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Developing Science IFS 30 YEARS Science for Development

Ebbe Schiøler

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30 Years and Going Strong

THE INTERNATIONAL FOUNDATION FOR SCIENCE is now celebrating 30 years of working with young scientists in developing countries and providing them with competitive research grants. The first grant was awarded in 1974 to N'guessan Kouassi at the University of Abidjan for studies on introducing intensive fish farming to lakes in Côte d'Ivoire. Dr. Kouassi received a PhD in the course of his IFS-funded research and became an established scientist at his university.

Over the years, IFS has awarded research grants to some 3,500 young scientists throughout the developing world. In this booklet we present the scientific careers of just 33 of our grantees, as told by Ebbe Schiøler, a Danish science journalist and former chair of the IFS Board of Trustees. These exciting stories illustrate that scientific excellence can be achieved at academic institutions in even very poor countries. They show how determined and innovative researchers can, with a bit of external support at critical moments in their careers, overcome discouraging conditions and launch dynamic research programmes – often with profound positive effects on the local agriculture, environment and economy.

IFS grants go to individuals, but always in an institutional context. The bulk of the grant (12,000 USD) is used to purchase scientific equipment and supplies for experiments and laboratory analyses. The equipment is installed at the grantee's department and remains the property of the research institution when the project is completed.

Our stories show how an individual IFS grant can become a rallying point for the establishment of a research team in the grantee's department. While the immediate goal of an IFS grant is to strengthen the academic competence of the individual, his or her institution is simultaneously strengthened by the addition of new equipment, access to current literature, the formation of research teams, and much more.

It would be an exaggeration to link all the scientific progress mentioned in this booklet to IFS funding alone. Nevertheless, so many of the grantees themselves say, "Had it not been for this first grant...", "IFS opened the gateway to my career...", and many other words to that effect. In different ways, IFS support came at decisive moments in careers that otherwise might have stalled or led to brain drain.

You will find veterans and established scientists profiled here, as well recent graduates and their encouraging results. At the age of 30, we at IFS are not only taking stock of a rewarding past, but are letting you know that there are many more stories in the pipeline, waiting to be told on another occasion.

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Michel Ste

Michael Ståhl Director September 1, 2002 Stockholm, Sweden

Bridge over Troubled Waters





Felixtina Jonsyn Ellis

AN ACADEMIC LIFE STORY can always be summarised in a brief, matter-of-fact statement such as: "My university career spans a period of 22 years, from lecturer at Njala University College, University of Sierra Leone in 1980 to Associate Professor and Acting Dean of the Faculty of Science and Agriculture, University of the Gambia in 2002."

But add words like civil war, invasion of the university campus, narrow escape, and you understand that there is much more to Felixtina Jonsyn Ellis' modest career summary.

Based on her national training as a biologist, Jonsyn Ellis took an early interest in the often overlooked health problems caused by mycotoxins. Well known by many of us as the "poisonous compounds" produced by moulds, mycotoxins are found in a number of foods and food ingredients if they have not been handled carefully in all links of the food chain.

To understand these complex linkages was, of course, very much a laboratory effort – if one had a decent laboratory fitted for the purpose. This was definitely not the case at the Njala University College back in the 1980's, but – surprise, surprise – an active Head of Department linked Jonsyn Ellis with IFS, which provided an initial grant of 10,000 USD in 1986 for Jonsyn Ellis' research.

These most welcome funds turned the laboratory rooms into a very popular working facility that became the foundation for the Microbiology Unit in her department of Biological Sciences. Not only her own department benefited – students from Agriculture and Chemistry also took advantage of the new equipment, making it possible for them to undertake obligatory research work for their degree work.

Jonsyn Ellis herself received another bonus from her IFS involvement. With badly needed travel grants, she attended work-

shops and conferences and met with a senior IFS Scientific Adviser who, as Jonsyn Ellis puts it, "pioneered my doctoral work".

IFS added a second grant in 1990, the same year that she was promoted to Senior Lecturer at her university. Jonsyn Ellis published the results from her research and was now counted as part of an elite group regionally and internationally working on mycotoxins. She was appointed to advisory positions in the US and by WHO, and received a British Council Overseas Study Award.

Her speciality came to good use both in the country and the region, because an important problem was how to disseminate the findings on safe treatment of foods to avoid the dangers of aflatoxins, by using the mass media to reach ordinary citizens.



Disruption and a new start

In the middle of her steadily advancing career, much bigger dangers came along during the 1990's with the increasing troubles involving the rebel army in Sierra Leone. An attempt to set up a WHO sub-regional programme on mycotoxins – related to Jonsyn Ellis' then current interest in child diseases – came to nothing because of the war, and one of her national programmes related to agriculture was stopped for the same reason.

In 1995 her campus was invaded by the rebel forces, and she got away with only a few personal belongings to Freetown. The rebels pulled out of the university but came back five times, and by 1997 not even Freetown was exactly free; the rebels invaded it and Jonsyn Ellis, like so many others, fled to neighbouring Gambia.

Luckily she brought many of her research findings with her and was able to publish in her new surroundings – without an institutional affiliation, without a research programme and with no job. And this is where IFS played a large and important role. Perhaps not in total keeping with its standard criteria, IFS continued to fund Jonsyn Ellis' participation in international workshops and conferences, keeping her scientific value on par, so to speak, during those difficult years.

And the reward was her appointment, in 2000, as an Associate Professor at the newly established University of the Gambia, her new homeland, where she is presently Chairperson of the Committee of Deans.

In development jargon you can talk about many kinds of money, and quite often IFS funds act as "seed money", to set a career in motion. Professor Jonsyn Ellis' story certainly qualifies here. But there is also talk of "bridging funds", usually small sums invested by a friendly and flexible donor, making sure that a project does not vanish for bureaucratic reasons while waiting for the paper-





...worthy of comment is the manner in which IFS has supported, encouraged and sustained an interest in my career particularly through the discouraging years of the rebel war.

FELIXTINA JONSYN ELLIS, SIERRA LEONE

work for the next phase to be processed. Let's call it "special bridging funds" here. And then there is, of course, regular venture capital, taking a risk against the odds, which also applies here – although the odds seemed pretty fair in this case.

Professor Jonsyn Ellis no doubt has all these terms on her mind, and much more, when she expresses her gratitude for the IFS "in-depth assistance" in the development of her scientific career. And quite obviously an investment in "a role model for young female African scientists." FELIXTINA JONSYN ELLIS tinajonsyn@hotmail.com

PHOTO: FAO/R. FAIDUTTI

Hot and Cold Success



IFS donors and sponsors can rest assured that grants awarded to young scientists in the early part of their career... are ideal for initiating and stimulating research [and] will have the greatest impact and benefits to the recipients.

HOONG FONG CHIN, MALAYSIA



IN MALAYSIA, YOUNG BIOLOGIST Hoong Fong Chin came across the difficulties of storing grain legumes and horticultural crops, especially their seed. They were nearly always imported species, not adapted to local conditions. Local seed production was extremely limited and not based on scientific insight. So it was a question of starting again and coming up with better options.

One legume in the diet is beans, and the imported species had some superior features, but did badly in the field. So the trick was to breed some of their best characteristics into the domestic bean lines. This work was done in Dr Chin's laboratory.

In spite of their hardiness, many local varieties had a relatively low yield, and a number of improvements in culture techniques and management practices were established and handed over to agricultural authorities. But the real setback for local beans – and many other vegetables – was their rapid deterioration when stored as seed. Research by Dr Chin documented that high moisture content was behind both loss of viability and attacks from pathogens or insects. Adjusting laboratory routines to simple, practical farm technology led to home drying of seeds, down to a 6% moisture level. Wrapped in plastic bags and kept in fluctuating Malaysian room temperatures, the beans could stay viable for months or years.

Chin listened to agricultural practitioners and IFS gave it's first support in 1977. Malaysia was in those days a developing country with a very limited scientific research budget, and nothing at all at Dr Chin's university. So the IFS support "came in timely to kick-start my career in agriculture," Dr Chin recalls.

An authority develops

By 1980 Dr Chin had built up a group taking a broader look at seed performance, conservation and germination. One intriguing problem was that of recalcitrant seeds. These stubborn, difficult and delicate seeds are extremely vulnerable, tolerating neither cold nor a spell of drying, making them hopeless to store. But many useful species, amongst others in forestry, have these seed characteristics, which prevent them from being used optimally, leading to replacement by less valuable species.

Professor Chin conceived and developed a technique of cryopreservation of embryos taken out of the seed to overcome this problem – at temperatures as low as -196°C. This has had both immediate practical results and has led to germplasm storage for many tropical crops that are of inestimable value. Rubber, coconut, jack-fruit, rambutan and ornamental plants are among the beneficiaries.

Given his contributions, Professor Chin has been much in demand during the later stages of his professional life as a consultant in plant genetic circles. And his list of honorary degrees and board positions would make any scientist blush. Currently he is an Honorary Research Fellow at The International Plant Genetic Resources Institute. Outside academic circles, Professor Chin has skilfully built public awareness of the importance of preserving biodiversity and handling natural resources with care. Hot or cold, an all-round success.

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Battle Stations



EACH YEAR DURING 1999-2001, IFS Silver Jubilee Awards went to at least one Moroccan scientist working on date palm resistance to the deadly Bayoud disease. Let us take the example of Professor Mohammed Baaziz of the Université Cadi Ayyad in Marra-kech, a biochemist who, upon returning from France in 1984, faced the challenge of preparing his PhD thesis under financial circumstances that were close to rock-bottom. Like so many young Moroccan scientists at this time, he got in touch with IFS after he had developed a promising line of research.

He received his first IFS grant in 1988 – the first of a series of three – which eventually led to the creation of a research group entirely devoted to the date palm. A visit to his department's web site will testify to the high productivity of the dedicat-

ed research team he has built up over the years, as well as to the importance of the initial IFS project grants. Several members of his group have also themselves become IFS grantees.

Now you may not be fully up to date on Bayoud disease and what it does to date palms. But you can probably guess how important date palms are in North Africa, producing valuable fruit for home consumption and export and having an important positive environmental impact in a desert climate. Bayoud disease is caused by a fungus invading the palm's roots, which can wither and kill it within as little as three years. Bayoud is therefore a nasty enemy that has caused considerable damage to date palm groves. Estimates go as high as two-thirds destruction of Moroccan groves since the beginning of the last century.

Mohammed Baaziz decided to identify date palm varieties resistant to the disease using the latest biochemical and molecular tools. Since date palms only produce a few offshoots during

their lifecycle, the next logical step after identifying strong palm candidates was to optimise artificial reproduction of these superior varieties, allowing the replacement of weak and dying date palms.

Leading one group of researchers at his university, Professor Baaziz has not only contributed to letting academia know about their many findings but has also been able to communicate the results to a non-scientific audience in his country. And as you might expect, Professor Baaziz has extended his international service as an active IFS Scientific Adviser since 1997.

The fight against Bayoud disease is not the concern of a single university, but of broad regional interest. Many researchers, including several IFS grantees, are working on the problem and information exchange and collaboration is vitally important. The next step in the battle against the Bayoud is to set up a national network of date palm researchers that can attack the enemy on a wide front, using best practices distilled from many laboratories. While Bayoud is not yet defeated, we don't doubt that the battle will eventually be won thanks to the work of Professor Baaziz and his compatriots.

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If only other donors could handle funds in the same easy way IFS does, I am sure that our productivity as scientists in countries such as Mexico, would be considerably higher.

ENRIQUE GALINDO, MEXICO

... To Continue Forever



WHILE IN DISCUSSION WITH his supervisor at the Laboratory for Plant Morphogenesis of Orsay University, France, back in 1977, Vietnamese plant bio-technologist Nguyen van Uyen expressed concern about the food prospects for his country. Vietnam was trying to recover from the recently ended war and relied on food imports of more than one million tons annually – just to survive.

An attractive tool for improving agricultural harvest statistics appeared to be tissue culture technology, but this was still regarded as advanced technology and seemed very difficult to transfer to the start-up facilities of post-war Vietnam.

During one of their discussions at their Institute, the National Centre for Scientific Research in Ho Chi Minh City, Nguyen recalls, "my professor handed me a small booklet on IFS and encouraged me to apply." That turned out to be a turning point of much greater magnitude than either of them could possibly have imagined. Nguyen's grant was the very first provided by IFS to a Vietnamese scientist, and it paid for setting up the first tissue culture laboratory in the country that same year, 1977. The target was potato propagation on a huge scale.

Well, not exactly in a laboratory setting. Space was provided in a recently abandoned hotel in downtown Ho Chi Minh City. This was the forerunner of what was to become the Laboratory of Cell Genetics and Tissue Culture. These non-traditional facilities appear to have stimulated the scientists around Nguyen in transferring their techniques to even more humble environments than would be the standard for most R&D.

The first phase, however, was rather like being at an assembly line at a "potato factory". In no time micro-propagation had been adapted to the facilities at hand



ROOTING OF CUTTINGS OF ROBUSTA COFFEE IN RICE HUSK – A METHOD OF PLANT PROPAGATION AT NGUYEN VAN UYEN'S LABORATORY

and organised on a large scale, so much so that distribution of healthy seed potatoes to farmers spread over the whole country. In two years 60% of all seed potatoes in Vietnam were derived from the new technique.

Taking it to the field

Nowadays tissue culture speaks for itself in most countries. It is a safe and speedy way to ensure healthy and vigorous planting material based on high-value, clean parental material and low-cost facilities. Dr Nguyen's great achievement has been to adapt the technology from laboratories to farmers' backyards.

There are two steps involved. First growing plantlets from tiny pieces of plant vegetative material on a growth-enhancing medium in test tubes – in a space like a farmer's bedroom floor. And following that the mini-plants are planted in sand trays. The tips of the plants are cut as they grow and then transplanted to a field. One small tray can quickly produce thousands of shoots ready to take to the field.

One can imagine the need for a bit of breathing space, and even some concern that a scientific career would be diverted into that of a – quite obviously – successful potato grower. But the results were so impressive that the international scientific community also took note, and "the Vietnamese method for propagation of potato" became a lesson for us all. The world scientific leader in the field, the International Potato Center, organised a regional training workshop in Vietnam in 1984 to let others benefit from the results.

Beyond potatoes

Potatoes were the first priority, but the general need was to produce food in bulk. In the event, the technology developed and

refined by Dr. Nguyen and his laboratory had universal application, and in 1993, with the help of IFS, they organised an East Asia Regional Workshop on "Adapted Propagation Techniques for Commercial Crops in the Tropics" in Ho Chi Minh City. This was the occasion when the Asia Pacific Association of Micropropagators was established.

"Commercial Crops in the Tropics" proved to be the general label for what followed, namely to apply and adapt techniques for this long list: Robusta coffee,

pineapple, sugarcane, banana, virus-free sweet potato, orchids, ginger, mulberry, rattan, medicinal plants, bulb flowers, rapid growing forest trees... and more.

And forest trees are the present focus of Dr. Nguyen's laboratory, the post-war reconstruction effort having taken its toll of timber in Vietnam. The task is to cover

five million hectares of barren and waste land, much of it hills. Till now, micro-propagation has helped with, among others, bamboo, neem, teak and sandalwood – all on a commercial scale these days. And the story goes on with a renewed interest in sustainable agriculture based on improved plant species. And by now, of course, based on updated science and new perspectives from genetic improvement of species, the Vietnamese Government gives the highest priority to R&D in plant biotechnology.

A field visit provides evidence of substantial change. "I just visited a farming family," reports Nguyen van Uyen, "where three generations together – grandfather, father and his little son – have continuously micro-propagated potato from 1980 until today. And they still want to continue forever!"

If you need of a lucky number for your next lottery ticket, we can give you a small piece of advice; Dr. Nguyen points to it all the time. His results refer back to one source: IFS Grant number 476.

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My IFS grant was the first to go to Vietnam and it has opened new potential for the modernisation of our agriculture.

NGUYEN VAN UYEN, VIETNAM



Harvesting of apical buds of Robusta coffee for potting



Life from Dust

AT FIRST GONZALO GAJARDO travelled a standard route as a biologist at the Faculty of Sciences at the University of Chile. His first degree on population genetics of a fly and doctoral dissertation on freshwater fish were a hint of his later specialty.

In the course of a British Council Scholarship, population geneticists in Britain introduced him to Artemia, a primitive brine shrimp that takes up a most interesting place in evolutionary studies. Artemia eggs, which look like dust, are used to feed cultivated fish.

The IFS network at work

He then crossed the Channel to meet specialists at the Artemia Reference Center in Belgium, headed by an IFS Senior Scientific Adviser. On the basis of his work and collegial networks there, Gajardo applied for IFS funds and returned to a job in 1988 at a small university in southern Chile.

The job was there but not much more, and the IFS funds were essential: "A fridge, chemicals, a balance and money for collecting Chilean Artemia and ... books." These were the beginnings of the Latin American knowledge base on the species. Several IFS travel grants supplemented his two research grants.

Gajardo established himself in the top echelon working on this theme. After charting Artemia throughout Latin America, he attracted sufficient international interest and funding to develop a full-fledged facility for genetic research on native and introduced aquatic resources. The laboratory's goal is to characterise, evaluate and ultimately exploit these genetic resources for aquaculture.

And both industrial and small-scale operators, turning dust into fish food, now benefit from results coming out of Dr Gajardo's laboratory.

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OTO: CONZALO GA JARDI

GONZALO GA JARDO

Thought for Food

ONE SCHOOL OF THOUGHT on how to improve the productivity of living resources in the rural settings of developing countries was long dominant: Introduction of exotic elements. But when Indonesian animal nutrition scientist Dahlanuddin returned home with his PhD from Australia in 1998, he had just obtained an IFS grant to take a different approach.

Goats are essential in the household economy of small farmers, but they have a low productivity, the general attitude being that they are lousy performers genetically. Dahlanuddin, working on the island of Lombok, started feeding trials and gradually established simple and affordable advice to farmers "based on locally available resources", as his research project had promised. Supplementation with tree legumes during late pregnancy



DAHLANUDDINS GOATS

TO: APTEMIA REFERENCE CENTER B



Chile

ARTEMIA



and early lactation improved kid growth markedly and assured higher survival rates. The potential of local goats – with all their hardiness – was simply underexploited. Dahlanuddin is continuing his work under a second IFS grant.

Being well connected by the IFS computer and modem – the only internet access around – Dahlanuddin immediately established national and international contacts and is now part of three collaborative research programmes in Indonesia and Australia. Publications in national and international journals are coming along, and IFS funds have secured his conference participation overseas. A recent Australian Junior Scientist Award is an early recognition of his capacity.

Colleagues and students in his institution at the University of Mataram benefit as well by being involved and activated by this new window to the world. Fourteen undergraduate students participated in the research from the first IFS grant, four more are accommodated in the second. And this is only the beginning...

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Indonesia

Research Going to Waste

AS WITH MANY ARID AREAS, agriculture in central Tunisia relies on irrigation. As a young agricultural engineer around 1980, Akissa Bahri clearly saw the double-sided problems of dwindling water resources and the risks of soil deterioration associated with land application of marginal (brackish and reclaimed) waters and sewage sludge. Beginning the first of her three IFS projects at a critical time in her career, Bahri faced these problems head-on, since farmers in her study area irrigated with brackish and reclaimed waste water and applied sewage sludge from neighbouring towns as fertiliser. If not managed well, these practices may create a potential problematic long-term environmental impact and maybe even a public health problem.

Through both laboratory work and field tests, however, Dr Bahri was able to arrive at best practices for using the water and sludge available. Her findings became direc-



HOTO: DAHLANUDDIN

tives to farmers for practical application. Bahri also involved herself in extension work and became a key policy adviser. As Laboratory Chief at the National Research Institute for Agricultural Engineering, Water and Forestry, she can supervise implementation of her results and further develop her special interest in efficient water use. She is now in the cadre of top international scientists delivering analyses and solutions to this major problem facing mankind.

And as if all that were not enough, Dr Bahri heads a Ministry of Agriculture Commission that identifies research areas of national importance and then approves projects within these areas. She also helps to coordinate the utilisation of World Bank loans to Tunisia targeted on increasing research capability as an element of the country's infrastructure.

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A TREATMENT PLANT IN TUNISIA

A Fair Chance for Poor Man's Fare



Cameroon

IF WE CONSULT A RECENT BOOK, Seeds of Contention – World Hunger and the Global Controversy over GM Crops¹, we find the following quotation: "Ask a farmer in Uganda whether she would prefer 'natural' cassava or a GM variety that can combat leaf mosaic, a virulent plant disease. We can guess what her preference would be. But no one asks her."

But the authors had not checked with scientist Vincent Fondong of the Institute for Agricultural Development in Buea, Cameroon, who would have consulted this farmer early on – and decided to act in her best interest.

Fondong would have understood her difficult situation as a farmer, although he began his research career as a plant pathologist with a different tuber crop, potato,



and specialised in the detection of its viruses. This interest took him to a meeting of the International Root and Tuber Crop Society in Ghana in late 1990. Back home in Cameroon things were not exactly conducive to implementing scientific research. Government funds were drying up and outside financing was a must if a newcomer had any professional ambition at all. So just in case, Fondong brought along with him a project proposal on his current research priority. He ran into just the kind of people he could hope for, the international peers of his scientific area.

And one of the helpful senior researchers there pointed directly to IFS as a likely source of such funding and suggested that he work on cassava.

Now armed with an IFS grant, Fondong decided that cassava was a better option. Cassava, as you might know, is the stable calorie provider for peasant farmers in many places, hardy and thriving on meagre lands and even when drought sets in. When everything else fails, a family with cassava in the field stands a better chance.

It wasn't very long before Fondong realised the – at times – terrible impact of the devastating African cassava mosaic virus, ACMV, transmitted by the infamous whitefly. And against that background he successfully applied for IFS support and received the first of his two grants in 1994, to take a close look at the spread of mosaic virus in different ecological areas of Cameroon.

Progress was impressive and swift and he had an opportunity – with IFS sponsorship – to present his initial findings at an international conference in Uganda in 1996. This turned into a wealth of opportunities for him, because two agencies that were present took a strong interest in his work. And between them – the Rockefeller Foundation and IFS – an interest developed to go full-scale in support of his continued work. IFS renewed its grant; Rockefeller funded a sandwich PhD programme in South Africa and California.

CASSAVA

10

PHOTO: EBBE SCHIØLER

Paying back the trust

With the mapping exercise behind him, and having a fair idea of how the virus spread in different ecological areas, Fondong's further research showed how resistant – but still susceptible – cultivars recover from infection. This led to procedures to produce disease-free planting material from infected plants under greenhouse and field conditions, avoiding costly and demanding heat treatment.

The IFS funds enabled Fondong to collect cassava samples to take along to California, where the first findings were rather disturbing



– but highly interesting – for the design of his studies. His original design was based on the established belief that only one virus was at play in Cameroon, the ACMV. But molecular work showed that a previously unidentified virus was present as well, the East African cassava mosaic virus – Cameroon strain, EACMV-CM, for short, sort of.

What's more, it transpired, whiteflies might sometimes be cruel enough to coinfect a cassava plant with the two virus strains, leading to a most severe synergistic effect.

In the laboratory it was established how, and how much, infection harmed the plants depending on at which stage in the plant's life cycle infection took place. Other useful results

Given the foregoing I can only sit back today and conclude that the IFS was indeed worth the effort as it celebrates 30 years of its existence.

included the cloning and sequencing of the virus strains. This has a direct bearing on the screening of transgenic cassava plants (or any cassava breed, for that matter) for their resistance to the virus. So our Ugandan farmer might see helpful results coming her way from this and related work on her farming problems.

One of the more readily available, useful pieces of advice was taken directly from Vincent Fondong's test fields. Cassava growing in many places still takes place in rather uniform-looking parcels of land with only cassava present. But intercropping is not unusual among small-scale African farmers. With cassava covering the land for more than one full year to maturity, intercropping of cassava can be organised with maize and/or cowpea – both farmers' favourites in the large "Cassava Belt" across Africa. The spread of the virus can be reduced and the land use, on top, can be optimised.

There is no conclusion to this ongoing story, but it might be worth noting that IFS has just awarded a grant to a colleague of Vincent Fondong for follow-up studies on the mixed infections. In the middle of his postdoctoral studies at Cornell, Fondong notes with gratitude: "I can only sit back today and conclude that the IFS was worth the effort as it celebrates 30 years of its existence." Well, it is easy to accept these kind words and it feels assuring that these kinds of results make the whole effort worthwhile.

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VINCENT FONDONG, CAMEROON



A DISEASED CASSAVA LEAF

Per Pinstrup-Andersen and Ebbe Schiøler, Seeds of Contention – World Hunger and the Global Controversy over GM Crops, The Johns Hopkins University Press, Baltimore, 2001





SAVITRI GUNATILLEKE EXAMINING A RAIN FOREST PLANT



Natural Laboratories

BACK IN 1975 FOREST ecology was not yet a household word, at least not in Sri Lanka, and definitely not an area supposed to be of interest to young ladies. Nevertheless, returning from training with her PhD in the ecology of endemic rain forest tree species, biologist Savitri Gunatilleke resumed her teaching job at the University of Peradenyia. As the first woman in her country to work in this scientific area, she focused her next 25 years of research on the Sinharaja, at the time a partly protected rain forest. This long-lasting devotion started with an IFS grant, which included such mundane support as a vehicle, making frequent 200-km trips to Sinharaja possible. As she puts it: "The best laboratories for tropical biology are in the natural forests."

While forest tree diversity was amazingly great, it was severely threatened. A cautious policy of selective logging was in place, but this was based on a general attitude to rain forest conservation, not on specific knowledge.

With flexible support from IFS, which understood "the problems faced by individual scientists of the developing world", Gunatilleke and her enthusiastic young students inventoried these forest treasures, producing baseline studies of 200 tree species, of which 60% were endemic to the island. The authorities declared the whole area protected and logging came to a halt. UNESCO designated the Sinharaja as a World Heritage Site in 1988.

Real life benefits

End of story? Not at all, because the unique research opportunities attracted a strong national and international interest. Funding, networks and awards came Dr Gunatilleke's way over the years, leading to a professorship at her university. Professor Gunatilleke also continues her international service as an IFS Scientific Adviser.

After the initial IFS-supported phase of mapping tree diversity, her research took a more applied direction, looking at ways to secure better performance of valuable species and enriching and protecting forest areas in the country – from the biology of seedlings and pollination improvement to providing scientific criteria for good management of healthy and diverse forests for multiple users.

One of the most inspiring aspects of her work has been the total change in the ecology curriculum for undergraduate students, and even for secondary school biology classes, to include field studies in Sinharaja, leading in turn to recruitment of new cadres of devoted biologists. The reserve has developed an infrastructure for tourism and some of the forest margin dwellers, who were cut off from using the forest when it was turned into a reserve, have become active guides and informants for continued research in the area.

To borrow words from one of her award nominations, Professor Gunatilleke "has achieved what very few others in her area have, namely successfully carrying her research through from theory to empirical description and experimental test and then extending the results to applied research, whose results are actually being implemented by the forest service and rural communities".

SAVITRI GUNATILLEKE savnim@slt.lk

Improving Fast Food

STANDING AT THE CROSSROADS after obtaining his Master's degree from a French university back in 1987, Joseph Hounhouigan food scientist from Benin, faced a Catch 22 situation if he wanted to pursue a PhD programme looking at real problems in his country.

He would have to carry out part of the research in an underfunded laboratory in Benin. Without sufficient funds, there was no way forward. And without things organised, no funds.

He counts his blessing that in 1989 he learned about IFS, an organisation set up to break this unproductive circle. The grant he obtained that same year, the first of three, worked for him as the "catalyst", and an IFS Scientific Adviser pointed him towards Wageningen Agricultural University in the Netherlands. He managed to get some Dutch money which proved to be as flexible as the dollars coming from IFS. One piece of equipment, a freeze dryer, still reminds him of their pragmatic attitude. Half was paid by each of the funders.

Generous travel grant support kept him in direct contact with international colleagues and peers and stimulated his publication activity, which in turn led to better access to new funding sources.

And the relevance?

As a young student Hounhouigan had noted the effects of an unreliable food supply in the towns of Benin. Back in the early 1980's people had gone on strike to protest against the price increase of an important staple, European-style breads baked from wheat, an imported grain. Definitely not a sustainable food item.

Local options included two different maize commodities, *mavé* and *aklui*. The first one was a dough used in many dishes, the second a granulated porridge, sold from stalls as street food. Typical sub-Saharan foods, also plagued by quality problems.

Based on a natural fermentation that is difficult to control, the foods might contain harmful bacteria that could cause illness, and their high moisture content leads to a short shelf-life, not always respected by the vendors. Add to this the fact that it is time-consuming to prepare the dishes from the raw material, and, of course, production hygiene is seldom perfect.

Hounhouigan and the research team that grew around him at the National University of Benin analysed these products and improved both product and production processes so significantly that their solutions are being applied not only their own country but also in neighbouring Togo and Burkina Faso.

An important accomplishment was the development of methods to adequately control the fermentation process, making the finished product uniform and acceptable to the consumer's palate – and nose. A small unit was set up to assess the new procedures for commercial application, and it now works as a reference centre for many small-scale private enterprises. So, in short, Dr Hounhouigan could be said to have really earned his dough.

JOSEPH HOUNHOUIGAN hounjos@cnfc.bj.refer.org





On the market: a porridge resulting from Professor Hounhouigan's research



JOSEPH HOUNHOUIGAN SUPERVISING PRODUCTION

All Creatures Big and Small



SARA FERESU

IF yOU ARE NOT in medicine or veterinary science you will need an encyclopaedia when you go through the 23 pages of Sara Feresu's CV, if you want to grasp the finer details. Not that her research is of low relevance to her country, Zimbabwe – or the rest of the world, for that matter. It is rather that we are in the world of microscopes, bacteriology and advanced biotech. But always with an applied focus.

Professor Feresu undertook both her undergraduate and PhD studies in microbiology in Britain, coming back to Zimbabwe in 1981 to take up a position as a research officer at the Veterinary Research Laboratory. She moved on to the Department of Biological Sciences at the University of Zimbabwe the following year and advanced further until she was seconded as acting director of the country's Institute of Environmental Studies, taking over as director from mid-2001. The progression in her career reflects not only the typical focusing and specialisation of an academic but also her desire to influence things and have an impact on matters of importance in national development.

But let us take a look at her first IFS grant, back in 1985, and the subsequent two grants over the next five years. The title of her project, "Leptospirosis in the bovine population in Zimbabwe" (for non-crosswords specialist: an infectious disease of cattle) attracted the interest of IFS. Not only was the science involved of high quality, but the problem area to be analysed has major significance. The grant from IFS equipped the laboratory and Feresu could start working.

What was known was that this disease was one of several harming cattle – and other animals and humans. In cattle it leads to abortions, reproductive disorders, and decreased milk production. The infection appeared all over Zimbabwe, but was a marked problem in some areas. And only laboratory tests could verify if



leptospirosis was the cause of losses observed.

By then a limited number of serotypes had been identified, but during her studies Feresu identified several more, with a diversified spread over regions of her country. There were a number of tracks to follow to help in the fight against the disease. One was to identify which serotypes were more or less harmful in a given location, assisting in priority setting for fighting the disease. A logical next step was to identify the usefulness of vaccines and medicines in the Zimbabwe setting.

A third approach was a close scrutiny of contamination patterns. Cattle are in most instances kept in large herds in most of Africa, and even smallholders will confine the cattle at night in kraals, securing close contact among animals. With the disease spreading through urine and even as drop infections and from shared drink-

PHOTO: FAO/I. BALDER

ing sources, conditions were optimal for a permanent high infection risk. Add the fact that many animals carry strains of the bacteria not affecting them, and therefore will not show visible symptoms, but will maintain the disease and spread it to more vulnerable animals nearby. Wildlife sharing the same waterholes as the cattle, the flocking in the dry season of cattle flocks from a large area, and the herdsmen being in close contact with their animals all add to the difficulties in fighting the disease. But some good advice on managing herds could be given to commercial farmers as well as to smallholders.

And this was just the beginning

Professor Feresu received several international awards for her pioneering research, including two from IFS, and this vein of interest would have been a life-long venture for many a researcher. But occupying herself with additional tasks in her university, among others as member of the planning committee of her Department of Biological Sciences and chair of the same department, Sara Feresu took a broader interest in the application of science to the development of Zimbabwe.

Following one particular path in her working life, one will note that she was in the early 1990's a member of the National Biotechnology Forum of Zimbabwe, leading to her membership from 1993 of the Regional Committee for Safety in Biotechnology. This was at a time when most people in the North still regarded this preoccupation as something of a distant concern. Since 1994 she has been a member of the Zimbabwe Biotechnology Advisory Committee and since 1997 deputy chair of the national Biosafety Board.

But, of course, still active in the pursuit of her original science interest, she sits on the International Leptospirosis Steering Committee and is co-editor of the Zimbabwe Science News. And the list of commitments is a long one.

Professor Feresu feels she is in a privileged position in Zimbabwe and can use her professional skills in many ways to increase the social relevance of research. She is the deputy chair of the Biotechnology Trust of Zimbabwe, an NGO currently funded by the Netherlands. It represents research institutions, government departments, NGOs and farmers. The objective of the trust is to help poor farmers – particularly women – to use the outcomes of biotechnology.

Thus far they have helped farmers with biological nitrogen fixation (inoculation with rhizobia) in soya beans, propagation of disease-free sweet potato vines, mushroom production, silage making, and much more. They also provide farmers with training on marketing and business management.

Sara Feresu is also involved in stimulating women to proceed with science careers. She is a member of the Advisory Committee on Strengthening Science for Women of the Kapnek Charitable Trust. Promising girls are identified at O-levels, sponsored to study relevant A-level subjects and stimulated further to obtain training in medically related disciplines.

And why not a shining career abroad, no doubt with a high salary? Professor Feresu states herself that "she wants to be where she can make an impact". The founders of IFS could not agree more with her choice.

SARA FERESU feresu@africaonline.co.zw



I have no doubt whatsoever of the tremendous impact of the IFS support in my scientific career and in my very life.

ADMANDO HUNG, PERU





A FRUIT MARKET

IFS has fully supported me to be successful in this field of specialisation. I think that if IFS had not supported me I would never have arrived where I am today

KASEM SOYTONG, THAILAND

Never at a Loss

SRI LANKAN PLANT PATHOLOGIST Nimal Adikaram has no reservations when it comes to the impact of the IFS investment on his research results, his impressive career, his international standing and the very existence of the institution he is heading: "Today the Department is in the forefront of post-harvest activities in the country, having started basically from scratch, the IFS being instrumental in providing a strong platform for its building process."



Sri Lanka

In the early 1980's Adikaram observed the sad sight common in so many developing countries of harvested fruit decaying at marketplaces. Such post-harvest losses could amount to 40-50%. Much of it was caused by fungi making the fruit rot in the ripening process, destroying important species like papaya, bananas and avocado. The only way to address the problem appeared for a long time to be applications of synthetic fungicides, which are undesirable both for human health and the environment.

Adikaram had also taken note that not all fruits suffered this fate. Studying their natural resistance, he came across quantities of important compounds in the fruit that kept the fungi at bay in the early development of the fruit but decreasing with ripening. Papaya latex, in particular, showed strong antifungal properties. Application of this natural and totally harmless substance on fruits to fortify their own protection is now replacing fungicides.

Taking this and other findings into practice needed bridging mechanisms between academia and industry. Professor Adikaram was convinced that the strongest tool would be the education of a new generation of plant pathologists, so he set up an MSc programme for that purpose, which has already produced 30 new specialists. NIMAL ADIKARAM adi@botany.pdn.ac.lk

Of Patent Quality

THE IFS FOUNDING FATHERS would probably not have regarded patents as a valid yardstick of success for grantees. As we all know things have changed, and these days patents are now regarded as an indication that applicability and original science have been behind the research work supported.

In the case of Professor Kasem Soytong of King Mongkut's Institute of Technology, Bangkok, four patents have resulted from his work as an IFS grantee.

Since the term "relevance" was always high on the IFS checklist, let us go behind the patent numbers, arriving at the keyword in all Professor Soytong's patents: Ketomium, a registered trademark, by the way. Till now you will probably think in commercial terms only. But you should know that this is a natural product, discovered and analysed for its wonderful properties to act as a biofungicide, fighting pathogens and plant disease where farmers used to apply chemical pesticides, endangering their health and poisoning their environment. It works well both in the

field and in greenhouses and has proved to be very broadspectrum. Interestingly, it will also work well as a biological fertiliser, so no surprise that Ketomium has been taken to heart by ordinary and organic farmers in the region. Senior colleagues from Thailand and abroad flock to Kasem Soy-

tong's new Research Institute of Applied Microbiology for Agriculture. Students from home and abroad compete for entrance, many of them working with the equipment purchased with the IFS support, which covered 90% of the project work.

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Thailand

A Top and Bottom Success

CROP SCIENTIST ABDULAI JALLOH of the Institute of Agricultural Research, Freetown, summarises the facts well: "In Sierra Leone and most developing countries, farmers make up the bulk of the population... These farmers are producing at below-subsistence level."

Noting that cassava is a staple in his country, he took an early interest in improving the productivity of the crop. The IFS grant provided him with badly needed funds and enabled him to study intercropping practice of cassava and upland rice, testing a number of alternatives in densities, ratios between plants, optimal planting time, etc. Promising interim results appeared just as



Abdulai Jalloh measuring light in a field of rice and cassava

disaster struck: the civil war arrived at his university and test fields.

Much was destroyed by rebels, and Jalloh himself had to flee to Guinea, where IFS maintained his scientific productivity by supporting his international contacts. When he was able to return home in 1998, his renewed research led to more interesting findings: Leaf harvesting in the 12-month cassava growth period boosted the total production in intercropping, because with reduced shade slimmer plants could be grown at much higher densities, yielding an income from the popular leaves long before the tubers had bulked sufficiently for sale. And advice on optimal planting sequencing for rice gave a similar benefit.

Jalloh's recommendations are now being spread to farmers country-wide – and interest is being shown by neighbouring countries. Genuine win/win research results, from top to bottom.

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KASEM SOYTONG INSPECTING PLANTS IN HIS GREENHOUSE



Sierra Leone

IFS has a 'no-nonsense' way of doing things that greatly facilitates relationship with grantees from different cultural backgrounds.

JOSÉ MARÍA GUTIÉRREZ, COSTA RICA

IFS 30 years

In Love with His Profession

THERE ARE SEVERAL TRENDS to follow in the life and background of Uruguayan immunology professor Alberto Nieto, if you want to understand why he became such an outstanding and devoted scientist and why he has always struggled to transform his findings into products of immediate use by society.

His father ran a small family business producing cosmetics, gradually employing young Alberto and his younger sisters in their free time and their mother, a teacher, in administration and production. But Alberto opted for MSc studies. He did more than well and continued in research in the University hospital and later at the University. But it was no bed of roses. As a young associate professor in 1977, he had to flee his country for political reasons and came to Spain. Here he sold diagnostic kits, not totally out of his line – and continued in his spare time to undertake research at the Municipal Hospital of Barcelona. He moved on to a private pharmaceutical company for a few years as a full-time scientist and then found a position at the Barcelona University Hospital, finishing his PhD in 1986. By then the political winds had changed, and his homecoming that same year was followed shortly by an appointment as Professor of Immunology.

Where did his scientific devotion come from? His school had "good facilities in terms of labs for chemistry and physics... I had very good teachers there, I especially remember those in chemistry, physics and biology who opened my eyes to science." And this constructive beginning continued at university, where his school of chemistry was "organised in a very pragmatic way giving access to labs to almost every student", as compared to later overcrowded facilities.

Teaching was of an excellent standard – "Uruguay was rich enough (then) to send young teachers to study in Europe" – and visiting scientists were of Nobel class standard. This favourable situation compared badly with that of the country Alberto Nieto met on his return from exile in 1986.

Remember his origins in an applied chemistry family with the cosmetics business? It occurred to him early on that it must be possible to extract polysaccharides, which are used in the production of cosmetics, from local seaweeds instead of importing them. So he spent his spare time as an undergraduate in the well-equipped labs – and one proud day succeeded in obtaining a white powder. One of his professors passing by asked the nasty question: How do you know this is your polysaccharide? He then presented a long list of tests necessary to document success – which the powder failed. Nieto now understood the need for in-depth laboratory studies, even for practical applications.

Back to basics

Not that Alberto Nieto found it easy to perform state-of-the-art research coming back from exile. He found a nearly empty old room of 30 square meters, holding one worn-down refrigerator, a freezer more appropriate for kitchens than for research, and a new micro-centrifuge. Funding was just as depressing. IFS, which Nieto learnt about while in Spain, was the first to specifically fund his work, beginning in 1987.



ALBERTO NIETO

Virtually every dollar from this first IFS grant and the three that followed over the next five years went into upgrading the laboratory at his department to a standard comparable to his overseas working environments. Later a Swedish Sida-SAREC programme provided a more comprehensive support to his university.

Nieto's superior facilities attracted a host of young graduates and even senior colleagues. IFS came in again, supporting some of the junior scientists, and IFS travel funds contributed strongly, Nieto states, to international contacts and professional networking for him and his team.

The positive effects spiralled onward: larger programmes and more collaboration, spreading from the department, across faculty borders, across national borders and – even more impressive – outside academic circles to industry. The latest addition to the list of counterparts and liaison mechanisms is the Technology Pole, a university programme for collaboration with the private sector. Nieto has recently attracted international interest in this project with a paper in a recent UNESCO manual on this issue.

His Faculty of Chemistry – where Nieto is presently Dean – scores impressively: 20% of all international publications from Uruguay lead back to the faculty and 50% of the patents filed by the University have the same source. And one more number: The Faculty receives 2% of the annual University budget.



The objective of the IFS-funded research project might not ring a bell for everyone: "Isolation and characterisation of antigens with protective activity from *Echinococcus granulosus.*" But you can guess that it has to do with immunology and avoiding harm from a nasty parasite, which resides in dogs and other carnivores but infects other animals and man as intermediary hosts.

The infection can cause a serious disease in man and unfortunately the infection is still widespread in many developing countries. It is not an easy task to diagnose the human infection, and part of the research was aimed at developing rapid field diagnostic tests for veterinarians and medical doctors to use, and for the pharmaceutical industry to produce. Following this success, other infections have been analysed and diagnostic tools developed for private business to commercialise. The investigations range from veterinary and human medicine to environmental science, plant pathogens and bee toxins, and the effects are just as diverse. Animal reproduction has gained, unborn babies are secured a healthy growth in mothers' wombs, and tomatoes are saved from nematode infections in the field. To mention just a few of the results.



PHOTO: EBBE SCHIØLER



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Bitten by Science



IN HIS OWN WORDS, Costa Rican scientist José María Gutiérrez has been "interested in pursuing research subjects that are, at the same time, scientifically sound and socially meaningful." It was no wonder that IFS – with much the same philosophy – encouraged him to apply after a visit by IFS staff to Costa Rica in 1985.

Poisonous snakes are a dangerous part of daily life in large parts of Central and South America, leading to deaths and severe ailments. The Instituto Clodomiro Picado, where Gutiérrez took up employment after his doctorate in physiological sciences, reduces these problems by producing antivenins based on proper research.

There were, however, several open questions related to the chemical structure and effects of toxins. Gutiérrez decided to take a close look at a most dangerous species in his IFS-supported studies, the pit viper known locally as 'terciopelo'.

The new grant funding had two major effects on the work at the institute and Gutiérrez' career. He could set up a well-equipped laboratory facilitating novel research. This attracted a host of graduate students, which allowed him to greatly expand the scope of the project work.

Sophisticated results

It was an established fact that the antivenins of the institute worked – if applied in time – to prevent death. But little was known about their neutralising effects on the lesser injuries caused by snake venom. So part of the research was directed at this significant problem, and part on optimising antivenin production technology.

Over the next few years it was established that the snake venom did indeed lead to severe injury and suffering, even if death was prevented. Laboratory methods for evaluating the whole spectrum of neutralising properties needed in an antivenin were developed and communicated to colleagues and health authorities in Latin America. This also led to better product screening at his own Institute, which in turn



José María Gutiérrez

led to recognition of the efficacy of the Institute's immunobiologicals and promoted their sale throughout the region.

A raw material in antivenins is horse immunoglobulin. Taking high-tech experimental work in the labs to the production line of their Institute, Gutiérrez' research group managed to develop simple and inexpensive techniques for purification, improved quality and very good neutralising potency. Clinical tests proved that the researchers' ambitions were more than met.

Public health in the region has gained a lot from the research. José María Gutiérrez achieved – among many other awards – full recognition by IFS in the form of its 1997 Sven Brohult Award.

JOSÉ M. GUTIÉRREZ jgutierr@icp.ucr.ac.cr

Truly Chickenhearted

AS A SECONDARY SCHOOL student Funso Sonaiya wanted to go back to the rural areas of Nigeria to become a farmer. Having lived in Lagos since early childhood, he still felt that his future was in the countryside. But to become a "modern farmer", as he puts it, education was a must, and he started his agricultural studies at the University in Ile-Ife. He never became a commercial farmer. As he admits: "I caught the scientific bug and I am still suffering from a chronic infection."

His "infection" included an impressive chain of very early international publications and a university career, where he became absorbed in rather traditional studies of fat development in broilers. But in 1987, after returning from some postdoctoral research in Germany, he re-directed his research to rural poultry. This was not popular among his colleagues, and his academic reputation was jeopardised, because poultry were regarded as "poor women's livestock". His department was highly sceptical of anyone "running after one or two chickens in the villages".

From rock bottom

When Funso Sonaiya approached IFS, rural poultry was just opening up as a research subject. So his first external research grant in 1988 gave him back prestige and some confidence. He created a small research team, used the IFS grant to equip the new Poultry Meat Research Laboratory at the university and started field studies on virtually everything: breeds, housing, health, feeding, management and marketing.

And here the IFS quality stamp and funding had impact, since they allowed him to put together a multidisciplinary team with researchers from the departments of Animal Science, Agricultural Economics, Agricultural Extension and Rural Sociology.

This was pioneer ground, with many interesting findings on local, exotic and inbred breeds – and their adaptation to the stresses and diseases of rural Nigeria. It was shown that as little as 8 grams of supplementary food daily would decisively improve the growth, health and productivity of scavenging chickens. But what is more – a supplement could be developed from household and agricultural waste, which was even later produced by local feed mills at very low prices.

Twenty postgraduates and around 250 graduates in "chicken science" later, his laboratory is the most heavily used in the university, having been expanded by international funding from several sources since IFS came in.

And the humble chicken, can it lead to anything? Certainly. Professor in 1992, Head of Department 1992-1995, Dean of Faculty 1999-2001 and Fellow of the Nigerian Society of Animal Production 2002. And now Funso Sonaiya has branched off into biotechnology.

Chickens are still scavengers in most rural settings, but by now they are covered by strong networks in many places, such as the International Network for Rural Poultry Development. Dr Sonaiya has been instrumental in the establishment and maintenance of this network. So Nigeria might have lost a farmer, but most will applaud that he, against academic odds, never chickened out.









Mexico

The IFS system of advisers is admirable and very commendable; it was instrumental in opening doors and putting me in contact with a number of prominent researchers who provided valuable advice and guidance.

LEE SU SEE, MALAYSIA

MARIA VALDÉS OF MEXICO envisaged her future as a person doing something about the environmental problems of her desert region, near the US border: arid, severely eroded and with only sparse tree coverage.

The logical thing would have been to study at the School of Agronomy, but this was a male-only career back in the 1950's. So at 16 Valdés began studying biology at the National Autonomous University of Mexico, UNAM, and gradually focused on something that seemed pretty relevant: soil microbiology.

At 22 she obtained her BSc in biology and was so promising that she was awarded a scholarship in France, based on funding from her university and the Mexican Council for Research and Technology, CONACYT. In France she continued her studies in soil sciences, taking a special interest in symbiotic nitrogen fixation. Her career developed well, and over the years 1962-1970 Valdés shifted between Mexican and French institutions and established her own research, being appointed as a professor at the National Polytechnic Institute, IPN.

A change in direction

Along the way, she got some very good advice from her former professor of mycology: Take a close look at mycorrhizae. She thanked him for the advice and went to the library to find out what he was talking about. The working of these symbiotic fungal associations to promote nitrogen fixation turned out to be just the focus she had been looking for. She now had a very promising tool for her campaign to combat environmental degradation.

Valdés also met with an IFS Scientific Adviser – one of the very first – during an international symposium on mycorrhizae in the US. He advised her to apply for a grant, and she was awarded IFS grant no. 39 in 1974 – the first Mexican grantee. Her project was right on target: *Mycorrhizal inoculation and the afforestation of the deep Valley of Mexico City*. In layman's terms, how can we use fungi applications to re-forest barren lands? Or to put it more precisely: How can we make pine seedlings hardy enough to secure their survival in strongly eroded soils near Mexico City?

At her teaching institution Maria Valdés had, like everyone else, no access to sufficient research funds. So the IFS grant of 10,000 USD allowed her to organise a research programme. But more than that, it changed the attitude of professors and administrators at her institution towards her research. And when transfer of IFS funds turned out to be extremely difficult, due to foreign exchange restrictions, her institution showed its genuine trust in her and IFS – the Vice-Rector arranged temporary funding for her project to start. In Maria Valdés' own words: "This was the first positive effect of the grant."

She was now not only regarded as a teacher with a basic salary but also respected as a researcher. And her results soon proved them to be right in their judgement. Her new research provided results worthy of publication, and she produced constantly, adding to her profile locally and nationally, even attracting smaller Mexican grants for her work.

Success breeds success

Her initial work and frequent publications opened her way to international contacts, as Valdés became a recognised authority on her subject, step-by-step. IFS helped her establish her networks by providing travel grants during the 1970's and early 1980's to international conferences and workshops that provided updates on her speciality. She combined learning and collaboration with a number of shorter stays at North American universities – sponsored by Mexican and US funds – as well as some months in France on a French scholarship. Valdés became one of the national scientists who was early on recognised by the Sistema Nacional de Investigadores, SNI, a platform for advancement and improved salary in Mexico.

The pattern of international support continued during the final years of IFS funding, and



a real boost came with a 300,000 USD donation from BOSTID (Board on Science and Technology for International Development) in the US to ensure that her laboratory was well equipped. CONACYT stepped in with funds from 1981 onward, and academic recognition from home and abroad led to Mexican awards, membership of international editorial boards, and many other distinctions – culminating in 2002 with the Mexican National Award on Forestry.

From the IFS perspective, the cycle of success was complete when Professor Valdés became one of its Scientific Advisers in 1990.

And the barren lands?

Over the years, Maria Valdés has stuck to her original commitment of improving the quality of eroded lands. She has never applied for a patent, trusting that her findings would be available to benefit everyone. And that is precisely what is happening. The National Forestry Institute of Mexico is currently applying her findings to practical use in reforestation by farmers.

And she has made sure that mycorrhizae is now a household word among the students she supervises

The IFS grant is not only ten thousand dollars. Receiving money from an international funding institution gave rise to the interest of professors and the administration towards me.

MARIA VALDÉS, MEXICO

IFS 30 years

from her laboratory. One can easily imagine the tempting offers from national and international institutions which have come her way over the years, after the odd lecture at Harvard or UCLA. But Professor Valdés has preferred to stay at her Polytechnic, changing that institution in the process to combine science and teaching while passing on the commitment to a new generation.

And perhaps the day will come when some members of that generation echo her conclusion on the IFS support: "It's a formative grant, small, but giving courage and above all giving the possibility to find other support elsewhere in order to continue."

MARIA VALDÉS mvaldes@encb.ipn.mx

From Forest to Pharmacy



YOUNG PHILIPPE RASOANAIVO was captured for science by a traumatic experience – but with a happy ending! His father fell ill from a stomach disease, and the European doctors of Madagascar did their best, but several months went by and his condition did not improve. Philippe Rasoanaivo's family had to sell their rice fields to get more money as the case was becoming desperate and the family thought that the father would soon die. Luckily a friend of the family counselled them to let Philippe's father try a local medicine, a decoction from a plant. Within two weeks a miraculous recovery was well underway. Rasoanaivo opted for a career in chemical science working in, as you will have guessed, traditional medicine and medicinal plants.

We are back in 1975 when an exploratory mission of the new organisation IFS came to the island and met with the newly appointed assistant professor at the Faculty of Sciences of Antananarivo. At this stage he had set his eye on the medicinal plant *llex mitis* (Aquifoliaceae) reputed to have wound-healing properties. Realising the potential of his research, IFS awarded him a grant. He had the good fortune to be promoted to Head of Department of Chemistry at the national pharmaceutical research centre and could utilise the IFS funds in a multidisciplinary group. Their research and clinical trials turned into a medicine, which took the trade name Fanaferol, now being locally produced.

Madagascar is a haven for many kinds of botanical studies, with its rich biodiversity of about 13,000 species, 80% of them endemic. At the same time it can be a depressing experience, since only a very small fraction of the plants have been

analysed for their chemistry – and natural plant life is being eroded at an alarming speed. But based on traditional knowledge, Professor Rasoanaivo had a good idea of which plants would be the most promising candidates for useful medicines.

His visions and priorities were changed, however, when malaria re-emerged in Madagascar in the 1980s and quickly became the most devastating tropical disease of his country. Professor Philippe Rasoanaivo moved on to the institute for applied research with the aim of setting up and implementing a research programme on malaria. The population turned to herbal remedies, and Professor Rasoanaivo's focus changed to study their effects and potential in the preven-



PHILIPPE RASOANAIVO GATHERING PLANTS AND BARK IN FIELD



Philippe Rasoanaivo

tion and cure of the dreaded disease. From the several ethnobotanical field studies that were performed in different regions of Madagascar by Rasoanaivo, it appeared that the rural population treat malaria by means of self-medication with chloroquine together with a decoction made from various plants. These ethnobotanical data made it possible to discover various types of alkaloids with unique chemical structures that markedly enhance chloroquine action.

One of the plant families involved among the medical plants used among the rural population against malaria turned out to be the same plant that had been the object of one of Professor Rasoanaivo's earlier IFS-supported studies. Some derivates from the bio-active *Strychnos myrtoides* alkaloid were found to be useful enough to be patented. Moreover, the parent compound itself turned out to be a useful biochemical tool contributing to the understanding of drug resistance and its reversal. Furthermore, Philippe Rasoanaivo has thrown himself into "a hotly debated topic" when trying to understand if a naturally occurring bioactive unit, which is also present in the structure of chloroquine, has anything to do with the mechanisms of chloroquine resistance and its reversal.

This pioneering ethnobotanical work has put Madagascar on the world map of malaria research and placed Philippe Rasoanaivo in the top echelon in his field, as reflected in the list of awards and international scientific positions he has held over the years. Rasoanaivo states himself that three factors have contributed to the success of the programme; i) collaboration, ii) fundraising, and iii) training activities of young scientists – just the factors that are well-established as core elements in the IFS programme.



The medicine Fanaferol which resulted from the research of Professor Philippe Rasoanaivo with the plant *Ilex mitis*

With the support of IFS, his research team has been able to arrange an international conference, a summer school and a monograph on a methodology for the



biological screening of plants. Their Institute is now recognised as a centre of excellence in Africa. To cap it all off, Professor

> My status as a former IFS grantee contributed to my nomination as the recipient of the 'Prix de Recherche 2000', the highest research award in Madagascar.

> > PHILIPPE RASOANAIVO, MADAGASCAR

Philippe Rasoanaivo was awarded the IFS Sven Brohult award in 2001 and is working as an IFS Scientific Adviser, actively seeking to motivate and help others who have their own forest to explore. PHILIPPE RASOANAIVO rafita@wanadoo.mg



China

A Root in the Classics

IN RECENT YEARS IT has gone out of fashion in many places to undertake taxonomy studies. There are so many new facets of modern science to take up, and for many there is probably also a sense of "it has all been done."

Chinese Professor Vulong Ding has done his share in taking a different attitude to this classic element of botany. Based on advice from an IFS Scientific Adviser visiting China, he embarked on "Anatomic Studies on the Rhizome and Root of Bamboo", securing an IFS grant for the project. 108 bamboo species were collected from many corners of South and Southwest China, and his analyses of the material led to breakthroughs on the subterranean parts of the plant.



The discovery of air channels in parts of roots of some species provided a new morphological classification tool, and led to useful advice on bamboo cultivation. Furthermore, it was shown that environmental conditions had a greater effect than previously known on root development – another important scientific contribution to understanding both the plant and its growth.

Professor Ding is one of those grantees who did not gualify for a second grant, but for a very good reason. The results of his first project were so impressive that he was promoted to professor. He was simply regarded as "established" when he applied the second time. Correctly so, considering that he was appointed soon afterwards as the Director of the renowned "Bamboo Research Institute" of Nanjing Forestry University. Which shows that if you want to move to the top, it's best to start at the root of the problem.

YULONG DING ylding@public1.ptt.js.cn



A New Look at Old Stuff

IT MIGHT BE HARD to imagine, but the high central Andes were once a lush, green eye's delight; some of the area turning purple for part of the year, in fields covered by blooming quinoa. This is a multipurpose crop that nearly disappeared with the breakdown of traditional agricultural practices in the Andes, once the conquistadors changed the way of life here. A real pity, because the plant – sacred in prehistory is hardy and can adapt to many environments.

Jenny Ruales, an Ecuadorian food scientist, intended to revive this nutritious commodity. IFS realised the potential when they granted her funds in 1989, enabling her to organise a research team at the National Polytechnic School in Quito, which worked to exploit all the healthy properties of *quinoa* in products fit for processing, sale and ultimately export. The crop is not strictly botanically a cereal, but looks like one. Besides having small "grains" stuffed with protein like no cereal has, it contains no gluten, giving it an edge in some markets. It can be turned into all kind of products, and Dr Ruales' group even developed an infant product based on quinoa. But

along the way they delivered other results on processing options, documented and presented so that local industry could adapt and adopt them.

With the distinction of having updated the use of a pre-Colombian crop that was close to extinction, she has earned the appreciation of peers and has been able to attract new funds from many sources, which makes the initial IFS investment – once again – a real winner.

JENNY RUALES jruales@pi.pro.ec

New Gurus at Work

FOREST DEGRADATION IS WIDESPREAD in many parts of the world, alarming specialists and the general population with good reason, because its effects are loss of precious biodiversity and often marked deterioration of the environment. Deforestation has been severe in Togo and other parts of the region, but as botanist Kouami Kokou of the Université de Lomé had noted, "forest fragments" – often as small as one hectare – were left relatively unharmed in otherwise bare landscapes.



Social and natural sciences together take a strong interest in this phenomenon, since the forests are nearly always remnants of sacred groves and have therefore been off limits till recently. This has given plant and animal life opportunities similar to those found in protected natural reserves elsewhere. The initial question is the mapping of the species, and IFS can take pride in that many rare animals and plants have been registered by Dr Kokou in the course of IFS-supported projects. For natural history the findings are naturally exciting, giving an impression of the character of the forest that once covered large parts of the region.

But for practitioners these scientific insights – combined with ancestral beliefs and rites – support a growing awareness in the population of the value of their surrounding natural heritage, and help to secure their sustainable management.

It is high time to intervene, since ancestral spiritual values are eroding and the authority of religious leaders has been waning. The status of locally active scientists has thus become useful in this entirely new situation.

KOUAMI KOKOU kokoukouami@hotmail.com



Quinoa

5

Тодо

Summit Science



IF yOU EVER LANDED by plane in the Peruvian Altiplano town of Puno – or in any other high-altitude location, for that matter – you might have noted that airport staff was discreetly standing by with oxygen masks, in case any of the passengers were hit acutely by mountain sickness. In the airport or, more likely, later in the day a number of the newcomers would suffer to varying degrees, most of them improving over the next days once adaptation took hold. But a few were hit so hard that they had to be returned, as soon as possible, to lower altitudes.

It might never have crossed your mind that if you brought with you a cage of chickens they would – in all likelihood - all be knocked out over time, developing chronic mountain sickness.

Fabiola León-Velarde of the lowlands in Peru found this out as a young biologist graduate when she decided to take a close look at the options for improving the welfare of the Andean people by giving them the opportunity to benefit from poultry husbandry. Poultry farming gives poor women access to better nutrition in so many

Fortunately, IFS' trust of their grantees and [its] deep understanding about the idiosyncracies that characterise most developing countries gave me the necessary freedom and legal recognition.

PATRICIA J FOLGARAIT, ARGENTINA



Muscovy ducks

places in the world, but is not exactly a high profile scientific issue.

The IFS project funding came her way from the mid 1980's. There were three grants over the years, allowing her to improve her working conditions and equipment at the department of her university in Lima and to do some research in the mountains.

Her research showed very early there were good reasons for poultry not being around. Chickens were brought to Peru by the Spanish colonisers, and they thrived in the lowlands of the country but virtually never made it to the mountains. Her research showed that the chicken had a pronounced incapacity to acclimatise to high altitude. Not only would they suffer from all the discomfort and ailment of mountain disease, with a number of them dying off, but they would also be stunted in growth and would not be able to reproduce. This was in strong contrast to local wild birds in the mountain regions.

But strangely enough, in the Puno region – and we are at 4,000 meters altitude – she came across a colony of chickens performing well, not suffering from mountain sickness and able to reproduce – but still descendants of the colonial chickens who arrived 500 years earlier. In contrast to lowland chickens, their blood characteristics allowed the necessary high oxygen intake based on a haemoglobin type with an affinity for oxygen similar to that of indigenous birds. Research established this as a hereditary factor. These findings came out in the late 1990's, and mark real progress in gathering knowledge towards making poultry part of local mountain farming. The troublesome part of the story is that the gene pool of the chicken is being diluted rapidly because of out-breeding with chickens from the coast. What a foul fate for the local fowl...

Indigenous but not local

In contrast to the chicken, ducks had their origins in South America, as witnessed by prehistoric pottery. But again, they were not present in the mountain regions. One ideal species for small-scale husbandry, the muscovy duck, was brought from the Amazon basin. It was chosen because of its "important resistance to viral diseases, its tolerance to all kinds of food and its excellent meat/fat ratio." But virtually nothing was known about its adaptability to high altitudes. A warning signal could be, though, that this kind of poultry was also not to be found in the mountains.

One discouraging and early finding was that it was not at all good at reproduction in the new settings. But it survived well, no deaths reported – even if research took place at 4,300 meters – no signs of chronic mountain disease, coupled to an ability to fight viral diseases in the location without being vaccinated. In the laboratory, blood tests showed some warning signals, but when taken up as ducklings, the fowl adapted fully and never developed the cardiac insufficiency found so often in chickens.



The muscovy ducks are brilliant at thriving on the diet that can be provided in the area, based on very limited economic resources, it was found. And, most surprisingly,

their capacity for meat production was even higher here than in the lowlands! Based on these results, duly reported in local and international publications, it is up to the agricultural authorities to bring the findings to practical use.

That might be a stumbling block, but the excuse that "things are difficult in the rural reality" will probably not be met with much understanding from professor León-Velarde. Her research has been no Sunday picnic, taking place during the many years of unrest and guerrilla warfare in her country. But perseverance and tenacity seem to be common characteristics of IFS grantees, just like mountain fowl.

FABIOLA LEÓN-VELARDE fabiolv@upch.edu.pe



Chasing the Killers



KENYAN SCIENTIST DANIEL MASIGA may have regarded it as a severe blow when his first grant application to IFS, his first to any agency, was rejected in 1995. Now he regards the experience as the start of a learning process. "The comments of the five reviewers were sufficiently informative for me to make a successful re-submission of the proposal." And with hindsight, he adds: "I have since come to appreciate that the review process and feedback are major strengths of the IFS granting process."

Daniel Masiga studied at home and in Britain for his PhD on Molecular Parasitology and saw only progress in his academic career. Employed by the Kenya Trypanosomiasis Research Institute, KETRI, right after he completed his undergraduate training in biochemistry and zoology, he travelled for graduate and doctoral training.

Getting established was the usual chicken-and-egg problem: No recognition, no funding. Without funding, no chance of recognition. So IFS was just what he needed. While his first application was being reviewed he was invited to an IFS workshop on Parasitology Research in Burkina Faso, a good base for his international network.

Once the first IFS funds came his way, Masiga could prove to peers that he was able to compete internationally. He also became better connected than most Kenyan researchers, through an e-mail linkage provided by IFS.

All for the impact

Masiga equipped his laboratory for both in-house and field work with IFS grants, all with the purpose of "finding solutions that would make a difference", as he phrases it. He focused on an area of life or death for people and for animals, the African *Trypanosoma* parasite. Transmitted by tsetse flies, infecting livestock and causing sleeping sickness in people in many rural areas of Africa.

The mission for Dr Masiga's team was the mapping of species and subspecies, charting the epidemiology and diagnosis of trypanosomiasis more accurately. The



TSETSE FLY TRAP IN RAIN FOREST.

international network grew with the upgrading of KETRI staff, WHO (World Health Organization) came in early, and the latest addition is the African Bioinformatics Network, ABIONET.

Interesting findings relate to the overlooked role of sheep and goats in the transmission chain of sleeping sickness to humans. These smaller animals are generally hardier than cattle, but they appear to be important carriers of the parasite. And since they are often intermixed in cattle flocks, and often live close to people, even a healthy looking goat can be a time-bomb. It was this finding that earned the IFS/Danida award for Sub-Saharan scientists for Daniel Masiga in 2001.

Dr Masiga is now building knowledge on how to best manage animal herds to minimise health risks and obtain long-term control. Presently, he is a Visiting Scientist at the International Centre of Insect Physiology and Ecology, ICIPE, in Nairobi. Back at KETRI, Dr Masiga uses his first encounter with IFS to "advise on successful grant writing."

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Unconventional Wisdom

THE WORK OF ENRIQUE MURGUEITIO and his colleagues is some of the most valuable that has come out of his troubled country in recent years, but it all started with frustration. While studying for his BSc in Veterinary and Animal Science at Colombian Universidad de Caldas, Murgueitio wanted to study local feed resources in livestock production. The curriculum, however, was focused on extensive grazing by beef cattle, reflecting practice throughout South America. So together with others from his university, he tried some feeding trials based on local plants and residues – possibly as nutritious as the grasses in the plains.

Although only 17% of Colombia is fit for large-scale cattle herding, 35% has been used – at the expense of tropical rain forests. Keyword: Environmental degradation.

Over decades land ownership has become so skewed that 70% of rural people occupied only 15% of the land, yet produced half the national food supply. Keywords: Poverty and social conflict.

As in the rest of the world, livestock productivity was not keeping up with the growing demand for meat. A standard solution is to import supplementary animal feed. Keyword: Foreign exchange burden.

So the answers appeared to be: Optimise land use, improve rural livelihoods and make the livestock sector produce more and cheaper. As simple as that. IFS grants served to acknowledge that [working] with farmers at their own plots could be considered as scientific research. At that time participatory methods were still unknown in the context of animal science in Colombia.

A meeting of minds

Together with other concerned students and graduates, Murgueitio created a centre for Research on Sustainable Agricultural Production Systems, CIPAV. He then obtained an IFS travel grant to attend a Cuban workshop on molasses in animal production. There he met with IFS advisers and grantees, who encouraged him to apply for project funds, which he received in 1987.

The resulting model was elegant in its simplicity: partially confine the cattle in enclosures; feed them sugarcane that could be produced in high volume with improved, sustainable methods; supplement this high carbohydrate diet with protein from local plant trees; diversify with smaller animals like goats, sheep and pigs to increase meat production.

This integrated crop-livestock model has since spread and been refined through IFS workshops, scientific publications and CIPAV's own international seminars and electronic journal, Livestock Research for Rural Development.

The model, which makes it possible for farmers with small land holdings to compete, has now been adapted to all the eco-regions to be found in Columbia and neighbouring countries. Results from thinking differently.

EnriqueMurgueitio with pigs



ENRIQUE MURGUEITIO, COLOMBIA

Colombia

ENRIQUE MURGUEITIO enriquem@cipav.org.co

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A Career for all Seasons



THERE ARE SOME NOTEWORTHY paradoxes in Tanzanian Professor Keto Mshigeni's life and career, but he has been able to handle them all very constructively. Coming from the green Kilimanjaro region, growing up at 1,600 metres in the cool climate, attending secondary school in the dry Western inland of his country, Mshigeni ended up as a coastal dweller in hot and humid Dar es Salaam.

Having been inspired to go into science by enthusiastic biology teachers, he took a keen interest in birds – even won top East African school awards – only to specialise his career on botany, focusing on algae.

Before sustainability had even been introduced in development jargon, he went full steam ahead, taking the concept into real life. Trained to reach peak performance in academia, he worked instead in many ways as an entrepreneur.

I am sensitising African Governments to give us matching funds... I want to show what commitment, determination, and clear goals can do with appropriate financial support.

KETO MSHIGENI, TANZANIA

IFS and Mshigeni had the good fortune to meet at just the right junction.

They came in contact after Keto Mshigeni had obtained his PhD from the University of Hawaii on seaweed, financed by the Rockefeller Foundation, which had earlier recognised the obvious potential in this young BSc. During his undergraduate studies at the East Africa University, Dar es Salaam campus, Mshigeni had been able to attract a small sum for his field work from NORAD – a highly unusual accomplishment. And now IFS wanted to follow up on his promising studies with an applied angle.



MAZAELLA SEAWEED

Below the surface

Mshigeni had observed that coastal villages harvested one particular species of algae, which was exported to Europe for industrial use as a gel. But they were using destructive methods, undermining their income base. And little was known about the algae, so not much advice could be given on how to rectify the situation.

Hawaii appeared on his horizon because Mshigeni had found out that this was the seat of the most outstanding specialist on algae, Professor Maxwell Doty, and he simply started a correspondence with him – before he had even earned his first degree. Interestingly, other IFS grantees in this area had the same reference point and were adopted just as constructively by Professor Doty. Take the case of Distinguished Professor Bernabé Santelices of Chile, also supervised by Doty and in the same way inspired to combine first rate science with relevant transfer to society.

But, to come back to Keto Mshigeni, this man of paradoxes did not make it the easy way. He was forced to accept that his PhD work would concentrate on another algal species than the one he had focused on earlier. Becoming an established expert on that, he reverted to his original favourite when he got back home and took his studies along the mainland Tanzanian coastline and to the islands across from Dar es Salaam, Zanzibar and Pemba, among others. And now follows a legend of building up scientific capacity at his University, based on impressive funding from overseas. This infused his own academic advance, leading to an extended international network and taking him from lecturer to professor level in just five years. In the process he produced some of the milestone publications in his field, and was awarded generously and recognised by diverse actors ranging from giants of private industry to the UN.

In the field in Tanzania – or maybe the right term here should be, in the shallow waters there – his group's research gradually led to different harvesting methods and promotion of interventions to secure growth of his favourite algae, which later even diversified to other species. Currently the seaweed industry in the country provides employment to 40,000 villagers, mostly women, leading to improved income levels, investment in other aquaculture activities and pilot algae farms being set up at several locations. In the case of Zanzibar alone, algae production went up from 261 tons in 1990 to 4,300 by 1996 – meaning that this export commodity now earns 10 million USD annually, on par with the famed cloves spice coming from the island.

Professor Mshigeni – or at that stage Founding Director of Postgraduate Studies – decided to take a breather in 1991 when the rich application of his work had gained ground among villagers and small entrepreneurs. He planned a sabbatical, so why not go to the US, where he had spent two previous sabbaticals, and benefit from the well endowed facilities there? But true to his paradoxes, he opted for a different direction again. During a Pan-African meeting on Teaching and Research in the Biological Sciences he came across the Namibian delegation, which invited him to come over to advise on potential use of the rich seaweed resources in their waters.

It was a special joy advising on new and "giant" species in the cool waters of the Benguela Stream, and he spent the full sabbatical year there. Winding up his activities, he organised an international workshop there, attended by the Vice Chancellor

of the University of Namibia, which being in a recently independent nation was just beginning to find its feet. He was asked to act as one of the planning consultants for the University, stayed there longer than planned on a special leave of absence from his home university, and at the end of his assignment was appointed Pro-Vice Chancellor for Academic Affairs and Research in his new setting.

This was enough for a lifetime, you might think. But sure enough, another change recently emerged when the UNDP Africa/UNESCO/UNU ZERI project urged Mshigeni to take on the Director's role, which would draw on a combination of his scientific, administrative and entrepreneurial qualities. ZERI stands for Zero Emissions Research Initiative, or genuine sustainability in full force. It translates into utilising wastes, by-products and spillover for productive purposes. An example: village rearing of valuable mushrooms on farm and industrial waste.

Turning waste into wealth, or whatever the challenge, Keto Mshigeni is a scientist who can master his paradoxes constructively, and we know we'll hear more from him. The Foundation has been extremely important for the personal development of countless scientists in developing countries while, on the other hand, it constitutes a vivid example of an institution that genuinely believes in the importance of science and technology to develop the Third World.

Keto Mshigeni

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IFS 30 years

Fish in Abundance



WE ARE BACK IN THE DAYS of the IFS founding fathers, experiencing the spread of the small grant concept and seeing information on this new opportunity travel from country to country. Meeting with a Thai colleague who was the first IFS grantee of his country, Assistant Professor Rafael Guerrero III, a biologist at Central Luzon State University, warmed to the idea of joining him and in 1975 became the first scientist in the Philippines to receive an IFS grant.

Dr Guerrero focused on fish, taking a special interest in the *Tilapia* species, which tastes just as delicious as its good looks imply. And what's more, it can provide a lot of the precious animal protein badly needed in the typical rural diet in this part of the world. He decided to go full scale for development of techniques for mass production of tilapia, knowing full well that other benefits might come – as indeed, they did. During his PhD studies, Guerrero had looked at the options for changing the

I owe much of the advancement in my fisheries career and the recognition I have received to the IFS.

RAFAEL GUERRERO, PHILIPPINES

growth pattern of tilapia, and with the support of IFS – his first research project funded by sources outside his country – took it further to stud-

ies of cage culture of his favourite fish. An additional grant was awarded to develop hatchery techniques, and Dr Guerrero now was totally given in to fisheries research – hook, line and sinker.

The next years of his research work saw an interplay between upstream research

and downstream application, so to speak. Guerrero was bent on seeing his research results materialise as practical advice and techniques for fish producers. So he took it upon himself to divert slightly from his scientific career – at a time when he was Dean of the Fisheries Faculty and academic rewards came his way in bulk. He became involved as a consultant for private companies and the Asian Development Bank, ending up as Executive Director of the Philippine Council for Aquatic and Marine Research and Development, in charge of planning, monitoring and evaluation of research. As if this wasn't enough, he was also developing programmes on aquatic resources, the practitioner side of him having a strong say.

This addition to his scientific career has been enormously rewarding, now that he has seen improved tilapia pond production spread throughout his country, involving more than 10,000 mostly small-scale fish farms, which are built on 1,000 productive tilapia hatcheries. All the income and employment created has been a boost to rural welfare and livelihoods. If you look at a few statistics, it is also obvious that the national economy has benefited: Tilapia production has grown to over 100,000 metric tons, more than 8% of the country's total fish production, and the Philippines is today one of the world's top five producers of farmed tilapia.



RAFAEL GUERRERO INSPECTING TILAPIA

RAFAEL GUERRERO dedo@laguna.net

A Classic Example

ONE CAN FIND HUNDREDS of personal stories in the IFS database. The typical ingredients are benefits to individual scientists, their institution and colleagues – and not least to their countries.

A severe problem

The Egyptian scientist Yasser Shabana can divide the blessings of his IFS involvement into three short stories, beginning with his first grant in 1989. With an early interest in the major problem of water hyacinth blocking inland waterways from lakes to irrigation systems, he decided to join the effort to clean-up. The plant came to Egypt as a pretty ornamental, but had spread like Australian rabbits. Like the Australian plague, it had few natural enemies to challenge its dominance.

The immediate answer to such a classic problem might be to try to eradicate it with a sprayer, cut the pestering weed down or use it as animal feed. It had all been tried, with no success anywhere. When Dr Shabana's generation of scientists at-tacked the growing problem – ask in Bangladesh or in the Great Lake belt of East Africa – it was obvious that new solutions were needed.

A natural enemy needed to be recruited for the fight – an agent in a biological control programme. Dr Shabana, working at Mansoura University, took an interest in a fungal pathogen, specific for water hyacinth. It appeared on water hyacinth in many locations in the world and apparently suppressed its growth. Once this was established as a scientific fact, research was directed at developing a natural herbicide based on the fungus and in a form that could be applied easily and affordably, without harm to nature – with the exception of water hyacinth, that is. Two patents have been granted on the mycoherbicides developed by this IFS-based research.

Strong capacity building

The IFS grant made it possible for Yasser Shabana to create a laboratory of international standard, attracting graduate and doctoral students. It was then possible to convince additional colleagues to form an interdisciplinary group to fight the water hyacinth problem. As a result, an outstanding multinational, collaborative research project on mycoherbicides against water hyacinth, IMPECCA, was started in 2000 with the University of Mansoura as one of the cornerstones.

Another impact of the IFS funds is the impressive list of publications: "13 fulllength papers published in well-reputed international refereed journals plus 12 abstracts published in international conference proceedings".

What started with an IFS award in 1993 has continued with international and national prizes and awards. The obvious place to pay back some of the investment was for Dr Shabana to accept the role of an IFS Scientific Adviser from 1998.

Value for money, in short. Or, since IFS grants are paid in dollars: Bang for the buck!

YASSER SHABANA ymsh@mum.mans.eun.eg



The main quality or advantage of being an IFS grantee is to become a member of the global scientific community.

PRABIR SARKAR, INDIA



Accumulation of water hyacinth clusters under a bridge in Mansoura, Egypt

Of Cockles and Mussels



Argentina

APPARENTLY YOUNG MARCELA PASCUAL had never heard the hard-to-beat proverb "cobbler, stick to your last" – or at least she paid no attention to it. Otherwise there might not have been a very interesting story to tell about her scientific career and results.

Coming from central Argentina – and one of its major cities, La Plata – she decided after her studies in 1977 to move to the tough environment of Patagonia, far down the long Atlantic shoreline, and applied for a research position there to work on kelp, a large seaweed. But as she phrases it: "Those were tough times in Argentina: a coup in 1976 had established a military government, and many scientists had to flee the country and go into exile." The job came to nothing, and instead she received a scholarship to work on coastal ecology in her home region: Mar del Plata.

But her determination to "go West" – sorry, in this case it is, of course "go South" – led to her successful application for a job in the small faraway provincial town of San Antonio Oeste in 1980. So Patagonia it was, but the botanist was to be involved in research on native oysters. In Marcela's words: "I became a self-made zoologist". This would have been enough of a challenge for most people. But, as she adds: "Aquaculture was a new field in our country and I had to start my career without the benefit of advisers or professors."

At least there was no one nearby. But in 1983 one of her colleagues came across an IFS pamphlet and mentioned it to Marcela Pascual, seeing the prospects for matching her scientific profile with IFS' support criteria. And sure enough, she did qualify, and she was right in her observation that aquaculture was a new venture in Argentina. She was one of the first scientists in her country in the field of aquaculture to be supported by IFS.

The policy of targeting this very appropriate [young] category of researchers for support, flexibility in grant administration, provision of opportunity for genuine researchers to emerge and excel and dependability are some positive aspects of the IFS research grant programme.

N.K.B. ADIKARAM, SRI LANKA

More than seed money

At Marcela Pascual's workplace, the Institute of Marine Biology and Fisheries, the research tasks were much more impressive than the facilities provided. "A small station with reduced staff, few pieces of equipment and meagre resources to conduct research." But still, it was here that the nation's oyster research was initiated, concentrating on the collection and growth of spat. Oyster fry, so to say.

Having access to her own research money for the first time changed virtually everything for Pascual and her colleagues. Suddenly they were able to purchase a quality computer and a laser printer – and there was

a reliable budget and a work plan that could be followed with some degree of regularity. And just as importantly, the funds and the equipment secured a lifeline from their scientifically isolated station to databases and international colleagues, "longlasting scientific contacts." The first scientific results soon followed, notes Pascual.

The next advance is in full accordance with the IFS textbook. Marcela Pascual was invited to an international scientific meeting organised by IFS in 1986 in Lima, Peru, where some of her - from then on - life-long heroes extended her network decisively. Another turning point was an invitation to go to the University of Washington in Seattle, USA - based on advice and funds from IFS - to finish her doctoral work. This sharpened her scientific focus and led to a reorganised agenda back in San Antonio Oeste.

There it was obvious that progress in their research on the Puelche oyster depended on having access to an oyster hatchery and specialised laboratory facilities. But such facilities were not available in Argentina for years to come. But less can go a long way, it turned out.

Dr. Pascual was able to study larvae hatching in France, based on parental stocks of her Puelche oysters brought from home, and IFS funded additional trips for her to study a number of hatcheries while in France. And back home IFS funds ensured the setting up of a modest specialised laboratory where the very first oyster larvae cultures were developed. To outsiders the simple hatchery attached to the labo-

ratory probably looked like an extended bath tub, measuring 3 by 3 metres. And even if seawater had to be carried in buckets to make it work, this "mini-lab" did produce valid results.

At long last, in 1996, a genuine, full-size hatchery and laboratory facilities were set up at the station, making it possible to expand to large-scale operations - and now based on national funding. And large scale means undertaking substantial research, with Dr. Pascual heading the institute, now staffed fully and with a generation of young enthusiastic scientists around her.

But there is more to it: The facilities also function as an extension and training station for private industry and above all create opportunities for smallscale producers and artisanal fishermen to expand into aquaculture. The results should be visible in the national economy of Argentina, since the techniques have led to private mussel and oyster aquaculture enterprises at several locations along the whole coastline of Argentina.

It was therefore no surprise that Marcela Pascual was honoured with the IFS Silver Jubilee Award and invited to become a Scientific Adviser in 2000. Flattering and warming, obviously.

But probably she is even happier that her aspirations as a young student have been fulfilled to an extent that few people will experience: "...I also had a strong interest in social issues and felt that my work had to be directed at improving human welfare."

MARCELA PASCUAL ostra@canaldig.com.ar

The enormous merit of the Foundation is that it helps young scientists to initiate their own research in new fields at a time in their careers when they cannot apply to other traditional funding sources.





MARCELA PASCUAL

IFS 30 years



India

Village Microbiology

An important nutritional issue in many countries is access to essential amino acids, since relatively little expensive animal protein is consumed by poorer people. Protein from beans and lentils can, however, go a long way towards providing these vital nutrients.

Indian microbiologist Prabir Sarkar had noted one popular form of nutritious soybeans in the Northeastern region of the country, Darjeeling. This was *kinema*, a fermented product made by women in the household and sold at local markets. He had, however, doubts about its safety and nutritional quality. So even if he was not strictly a food scientist, he started to analyse samples at the University of North Bengal and published data and displayed a poster at the 1988 International Food Convention in India, attracting the interest of a visiting IFS Scientific Adviser and eventually securing a grant.

His studies proved traditional preparation to be safe in principle and the product healthy in the way that it was consumed. *Kinema* mixed with vegetables, salt, spices and water is made into a curry and the protein content is on par with that of eggs and milk. But its preparation – boiling, crushing, wrapping, and the fermentation time and temperature – needed to be standardised so that one ended up with a more uniform and hygienic product with a longer shelf life. This was just the kind of advice that came out of Sarkar's laboratory and that was taken up by small-scale producers, who could sell the improved *kinema* widely.

Microbiology taken to the village kitchen has secured Prabir Sarkar an impressive academic career and an acknowledged international position in food science. PRABIR SARKAR pksarkar@sancharnet.in



Building Capacity by Supporting Others

AFTER HIS US TRAINING around 1970, Ethiopian chemist Berhanu Abegaz specialised in small ring molecules, recalling his supervisor's advice to look for potential contributions to developing rocket fuel. When he returned home he opted instead for analysing local herbs and medicines, looking for interesting molecules with beneficial properties. But his group's research proposals did not receive university

Ethiopia

funding and political turbulence made research difficult. At this point IFS came to Berhanu's rescue with initial funding and four years later he presented the first paper published in an international journal coming out of Ethiopia in the area of natural products.

In the 1980's Professor Berhanu Abegaz initiated the Chemical Society of Ethiopia together with some 40 colleagues, and Berhanu was selected to lead the organisation and was then charged with establishing the Society Journal. He produced the journal for six years and had it distributed to 77 chemistry departments in Africa (it is now searchable online).

At the same time, together with Professor E. Dagne of Ethiopia, he established a network for natural product scientists in Africa, running it for 16 years. Here as well, IFS stepped in with financial support. The biannual NAPRECA Symposia are now regarded as the best fora for presenting work on natural products.

A third network, NABSA, allows researchers to receive help with analyses of chemical and biological samples.

When Berhanu looks back on his 30-year research career he feels that most of his achievements stem from three factors: collaboration, flexibility and professional and financial support from international organisations like IFS.

The IFS/Danida Award went to him and a colleague in 1997, and Berhanu is also a dedicated IFS Scientific Adviser.



HOTO: FAO/G. BIZZARI

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Crossing the Frontier

WITH HER FORMAL TRAINING and career staked out in organic chemistry, young Banasri Hazra did a rather unconventional thing when she began performing bioassays. But her PhD studies had developed her interest in a plant extract, which according to folklore had some medicinal properties. And since she not only wanted to look at the chemical characteristics of this extract, but also took an active interest in its effects on her experimental animals, she had to develop her skills and knowledge in areas of biology that were entirely new to her.

Her first IFS grant made it respectable – and possible – to organise her work together with a multidisciplinary group drawn from biochemistry, pharmacology, parasitology and oncology at Jadavpur University in Calcutta, India. The IFS Scientific Advisers found it particularly commendable that she would cross the boundary of phytochemistry – the chemical analysis of the plant extract – and was aiming for applied findings, by testing the efficacy of the products.

Results proved that the derivatives synthesised from the active compound of the plant, diospyrin, had a tumour-inhibitory activity and – totally unexpectedly – also effects on the ugly leishmania disease.

We could continue with a very impressive – and indeed courageous – scientific career description. But let us just listen to Banasri Hazra's words, as she looks back on her IFS support: "Thus, the grant came to me as a catalyst at this point, urging me to spread my wings beyond the national boundary. And that was just the beginning to a very hectic, albeit interesting, journey which, in fact, eventually influenced the very course of my life to some extent".

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BANASRI HAZRA COLLECTING ETHNOMEDICAL INFOR-MATION FROM A VENDOR OF MEDICINAL PLANTS IN A LOCAL MARKET

A Bee in His Bonnet



MANY RURAL TECHNOLOGIES in developing countries have worked well and in a sustainable manner when lands were sparsely populated and natural resources had the time and space to recover. Land opening by slash-and-burn is a case in point. Another example is honey collection. Traditional African methods would often mean that beehives in nature were destroyed and the swarm of bees killed. There would always be new places and new hives around. With growing population this approach was no longer sustainable – but since bee products were popular and generated a good income, beekeeping began. Agricultural scientist Kwame Sarkwah Aidoo in

Ghana observed keenly as a secondary school

teacher in the mid-1980s the very inefficient attempts to organise beekeeping in rural areas. Pursuing his

interest, he applied for and was awarded a one-year Commonwealth Fund Scholarship to study apiculture

at the University of Wales. His thesis covered devel-

opmental biology of an African bee species related to seasonal supply of forage resources. This turned

into a beekeeping calendar for southern Ghana. And in the process Aidoo developed a simple method for

Obviously, the benefits of our tenyear IFS grant have undoubtedly gone beyond the accomplishments of our research objectives.

FELY ALMASAN



KWAME AIDOO



BEEHIVE IN THE JUNGLE

rearing queens for bee colony multiplication.

In Wales he heard about the IFS programme and received a grant in 1992 to start work on one of the many topics in need of applied scientific research: "The Development of an Appropriate Top-bar Hive for the West African Honeybee." His results led directly to an improved village technology, the Saltpond Hive, being quickly adopted by beekeepers in Ghana and the region.

He had now, with his uncommon research-based knowledge of beekeeping, established himself as an authority and became employed as a teacher at the School of Agriculture, University of Cape Coast, and as a consultant. Taken to the field through his consultancy work for a number of NGOs and development agencies, his findings have led to improved income for scores of rural communities. Beekeeping being a family activity, women have gained much from these advances, and many secondary schools in the country now take an interest in apiculture.

With his entrepreneurial spirit he managed to set up a whole institution in 2001, the "Saltpond Honey Centre", a family business unit demonstrating bees and beekeeping as a viable undertaking. Products are made available to visitors, and local craftsmen produce and sell quality equipment, such as smokers, bee suits, hive tools and bee hives. The centre and involved neighbours produce enough to sell in the community and to markets elsewhere. And visitors, even from abroad, flock to the Centre, which is gradually becoming an eco-tourist destination.

Presently Aidoo has advanced plans on taking up PhD studies soon. There must be some truth to the claim that propolis, a waxy honeybee product, has an invigorating effect.

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"The enormous merit of the Foundation is that it helps young scientists to initiate their own research in new fields at a time in their careers when they cannot apply to other traditional funding sources." Marcela Pascual, Argentina

"My IFS grant was the first to go to Vietnam and it has opened new potential for the modernisation of our agriculture." Nguyen van Uyen, Vietnam

"The confidence and prestige I gained from receiving the IFS grant as my first external research grant was the stimulus I needed to launch my research." Funso Sonaiya, Nigeria

"The IFS system of advisers is admirable and very commendable; it was instrumental in opening doors and putting me in contact with a number of prominent researchers who provided valuable advice and guidance." Lee Su See, Malaysia

> "At that point the impact of the IFS grant made the difference." Luis Manuela Peña Rodriguez, Mexico

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