, influence of pre-heating, adhesion, particle size and moisture content. Mechanical properties such as compressive and tensile strength and adhesion will be assessed using standard methods. Thermal characteristics will be determined using a water boiling test and combustion flame temperature. Statistical models relating the mechanical, chemical and thermal properties to the factors affecting briquette performance will be developed and optimised.

DR RIM OURTENI, Tunisia. *Biochemistry and gene expression level stu-*

dies of salt tolerance in Tunisian barley accessions.

Barley is one of the most important crops and ranks fourth in terms of production worldwide. Dr Ourteni's group has genetically characterized 25 barley ecotypes and carried out salt tolerance assays in greenhouses to identify genotypes with contrasting responses to salt tolerance based on physiological parameters. In this project, she will focus on the assessment of biochemical traits and gene expression quantification for key genes of Tunisian accessions involved in salt tolerance at different plant developmental stages to elucidate the biochemical networks involved in salinity tolerance. The expression levels of the key candidate genes involved in barley salt stress tolerance will be assessed by quantitative real time polymerase chain reaction in contrasting genotypes. The full length of the candidate genes will be determined and compared by sequence alignment. The project will offer novel traits related to salt stress tolerance in Tunisian barley ecotypes that will be very useful in breeding programmes.

Increasing use of research

results produced by IFS

It is a declared objective of IFS to improve use of research by early-career scientists in low- and lower middle-income countries that is relevant to those countries.

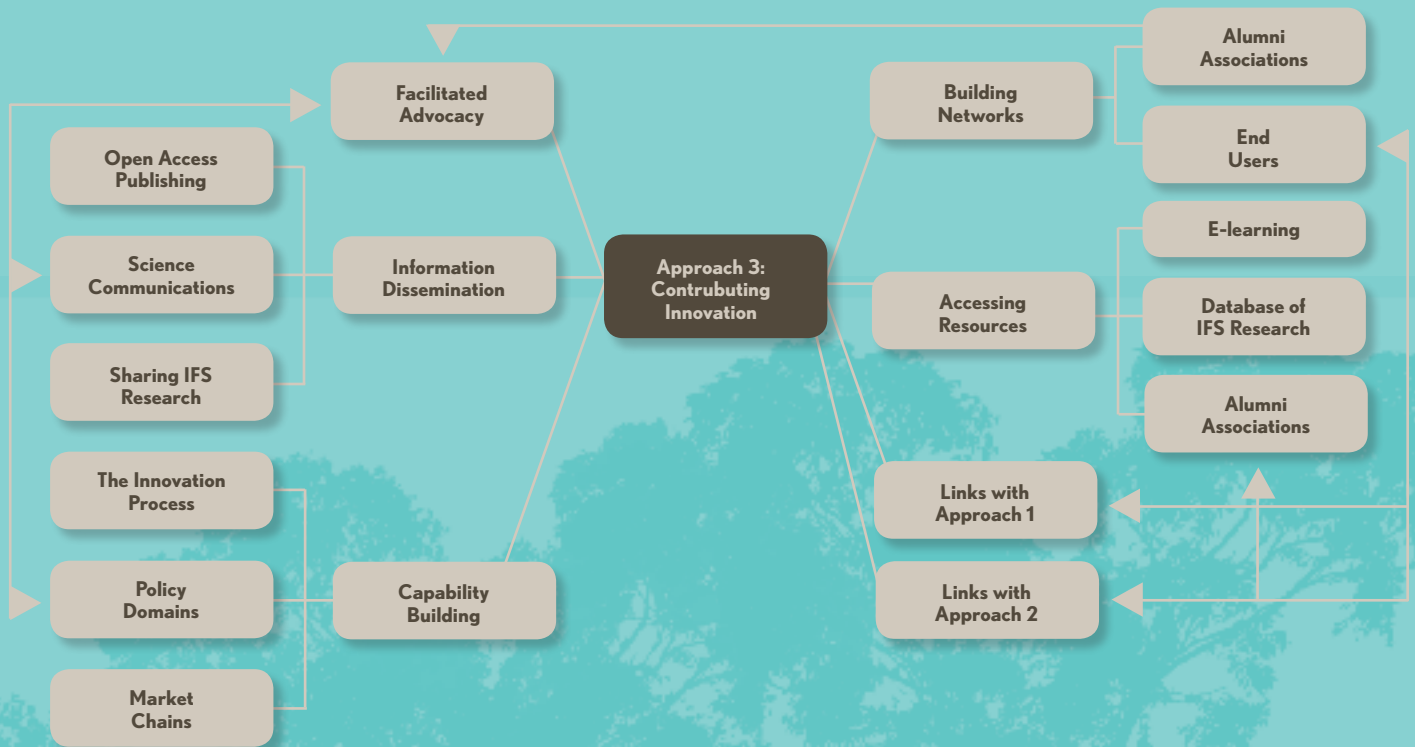
We aim to do this by:

- IFS-funded research being accepted for presentation, or researchers funded by IFS grants being invited speakers at international conferences;
- IFS-funded researchers being recognised as experts in their fields and being invited to policy meetings or expert groupings;
- Well qualified IFS-funded grantees becoming IFS experts, advisors and reviewers ;
- IFS grantees disseminating their approved IFS-funded research results in popular form (TV, radio, workshops, policy briefs, booklets/cartoons);
- IFS grantees research results in contributing innovation through being used in new products, services or policies.

IFS contributes to innovation through supporting of research by early-career scientists in low- and lower middle-income countries, building capability to share research and engage with policy processes and by building linkages to those who can support the use of their research.



Linkages between IFS initiatives that contribute to our innovation approach



Putting research into use

Knowledge of the sustainable management of biological, water and energy resources is not enough. To help to reduce poverty and attempt to solve some of the environmental challenges that we face, we also need to take action. That is why IFS undertakes a range of initiatives that can contribute to innovation, and that is why the IFS mandate includes not only strengthening capability but also agency to put it in to use.

Travel grants

Eight IFS grantees were given opportunities to exchange views with scientists working on related issues and build up their national and international contacts and networks through IFS travel grant support.

These opportunities were given in various forms:

- Visits to mentors where young researchers received individualized training.
- Visits to well-equipped laboratories where grantees received training and utilize advanced instruments that are not available in their own laboratories.
- Travel grants to participate in scientific meetings and international conferences and congresses, where grantees at the end of their granting period were given the opportunity to present their findings.



To International Conference of Emerging Trends in Scientific Research, Malaysia (Oral presentation of paper) from University of Ruhuna, Sri Lanka.

Professor W.T.S. Dammini Premachandra participated in the International conference on 'Emerging Trends in Scientific Research' in Malaysia, with the funds provided by IFS, and presented her paper entitled 'Effect of aqueous Betel leaf extract against root-knot nematodes *Meloidogyne incognita* as a soil drench'. She was awarded the Best Scientific Paper 2014. The participants and presenters came from different countries, including Bangladesh, China, India, Malaysia, Nigeria, Philippines, Sri Lanka and Thailand.

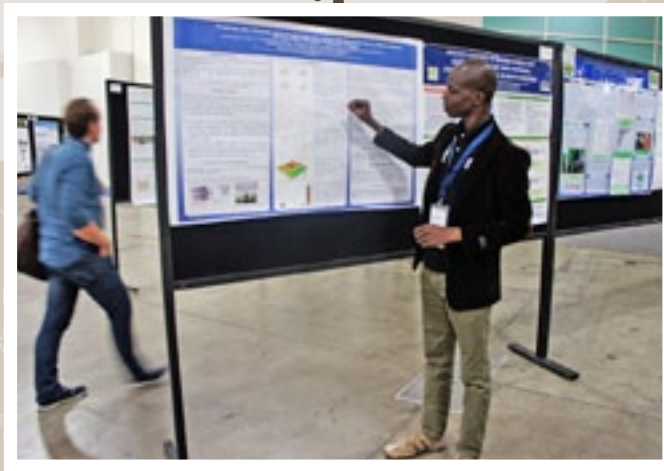


Olujimi Olanrewaju Olusoji to International Conference on Water, Informatics, Sustainability & Environment, Gatineau, Canada (Presentation) from Nigeria.

Salgado-Bernal, Irina to International Microbiology Congress of the International Union of Microbiological Studies (IUMS) Canada from Cuba.

Pereki Hodabalo to XXIV IUFRO World Congress, Salt Lake City, 5-11 October 2014 (Paper presentation) from Togo.

Affokpon Antoine to 6th International Congress of Nematology (Oral and poster presentation) Cape Town, South Africa from Benin.





Baba-Moussa Lamine S to FoodMicro 2014 Nante, France from Benin (The FOOD MICRO 2014 conference is organised every two year, with the scientific support of the International Committee on Food Microbiology and Hygiene ICFMH).



MABA ,Dao Lamèga to the 10th International Mycological Congress, Bangkok Thailand (2 presentations oral and poster) from Togo.

A selection of research results and achievements of IFS grantees



Identifying phyto medicines in sub-Saharan Africa

DR STANLEY MUKANGANYAMA

Project: Screening natural plant products from selected plants from Zimbabwe as a source of anti-infective compounds for phytomedicines development.

Institution: Department of Biochemistry, Faculty of Science, University of Zimbabwe.

Country: Zimbabwe

Grants Awarded: 2003, 2006, 2010

About 80% of people in sub-Saharan Africa rely on herbal medicine for their primary health care. Furthermore, their concomitant use with prescription drugs has not been well-studied, and in addition their efficacy and safety has not been evaluated in controlled clinical trials.

Dr Stanley Mukanganyama has therefore been screening natural plant products from selected plants from Zimbabwe as a source of anti-infective compounds for phytomedicines development.

'There is an untapped potential of plant-based traditional medicine which could significantly contribute to a sustainable management of infectious diseases' says Dr Mukanganyama. He has identified a wide array of plants with anti-infective properties. Nine with antibacterial activity, 5 with antimycobacterial effects, 9 with anticancer effects against human leukemic cell lines and 20 with antifungal properties. It is common to isolate extracts from plants for medicinal use. However, Dr Mukanganyama has noted that some fractionated compounds lose their biological activity.

As is common with IFS support the 3 grants provided to Dr Mukanganyama has resulted in wider benefits. Twenty four colleagues have benefited from mentoring and sharing the equipment provided by IFS, which has resulted in 15 publications. During this time Dr Mukanganyama has become an Associate Professor and the Country President of the Society of Natural Products Research for Eastern and Southern Africa (NAPRECA) and has leveraged funding from three other donors.





Understanding food borne illnesses in Burkina Faso

Foodborne illnesses are a worldwide public concern and a significant cause of reduced economic growth. Dr. Assèta Kagambega is an epidemiologist who with IFS support has been uncovering and highlighting the prevalence of foodborne illness causing bacteria in open markets in Ouagadougou, the capital of one of the poorest countries in the world.

In one study, up to 43% of the beef products and 20% of the mutton sold at the open markets in Ouagadougou, the capital of Burkina Faso, contained an especially virulent strain *Shigatoxigenic Escherichia coli* or other diarrheagenic *E. Coli*. In other studies 37–57% of chicken carcasses were contaminated with *Salmonella*. Prevalence was generally higher in the rainy season. As well as the high contamination rates observed it was discovered that less common serotypes of *Salmonella* are commonly observed. This might be explained by animal husbandry practices which bring animals into contact with grasses contaminated with faeces by wild animals on shared bush pasture.

An assessment of the hygiene practices for the production, transportation, display and vending of meat has revealed unhygienic conditions and low education and poor knowledge of foodborne pathogens and their transmission routes.

There are also public health concerns related to antimicrobial resistance.

A number of *Salmonella* isolates were found to be resistant to tetracycline, streptomycin, and sulfonamide, and nine other *Salmonella* isolates had intermediate resistance to sulfonamide.

These surveillance, typing and antimicrobial resistance studies are vital steps to formulating prevention strategies as well as early detection of emerging new strains and antibiotic resistance. The common occurrence of *Salmonella* and *E. coli* in meat in Burkina Faso are a threat to consumers health and highlight the vital importance of the work of Dr Kagambega and her colleagues.



DR ASSÈTA KAGAMBEGA

Project: Evaluation de la contamination des viandes de grandes consommations par les *E. coli* verocytotoxinogène (VTEC) et les salmonelles en vue de la protection de la santé des consommateurs.

Institution: Laboratoire de Biochimie, CRSBAN, Université de Ouagadougou.

Country: Burkina Faso

Grants Awarded: 2010

A selection of research results and achievements of IFS grantees



Identifying eco-friendly sources of larvicides to reduce mosquitos

DR ESTER INNOCENT

Project: Phytochemical studies of mosquito larvicidal compounds from ethanol extracts of four *Kotschya* species.

Institution: Department of Biological and Pre-clinical Studies, Institute of Traditional Medicine, Muhimbili University College of Health and Allied Sciences.

Country: Tanzania

Grants Awarded: 2010, 2014

Lymphatic filariasis, commonly known as "elephantiasis", is a painful and profoundly disfiguring disease. It is caused by a parasitic nematode worm which enters the lymphatic system in its larval form. The worm secretes toxins that cause excessive dilatation of the lymphatic vessels leading to permanent dysfunction and severely disrupted drainage. The affected

area and the skin then hardens and thickens. It is a mosquito borne parasitic disease which is transmitted by *Culex quinquefasciatus*. The disease is endemic throughout Tanzania with an estimated 6 million people suffering debilitating manifestations.

The World Health Authority recommends spraying insecticides in mosquito breeding sites to alleviate the problem, but there have been problems with non-biodegradability and resistance to the most common insecticides used in mosquito control.

Dr. Ester Innocent says that "*Ethnobotanical surveys have shown that species of Kotschya (a genus of legumes in the Fabaceae family) are not widely used in insect management but scientific investigation of polar extracts from Kotschya uguenensis, K. speciosa, K. thymodora, K. strigosa indicated that they are a source of growth inhibitors of immature stages of mosquitoes*".

The present study suggests the presence of active compounds in crude ethanol extracts from the roots and stem of *K. thymodora, K. Speciosa* and *K. strigosa* that are effective against *Culex quinquefasciatus*.





Finding a stable source of antioxidants and Vitamin C in Africa

Vitamin C, or Ascorbic acid, is an essential dietary ingredient. It is vital for wound healing and is an important physiological antioxidant, which may help to prevent or delay the development of certain cancers, cardiovascular disease, and other diseases in which oxidative stress plays a causal role. It helps to regenerate Vitamin E too, and also helps us to absorb the form of iron that we get from vegetables.

Penny Hiwilepo-van Hal from Namibia has been investigating the Vitamin C characteristics of the Marula Fruit *Sclerocarya birrea* subsp. *caffra*. The fruit has a Vitamin C content of more than 4 times that of oranges and grows on a tree which is widespread in Africa from Ethiopia in the north to KwaZulu-Natal in the south.

“The problem in warm climates”, says Penny, “is the degradation of Vitamin C in many fruit products during processing or storage”. The good news is that she discovered that the degradation rate of Vitamin C in Marula was less influenced by the temperature at which it was processed or stored when compared with other fruits like mango and guava. In fact it is 15 times more stable to heat than these other fruits.

Marula juice can be fermented to give a refreshing drink and in many parts of

southern Africa, including Botswana, South Africa, Swaziland, Namibia and Zimbabwe, traditional Marula beer and wine is produced and traded. The alcohol content in Marula wine is about 5% and it depends on the fermentation time. The other good news is that naturally fermented Marula retains its antioxidant activity. Specifically, Penny Hiwilepo-van Hal reports that “to produce an alcoholic product high in antioxidant you should ferment at temperatures ranging between 30 and 40 degrees for 4–6 days.

PENNY HIWILEPO-VAN HAL

Project: Kinetics of thermal degradation of Vitamin C in Marula Fruit (*Sclerocarya birrea* subsp. *caffra*) as compared to other selected tropical fruits.

Institution: Department of Food Science and Technology, Faculty of Agriculture and Natural Resources, University of Namibia.

Country: Namibia

Grants Awarded: 2011



A selection of research results and achievements of IFS grantees



Developing a region-specific climate adaptation policy

DR ANTWI-AGYEI

Project: Vulnerability and adaptation of Ghana's food production systems to climate variability and change.

Institution: Department of Environmental Science, Faculty of Bioscience, Kwame Nkrumah University of Science and Technology, Kumasi.

Country: Ghana

Grants Awarded: 2010

Climate change and variability pose one of the greatest threats to humankind in the 21st century and climate-crop modelling studies suggest that agriculture will be disproportionately affected compared with other sectors. Responding to the urgent need to better understand how climate change and variability may affect not only food production systems but rural livelihoods Dr Philip Antwi-Agyei, applied and evaluated a new multi-scale, multi-indicator method within ten regions of Ghana for assessing the

vulnerability of crop production to drought at a national and regional scale.

Quantitative national and regional assessment are critical first steps in identifying differences in the drought sensitivity of food production systems. The assessment enabled the formulation of more targeted district and community level research that can explore the drivers of vulnerability and change on a local scale.

Dr Antwi-Agyei went on to apply a Livelihood Vulnerability Index at the community and household scales to identify the vulnerability of households and communities to drought. The results showed that within the same agro-ecological zone, households and communities experience different degrees of climate vulnerability. These differences can be largely explained by socioeconomic characteristics such as wealth and gender, as well as access to capital assets. Results identified vulnerable households within resilient communities as well as more resilient households within vulnerable communities. Outlier households in vulnerable communities have an array of alternative livelihood options and tend to be socially well-connected, enabling them to take advantage of opportunities associated with environmental and economic changes.

”To sustain and enhance the livelihoods of vulnerable households and communities”, says Dr Antwi-Agyei “policymakers need to identify and facilitate appropriate interventions that foster asset building, improve institutional capacity as well as build social capital”.





An innovative way to clean up toxic metals and dyes from water

Take two problems in aquatic environments: The first – Water Hyacinth, which has been described as the world’s worst invasive aquatic plant due to its extremely rapid proliferation and growth, presenting serious challenges in navigation, irrigation, and power generation. The second – Pollution from synthetic dyes and heavy metals, which has emerged to be a significant environmental issue over the past few decades.

Various approaches have been tried to find a use for Water Hyacinth, and many ways have been tried to clean up aquatic environments including algae, bacteria, fungi and plants that adsorb unwanted materials. What if the two problems were addressed together!

Dr. Courtie Mahamadi’s award winning IFS research (Young Scientist Award for Zimbabwe) shows that Water Hyacinth *Eichhornia crassipes* fixed on alginate efficiently removes toxic metal ions in both batch and continuous flow modes and hence shows great potential as a biosorbent material. Alginate –hyacinth beads can be prepared made by drop-wise extrusion from a pipette. Dr Mahamadi’s research has shown that Alginate –hyacinth beads are effective in the removal of basic dyes such as Methylene Blue (MB) and Crystal Violet (CV), and heavy metals such as Copper 2 metal ions and Nickel 2 metal ions.

There are many reasons why this technique is valuable. These include: the low cost of the biosorbents, great efficiency for metal removal at low concentration, potential for biosorbent regeneration

and metal recovery, high velocity of sorption and desorption, limited generation of secondary residues and the more environmentally friendly life cycle of the material (e.g. easy to eliminate compared to conventional resins).

As Dr. Courtie Mahamadi points out *”Immobilisation of the biosorbent in alginate is a very effective way of improving its mechanical properties as indicated by the high removal efficiencies demonstrated”*.

An especially exciting feature of the new approach is the absence of clogging or column bleeding after repeated sorption/regeneration cycles at low flow rates. The improved sorption capacity compared to free biomass suggests that the biosorbent has great potential for use in continuous-flow biosorption from aquatic environments.



DR COURTIE MAHAMADI

Project: Batch and continuous flow sorption of heavy metals from aquatic systems by water hyacinth weed (*Eichhornia crassipes*)

Institution: Department of Chemistry, Bindura University College, Zimbabwe

Country: Zimbabwe

Grants Awarded: 2007, 2010

IFS Alumni Association highlights

The Alumni Associations of IFS provide sustainable forums for networking and advancing shared goals between different generations of IFS grantees in their respective countries.

As reported in the Foreword of this annual report, a special feature of this year has been the efforts of IFS to continue to pursue our plans to identify how best to support and to work with our alumni to benefit the next generation of early-career scientists. IFS alumni are often great role models and sources of support for applicants for IFS grants and are often well placed to offer practical support to young researchers as they start their research careers.

Each year we strive to engage with greater numbers of alumni and to try to build robust networks in support of IFS objectives and actions. In 2014, IFS alumni launched new associations in Kenya, Burkina Faso and Ghana and commenced activities in Ethiopia and Togo. Highlights from the Alumni Associations' accomplishments in 2014 include:

discussions on the current status of scientific equipment policy and its effects on research in local institutions. The outcome informed the need for research and higher learning institutions in Kenya to motivate the participation of scientists in science policy formulation and implementation. Members extensively explored the question of science equipment policy with regard to procurement of equipment; sharing, maintenance and disposal.

A highlight of the meeting was the launch of the IFS Alumni Association of Kenya (IFSAAK). IFSAAK draws membership from over 220 alumni comprising current grantees, past grantees and Kenyan-based IFS Scientific Advisors. IFAASK aims to capitalise on the strong research base of its members, with over 70% having PhD qualifications in diverse research fields in science. The core objectives of the association are to:

1. Build capacity of early-career scientists and upcoming IFSAAK scientists in Kenya.
2. Create a platform for collaborative research and consultancy among the members in thematic research areas.
3. Provide a platform for membership participation in policy guidance on matters relating to training and emerging research needs in Kenya.

The launch was endorsed by the Kenya National Academy of Sciences (KNAS), the African Academy of Sciences (AAS), International Centre of Insect Physiology and Ecology (ICIPE) and IFS. The association is managed by a Chairperson, Vice-Chairperson, Secretary General, Treasurer and three Committee Members.

Members further explored activities for IFS alumni in Kenya that will promote relevant research and sustainable development including collaborative research and training on food security, biodiversity and natural resource conservation, poverty reduction, and science for sustainable development.

The management is advancing the formal



The launch of the Kenya Alumni Association in February 2014 at ICIPE in Nairobi.
PHOTO BY NIGHISTY GHEZAE.

KENYA

Current grantees, past grantees and Scientific Advisors from Kenya held a two day meeting at the International Centre of Insect Physiology and Ecology (ICIPE) Duduville campus on 13–14 February 2014 in Nairobi, Kenya. During the meeting the alumni had extensive

registration process for IFSAAK, which is expected to be complete in 2015. To advance its mandate in capacity building and research, IFSAAK is collaborating with the African Biodiversity Centre, the Biodiversity Conservation Centre (NMK) and the National Council for Science and Technology (NACOSTI) in biodiversity training for 2015. The alumni association will engage in active fund-raising through membership contributions, grants, and donations, and will engage in partnerships and collaborations to achieve its objectives. IFSAAK members will co-facilitate a training workshop on proposal writing with IFS Scientific Programme Coordinators at ICIPE next year.

GHANA

In April 2014, a meeting with IFS former and current grantees was hosted by Dr George Owusu Afriyie, the Director of CSIR-STEPRI, to investigate the creation of an IFS/Ghana Alumni Association. The meeting was privileged to include Dr Musheibu Mohammed-Alfa, Deputy Minister for the Environment, Science, Technology and Innovation (MESTI). In his welcome address, Dr Musheibu expressed his happiness to see young scientists striving to make an impact in the nation and welcomed the creation of an IFS/Ghana Alumni Association. He said that young scientists represent the future of Ghana's science and technology development and that he is very impressed with the kinds of research support that had been given by IFS to young Ghanaian researchers. He indicated that the areas supported by IFS grants were all highly relevant to Ghana's developmental challenges. He said that by supporting young researchers, IFS was supporting Ghana and therefore needed to be commended.

He advised scientists present to take their work seriously and to ensure that it makes a lasting impact on the nation. He stated that early-career scientists should not just do research but should communicate their research



results to society and should strive to create awareness of the importance of science to the nation. That way the nation would come to appreciate the contribution to the development of the country.

The Deputy Minister further highlighted the importance of communication in a statement that echoed the Contributing Innovation Approach of IFS, stating that: "There is a need to bridge the science-to-society gap in Ghana. This requires that you as young researchers shift your thinking. You need to first articulate how (or if) your research contributes to society; this is especially important in countries like Ghana. This shift is what Ghana needs – not just science for science's sake, but to also use science to help recognize and solve societal problems – and means that the goals of communicating science have to shift as well. Ghana needs information from scientists not just in the form of interesting facts assembled in hard-to-find places, but especially as recommendations about how to solve developmental challenges. You have to move from reporting research just in specialized scientific articles in language comprehensible only to others with the same research specialty. This means that your jobs are not over when your articles are published in peer-reviewed journals. The critical next step is making sure society is aware of results, so it can use the information as deemed appropriate".

Dr Musheibu Mohammed-Alfa said that training and retaining young researchers in science is the one greatest economic challenge facing Ghana and he promised to be ready to make the case that more funding should be given to support training of young researchers. For his part, Dr George Owusu Afriyie promised that STEPRI would host and provide their facilities for the IFS/Ghana Alumni Association.

The National Workshop with the Ghana Alumni Association in April 2014 towards developing an enabling scientific equipment policy in Ghana. PHOTO BY NIGHISTY GHEZAE.

The first executives, elected by consensus, were: Dr Edward Yeboah (President), Mr. Isaac Osei-Bonsu (Secretary) and Dr Christopher Antwi (Treasurer). Dr Yeboah gave a speech on behalf of the new executives, thanking members for putting their confidence in him and the new executives, and asked for their support to help the IFS-Ghana Alumni Association to grow into a formidable scientific network. He said that he would ensure that the success rate in getting grants of young scientists in Ghana would be improved. He indicated that together with his team they would spearhead a strong regional network. After the elections, the new leaders assumed office and proceeded with discussions on the association and the way forward.

BENIN

The Benin IFS Alumni Association is processing with official registration, but has already organised a conference on the ‘Contribution of scientific research to the development of Benin and the role of the universities in development to meet the human resource needs of the Beninese economy’. The association has also run training workshops on ‘Proposal writing for failed candidates applying for a research grant; Statistical analysis and modelling in experimental design; and ‘Scientific paper writing (reports, articles, posters) and oral presentations. At the end of 2014 members of the Alumni Association contributed to the organisation and implementation of a major IFS workshop in Ouidah.

In addition, several visits have been organised to research sites and laboratories where IFS projects are being implemented to understand and help solve challenges faced by the grantees while pursuing their research.

BURKINA FASO

To date, more than 136 grants have been awarded to Burkina Faso. IFS former and present grantees together with the Ministry of Scientific Research and Innovation (MRSI), held a meeting in Ouagadougou, Burkina Faso from 17–19 March, 2014 to launch an IFS/Burkina Faso Alumni Association.

The meeting was opened by Dr Jean Noel, General Director of Scientific Research and Innovation at the Ministry, who welcomed the creation of an IFS/Burkina Faso Alumni Association. He highlighted that the objective of IFS is to encourage promising young researchers to conduct research which is relevant to their countries. Since former grantees have important positions today, the association is in a position to reinforce cooperation amongst grantees and younger students and create information exchange networks to adapt to a wide spectrum of rising challenges. The Director General said that building research networks is particularly important for Burkina Faso, which has a fragmented scientific community, small research groups, and scarce financing.

The acting chair for the IFS Burkina Faso Alumni Association, Dr Tapsoba is a former IFS grantee, who now occupies a key position at the Ministry of Scientific Research and Innovation. He believes that the ministry and the IFS Alumni can be a channel for strengthening technical and material capacities of the research staff, strengthening cooperation in research and innovation at national, regional and international levels, and the implementation



Professor Isa Tapsoba Chair of the Burkina Alumni Association with a student in his lab at the University of Burkina Faso.
PHOTO BY NIGHISTY GHEZAE.

A draft binding constitution is in circulation among the members and its endorsement is planned by the end of 2015 during which the association will be legally registered. The activities performed in 2014 included: Sensitisation and awareness creation of the IFS/Ghana Alumni Association; compilation of information on success rates of proposals, the publication track record of alumni, and their current positions; developing an IFS/Ghana Alumni newsletter; Designing a three-day workshop on experimental design and data analysis; and a proposal for funding for training young scientists in the use of online collaborative and knowledge-sharing tools to effectively communicate research findings or innovations was formulated and circulated among potential donors for funding.



Head of Program Nighisty Ghezae with Dr. Musheibu Mohammed-Alfa, Deputy Minister for the Ministry of Environment, Science, Technology and Innovation (MESTI) Ghana (left) and Dr. George Owusu Afriyie, the Director of CSIR-STEPRI (right). PHOTO BY NIGHISTY GHEZAE.

of strategies for access to financial support for research activities.

He hopes through the alumni association to create a framework for consultation between different research actors and strong synergy between universities, public, private and regional research centres in order to create long-term joint research units for more efficiency.

The ministry hopes that such a framework will also be a springboard to develop unifying national programmes that the ministry has supported since its foundation to cover the diversity of projects that IFS supports, particularly collaborative research projects.

TOGO

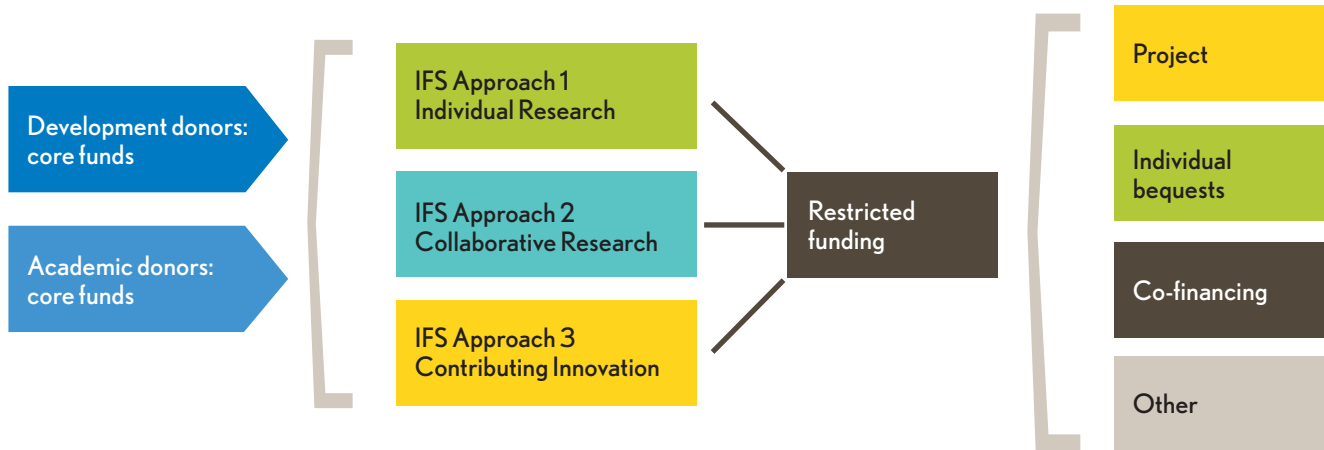
A proposal-writing workshop funded by the European Union (an activity of ACP-EU project: Strengthening capacities and informing policies for developing value chains of neglected and underutilized crops in Africa) was held between 17–21 November in Lomé, Togo. The closing ceremony was held on the last day at the University of Lomé which featured an open awareness session for young researchers on value chains of neglected and under-utilised crops as well as the initiation of a Togolese IFS Alumni Association. The ceremony was chaired by Professor Koffi Tozo, the first Vice-Dean of the Faculty of Science, in the presence of the Professor Koffivi Ketoh, Director of the Student Union Lomé Centre (COLOR), Professor Komla Batawila, the Human Resources Director of the University of Lomé and Dr Richard Hall from IFS and Dr Per Rudebjer of Bioversity International.

ETHIOPIA

Ethiopia has received around 98 research grants from IFS. A meeting of available IFS alumni was convened on April 2 in Addis Ababa to discuss the evolution of a national alumni association. In attendance were: Yilikal Anteneh, Eshetu Moges Adamu, Dr Kassahun Tesfaye Director, Institute of Biotechnology, Addis Ababa University (AAU), Abyot, Aramde, Hailu, Solomon Kibret and Abreham Assefa. An inaugural meeting was held on April 10, at Arat Kilo, College of Science, AAU, in the New Graduate Building, Room 409. The fledgling association has launched a digital space to progress discussions at Google Groups entitled IFS Alumni Ethiopia. It is proposed that members of the Ethiopian IFS Alumni Association will attend a workshop on scientific equipment provision in Kenya in 2015 where they will also get the chance to interact with other national alumni from across Africa.

The support of IFS

A range of donors and funders support the work of IFS, or parts of it:



As an individual or a representative of an organisation, if you share the mission of IFS, and wish to help, please contact us about: core funding of IFS, financing general or themed research calls, supporting capability building, collaborating on approaches or projects, co-funding our work, commissioning us to deliver research calls or capability building events, providing or sponsoring travel or placements for grantees, tools, equipment or software licences.

To make a bequest or legacy in your will is a valuable and enduring way of assisting and a personal investment to benefit early-career scientists in the developing world. If you or someone you know would like to make a bequest of financial support to IFS, please contact, in the first instance, the IFS director.

IFS donors/sponsors in 2014:

- Belgian Science Policy Office (BELSPO)
- Carnegie Corporation of New York
- Carolina MacGillavry Fund The Netherlands
- Deutsche Forschungsgemeinschaft (DFG), Germany
- Institut de Recherche pour le Développement (IRD), France
- Ministère des Affaires Étrangères (MAE), France
- Organisation for the Prohibition of Chemical Weapons (OPCW), The Netherlands
- Organisation of Islamic Conference Standing Committee on Scientific and Technological Cooperation (COMSTECH), Pakistan
- PODIO Project Management Software Citrix Systems Inc.
- PROTOS Benin.
- Swedish International Development Cooperation Agency, Department for Research Cooperation, (SIDA Globforsk) Sweden
- Swiss National Science Foundation (SNSF), Switzerland
- Syngenta Foundation for Sustainable Agriculture, Switzerland
- The European Commission, Research Directorate-General
- The John D. and Catherine T. MacArthur Foundation, USA



Special Feature: Swedish International Development Agency (Sida)

Sida has always been the financial backbone of IFS. From the outset in 1970, the Swedish Academy of Engineering Sciences, the Swedish Academy of Sciences, the American Academy of Arts and Sciences, and UNESCO sponsored a conference in Stockholm to consider the need for an international organization to support and encourage scientific research in

developing countries. The participants representing sixteen such organizations further recommended that a continuing committee be appointed to take the necessary steps to establish the International Foundation for Science (IFS), which was founded as a Research Council and registered as a non-governmental organisation (NGO) in Sweden in 1972 with the following member organisations:

Argentina	Academia Nacional de Ciencias Exactas, Físicas y Naturales
Belgium	Académie Royale des Sciences des Lettres et des Beaux-Arts de Belgique
Chile	Academia Chilena de Ciencias
Denmark	Det Kongelige Danske Videnskaberne Selskab
India	Indian National Science Academy
Indonesia	Lembaga Ilmu Pengetahuan Indonesia
Israel	The Israel Academy of Sciences and Humanities
Netherlands	Koninklijke Nederlandse Akademie van Wetenschappen
Pakistan	Pakistan Council for Science and Technology
Philippines	National Research Council of the Philippines
Sweden	Ingenjörsvetenskapsakademien and Kungliga Vetenskapsakademien
Thailand	National Research Council
USA	American Academy of Arts and Science and National Academy of Sciences

This was in large part the result of: the dedicated persistent efforts of one man, Dr. Sven Brohult, the President of the Swedish Academy of Engineering Sciences, and the financial support of the Swedish government. Over the subsequent years IFS has become, and remains, an effective and reliable source of support and the Sida investment in IFS has leveraged regular support from over 15 other donors.

BETWEEN 1974 AND 1981 IFS awarded 600 research grants across 70 countries, with nearly half the grants provided to Africa. The first independent evaluation of IFS (Sagast, Oldham, Thiongore and Voraui, 1981) acknowledged the cost and complexity of small grants pro-

vision to individuals, but highlighted and underscored their vital importance, to bridge the gap between attaining a graduate science degree and becoming a research scientist. The review also highlighted the vital role of Scientific Advisors, the importance and evident quality of the provision of science advice to applicants, and that the demand for grants, in the form of high quality proposals, exceeded the funds available to the foundation. The average age of grantees back then was just over 35, made up of 14% female grantees. Sweden provided approximately 50% of the IFS budget in 1981.

BETWEEN THE YEARS 1982-1993, IFS awarded 2,453 research grants across 87 countries, with nearly half the grants provided to Africa. The

second independent evaluation of IFS (Castillo, Head and Matos, 1993) acknowledged the cost and complexity of small grants provision to individuals, but highlighted the vital importance of their provision to individuals, and also highlighted the vital role of the now approximately 800 Scientific Advisors to IFS. The average age of grantees during this period was 36. Affirmative action was increasing the ratio of support to least developed countries, whilst excellence was still sought. The review team acknowledged that female grantees now made up over 21% of approved grants. Sweden provided 53% of core funding. The provision of interdisciplinary research support was initially suggested.



Dr Rim Nefissi from Tunisia is researching the biochemistry and gene expression of salt tolerance within Tunisian barley accessions.
PHOTO BY RIM NEFISSI OURTENI SP.HACHICHA.

BETWEEN THE YEARS 1994-2001, IFS awarded 1,536 research grants across 70 countries, with nearly half the grants provided to Africa. The third independent evaluation of IFS (Cetto, Freyvogel and Toure, 2001) covered this period. The review pronounced that the IFS mandate was as important as ever and highlighted the need to integrate interdisciplinary collaborative research approaches, and also to encourage grantees to use their knowledge and know-how in support of development. The use of small grants was acknowledged as a highly efficient way of providing incentives for research in developing countries, the average age of grantees during this period was 36 and female grantees now made up over 28% of approved grants.

BETWEEN THE YEARS 2002-2010, IFS awarded 2,542 research grants across 83 countries, with nearly half the grants provided to Africa. The fourth independent evaluation of IFS (Muraguri-

Mwololo, Schertenleib and Svensson, 2010) acknowledged the continued strong relevance of the IFS mandate and the impact identifiable from “Monitoring and Evaluation System for Impact Assessment” (MESIA) studies showing that most past grantees have had a successful science career, have published widely and continue to stay in their home countries in universities and other scientific institutions after the grant. The average age of grantees during this period was 35, female grantees now made up over 31% of approved grants. The review referenced the need to integrate interdisciplinary approaches into the way IFS works. It recommended a strategic vision be developed, to assess how best to support young individual researchers in Low-Income Countries (LIC) with weak and volatile scientific funding infrastructure.

IN 2012, a fifth independent review was commissioned (Ian Christoplos and Johanna Bergman-Lodin, 2012) by Sida. Grant management functions were perceived by virtually all those interviewed as supportive and unbureaucratic, with IFS explicitly recognising the needs and capacities of young researchers and responding accordingly. The review highlighted the relatively unique nature and value of IFS in “nurturing” young researchers and identified that these efforts were perceived to be of high quality. The extensive feedback provided on grant applications was considered very valuable. IFS support resulted in: very good publication rates, increased credibility in grantees own institutions and among other research councils, increasing their chances of leveraging additional funds, increased self confidence to develop their own research plans and knowledge to manage a grant and a research project. The review concluded that overall there appeared to be no other organisation that takes such a concerted approach to nurturing and enabling young researchers to pursue their relevant research interests.

In line with the vision of its founders, and in step with the Swedish ethos for principled, necessary and well conceived support into the international development arena, Sweden has been the champion of the International Foundation for Science. Sida support, has given the world an independent, reliable and highly valued nurturing and enabling initiative for young researchers to pursue their own research interests and realize their potential. Those entrusted with carrying this responsibility to the extensive current cohort of aspiring developing country scientists are proud and grateful for this continuing legacy.

Atta-ur-Rahman:

Impact of IFS on My Life

My association with IFS goes back to 1974, just 2 years after the IFS Charter was signed in 1972. I had returned to Karachi in 1973, after 8 years at Kings College, Cambridge University, UK, first as a PhD student and later a Fellow of Kings. There were hardly any research facilities in the chemistry institute at that time and starting a serious research program was a daunting task. My search for international research funding agencies led me to discover the International Foundation for Science. I submitted my first grant application in 1974 on synthetic approaches to the anti-cancer drugs vinblastine and vincristine. It was rejected as the reviewers felt that it was too difficult with the meagre research facilities in my institute then.

I APPLIED AGAIN on a different area of bioactive substances from local medicinal plants, but was rejected as the field was considered too broad. Undeterred I applied once again, this time on the chemistry of the indole alkaloids of *Peganum harmala*, a local medicinal plant, and to my joy, the project was approved in 1976. I became the 139th IFS grantee, eventually winning 4 grants worth about USD30,000 between 1976 and 1980 which allowed me to purchase critically needed equipment. This marked the beginning of a research career in Pakistan that has spanned 40 years. Today, thanks to this initial support from IFS which set the research activities in motion, my institute encompasses 17 research buildings in 200 acres and has a wide variety of sophisticated equipment. It is one of the most powerful centres of natural product chemistry in Asia with some 500 PhD students and many foreign students studying chemistry - including about a hundred from Germany alone! The Centre has twice won the Islamic Development Bank Prize as the best research institute among the 57 Islamic countries. The research carried out under my supervision has led to 1002 international publications including 37 international patents.

THE METEORIC RISE of our centre under my supervision led to my appointment as Federal Minister of Science & Technology, Federal Minister of Education and Chairman Higher Education Commission/Federal Minister

during 2000–2008. This was perhaps the most satisfying time of my life as I had the opportunity to dramatically change the landscape of higher education in Pakistan. Several of our universities became ranked among the top 300, 400 and 500 universities of the world – there were none in 2000. Enrolment increased from 270,000 students in 2003 to over a million, universities from 59 in 2000 to 137, research output jumped from about 600 research publications in 2000 to over 8,000 annually by 2012, and over 5,000 PhDs were awarded during 2003-2012 compared to 3,500 in the 55 years preceding 2003. A review of the Pakistan HE system carried out in 2008 by the Chairman of the UN Commission on Science, Technology and Development, Prof. Michael Rode of the University of Innsbruck, Austria, stated:

“Around the world when we discuss the status of higher education in different countries, there is unanimity of opinion that the developing country that has made the most rapid progress internationally in recent years is Pakistan. In no other country has the higher education sector seen such spectacular positive developments as that in Pakistan during the last six years.”

I WAS DELIGHTED to be appointed to the IFS Board of Trustees in 2007 and served in that capacity till 2014. I was greatly impressed by the efficient working of IFS throughout the 40 years of my association with this wonderful organization that is impacting the lives of so many young men and women in the developing world who are aspiring to establish research careers in science. When I was Coordinator General of COMSTECH (an OIC Ministerial Committee on Science and Technology of the 57 OIC member countries), I had the opportunity to initiate a major joint activity with IFS for funding young scientists in these countries that continues to this day.

When I look back at the last 40 years, I am convinced that it was all made possible by the support that I initially received from IFS. Not only has our institution benefited, but a country with a population of 200 million, with over a 100 million below the age of 20, has benefited from what I could contribute.

Thank you IFS!



PHOTO: KOPF B.M.

ATTA-UR-RAHMAN

Prof Atta-ur-Rahman, a former IFS grantee, has won many international awards for his contributions including election as Fellow of Royal Society (London), UNESCO Science Prize, and doctorate degrees by many universities including University of Cambridge. He was Federal Minister of Science & Technology, Federal Minister of Education and Chairman Higher Education Commission/ Federal Minister in Pakistan during 2000–2008. A research institute has been named after him at the Universiti Teknologi Mara in Malaysia.

The background of the slide is a blue marbled paper texture with various shades of blue and white, creating a watercolor-like effect.

People, affiliates, grants and finances

IFS BOARD OF TRUSTEES 2014

Prof Olanrewaju Babatunde Smith, Nigeria, Consultant, Ottawa, Canada (Chair)

Prof Torbjörn Fagerström, Sweden, Senior Adviser, SLU (Swedish University of Agricultural Sciences) Uppsala (Vice chair)

Prof Eckart Ehlers, Germany, Professor Emeritus, University of Bonn

Dr Wenche Barth Eide, Norway, Associate Professor, University of Oslo

Dr Yunus Daud Mgaya, Tanzania, Professor, Aquatic Sciences and Fisheries, University of Dar es Salaam

Prof Dr Atta-ur-Rahman, Pakistan, Coordinator General, COMSTECH (Standing Committee on Scientific and Technological Cooperation of the Organisation of Islamic Cooperation) Islamabad

Dr Edith Taleisnik, Argentina, Research Fellow, CONICET (National Research Council of Argentina) Cordoba

Ms Elisabeth Schenker, Switzerland, Scientific Officer, Swiss National Science Foundation, Berne

Dr Graham Haylor, Sweden, Director, International Foundation for Science, Stockholm, (Ex-officio)

Prof Patrick Van Damme, Belgium (Centre for Sustainable Development) University of Ghent

Prof Malcolm Beveridge, UK (Institute of Aquaculture) University of Stirling, Scotland

Prof Harriet Kuhnlein, Canada (Human Nutrition) McGill University

Prof Beatriz da Silveira Pinheiro, Brazil (Retired Embrapa Researcher)

Dr Bishnu Upreti, Nepal (Peace and Collaborative Development Network)

IFS STAFF 2014

Ms Heli Andersson, Manager, Database and Statistics

Mr Ulf Edin, Head of Administration

Ms Annika Eriksson, Programme Administrator, Animal Production and Aquatic Resources

Dr Nighisty Ghezae, Head of Programme

Dr Richard Hall, Scientific Programme Coordinator, Forestry/Agroforestry and Crop Science

Dr Graham Haylor, Director

Dr Ingrid Leemans, Scientific Programme Coordinator, Animal Production and Aquatic Resources

Ms Ingrid Lindhe, Programme Administrator, Crop Science

Ms Nathalie Persson Andrianasitera, Scientific Programme Coordinator, Food Science and Social Sciences

Ms Liliane Plaie, Administrative Assistant

Ms Sirilak Pongpatipat, Accounting Administrator

Mr Brian Porter, Manager, Network and Information

Ms Eva Rostig, Programme Administrator, Natural Products

Ms Pirkko Tolamo, Office Manager

Dr Cecilia Öman, Scientific Programme Coordinator, Water Resources

EXCERPT FROM Audited financial statement 2014

Administration Report Information about the activities

Applicants for International Foundation for Science support may submit their proposals through three thematic research clusters (in place of the former 8 disciplinary areas). These are:

I. Biological Resources in Terrestrial Systems

This includes but is not limited to: research on biodiversity, forestry, animal production, crop science, underutilised species, natural products, renewable energy and climate variability, and technical research on all forms and aspects of food production; also, aspects of the social, economic, cultural and historical context for current and future practices, use and management of natural resources as well as the fostering of socio-economic resilience.

II. Water and Aquatic Resources

This includes but is not limited to: water resources availability, conservation, use, and issues associated with water-related institutions; research on freshwater, brackish and marine aquatic organisms and their environments, as well as human and community access to such resources in the protection and improvement of their livelihoods.

III. Food Security, Dietary Diversity and Healthy Livelihoods

This includes but is not limited to research encompassing agricultural and livestock production systems including socio-economic and farming systems research, research on the conditions for the enjoyment of food security beyond food production, distribution and overall availability, and also research on access to food or resources for food for socio-economic resilience and improved livelihoods, health and well being in rural and urban areas.

A new Grant Agreement was signed on 12 June 2014 with Sida (6 months after the start of the period for which the grant is designated) for January 1st 2014–December 31st 2018, but with funding currently agreed up to 31.12.2016 due to Sida's financial constraints. Sida undertakes to fund SEK 62,000,000 up to 2016.

The IFS individual granting process included the receipt and registration of the research grant applications from a call open between 1.12.13–31.1.14, and the internal pre-screening of 1250 proposals. Thereafter, applications were sent to internationally established Scientific Advisers and Experts for comment (IFS has approximately 1400 Advisers in its database). The proposals were then reviewed and prioritised at the

meetings of the Scientific Advisory Committees (SAC) in May (25–27); upon the recommendations of the SACs, the IFS Director approved the research grants for funding. Thereafter, the Secretariat drew up the contracts for signature by the grantee, head of institution and the IFS Director. During the research period (one to three years and renewable twice), IFS provides supporting services to the grantees.

In June, one hundred and sixty one (161) individual applications were approved for funding, and in July, a second evaluation session considered Revised/ Rewritten and Renewal Proposals. Following a virtual SAC meetings held in November–December a further seventy four (74) applications were approved for funding totalling 235 proposals to the combined value of USD 2 638 094 (SEK 18 568 710). The Gender and Regional distribution of the awarded research grants in 2014 is as follows: 151 Male (64%), 84 Female (36%), 70% Sub-Saharan Africa, 24% South and SE Asia and 3% Latin America and 3% Middle East and North Africa.

The IFS collaborative granting process included an Expression of Interest stage and invitation of eligible aspirants into a social networking platform hosted by IFS. Following a period of forming and registration of teams, after 14 weeks we administered the electronic receipt and registration of the research grant applications (through a web-based process) and the internal pre-screening of all proposals. Thereafter, applications were made available on-line to internationally established, Scientific Advisers and Experts for comment. The proposals were then reviewed and prioritised at the meetings of the Collaborative Scientific Advisory Committee; upon the recommendations of the Collaborative SAC, the next step will be for the IFS Director to approved the research grants for funding. Thereafter, the Secretariat will draw up the contracts for signature by the grantee, head of institution and the IFS Director. During the research period (one to three years and renewable twice), IFS will provide supporting services to the grantees.

The 2013–14 call focused on Biodiversity and was the 2nd pilot of the collaborative research approach. It involved an expansion of the five countries in the first pilot to include: Benin, Burkina Faso, Cote d'Ivoire, Ghana, Nigeria, South Africa, Tanzania and Uganda and was financed by the Carnegie Corporation of New York, the Belgian Science Policy Office (BEL-SPO) and the Bequest from Carolina Mac Gillavry.

At the deadline 26 teams (of the 45 teams that formed) submitted applications involving 104 early-career scientists. Thirteen teams passed pre-screening and were invited to a 4-day workshop in Ouidah, Benin, from 8–11th December

run in conjunction with the University of Abomey Calavi (UAC) Benin. All but one of the 10 scientists coordinating teams from the first collaborative research cohort accepted the invitation and joined the workshop to share their experiences, along with all members of the teams from the second cohort that had passed pre-screening; The Workshop dealt with interdisciplinary and creative problem solving methods. The team proposals were sent out for evaluation by Scientific Advisers and Experts. These were completed on line and involved a quantitative assessment and a qualitative narrative of each project. Following a SAC meeting on 1st December nine teams were conditionally recommended, two teams requiring more major rewriting were offered mentoring with their revisions. Funding decisions will be made in 2015 pending the fulfilment of conditions.

The gender and regional distribution of the collaborative research grant that were conditionally accepted (for funding in 2015) were as follows: 18 Male (51%), 17 Female (49%); Burkina Faso 6%, Benin 14%, Cote D'Ivory 6%, Ghana 11%, Nigeria 26%, South Africa 6%, Tanzania 17% and Uganda 14%. Interestingly, seven of the nine teams that were conditionally accepted for funding were mixed Francophone-Anglophone in linguistic make up.

During the year eight individual research approach grantees were given opportunities to exchange views with scientists working on related issues and build up their national and international contacts and networks.

These opportunities were given in different forms as follows:

- Visits to mentors where the young researchers receive individualized training.
- Visit to a well-equipped laboratory. Here grantees can receive training and utilize advanced instruments which are not available in their home laboratories.
- Travel grants to participate in scientific meetings and international conferences and congresses are given towards the end of the research grant period to enable grantees to present their research findings.

Colleagues from Benin (3 persons), Cuba, Ethiopia, Nigeria, Sri Lanka, and Togo (2 persons) travelled to Canada (2 persons), France, Malaysia, South Africa, Thailand, and the USA (3 persons) respectively.

In total 14 workshops, involving approximately 450 participants were conducted through different partnership agreements and increasingly together with the IFS Alumni Associations. Six workshops were part of EU-ACP projects with partners, two were undertaken with IRD with the Benin and Burkina Faso Alumni Associations respectively, two with the MacArthur Foundation together with the Kenya and Ghana Alumni Associations, three with MacArthur Foundation funding in Kenya, Ghana and Ethiopia respectively, one with Protos, the University of Abomey Calavi and Benin Alumni Association and two collaborative research workshops with the University of Abomey Calavi, and funding from the Belgium Science Policy Office (BELSPO) and the Carnegie Corporation of New York.

93,6 % of total expense for the year 2014 was spent on programme services, fund raising and partnership building. The advisers and experts evaluations of proposals do not receive remuneration for reviewing nor for the SAC meetings. These contributed services valued at approximately 4 million USD in pro-bono support are not reflected in this report.

Plans for 2015

- **Stewardship of IFS** (resource mobilization, communications, managing change, improving efficiency and implementation of the new strategy).
- **IFS Individual Research Approach** (Specific Objectives: Capability of young developing country scientists built, to produce new research findings, relevant for developing countries and of assured quality according to current academic principals).
- **IFS Collaborative Research Approach** (Specific Objectives: Capability of researchers from developing countries to access collaborative research networks promoted, including links to the international research community).
- **IFS Contributing Innovation Approach** (Specific Objectives: The use of research in developing countries promoted and the demand for research increased).

Financial Result

The financial result for the year is a surplus of SEK 2 492 266 (EUR 262 889).

Recommendation for the disposition of the net result

Balance, 1 January	-1 641 013 (EUR -173 097)
Net Income less Expense for the Year	2 492 266 (EUR 262 889) 851 253 (EUR 89 792)

The Board of Trustees and Director recommend that the accumulated surplus is carried forward to the following year
851 253 (EUR 89 792)

The result of the organisation's activities, and the financial position at the end of the year, are reflected in the following Statement of Income and Expenditure, Balance Sheet and accompanying notes.

All amounts in the Audited Financial Statement are shown in Swedish Crowns (SEK) unless otherwise noted.

STATEMENT OF INCOME AND EXPENSE (in thousands SEK)

	1 January- 31 December 2014	1 January- 31 December 2013
Programme Revenue		
Core and Restricted Contributions	36,543	36,987
Grants Withdrawn	1,012	1,137
Other Programme Revenue	21	125
Total Programme Revenue	37,576	38,249
Programme Expense		
Programme Services	34,330	33,046
Fundraising and Partnership Building	2,133	1,945
Management and General	2,501	2,296
Total Programme Expense	38,963	37,287
Programme Income less Expense	-1,387	961
Result from financial assets		
Income from other investments held as fixed assets	496	
Interest Income	69	177
Interest Expense		0
Exchange gain / loss	3,313	115
Asset Income less Expense	3,879	292
Net Income less Expense	2,492	1,253

BALANCE SHEET (in thousands SEK)

	31 December 2014	31 December 2013
Assets		
<i>Fixed Assets</i>		
Tangible Assets		
Equipment, Furniture and Fixtures	106	161
Financial Assets		
Other long-term investments	12,442	11,946
Long-term Donor Receivables	589	241
Total Fixed Assets	<u>13,137</u>	<u>12,349</u>
<i>Current Assets</i>		
Current Receivables		
Donor Receivables	1,633	2,567
Other Current Receivables	746	583
Prepaid Expense and Accrued Income	573	623
Total Current Receivables	<u>2,952</u>	<u>3,773</u>
Cash and Bank Balances	<u>28,919</u>	<u>23,066</u>
Total Current Assets	<u>31,870</u>	<u>26,839</u>
Total Assets	<u>45,007</u>	<u>39,187</u>
Equity and Liabilities		
<i>Equity</i>		
Board Designated Fund for Contingencies	9,173	9,102
Carolina MacGillavry Fund	14,775	12,811
Total Designated Funds	<u>23,947</u>	<u>21,913</u>
Unrestricted Equity		
Balance, 1 January	-1,641	-860
Net Income less Expense for the Year	2,492	1,253
Total Unrestricted Equity	<u>851</u>	<u>394</u>
Total Equity	<u>24,799</u>	<u>22,306</u>
<i>Current Liabilities</i>		
Research Grants Payable	12,124	9,656
Deferred Restricted Contributions	5,971	5,036
Accounts Payable	0	138
Other Current Liabilities	811	847
Accrued Expense and Prepaid Income	1,302	1,203
Total Current Liabilities	<u>20,208</u>	<u>16,881</u>
Total Net Assets and Liabilities	<u>45,007</u>	<u>39,187</u>
Pledged Assets: provision for credit cards	400	400
Contingent Liabilities	None	None

AFFILIATED ORGANISATIONS 2014

NATIONAL ORGANISATIONS

ARGENTINA

Academia Nacional de Ciencias Exactas, Físicas y Naturales (ANCEFN)
Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)

AUSTRALIA

Australian Academy of Science (AAS)

AUSTRIA

Fonds zur Förderung der Wissenschaftlichen Forschung (FWF)
Österreichische Akademie der Wissenschaften (ÖAW)

BANGLADESH

Bangladesh Council of Scientific and Industrial Research (BCSIR)

BELGIUM

Académie Royale des Sciences d'Outre Mer (ARSOM)
Académie Royale des Sciences des Lettres et des Beaux Arts de Belgique
Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België (KVAB)

BOLIVIA

Academia Nacional de Ciencias de Bolivia (ANCB)

BRAZIL

Academia Brasileira de Ciências (ABC)
Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ)
Fundação Oswaldo Cruz (FIOCRUZ)

BURKINA FASO

Ministère des Enseignements Secondaire, Supérieur et de la Recherche Scientifique (MESSER)

CAMEROON

Ministry of Scientific and Technical Research

CENTRAL AFRICAN REPUBLIC

l'Enseignement Supérieur et de la Recherche Scientifique

CHAD

Direction de la Recherche Scientifique et Technique, MESRS

CHILE

Academia Chilena de Ciencias
Comisión Nacional de Investigación Científica y Tecnológica (CONICYT)

CHINA

Chinese Academy of Sciences (CAS)

COLOMBIA

Academia Colombiana de Ciencias Exactas, Físicas y Naturales (ACCEFYN)
Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria (CIPAV)
Instituto Colombiano para el Desarrollo de la Ciencia y Tecnología (COLCIENCIAS)

CONGO (BRAZZAVILLE)

Direction Générale de la Recherche Scientifique et Technique, MENRST

COSTA RICA

Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT)

CÔTE D'IVOIRE

Académie des Sciences, des Arts, des Cultures d'Afrique et des Diaporas africaines

CUBA

Academia de Ciencias de Cuba (ACC)
Ministry for Foreign Investment and Economic Cooperation

DENMARK

Akademiet for de Tekniske Videnskaber (ATV)
Det Kongelige Danske Videnskabernes Selskab (RDVS)

ECUADOR

Fundación para la Ciencia y la Tecnología (FUNDACYT)

EGYPT

Academy of Scientific Research and Technology (ASRT)

EL SALVADOR

Consejo Nacional de Ciencia y Tecnología (CONACYT)

ETHIOPIA

Ethiopian Science and Technology Commission (ESTC)

FINLAND

Delegation of the Finnish Academies of Science and Letters

FRANCE

Académie des Sciences
Centre de Coopération Inter-nationale en Recherche Agronomique pour le Développement (CIRAD)
Institut National de la Recherche Agronomique (INRA)
Institut de Recherche pour le Développement (IRD)

GERMANY

Deutsche Forschungsgemeinschaft (DFG)

GHANA

Council for Scientific and Industrial Research (CSIR)

GUINEA

Direction Nationale de la Recherche Scientifique et Technique

GUINEA BISSAU

Instituto Nacional de Estudos e Pesquisa (INEP)

GUYANA

Institute of Applied Science and Technology

HONDURAS

Consejo Hondureño de Ciencia y Tecnología (COHCIT)

INDIA

Indian National Science Academy (INSA)

INDONESIA

Lembaga Ilmu Pengetahuan Indonesia (LIPI)

ISRAEL

The Israel Academy of Sciences and Humanities

JAMAICA

Scientific Research Council (SRC)

JORDAN

Royal Scientific Society (RSS)

KENYA

Kenya Agricultural Research Institute (KARI)
Kenya National Academy of Sciences (KNAS)

KOREA DPR (NORTH)

Academy of Sciences of DPR Korea

KOREA R (SOUTH)

National Academy of Sciences (NAS)

KUWAIT

Kuwait Institute for Scientific Research (KISR)

LATVIA

Latvian Academy of Sciences (LAS)

LESOTHO

The National University of Lesotho (NUL)

LIBERIA

University of Liberia (UL)

MADAGASCAR

Académie National Malgache

MALAWI

National Research Council of Malawi (NRCM)

MALAYSIA

Malaysian Scientific Association (MSA)
Ministry of Science, Technology and Innovation

MALI

Centre National de la Recherche Scientifique et Technologique (CNRST)
Comité National de la Recherche Agricole (CNRA)

MEXICO

Consejo Nacional de Ciencia y Tecnología (CONACYT)

MONGOLIA

Mongolian Academy of Sciences

MOROCCO

Centre National de Coordination et de Planification de la Recherche Scientifique et Technique (CNR)
Institut Agronomique et Vétérinaire Hassan II

MOZAMBIQUE

Universidade Eduardo Mondlane (UEM)
The Scientific Research Association of Mozambique (AICIMO)

NEPAL

Royal Nepal Academy of Science and Technology (RONAST)

NETHERLANDS

Koninklijke Nederlandse Akademie van Wetenschappen (KNAW)

NIGER

Université Abdou Moumouni

NIGERIA

Federal Ministry of Science and Technology (FMST)
The Nigerian Academy of Science (NAS)

NORWAY

Det Norske Videnskaps- og Akademi (DNVA)

PAKISTAN

Pakistan Council for Science and Technology (PCST)

PANAMA

Secretaria Nacional de Ciencia y Tecnología e Innovación (SENACYT)
Universidad de Panamá

PAPUA NEW GUINEA

The University of Papua New Guinea

PERU

Consejo Nacional de Ciencia y Tecnología (CONCYTEC)

PHILIPPINES

National Research Council of the Philippines (NRCP)

POLAND

Polish Academy of Sciences (PAS)

SAUDI ARABIA

King Abdulaziz City for Science and Technology (KACST)

SENEGAL

Délégation aux Affaires Scientifiques et Techniques, MRST

SEYCHELLES

Seychelles Bureau of Standards (SBS)

SIERRA LEONE

Institute of Agricultural Research (IAR)

SOUTH AFRICA

National Research Foundation (NRF)

SRI LANKA

National Science Foundation (NSF)

SUDAN

National Centre for Research (NCR)

SWEDEN

Ingenjörsvetenskapsakademien (IVA)
Kungliga Skogs och Lantbruksakademien (KSLA)
Kungliga Vetenskapsakademien (KVA)

SWITZERLAND

Council of the Swiss Scientific Academies (CASS)
Swiss National Science Foundation (SNSF)

TANZANIA

Tanzania Commission for Science and Technology (COSTECH)

THAILAND

National Research Council of Thailand (NRC)
Thailand Research Fund (TRF)

TUNISIA

Direction Générale de la Recherche Scientifique et Technique, MES

UGANDA

National Agricultural Research Organisation (NARO)
Uganda National Council for Science and Technology (UNCST)

UNITED KINGDOM

The Royal Society
Natural Resources Institute (NRI)

URUGUAY

Programa de Desarrollo de las Ciencias Básicas (PEDECIBA)

USA

American Academy of Arts and Sciences (AAAS)
National Academy of Sciences (NAS)
New York Academy of Sciences (NYAS)

VENEZUELA

The Ministry of Popular Power for Science and Technology

VIET NAM

Ministry for Science and Technology (MOST)

ZAMBIA

National Institute for Scientific and Industrial Research (NISIR)

ZIMBABWE

Scientific and Industrial Research and Development Centre (SIRDC)
University of Zimbabwe

REGIONAL ORGANISATIONS**AFRICA**

Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA)
Association of African Universities (AAU)
Centre Regional pour l'Eau Potable et l'Assainissement à faible coût (CREPA)
Institut du Sahel (INSAH)
The African Academy of Sciences (AAS)
West and Central African Council for Agricultural Research and Development (WECARD/CORAF)
Western Indian Ocean Marine Science Association (WIOMSA)

LATIN AMERICA AND THE CARIBBEAN

Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
The Caribbean Academy of Sciences (CAS)
Caribbean Agricultural Research and Development Institute (CARDI)

INTERNATIONAL ORGANISATIONS

BioNET-INTERNATIONAL (The Global Network for Taxonomy)
International Organisation for Chemical Sciences in Development (IOCD)
International Union of Forest Research Organisations (IUFRO)
The Academy of Sciences for the Developing World (TWAS)
Consultative Group on International Agricultural Research (CGIAR):
CGIAR Secretariat
Bioversity International
Centro Internacional de Agricultura Tropical (CIAT)
Centre for International Forestry Research (CIFOR)
International Centre for Agricultural Research in the Dry Areas (ICARDA)
International Centre for Research in Agroforestry (ICRAF)
International Water Management Institute (IWMI)
World Fish Center

INDIVIDUAL RESEARCH GRANTS AWARDED 2014

AFGHANISTAN

JAWAD, Abdul Saboor
Climate change impact assessment on water availability and sediment yield in the Kabul River Basin

BANGLADESH

AMINUZZAMAN, F M
Rhizosphere colonisation, persistence, mass production and comparative biocontrol efficacy of spores versus encapsulated mycelia of three nematophagous fungi

HOQUE, Md. Sazedul
Probabilistic quantitative risk assessment of chemical (formalin)- treated fish in local markets of Bangladesh

ISLAM, Md Monirul
Adaptation strategies and sustainable livelihoods: addressing the impacts of climate variability and change on inland fishery-dependent people in Bangladesh

NOWREEN, Sara
Assessment of river water availability in Bangladesh for off-stream uses

BENIN

ADEOTI, Adéola Zouri-kifouli
Biodiversity of pearl millet cultivated in north Benin

ADIGOUN, Fabienne Adetola Etude ethnobotanique et génétique des ignames jaunes *Dioscorea dumetorum* (Kunth) Pax: implications pour la conservation de l'espèce au Bénin

AHOSSOU, Enangnon Oscar Doré
Country-wide responses to climate change of socio-economically important indigenous fruit species in Benin

AHOANSOU, Djidjooh Mathieu Maurice
Land use effects on spatial and temporal variation of groundwater quality in a semi-arid region: a case study in north-west Benin

AHOUDJI, Yédia Myrèse Carmelle
Nutrient translocation from above ground to plants and soil below ground: a study of grass and legume species

AKOTEGNON, Rodrigue Azonwakin
Caractérisation des biomolécules et proposition de différentes voies de valorisation de la feuille, de la pulpe et de la fève de *Hexalobus monoptalus* (A. Rich.) Engl. et Diels au Bénin

AKPONA, Adéloui Hugues
Importance of the aardvark (*Orycteropus afer*) in ecosystem functioning in the Pendjari Biosphere Reserve: implications for conservation and management

AMAHOWE, O Isidore
Linking functional traits and population dynamics of *Azelia africana* across disturbance and ecological gradients in Benin

AMOUSA, Abdou Madjid Olatoundé
Evaluation des propriétés antibactériennes, antifongiques et antiradicalaires d'extraits et de molécules issues de plantes médicinales de la pharmacopée béninoise

ATINDOGBE, Gilbert
Analyse de la structure spatiale et facteurs déterminants la mortalité des arbres dans les formations forestières au Bénin

AYÉNA, Tchènon Aimé Cézaire
Evaluation des potentialités phytochimique et pharmacologique de *Pterocarpus santalinoides* L. (*Papilionoideae*), une plante médicinale utilisée dans le traitement des toxi-infections alimentaires

AZONWADE, Ezin François
Caractérisations physico-chimique, microbiologique et bioactivités du miel du Bénin Benin

BADOUSI, Marius Eric
Optimisation des techniques de prétraitement et de la torréfaction des graines de *Pentadesma butyracea* pour la production d'un bio-beurre au Bénin

BALOGOUN, Ibouaïman
Développement des innovations agronomiques de production et de protection durable de l'anacardier au Bénin

DAN, Oswald Fulgence
Impact des systèmes d'assainissement sur la qualité des ressources en eau dans les zones humides: cas de la Commune de Sô-Ava

DICKO, Aliou
Assessing morphological variability and productivity of *Lophira lanceolata* in Benin

DJOHY, Georges
Appropriation socio-économique du téléphone portable dans les sociétés pastorales du Nord-Bénin

DOSSOU AMINON, Nanoukon Innocent
Impact des changements climatiques sur la production et la diversité variétale du sorgho dans les zones arides du Nord Bénin

DOSSOU-YOVO, Elliott Ronald
Modelling effects of alternative farming management practices on soil carbon emission and yield in rain-fed upland rice ecosystems in Benin

DOTCHAMOU, Titilayo
Phénologie, production fruitière en fonction des zones climatiques et impact des changements climatiques sur la distribution de *Parkia biglobosa* (Jacq.) R.Br. ex G.Don, au Bénin

EGAH, Janvier
Etude des nouvelles formes d'accès aux intrants agricoles et de leurs incidences sur la sécurité alimentaire des ménages ruraux: l'exemple des formes de warrantage au Bénin

GBAGUIDI, Ahodonissou Anicet
Morphological characterisation and agronomic evaluation of Benin Bambara groundnut (*Vigna subterrenea* L.) varieties for their conservation and sustainable use in the context of climate change

GBÈTOHO, Alain Jaures
Structure et dynamique des forêts secondaires de la Lama (Bénin, Afrique de l'Ouest)

GNAWE, Marcelline
Diversité variétale et ethnobotanique d'un légume (*Abelmoschus esculentus* (L.) Moench) à grande importance socio-économique au Bénin en vue de la sélection de variétés performantes pour sa promotion

GOUDEGNON, Oré Adédiran Eude
Land use impact on the sex ratio, sex-specific population structure and spatial pattern of the dioecious *Lannea microcarpa*, Engl. & K. Krause (*Anacardiaceae*) in Benin

HOUNGBO, Yénoukounmey Hermance Effet de la protection des mangues par les fourmis rouges (*Oecophylla longinoda*) sur la qualité des mangues protégées

HOUNSOUNOU, Espérance Olive
Contribution à l'amélioration des conditions d'hygiène et de qualité des eaux de consommation dans le 6ème arrondissement de Cotonou au Bénin en vue d'une réduction des taux de décès dus au choléra

IDOHO, Alix Frank Rodrigue
Impact of fruit and leaf harvesting on *Hyphaene thebaica* structure and productivity in different land use types in Benin

KPEGLI, Kodjo Apélé Raoul
Hydrogeochemical and isotopic characterisation of Ketou and Abomey plateaux in Ouémé Valley in Benin

LESSE, Paolo
Gestion et modélisation de la dynamique des parcours de transhumance dans un contexte de changement climatique au nord-est du Bénin

LOKONON, E Bruno

Assessing local conservation priorities of useful woody species within agroforestry systems along Ouémé catchment in Benin

MENSAH, Sylvanus

Assessing effects of abiotic and biotic factors on the early recruitment of an endangered African tree species: *Azelia africana* Sm. (*Caesalpinia-ceae*) in Benin

MOUMOUNI MOUSSA, Ismail

Understanding the role of agricultural innovation in social transformation: the case of organic cotton in Glazoue district, Benin

NAGO, Sèdjro Gilles Armel

Impact of land use on amphibian reproductive performance in the Pendjari Biosphere Reserve in Benin: implications for conservation and management

OLODO, Mondukpè Victorine

Analysis of technical and economic performance of some cultural practices of agricultural soil fertility conservation in northern Benin

OROBIYI, Azize

Investigation ethnobotanique, caractérisation agromorphologique et évaluation agronomique de *Sphenostylis stenocarpa* (African yam bean) pour la promotion de sa culture au Bénin

PADONOU, Elie Antoine

Impact of land use on future extension of bowé in Benin

RITA, Houngue

Fonctionnement hydrodynamique d'un lac côtier tropical: cas du lac Nokoué dans le delta de l'Ouémé au Bénin

SOCLO, Wilfried Parfait

Etude de la variabilité spatio-temporelle des paramètres hydrodynamiques dans la zone non saturée du plateau d'Allada: modélisation des flux pour une gestion rationnelle des ressources souterraines

WABI, Moudjahid Akorede

Evaluation des potentialités agronomiques et économiques des systèmes de culture à base de riz (*Oryza sativa* L.) ayant comme précédent cultural *Sesbania rostrata* (Bremek. & Oberm.) au Bénin

YABI, Biaou Francis

Biodiversité et caractérisation écologique de l'avifaune des forêts galeries au Bénin

ZANDAGBA, Esdras Babadjidé Josué

Gestion intégrée des ressources en eau du delta de l'Ouémé

BOLIVIA

CRESPO MELGAR, Carla Fabiana

Bioflavour production from citrus waste through fermentation technology

SORIANO CANDIA, Marlene

Quest for ecological sustainability and management of terra firma forests in the Bolivian Amazon

VALDIVIA, Sergio

Plant-plant interactions along a wide aridity gradient: a study through a detailed spatial pattern analysis

BRAZIL

DANIEL, Juliana Feijó de Souza

Biotransformation of insecticides thiametoxan and flubendiamide by fungi and laccase activity

BURKINA FASO

BAGRE, Touwensida Serge

Antibiotypage de *Salmonella* sp. et *Escherichia coli* isolés des produits laitiers au Burkina Faso

BOUDA, Soutongnooma Caroline

Caractérisation des souches aviaires domestiques et sauvages de *Escherichia coli*, *Salmonella* spp et *Campylobacter* spp au Burkina Faso

DIALLO, Amadou

Dynamique et distribution spatiale des agents pathogènes du chancre bactérien des agrumes au Burkina Faso; information, sensibilisation des acteurs de la filière agrumicole sur la maladie

DOAMBA, Flore Sabine

Effet des feux de brousse sur les activités biologiques et l'émission des gaz à effet de serre en savane ouest africaine

KIEBRE, Zakaria

Diversité génétique et valeur ethnobotanique de *Cleome gynandra*, un légume indigène en protoculture au Burkina Faso

OTOIDOBIGA, Cécile Harmonie

Contribution à la réduction et au contrôle durable des toxicités ferreuse et sulfureuse du riz irrigué par le drainage de subsurface, le mode de fertilisation et la sélection variétale au Burkina Faso

POODA, Sié Hermann

Effets des traitements à l'ivermectine sur la survie, la fécondité et la compétence vectorielle des glossines, vectrices de la *Trypanosomose animale africaine*

ROUAMBA, Ablassé

Evaluation du potentiel gènoprotecteur et cytoprotecteur de molécules isolées du fruit de *Detarium microcarpum* Guill. et Perr. (*Caesalpinia-ceae*)

SANOUE, Lassina

Restauration écologique dans les aires protégées

gées pour la conservation de la biodiversité et le développement rural au Burkina Faso

TINGUERI, Béatrice

Evaluation de la résilience des peuplements naturels et des capacités de reproduction de *Lannea microcarpa* en vue de son exploitation durable

TRAORE, Amadou

Use of phenotypic and molecular approaches to identify genetic variation underlying parasite resistance in Djallonké and Sahelian sheep of Burkina Faso

CAMBODIA

KET, Pinnara

Soil water flow simulation of surface drip irrigation using the combination of water budget and soil measurement-based scheduling methods

CAMEROON

DJAOUA, Moussa

Factors of annual resurgence and transmission patterns of cholera outbreaks in north-Cameroon

DOLINASSOU, Souina

Evaluation de l'interaction génotype x environnement de quelques caractéristiques physicochimiques des graines d'arachide (*Arachis hypogaea* L.) en zone soudano-sahélienne du Cameroun

FAYE, Adama

Impact des changements climatiques du passé sur les forêts tropicales humides d'Afrique centrale: phylogéographie de deux espèces de palmiers de sous-bois du genre *Podococcus*

FOTIO LAMBOU ÉPSE TONFACK, Agathe

Effect of extracts of *Agauria salicifolia* (*Ericaceae*) on liver diseases, *in vitro* and *in vivo*

JIOFACK TAFOKOU, René Bernadin

Domestication et gestion des populations *Tetracarpidium conophorum* (*Euphorbiaceae*) dans les systèmes Agroforestiers au Cameroun

KAMENINGOUNOU, Michel Bernard

Fuite des métaux lourds des boues de potabilisation d'eau flocculées par des polymères Cameroon

KONSALA, Souare

Natural regeneration and distribution of a key resource species of NTFP in Cameroon: a case study of *Xylopia aethiopica* A. Rich in Mbam Djerem and Mbere National Parks ecoregions

LIBALAH, Moses Bakonck

Influence of filters and traits on community assemblage and coexistence of trees in Central African forests; a case study in Cameroon

MAFFO MAFFO, Nicole Liliane
Influence des activités anthropiques sur la qualité des plantes médicinales de la zone littorale du Cameroun

MAKOMBU, Judith G.
Morphological and molecular identification of fresh water prawn of the genus *Macrobrachium* in the southern region of Cameroon

NDONTSA, Blanche Laure
Phytochemical and anticancer activity investigation of *Ardisia koupensis* Taton, *Ardisia etindensis* Taton and *Ardisia dolichocalyx* Taton from Cameroon

NFOTABONG ATHEULL, Adolphe
Dynamique spatio-temporelle des propagules de *Rhizophora* spp. dans les zones non, peu et très anthropisées de l'estuaire du Wouri

NGUIAMBA, Roger
Traitement des eaux de consommation par les membranes céramiques produit à partir des argiles du Grand Nord Cameroun

NKOUAM TSOPJIO, Francine
Déchlorophyllation par électrocoagulation des extraits de *Anthocleista schweinfurthii* et études phytochimique et pharmacologique

NTANGMO TSAFACK, Honorine
Impact sanitaire des eaux polluées d'arrosage du maraîchage urbain à Dschang (Cameroun)

SANDJONG SANI, Rodrigue Constant
Etudes écologiques et floristiques du Parc National de Mozogo-Gokoro (Cameroun): simulations de sa trajectoire pour sa conservation et son aménagement

SEUMO TCHEKWAGEP, Patrick Marcel
Electrochemical monitoring of arsenic contamination in rice and water around rice cultures in Cameroon

YVES ACHILLE, Amougou Ndi
Equations allométriques et séquestration du carbone par quelques essences forestières exploitées au Cameroun

ZOFOU, Denis
Developing new antimalarial drug candidates from selected products identified from Cameroonian medicinal plants

CHINA

FENGJIE, Cui
The Role of VFAs in the developed solid-state anaerobic digestion (SS-AD) of corn stover and its regulation mechanism

ZHANG, Yuejin
Study on the micro-combination mechanism between soil organic matter and polycyclic

aromatic hydrocarbons and nitrated polycyclic aromatic hydrocarbons

COLOMBIA

GUTIÉRREZ, Pablo Andrés
Sequencing of RNA viruses infecting an indigenous potato (*Solanum phureja*) to support future seed certification programmes in Colombia

ROA-GARCÍA, Clara Eugenia
Plantation forest impacts on soil water retention and water yield

CONGO

BOUKA DIPELET, Ulrich Gaël
Structuration de la biodiversité des forêts africaines et changements climatiques : une étude à travers le genre *Khaya* (Meliaceae), Congo, DR

AMZATI, Gaston Sefu
Eco-épidémiologie de la theileriose bovine dans les pays de la région des Grands Lacs: étude de la diversité génétique des populations de *Theileria parva* et de *Rhipicephalus appendiculatus*

CÔTE D'IVOIRE

AHOUA, Angora Remi Constant
Automédication et alimentation des primates: potentiels dans le contrôle du stress oxydatif chez l'homme

ASSOHOUN, Nanouman Marina Christelle
Evaluation des propriétés technologiques des souches de bactéries lactiques productrices de bactériocines isolées de la fermentation de pâtes de maïs

BEUGRE, Etienne Yves-martial
Viscosité et biodigestion anaérobie en milieu de digestion sèche

BROU, Kouakou Fulgence
Diversité génétique et identification des QTLs des principales composantes de rendement chez la cucurbitacée oléagineuse *Citrullus lanatus* (Matsumura & Nakai) en Côte d'Ivoire

EGUE, Aneme Ninka Laurence
Diversité et pathogénicité des espèces du genre *Candida* isolées du vin de palme produit en Côte d'Ivoire

JOFAK SOKENG, Valere-Carin
Apport de la télédétection, des SIG et des réseaux de neurones à la gestion des ressources en eaux de la ville de Yaoundé (Centre du Cameroun)

KONE, Ngolo Abdoulaye
Identification des sanctuaires de champignons sauvages utiles (comestibles et médicinaux) et stratégies de conservation durable et participative de leurs habitats

KOUAKOU, Amenan Clémentine
Diversités moléculaire et phénotypique des souches de *Saccharomyces cerevisiae* isolées des boissons traditionnelles fermentées de Côte d'Ivoire

KOUONON, Léonie Clémence
Etude de la biologie de reproduction, de la diversité génétique de deux congénères de *Lophira* (*Ochnaceae*) et leurs implications dans la mise en oeuvre d'une stratégie de conservation

MOUSSAN FRANCINE DÉsirÉE, Ake
Etude de la diversité des bactéries lactiques isolées de la sève de différentes espèces de palmier en vue de la sélection de potentielles cultures starters

N'DRI, Aya Brigitte
Perte d'éléments nutritifs en agriculture itinérante sur brûlis dans un contexte de forte croissance démographique en savane Guinéenne de Côte d'Ivoire: cas de la région de Lamto

CUBA

GONZÁLEZ BACERIO, Jorge Oscar
Identification of mechanisms of action of bestatin-based mimetic-peptides, M1/M17 aminopeptidase inhibitors, on inhibition of the in vitro growth of *Plasmodium*, *Trypanosoma* and *Leishmania* parasites

ETHIOPIA

ABATE SHAWUL, Alemayehu
Modelling the impacts of land cover change on water resources and soil erosion of the Bale mountainous region, Ethiopia

ADNEW, Mekonnen
Detection of trends in extreme hydrological events for Ethiopian rivers

AMARE MEKONNEN, Muluken
Management of sustainable floodplain grazing and water resource development in south-western Ethiopia

ASMAME MIHERETU, Birhan
Farmers' land management practices in the Galana Sub Watershed, Northern Highlands of Ethiopia: implications for sustainable agricultural production

ASSAYE, Fekadu Melak
Development of mineral-based water treatment media

ATNAFU, Tesfalem
Determination and enumeration of *Cryptosporidium* oocysts and *Giardia* cysts from untreated household drinking water systems (hand-dug wells and boreholes) in rural and urban areas of the Oromia region.

BEDEKE, Sisay Belay

Climate change perceptions and adaptation strategies: implications for smallholder farmers' food security in the Wolyta Zone of Ethiopia

BIRU WOLDEGIORGIS, Yihew

Studying the interaction between livestock and wildlife in Awash National Park, Eastern Ethiopia

DAGNEW, Dessalegn Chanie

Hydrologic and sediment yield responses of large-scale soil and water conservation programmes in the Debre Mawi Watershed, Upper Blue Nile Basin

FANTA ABEBE, Meseret

Agro-morphological diversity and biochemical analysis of Ethiopian potato, *Plectranthus edulis* (Vatke) Agnew

GIRMA, Zerihun

Biodiversity conservation and human livelihoods in the new Arsi Mountains National Park, Ethiopia

KEBEDE BESHAWORED, Mamo

Reproductive ecology and population dynamics of four Afromontane tree species in south-eastern Ethiopia: implications for forest ecosystem conservation and restoration

MAMARU, Moges

Assessment and evaluation of the non-point source by measuring water quality and using watershed modelling in the Lake Tana Sub Basin, Upper Blue Nile Basin

MERSHA, Adey Nigatu

From premise to practice: integrated water resources management for sustainable irrigation development in the Upper Awash River Basin, Ethiopia

NEGASSA, Selamawit

Application of biochar as a cost-effective biosorbent for coffee waste water treatment

SETA SHANKA, Talemso

Floristic diversity and carbon stocks of montane forests in Gurage Mountain Chain, Ethiopia

SHIMELSE JEMANEH, Samson

Carbon sequestration and plant biodiversity in the enclosures of restored vegetation in Tigray, Ethiopia, and its implication in climate change mitigation

TESFAYE, Wondimagegn Mesfin

Farm level socio-economic impacts of conservation agriculture and agroforestry in the context of climate change: the case of the Central and Eastern Highlands of Ethiopia

TULU, Fikirte Demissie

Options and planning for natural forest cover increase around Lake Tana Basin

WASSIE ANTENEH, Melkamu

Fish community effects of the recently infested non-indigenous aquatic plant, water hyacinth (*Eichhornia crassipes*), in the shore areas of Lake Tana, Ethiopia

WORKNEH, Birhanu

Preventative, suppressive and curative *in vivo* antimalarial and *in vitro* antioxidant activities of endemic Aloe species of Ethiopia

YIRGA ABAY, Gidey

Abundance, conflict, diet and human perception of lions (*Panthera leo*) conservation in Awash, Nechisar and Chebera Churchura National Parks, Ethiopia

GHANA

AMANING KWARTENG, David

Population size and habitat use of the endangered Bobiri reed frog, *Hyperolius bobirensis*, Ghana

AMEYAW, Elvis Ofori

Isobolographic studies of the antimalarial properties of xylopic acid and cryptolepine co-administration

GIBRILLA, Abass

Stable isotope composition of precipitation over Ghana

SABA, Courage Kosi Setsoafia

Antimicrobial resistance pattern in food-producing animals in the northern region of Ghana

KENYA

KIMOSOP, Selly Jemutai

Phytoremediation of pharmaceuticals in waste water treatment plants: a case study in western Kenya

MAINA, Caroline Wangeci

Reservoir survey using a multi-frequency acoustic profiling system for sustainable catchment management and development

MAKONDE, Huxley Mae

Microbial biodiversity, biogeography and their potential for nutrient cycling and waste bioremediation in mangrove ecosystems: a case study in Gazi Bay and Tudor Creek, Kenya

MASHEDI, Olga Mukasia

Genotypic and phenotypic characterisation of *Fusarium* species from soils in mycotoxic "hot zones" in Eastern province, Kenya

MZINGIRWA, Fatuma Ali

Connectivity of *Lutjanus argentimaculatus* in marine protected areas and the adjacent open fishing zones of the Kenyan coast

NALUYANGE, Victoria

Relationships between *Rhizobium leguminosarum*, *Colletotrichum lindemuthianum* and *Aphis fabae* in common bean

ODAK, Jenipher Akinyi

Relationship of mite infestation levels in Kenyan tea to overhead volatile organic compounds and their variations with cultivars, N-fertiliser rates, seasons and region of production

OTWOMA, Levy Michael

Assessment of larval dispersal and connectivity in threatened grouper populations (*Epinephelus coioides*, orange-spotted grouper and *E. malabaricus*, (malabar grouper) along the East African coastline

MADAGASCAR

FANJANIAINA, Marie Lucia

La spectrométrie infrarouge comme outil de caractérisation des flux de biomasse et de nutriments et l'efficacité des transferts de fertilité dans les exploitations agricoles malgaches

RAKOTOVAO, Harisoa Narindra

Empreinte carbone d'exploitations agricoles et séquestration du carbone dans le sol suite à l'adoption des pratiques agroécologiques en milieu paysan - Région Itasy, Hautes Terres Centrales Madagascar

RAVELOSON, Harinjaka

Durabilité de la résistance à la pyriculariose d'une variété tolérante déployée massivement sur les Hautes Terres du Vakinankaratra

RAZAFINDRAKOTO, Malalatiaina

Conséquences fonctionnelles des interactions entre vers de terre et microorganismes sur la disponibilité du phosphore dans les systèmes agricoles de la Haute Terre malgache

MALI

BENGALY, Souleymane

Fluctuations climatiques, dynamique des états de surface et écoulement dans le bassin versant de Sankarani au Mali: approches de la géoinformation

SANOGO, Kapoury

Potential of the shea tree (*Vitellaria paradoxa* C.F.Gaertn.) for carbon sequestration in agroforestry parkland systems and improved rural livelihoods in southern Mali

TEKETE, Cheick

Caractérisation des *Xanthomonas oryzae* pv. *oryzicola* pour l'identification de sources de résistance variétale du riz à la strie foliaire

MONGOLIA

CHULUUNBAT, Svudtsetseg

Monitoring of water quality and benthos in the Kherlen river

GANTSETSEG, Tumuruu

Characterisation and risk analysis of "mec A" positive *Staphylococcus aureus* isolated from animal products, environments and humans

TSOGTGEREL, Munkhtuul

Primer design of meat of some carnivores and domestic animals

MOROCCO

AIT BENICHOUE, Samah

Impact du centre d'enfouissement technique de la ville d'Al Hoceima sur les ressources hydriques

YAHYAOUI AZAMI, Hind

Investigations sur les souches responsables de tuberculose bovine au niveau des abattoirs au Maroc

MOZAMBIQUE

MUCACHE, Hermógenes Neves

Immunopathology of *Trypanosoma vivax* infections in cattle: cytokine profiles and cellular responses

NEPAL

MAINALI, Janardan

Drought vulnerability assessment in the southern region of Ramechhap district, central-east Nepal

PAUDEL BHATTARAI, Babita

Investigation of antimicrobial, anticancer and antioxidant secondary novel metabolites from lichens and their endophytes from high altitude regions of Nepal

PAUDEL, Mukti Ram

Micropropagation and anticancer activities of *in vitro* callus and *in vivo* *Dendrobium longicornu* Lindl.

POKHAREL, Dipendra

Screening wheat (*Triticum aestivum* L.) germplasm and detection of genetic variation for drought adaptation in Nepal

SHRESTHA, Bharat Babu

Impact of Parthenium weed on plant species composition and forage productivity of pastures in Nepal

THAPA, Gunjan

Synthesis of modified super paramagnetic iron oxide nanoparticles adsorbent and evaluation of its efficiency for arsenic removal from ground water samples of Nepal.

NIGER

MOUMOUNI DAN MAIRO, Adamou

Caractérisation biologique, morphométrique et génétique des souches nigériennes de *Bruchidius atrolineatus*, ravageur du niébé (*Vigna unguiculata* Walp.) en zone sahélienne

MOUSSA, Massaoudou

Potentiel de séquestration et stocks de carbone des parcs agroforestiers à *Faidherbia albida* (Del.) A. Chev. et *Prosopis africana* (Guill., Perrot et Rich). Taub. du Centre-sud du Niger

ZANGO, Oumarou

Etude de variations de rythmes de croissances et élaboration d'un modèle ontogénique et architecturale du palmier dattier (*Phoenix dactylifera* L.) au Sahel

NIGERIA

ADEYEMI, Oluyomi Adeyemi

In vivo and *in vitro* evaluation of nanoparticles for selective trypanolytic activity

ADOWEI, Pereware

Adsorption of synthetic organic chemicals using carbonised and surface-modified nipa palm (*Nypa fruticans* Wurmb) leaves

AGBELADE, Aladesanmi Daniel

Biodiversity and socio-economic assessment of trees in some selected urban and peri-urban centres in Nigeria

AJAERO, Chukwuedozie Kelechukwu

Flood-induced migration and food security status of migrant female-headed households in rural communities of Anambra State, Nigeria

BABATUNDE, Bolaji Benard

Application of nuclear techniques for pollution history reconstruction and ocean acidification monitoring

EMESE, Anthony

Investigations into the genetic control of oil sorption capacity in Kenaf (*Hibiscus cannabinus*) towards efficient cleaning of oil spills

OBUEKWE, Ifeyinwa Sarah

Assessment of biodegradation of 2,4-dichlorophenoxyacetic acid and derivatives of environmental concern

OLATUNJI, Ololade

Application of biopolymer from fish scale for microneedles production

OLUJIMI, Olanrewaju Olusoji

Determination of phthalate esters, bisphenol A and nonyl phenols in soil and leachate samples and toxicity assessment of leachates: a case study of dumpsites in Ogun State, Nigeria

OMONIWA, Babasoji Percy

Evaluation of aqueous extract of *Cissus populnea* Guill & Perr (*Amplidaceae*) stem for reproductive and toxicological effects

YILANGAI, Rahila Meribah

Role of forest cover and species diversity in watershed services in a protected Nigerian reserve

PAKISTAN

AFZAL, Muhammad

A plant-bacterial synergistic strategy to improve degradation of synthetic textile dyes in constructed wetlands

ARIF, Muhammad Saleem

Development of biofilm forming rhizobacterial biofertiliser for drought resilient soil-plant systems of maize

AZAM, Syed Sikander

Exploring the effectiveness of natural products against druggable targets from pathogenic bacterial genomes

AZEEM, Farrukh

Regulation of HKT transporters and salinity tolerance in rice

CHEEMA, Hafiza Masooma Naseer

Characterisation of cucumber (*Cucumis sativus*) germplasm for biotic stress and innate immune response

CHEEMA, Sardar Alam

Assessment of persistent organic pollutants contamination in soils and crops irrigated with wastewater

IHSAN, Ayesha

Development of fluorescence turn-off sensor for heavy metals detection

JAMIL, Nazia

Analysis of purified bioplastic from indigenous bacteria for *in vitro* cell culturing

MASOOD, Farha

Synthesis and characterisation of biodegradable nanocomposites for commercial food packaging applications

MEHMOOD, Muhammad Aamer

ABC-transporter mediated secretion of heterologously synthesised biofuel

MUSTAFA, Ghulam

Characterisation and over-expression of sugarcane derived Scdr1 gene in sugarcane to combat abiotic stresses

NIAZI, Nabeel Khan

Assessment of arsenic risk from arsenic-contaminated water, soil and food/fodder crops around agricultural areas of Punjab, Pakistan

QAYYUM, Muhammad Farooq

Immobilisation of cadmium in sewage-irrigated soil by using biochar of agricultural wastes

QAZI, Waqas Ahmed

Observation of ocean upwelling and biogenic slicks through spaceborne SAR

REHMAN, Asma

Preparation of macroporous composite materials for heavy metal removal from wastewater

SHAKOOR, Sadia

Assessment of potable water microbiological quality and antibiotic resistance of indicator organisms in peri-urban slums of Rehri Goth and Bhains Colony, Karachi, Pakistan

SIDDIQUI, Hina

Synthesis of novel harmaline analogues as potent inhibitors of multi-drug Resistant *Escherichia coli*

ULLAH, Aziz

An integrated approach to improve water quality in war-affected areas of southern Khyber Pakhtukhwa and adjacent tribal agencies, Pakistan

ZAFAR BAJWA, Sadia

Development of smart sensors for the detection of veterinary drug residues in human food

ZUBAIR, Muhammad

In vitro wound healing activities of purified compounds from *Plantago major* leaf extracts

PHILIPPINES

FAJARDO, Analinda

Foraging sources of *Apis andreniformis* Smith in Palawan, Philippines

RWANDA

KARAME, Prosper

Bioinformatics-led solutions for sustainable natural resource management, Nyabarongo Wetlands, Rwanda

SENEGAL

DIATTA, Jeanne

Vers la maîtrise du rendement et de la qualité de la mangue au Sénégal: déterminants de la floraison, fructification, et impact de pratiques culturales et de facteurs environnementaux

GUEYE, Amadou

Research for the development of business-oriented solutions for faecal sludge treatment in Dakar (Senegal)

SYLLA, Elhadji Serigne

Invasion de la mineuse de la tomate, *Tuta absoluta*, en Afrique sub-saharienne: dynamique, niche écologique et potentiel de régulation biologique

SRI LANKA

SAMARAWEERA MUDIYANSELAGE,

Chandima Himali

Effect of egg coatings on internal quality and shelf-life of eggs stored at ambient temperature

VITHANAGE, Meththika Suharshini

Chemical and environmental micropollutant determination in hospital effluents in Sri Lanka: implications for its treatment using economical materials

ZIYATH, Abdul M

Quantitative assessment of aquatic ecosystem health risks imposed by atmospheric particulates in urban areas

SUDAN

ELSHEIKH, Eman Rahamtalla Ahmed

Optimisation of agricultural water productivity under different water conditions: the case study of the Gezira Scheme, Sudan

TANZANIA

ABEL, Daniel

Reconstruction of heavy metals and radionuclides pollution history in the Msimbazi estuary by radiometric dating

INNOCENT, Ester

Phytochemical studies of mosquito larvicidal compounds from ethanol extracts of four *Kotschyia* species

MGOODE, Georgies

Role of rare mole rat species co-existing with humans in northern Tanzania in transmission of neglected zoonotic diseases

TOGO

BADJANA, Heou Maleki

Climate variability, land use dynamics and water resource vulnerability in the Kara river basin, Togo

DAGNON, Yao Dodzi

Caractérisation agro-morphologique et moléculaire des variétés locales de niébé cultivées au Togo

DANSOU-KODJO, Kodjovi Atassé

Molecular characterisation of begomoviruses and their vector *Bemisia tabaci* (Genn.) on vegetable and food crops in Togo

KODJO, Napo 3è

Analyse de l'impact de la diffusion des teckeraies sur la dynamique spatio-temporelle de la structure du paysage de la région des plateaux au Togo

NYAMETSO, Akouèté Yawovi

Contribution à la connaissance de l'hydrogéochimie et de la vulnérabilité à la pollution des aquifères superficiels du bassin sédimentaire côtier du Togo

SEGLA, Kossi Novinyo

Etude des peuplements naturels de *Pterocarpus erinaceus* au Togo: structure démographique et qualité technologique du bois

TANOUIYI, Gnon

Utilisation des géomatériaux locaux dans la dépollution des eaux

TUNISIA

ABDELKADER, Sana

Development of new wastewater treatment processes for water recycling in the food industry

HAIFA, Feki

Impact du changement climatique sur les ressources en eau et les extrêmes hydrologiques dans le bassin de la haute vallée de la Medjerda

OURTENI SP. HACHICHA, Rim Nefissi

Biochemistry and gene expression level studies of salt tolerance within Tunisian barley accessions

UGANDA

BULAFU, Collins E

Diversity, population structure and regeneration potential of *Acacia senegal* (L.) Willd. in forest reserves in central and northern Uganda

GUMISIRIZA, Robert

Enhancement of a "biofox" bioreactor system for improved biogas production from fish processing wastewater generated along shores of Lake Victoria

LUBWAMA, Michael

Development of rice and coffee husk briquettes as sustainable fuel sources for domestic cooking applications in Uganda

MENYA, Emmanuel

Investigating the effect of co-digestion of cassava peel with cow dung and pig dung on biogas production

VIETNAM

DINH BAO, Truong

Méthodes participatives dans la surveillance et la lutte de la fièvre aphteuse: comment mieux impliquer les éleveurs à l'échelle locale?

DUC, Nguyen Minh

Genetic conservation and sustainable management of threatened dipterocarps (*Dipterocarpaceae*) in tropical forests in South Vietnam

DUONG, Thi Thuy

Human activities and climate effects on phytoplankton and periphytic communities in the Red River system, Vietnam

HAN, Quang Hanh

Welfare quality, productivity and meat quality of broiler chickens kept in different production systems in North Vietnam: an assessment of household farms and experimental farms

LUU, Thi Nguyet Minh
Nutrient transfers along a river continuum to estuarine and coastal sea: risk of eutrophication evaluated by the ICEP approach

NGUYEN VU PHONG,
Host-induced gene silencing for root-knot nematode resistance

NGUYEN, Huy Thuan
Biosynthesis and optimisation for production of two flavonoid glycosides by statistical algorithms (Plackett-Burman and Response Surface Methodology - Central Composite Design)

NGUYEN, Thao Suong
Impact of host stress hormones towards virulence factors of *Vibrio parahaemolyticus* – the infectious agent causing shrimp early mortality syndrome in the Mekong delta, Vietnam

NGUYEN, Thuy
An assessment of the significance of spatial and temporal changes of wetlands and wetland ecology using remote sensing and GIS in the Red River estuarine area, Vietnam

PHAM Thi Thanh Mien
Research on impacts of biological, chemical and

mechanical treatments on agarwood formation in stems of planted *Aquilaria crassna* trees to contribute to poverty reduction in Vietnam

PHUONG, Nguyen Hoang Ngoc
Creation of *Bacillus subtilis* strains to hydrolyse cellulose by using mini-cellulosome from *Clostridium sp.*

SON, Ngo Thanh
Modelling land use and climate change impacts on hydrological processes and soil erosion of the Nam Rom River Basin in Vietnam while considering sustainable natural resource management

TA, Thi Minh Ngoc
Preparation of novel pre-formed natural coating material from fish waste to produce pro-vitamin A encapsulates for use in food and supplements.

THUY Mai Thi Phuong
Genetic diversity analysis of five-needle pine (*Pinus kwangtungensis* Chun ex Tsiang) in Hang Kia - Pa Co Nature Reserve, Vietnam, using molecular genetic markers

TRAN DUC, Hau
Importance of the Kalong Estuary located in northern Vietnam as a nursery ground for fish

ZIMBABWE

DUNJANA, Nothando
Evaluating the potential of vermicomposting farmyard residues for use as organic soil amendments in maize and tomato production under smallholder farming systems

MANGOMA, Ngonidzashe
The use of mutagenesis breeding in grain sorghum to improve its flavonoid and condensed tannin profile and nutritional value.

MANZEKE, Muneta Grace
Agronomic fortification with zinc fertilisers for enhanced nutritional quality of staple cereals in Southern Africa

MLAMBO, Sibonani Sandra
Use of integrated biomarker response in largemouth bass (*Micropterus salmoides*) to determine endocrine disruptive activity and health risks in the Manyame catchment area

MTALI, Linda
Prospects for increasing the productivity of fallow land in communal areas and implications for sustainable land management in Zimbabwe



SUPPORTING YOUNG RESEARCHERS IN DEVELOPING COUNTRIES

The International Foundation for Science (IFS) supports scientific capability building in developing countries. It gives research grants and supporting services to young scientists at the beginning of their research careers. IFS was established as a non-governmental organisation in 1972, is funded by the academic, development and private sectors and has provided over 7,875 grants to researchers in 105 countries.



INTERNATIONAL
FOUNDATION FOR
SCIENCE

Karlavägen 108, 5th floor, SE-115 26 Stockholm, Sweden
Phone: +46 (0)8 545 818 00 | Email: info@ifs.se | www.ifs.se