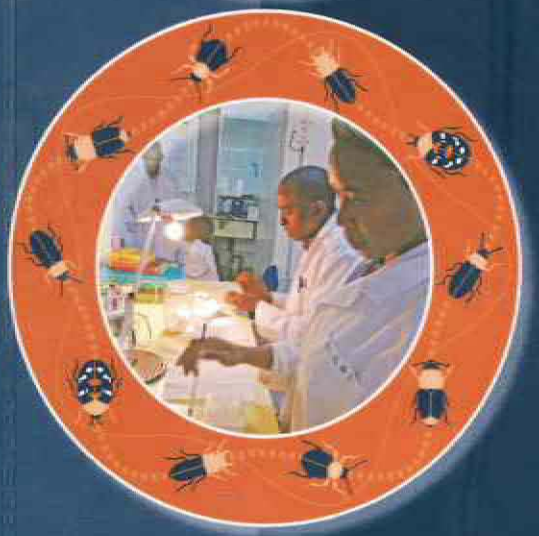

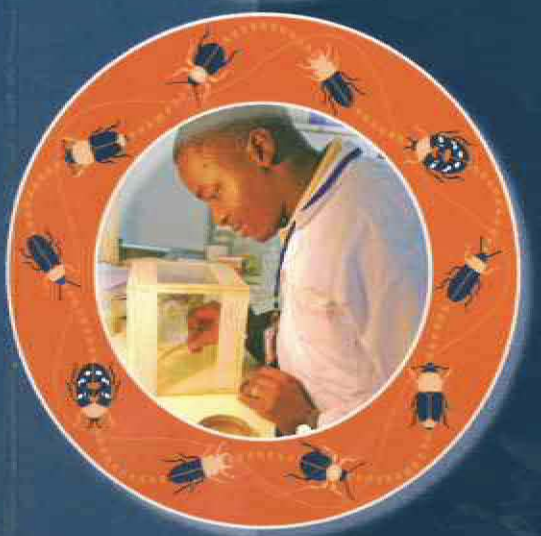

Africa-Wide Network of ARPPIS

Silver Jubilee

1983 – 2008

Nurturing African Talent for Leadership in Insect Science

25 Years of the ARPPIS Experience

icipe

African Insect Science for Food and Health

asa

ARPPIS Scholars Association

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Disclaimer

The views expressed in this magazine are the authors' and are not necessarily shared by *icipe* or any of its donors or partners in the training programmes.

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FOREWORD

A research training experience for Africa's talented young scientists

Christian Borgemeister

As the only international institution in Africa working primarily on arthropods, *icipe* – African Insect Science for Food and Health, considers building the capacity of individual researchers, institutions and communities in Africa an integral part of its research and development activities.

In line with this, in 1983, *icipe*, in partnership with leading universities in Africa, launched the African Regional Postgraduate Programme in Insect Science (ARPPIS). The vision of the programme has always been the training of young African scientists to take regional and international leadership in insect science, to meet the needs of the continent as well as the challenges of a rapidly changing global environment.

As ARPPIS celebrates its silver jubilee this year, it has earned a well-deserved reputation of an incubator of some of Africa's finest young scientists. In collaboration with 35 African universities, the programme has trained close to 300 African PhD-level and 170 MSc-level scientists. A further 250 postgraduate students, mostly from Africa, have been trained through the Dissertation Research Internship Programme (DRIP). This is a sandwich form of study, where scholars spend half their academic tenure at *icipe* and the other half at their respective universities. At any one time these two training programmes have at least 20, and at times up to 40 students at various stages of their research.

A shining success

The success of the ARPPIS programme is due to the fact that it combines *icipe*'s unique 4Hs research paradigm, i.e. research on human, plant, animal and environmental health, with the academic experience of its partner universities. *icipe* provides the students with a thesis project, research facilities and supervision, in addition to a training fellowship covering university fees, research costs and a maintenance stipend. A full ARPPIS scholarship amounts to US$ 30,000 per year. Students are registered at any ARPPIS participating university, whose responsibility is to provide additional research supervision, so as to ensure that the work of the scholars meets international standards. The university also examines and awards degrees to the students.

Most ARPPIS alumni have remained in Africa, where they are actively involved in research and development projects. A number of them have risen to policy-influencing positions within their governments. Others have taken up major international positions, thus making valid contributions to insect science worldwide.

In addition, through re-entry grant assistance and South-South cooperation schemes operated through ARPPIS, graduates returning to their home institutions are able to establish a research career in Africa and collaborate with one another.

Sericulture: *Esther Kioko (ARPPIS, 1995) discusses a point with farmers during a field visit to the icipe headquarters*

Celebrating 25 years of ARPPIS

In commemoration of this milestone, *icipe* is co-sponsoring the publication of this collection of profiles of ARPPIS (and a few DRIP) alumni selected from across the years and regions. Also featured are several students who are currently undergoing training through the programmes. Told either as narratives, in depth interviews or testimonials, these stories bring to life the reality of ARPPIS. They show that beyond its insect science capacity-strengthening mandate, ARPPIS is much more. It is a programme about people, and it has touched its graduates in many unique ways. For some, ARPPIS has been a journey of self-discovery and self-realisation. For others, ARPPIS was a second chance, and

FOREWORD

Cereal pests research: *Charles Mugoya (ARPPIS, 1988) trains a Masters student on stemborer incidence on maize in a trial field site at Mbita*

for others still, especially those from strive-torn countries, a life line. Above all, these accounts show that ARPPIS has indeed lived up to its dream of nurturing young African talent and creating leaders, who are today willing and motivated enough to promote a science culture and science-led development.

Lessons learned

These stories are as thought-provoking as they are inspiring. While they show how much has been achieved, they also reveal how much more work still needs to be done, in the quest for a better livelihood for the people of Africa. It is for this reason that we plan to chronicle the story of ARPPIS even further. This will be through a commemorative resource book, which will have policy implications for science training in Africa. This publication, which will be published by the *icipe* Science Press, will build on the deliberations of the ARPPIS Scholars Association (ASA) scientific symposium to be held on 25–28 November 2008 at *icipe*'s headquarters in Nairobi, Kenya. It will then trace the genesis of the ARPPIS programme, right from the Bellagio Planning Conference held in Italy in September 1981, where the idea of the programme was first mooted. The book will then proceed to take account of the milestones and achievements, as well as the challenges encountered along this epic journey, and how various organs such as the ARPPIS Academic Board (AAB) and the recently formed Council of Vice Chancellors (CVC) have become pillars of strength for the programme. And in line with the vision of the founders of ARPPIS, we will dedicate a significant part of the book to honouring the outstanding achievements of the ARPPIS alumni, in five aspects: (i) scientific research, (ii) training and institutional building, (iii) policy advocacy, (iv) socio-economic development and (v) community empowerment. We trust that this book will become a valuable resource for governments and institutions to build capacity of African scientists.

Acknowledgement and support

icipe appreciates the support of a consortium of donors towards making the ARPPIS dream a reality. These include the German Academic Exchange Service (DAAD), which is currently providing 10 fellowships annually (equally split for masters and doctoral training). Through the Dutch Cooperation Programme with Developing Countries (SII), the Royal Government of the Netherlands has provided three PhD and nine MSc fellowships annually, as well as providing coordination support for the last 15 years. The combined support provided by these two key donors has enabled *icipe*, through ARPPIS, and in partnership with the participating universities, to train an impressive total of 201 doctoral and 102 masters-level scientists since 1983.

Familiarisation visit: *Past ARPPIS students review pest management practises in a farmer field site*

Prof. Christian Borgemeister
Director General, icipe
and Chairman, ARPPIS Academic Board (AAB)

ARPPIS—A BRIEF

Young African scholars—a valuable resource for *icipe*

Careful, painstaking insect-related research by African students, working alongside scientists at icipe has resulted in key scientific discoveries

JPR Ochieng'-Odero

Over the years, *icipe*'s research programmes have greatly benefited from the work of students from various parts of Africa. Through research undertaken as part of their masters' dissertations or PhD theses, these young scholars have provided unique insights and scientific discoveries. In many instances, the work of students based at, or linked to *icipe* has assisted in designing and shaping the direction and focus of the centre's programmes at their infancy. These studies have provided vital clues as the projects mature, and aided in refining the methodological approaches. They have also provided much needed socio-economic impact assessment of the technological packages that are eventually adopted by the target communities.

Student work drives research

icipe has for many years been in the forefront of the control of tsetse, the deadly, blood-sucking flies, which carry the trypanosome parasite that causes the human African trypanosomosis, commonly called sleeping sickness, and the livestock disease, nagana. *icipe*'s approach is to develop integrated management strategies, which are affordable and accessible to the communities most affected by the tsetse menace, such as community-based trapping technology of the flies. Over the last two decades, a total of 22 students from Africa have been involved in key aspects of this research. They include Charles Kyorku from Ghana, who joined a team of *icipe* researchers in 1985 to develop the NGU trap, which has been successfully used all over Africa for control of the savanna species of tsetse. His pioneering work at determining the efficacy of the trap was later on expounded by Jean-Berckmans Muhigwa from the Democratic Republic of Congo, who together with Mwangelwa I. Mwangelwa of Zambia developed baits for the riverine species that transmits human sleeping sickness. Parallel to the development of the traps, *icipe* has also been conducting research on potent repellents that could be used in the management of the flies. In 2003, a Kenyan student, Nicholas Gikonyo was instrumental in the identification of the active tsetse repellent blend from the waterbuck. Gikonyo's work and that of other subsequent students has provided the basis of a bio-based product. This in turn led to a groundbreaking tsetse control innovation comprising of repellent collars, a 'mobile' technology which is ideal for pastoralist communities, but is also increasingly popular with sedentary livestock keepers. The repellent collars are currently being evaluated for commercial development.

Working with several partners, *icipe* has been searching for ways to combat striga and stemborers, two key constraints in the production of Africa's main staples. Through its Habitat Management Programme, *icipe*'s research has led to the development of the 'push-pull' technology, so called because it involves a novel combination of forage plants which, when intercropped with cereals, act both as a trap and a repellent for stemborers and also disrupt the growth of the striga weed. This quest has received significant contribution from 14 doctoral-level students. Joseph J. Randriamananoro from Madagascar joined the programme in 1993, becoming the first PhD-level student to be trained under the 'push-pull' project. His research was key in evaluating several wild grasses for their suitability to the stemborer *Busseola fusca*. Joining a year later, Mohammed Hassan Mohamud from Somalia investigated the suitability of different wild grasses for the development of the other economically important stemborer, *Chilo partellus*. The results obtained by Joseph Randriamananoro and

Malaria research: *Clifford Mutero, a former icipe scientist, discussing research findings of his ARPPIS student with a visiting researcher*

Behavioural ecology: Peter Njagi, an icipe scientist, discusses with donors aspects of some student research work

Hassan Mohamud formed the basis for selecting grasses for testing in the 'push-pull' strategy. These pioneering contributions have been complemented by the work of other students. Linnet Gohole, working within a partnership doctoral programme between Moi University, Kenya, the Wageningen Agricultural University, the Netherlands, and *icipe*, demonstrated the altitude specificity of nonatriene, an SOS volatile chemical produced by molasses grass. This work is important in understanding the biochemical mechanism of the push-pull interaction.

From a socio-economic standpoint, the ongoing work of Esther Njuguna, a PhD student from the University of Nairobi, Kenya, on the evaluation of determinants of the farmer technology choice in stemborer and/or striga management in maize in western Kenya is important. When completed, this work will broaden *icipe*'s understanding on how farmers choose a technology and what criteria they look for before adopting it. Other ongoing student projects that will contribute to the 'push-pull' portfolio include that of Lefulesele Lebesa, from Lesotho, who is conducting research on blister beetles that attack the useful *Desmodium* plant. Through screening trials in Sudan, Khogali Idris aims to identify drought-tolerant desmodium species. The results from his study will also be used to design push-pull strategies for sorghum and millet in drier areas of Africa.

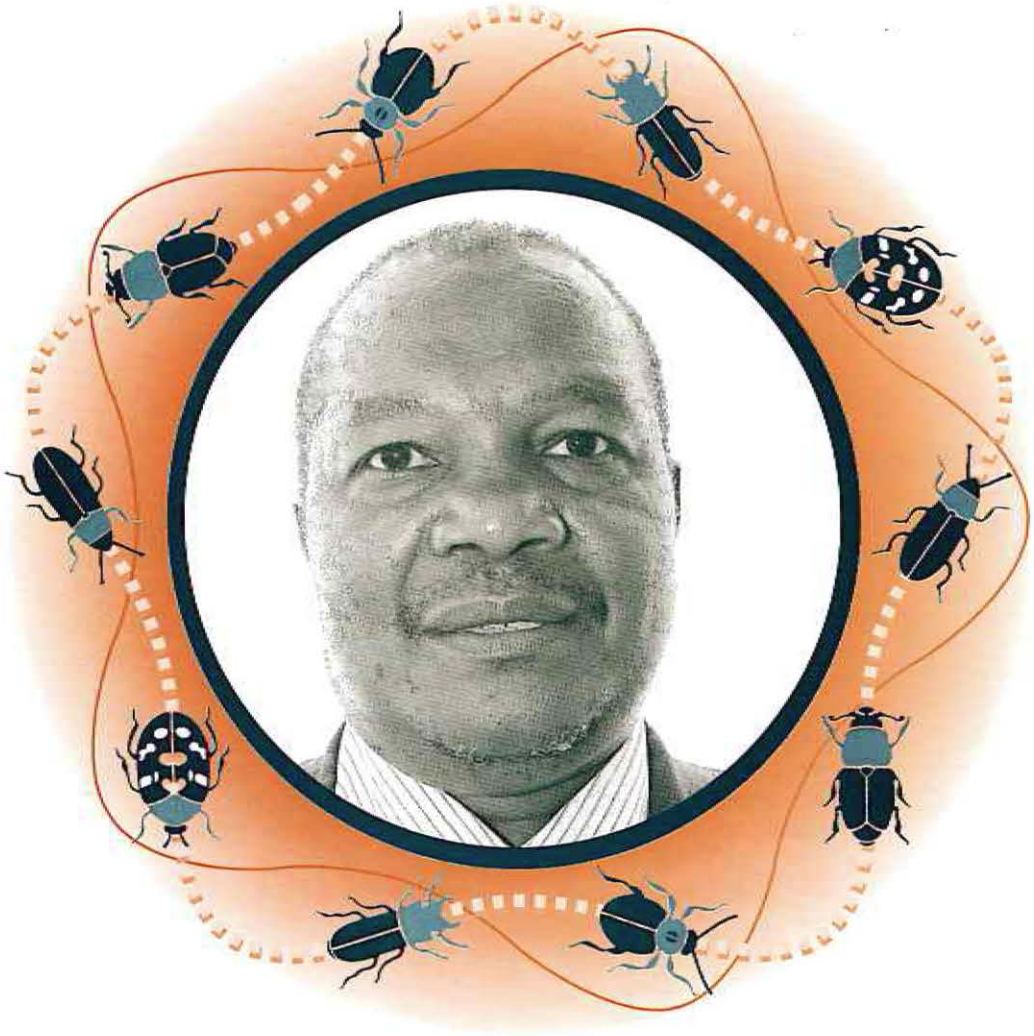
Tripartite partnership model

This contribution from ARPPIS students has been made possible through a unique tripartite partnership that links university lecturers, *icipe* scientists and young African talent. Known as the African Regional Postgraduate Programme in Insect Science (ARPPIS), the programme continues to reaffirm *icipe*'s commitment in capacity building in Africa. Through research training undertaken at the Centre's laboratories and field sites located in various agroecological zones, *icipe* is able to expose the upcoming scientists to modern scientific approaches and techniques under the supervision of an internationally reputable group of scientists backed by their counterparts in African universities.

In the laboratory: Intricate details of the insect world often need the help of microscopy

Tapping into this immense resource of African young scientific talent has not only helped *icipe* to advance its own mandate of improving the lives of Africa's poorest people. It has also helped to strengthen the capacity of key African universities.

JPR Ochieng-Odero
Head of Capacity Building and
Institutional Development Programme, icipe
and Network Coordinator, ARPPIS



INTERVIEW

Richard Kiome BAGINE
(ARPPIS Scholar 1983–1986)
Sponsors: United Nations Environmental Programme (UNEP), *icipe* and Dutch Government

Richard Kiome Bagine has over 25 years experience in biodiversity conservation, research and development. He has held senior positions in academic and scientific research circles, which have allowed him to serve his nation, region, as well as the international community. He discusses this in the interview below.

Richard Kiome BAGINE (ARPPIS Scholar 1983–1986)

Q. What is your background?

A. I was born and brought up in Meru District, in a village called Menga-Gikumene in Ntakira sub-location, North Imenti constituency. I attended a primary school not far from home, which had been started by the Methodist Church and later taken over by the Government of Kenya. I then moved to Kaaga Boys Secondary School for both the Kenya Junior Secondary Examination Certificate (KJSE) and 'O' levels, between 1969 and 1974, and then to Nkubu High School for 'A' levels, between 1975 and 1978. I proceeded to Kenyatta University College, Nairobi, for a Bachelor of Education degree, between 1980 and 1982. I then studied for a Master of Science degree in Zoology (Biology of Conservation), at the University of Nairobi, Kenya. I obtained a PhD from Makerere University, Uganda.

Q. How did you get interested in science?

A. My childhood was rooted in the Meru traditional culture, and as a young boy I was charged with looking after my father's cattle. I would graze them far away from home, in the open grassland and swampy fields that belonged to our clan. When not grazing the cattle with other boys and old men, I would help my mother in the farm. Through my experiences as a child, grazing cattle or working on the farm, I got interested in nature from a young age. I enjoyed observing the behaviour and feeding habits of mammals, birds, insects and reptiles that I encountered while in the farm or in the field. Sometimes we would trap and catch some of the animals, e.g. the speckled mousebird *(Colius striatus)* and red-billed firefinch *(Lagonosticta senegala)*, game birds (e.g. harlequin quail *Coturni delegorguei* and yellow-necked spurfowl *Francolinus leucoscepus*), doves *(Streptopelia* spp.), arthropods (e.g. insects such as termite alates and grasshoppers) and mammals such as antelopes (duikers, reedbucks), hares, porcupines and others, for food or for fun. I was also involved in spraying chemicals on our coffee and crop farm to kill or control insect pests. In addition, my father, who was an agricultural officer, provided me with a good environment and opportunity to understand crops and their enemies. While in school, my teachers encouraged me to get involved in scientific activities such as science, nature and geographical discovery clubs. My main challenges included lack of adequate science facilities in the primary and secondary schools, selecting the right combination of science subjects, as well as attaining the required grades. I also felt challenged to emulate other prominent scientists.

Q. How did you join *icipe*?

A. After I completed my MSc coursework at the University of Nairobi, I wanted to pursue a course in insect ecology and taxonomy. The late Prof. Thomas R. Odhiambo, who was the Director of *icipe*, offered me the opportunity to use the Centre's facilities and to train as a young scientist. His excellent knowledge in entomology, as well as his desire to train and support young scientists increased my enthusiasm to continue pursuing academic excellence. I admired the *icipe* family of eminent scientists led by a great scholar, orator and a visionary leader. The training and experience I acquired from the institute strategically positioned me for a career in science. I got to know other scientists in the world, and I was able to mould my scientific career and therefore get fulfilling jobs. As a result, I have been able to carry out extensive research focusing on ecology, biosystematics and biodiversity. More importantly, I have been able to serve my country, region and the international community in my capacity as a scientist and manager, giving advice to policy makers and building capacity.

Q. What are your career highlights?

A. After the training at *icipe*, I joined the National Museums of Kenya (NMK), where I remained until 1997 when I was seconded to the Kenya Wildlife Service (KWS). While at NMK, at the level of Chief Research Scientist, I held key managerial positions, including, Head of Invertebrate Zoology Department, Deputy Director in charge of Centre for Biodiversity and Director of Collections Management and Documentation. In these roles, I developed institutional research policies and guidelines, carried

out research, promoted capacity development programmes and conducted social economic programmes for the communities. For instance, I was involved in initiating a butterfly-farming programme at the coast in Kenya. I also led the establishment of the Centre for Biodiversity at the NMK. I helped to integrate its capacity into the country's biodiversity studies and into the development of the Kenya National Environment Action Plan.

I joined the KWS in 1997 as a Senior Scientist and then rose to the designated Head of Department and Chief Scientist in charge of research and planning in 1999. I have held other senior management positions, including that of Deputy Director in charge of wildlife research, biodiversity and monitoring. My work responsibilities entailed biodiversity and wildlife research, conservation and management of fauna and flora, development of project proposals for funding, preparation of management policies, personnel administration and co-ordinating multilateral environmental agreements.

In addition, I continued with research and capacity building responsibilities. As a chief scientist, I developed key research studies that propelled KWS to be recognised as an active wildlife research institution. I established viable national and international research collaborations especially in the areas of biodiversity, conservation and bioprospecting, which have now advanced strongly in Kenya. I developed programmes and activities that now benefit communities especially in areas adjacent to protected areas. Today, these communities, alongside their local authorities, participate in conservation and are good managers and co-managers of biodiversity resources in their wildlife conservancies and reserves. Through biodiversity assessment, I have contributed in the nomination and listing of critical sites, habitats and endangered species in international agreements, e.g. the UNESCO World Heritage/Man and Biosphere Reserve, RAMSAR, CMS and CITES.

In 2007, I returned to the NMK as a Research Scientist. My role is to continue with research, build capacity and train others in scientific areas. Currently, I am in the board of trustees of JRS Biodiversity Foundation based in USA, which provides research grants to scientists and research organisations.

I have continued to represent Kenya as a delegate in international conventions, agreements and protocols. I also serve as a regional representative in technical and scientific committees of CITES, RAMSAR and CMS.

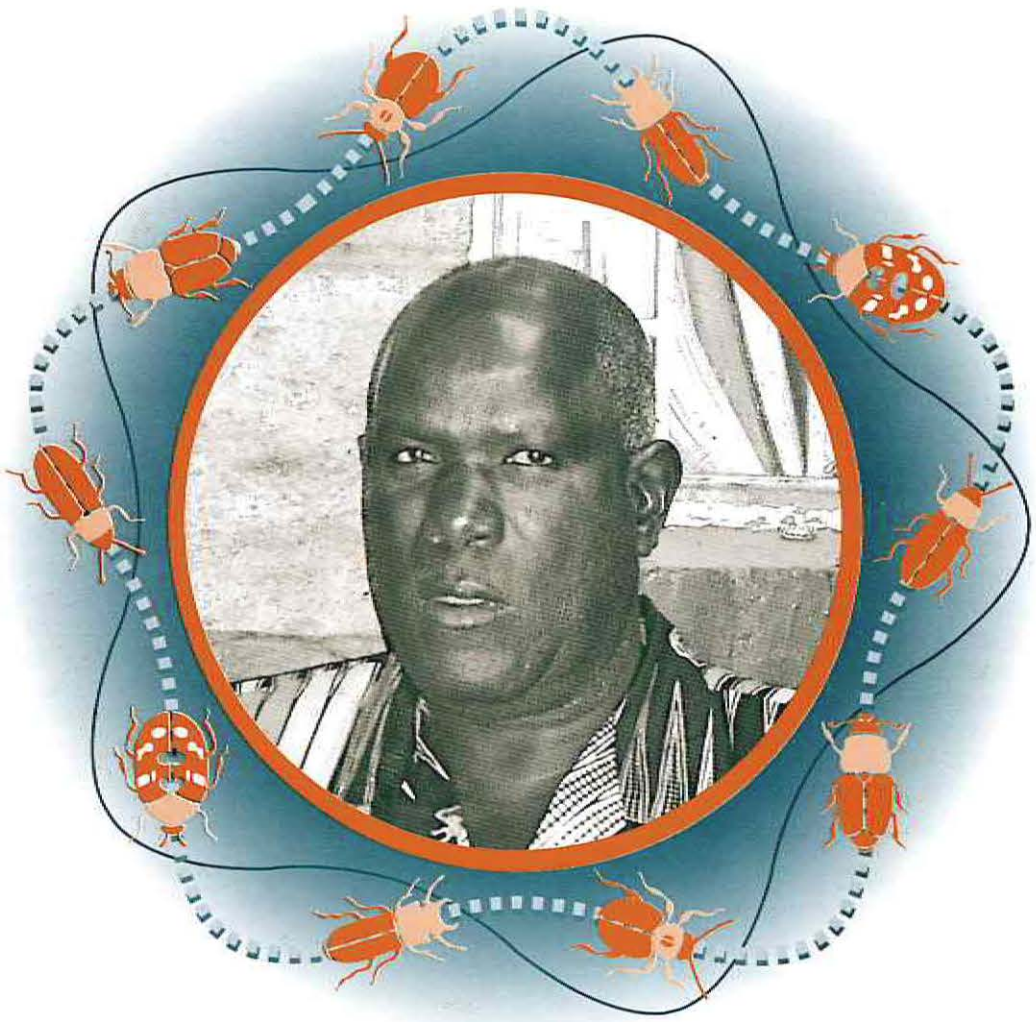
For the past 24 years, I have published many quality scientific papers in nationally and internationally accepted journals in areas of biodiversity and insect taxonomy (biosystematics). I have written and edited several conference and workshop proceedings. I have promoted capacity building through teaching and supervision of young and dynamic scientists. I have coordinated and taught insect taxonomy courses for ARPPIS PhD students and have continued to serve as external examiner at our national universities.

I am a member of many national and international societies, and I have served as the Chairman of the Biodiversity sub-committee under the Kenya inter-ministerial committee on environment for over three years.

Q. Based on your wide-ranging experience, what would you say are the challenges between scientific research and policy?

A. There are many depending on how one looks at their relationships. Unfortunately, scientific language often impedes proper communication between scientists and policy makers. The challenge is to simplify science for public consumption and understanding. Similarly, there is a challenge in the time taken to produce and disseminate policies. Science should guide the process of policy formulation, development and implementation. This is because politicians or non-scientists will tend to restrict the way a scientist would like to carry out his/her research in the field or in the laboratory. Science is vital and should provide practical solutions and simple tools to enhance implementation and evaluation through analysis and interpretation. Indeed, scientists should become managers and influence policies.

INTERVIEW



Joash Barrack OKEYO-OWUOR

(ARPPIS Scholar 1983–1987)
Sponsor: German Academic Exchange Service (DAAD)

Story of a pioneer...

Currently an Associate Professor at Moi University, Kenya, J. B. Okeyo-Owuor is one of the most distinguished integrated pest management (IPM), and environmental conservation and food security specialists in the region. He talks about his long and illustrious tenure at *icipe*, and his equally long list of 'pioneering' legacies.

Joash Barrack OKEYO-OWUOR (ARPPIS Scholar 1983–1987)

Q: What is your background?

A. I was born on 10th July 1949 in Kisumu, on the shores of Lake Victoria. My parents, Zedekia Owuor and Treeza Ndede Owuor, were peasant farmers, who also engaged in fishing. I attended local primary schools before proceeding to Rapogi Secondary School for 'O' levels from 1966 to 1969, and Nakuru and Kamusinga High schools for 'A' levels in 1970 to 1971, respectively. I obtained a BSc in agriculture and an MSc in entomology from the University of Nairobi in 1975 and 1977 respectively. I had performed well in sciences in secondary school, and continued to do equally well at the university.

Q. Please discuss the path and milestones of your long and illustrious tenure at *icipe*

A. After obtaining my BSc I was motivated to undertake an MSc in entomology by the performance and research work of Profs Thomas Risley Odhiambo and C. P. Kanute Kamala, both of the former Entomology Department, as well as that of several professors at the University of Nairobi. Professor Kamala is still at the Department of Zoology in the University of Nairobi. I was particularly interested in the challenges posed by insects that attack crops, especially the numerous pests of grains and legumes in Africa. Profs Odhiambo and Kamala became my mentors, as I worked through the field thesis research on pests of pigeon pea *(Cajanus cajan)* in Kabete and in Katumani research stations. I later got an opportunity to visit the newly founded ICRISAT centre in India where other scientists, especially Dr T. C. Davies, further inspired me into scientific research. On completing my MSc, I joined the Ministry of Agriculture—Research Directorate (now KARI) at the National Horticultural Research Station, Thika, as Head of Crop Protection Research, specialising in grain legume pests. However, driven by the desire to advance my work into PhD research, I left the Ministry. By coincidence, *icipe* had advertised for the position of Associate Research Officer, which I successfully applied for. I joined *icipe* in September 1978 and was posted, together with five other 'pioneers' to the *icipe* Mbita Point Field Station (now the *icipe* – Thomas Odhiambo Campus, Mbita). I always liked being a pioneer and hence was happy for this posting! While at Mbita I was a pioneer in the Crop Pests Programme, being the only scientist working on the key pest of cowpea, *Maruca testulalis* (its ecology, population dynamics and biological control).

Between 1983 and 1987, I joined ARPPIS as a pioneer student of the programme. I did my coursework in-residence at the newly established Duduville Guest House. I then conducted my thesis research on the 'Population dynamics and biological control agents of *Maruca testulalis* on cowpeas' at the Mbita Point Field Station while registered at the Department of Zoology, University of Dar es Salaam, supervised by Prof. David Griffiths and the late Dr G. W. Oloo.

In 1988, *icipe* established the PESTNET Programme, funded by UNDP/IFAD and I was posted to Somalia, based in Afgoye Research Station, Mogadishu and Bay Dryland Research Station, Baidoa. I once more became a pioneer, starting *icipe*'s work in collaboration with the Ministry of Agricultural Research Directorate, Somalia. I opened numerous short-term and postgraduate training opportunities for many Somali scientists. I also set up IPM activities on crop borers at the two stations and in the farmers' fields. When the war in Somalia started in 1990, I returned to *icipe* headquarters in Nairobi and helped start the *icipe*/WAU Biological Control Project in Nairobi and at the Kenyan coast.

In 1991, I was appointed by the Kenya Government to be the Managing Director of the Lake Basin Development Authority, Kisumu. I held this position while on leave of absence from *icipe*. I rejoined the Centre in 1993 to 1995, as a Senior Research Scientist in the Tsetse Programme and head of the Coastal Research Station at Muhaka. Once more, I returned to the *icipe* headquarters in Nairobi, this time to start the Arthropod Diversity Programme, before leaving the Centre in 1996.

Q. Please comment on the personal benefits of your time at *icipe*

A. First, *icipe* enhanced my academic qualifications to PhD level and prepared me to conduct high-level research in IPM. I have wide experience and knowledge on insect

Joash Barrack OKEYO-OWUOR
(ARPPIS Scholar 1983–1987)

and related sciences. I have diverse national, regional and international linkages and scientific friends. I have authored many publications and attended many conferences. I also enjoyed good remuneration and standard of living!

icipe was also a platform for me to contribute to the development of my country, Kenya, and the region. My research findings on grain legume pests and on the tsetse fly opened avenues for other research areas and led to IPM techniques for the target pests.

During the course of this work, I was able to build capacity in IPM management by training other scientists and technicians working in different parts of the country. I also contributed to national development through my tenure as the Managing Director of the Lake Basin Development Authority, Kisumu.

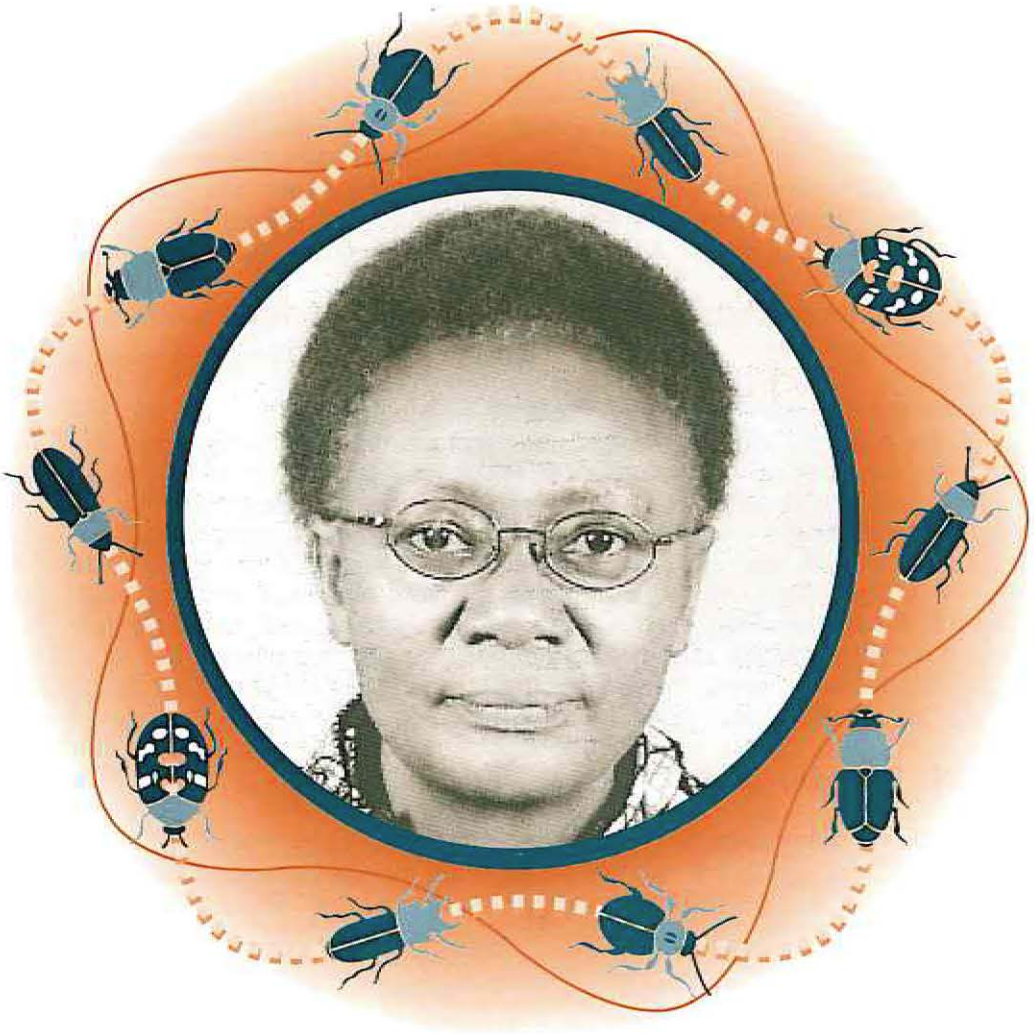
Q. What would you say are the challenges of agricultural researchers in Kenya and Africa?

A. Many smallscale farmers face numerous problems caused by insect pests, leading to huge yield losses. Most of the farmers have insufficient knowledge about the ecology of insects. They also lack the means to better management techniques. In effect, they over-rely on chemical pesticides, which have the potential to harm the farmers' own health as well as that of the environment apart from being expensive. Further, many of these pesticides are not always entirely effective, especially on crop borers, as well as being detrimental to numerous non-target organisms. For these reasons, there is an ever-increasing scientific need to develop integrated pest management strategies to be used by the subsistence and resource poor farmers. These approaches include a better understanding of pest behaviour and the use of environmentally friendly control methods, for instance biological control, through the use of natural enemies. Unfortunately, at the moment in Africa, we lack sufficient capacity of trained personnel to tackle the crippling crop pest problems through such IPM-based techniques.

The other challenge is the need to better use and conserve beneficial arthropods for enhancing livelihood and economic development in Africa. While many people still look at such insects as a nuisance and uneconomic, the fact remains that their benefits are numerous and can contribute effectively to development in sub-Saharan Africa. The need to develop suitable strategies still remains elusive amidst the severe food insecurity and poverty problems in Africa. The rampant environmental degradation in the continent is leading to fast decline and possible extinction of such valuable insects and better strategies for their conservation are increasingly becoming necessary.

Q. How has your career shaped post-*icipe*?

A. In June 1996, I left *icipe* and joined Moi University, School of Environmental Studies, as a Senior Lecturer where, for the past six years, I have held the position of Associate Professor and Head of Environmental Biology and Health. I have successfully supervised many MPhil and DPhil students, continue to conduct research in collaboration with other scientists from different national and international organisations and I am also conducting environmental impact assessment and monitoring short courses. In 1992, I helped found the Friends of Lake Victoria Environmental Programme (OSIENALA). I am also the founder and Director General of the Victoria Institute for Research on Environment and Development (VIRED) International since 2000. Both OSIENALA AND VIRED international located in Kisumu, are conducting excellent work in the Lake Victoria Basin and continue to contribute well to environmental conservation, capacity building and research findings in the region. These are gains obtained from my experience and work at *icipe* for which I am extremely grateful. I also helped to found the ARPPIS Scholars Association (ASA) for which I have been the president/chairman since November 2006 todate and I am proud to be associated with this organisation and grateful for the support we have continued to receive from *icipe* and other development partners such as DAAD and ANSTI.



Eliaineny Mose MINJA

(ARPPIS Scholar 1986–1989)

Sponsor: The German Academic Exchange Service (DAAD)

During her ARPPIS tenure, Eliaineny Mose Minja was challenged by poor health. But through her own willpower, as well as support from colleagues at *icipe*, she managed to attain her PhD ahead of the rest of her class. Today, the IPM practitioner from Tanzania is giving back, by helping small-scale farmers in eastern and southern Africa improve their livelihoods.

Eliaineny Mose MINJA (ARPPIS Scholar 1986–1989)

Q. What is your background?

A. I was born in Marangu village, Moshi District on the slopes of Mount Kilimanjaro in northern Tanzania. I spent my childhood years on my parents' farm, where they grew coffee, bananas and annual crops, and zero-grazed livestock. I went to boarding school for both primary and O-levels in our village, but moved to Korogwe, Tanga in eastern Tanzania for A-level studies. I underwent National Service Training in Dodoma, central Tanzania. My undergraduate studies were at the University of Dar es Salaam's Faculty of Agriculture, at its Morogoro Campus in central Tanzania.

Q. What motivated you into studying science and what are your challenges?

A. Right from primary school, I performed well in science subjects including mathematics. My parents, my elder sister and teachers inspired me further, and encouraged me to study sciences up to college level. My main challenge at all stages was to study and work hard to remain competitive, especially from 'A' levels to the postdoctoral level. Other challenges included the risk of conducting research work in farmers' fields, particularly in war torn and conflict areas such as in northern Uganda, eastern DRC (South Kivu), northern Mozambique and Namibia, and parts of eastern Kenya. Furthermore, working across some of the farming and research cultures in eastern and southern Africa required additional thought and diligence. I was also challenged by ill health for several years but the cooperation of the *icipe* management and my colleagues at all the work stations has helped me reach the present stage.

Q. How did you end up at *icipe*?

A. In 1984, I was invited to a conference at *icipe*. During the event, I got to know about the ARPPIS programme. I then applied for the 1985 class through the University of Dar es Salaam but since my application arrived late, I was considered for admission into the 1986 class. The experience at ARPPIS was good but rather tough. The pressure of the intensive six months' coursework and later the fieldwork conditions at Mbita Point Field Station in South Nyanza, western Kenya were a big challenge for me due to my ill health. But, I finished my research work and submitted the thesis well ahead of my classmates. I gained tremendous knowledge and experience in cereal and legume pest management, which opened the door for me to advance to postdoctoral training some four years later. I made contacts with many first-rate scientists and non-scientists, some of whom I still work with in Tanzania, and in East, Central and southern Africa, and even beyond the continent.

Q. What are your scientific and development contributions as well as other accomplishments since you left *icipe*'s training programme?

A. I am currently an independent researcher and IPM practitioner, where I use my knowledge in collaboration with other stakeholders to reach out to smallholder farmers in rural areas in East, Central and southern Africa. I have also made contacts and worked with different research and training organisations, government institutions and donor agencies.

In the past, I have conducted on-station and on-farm research on integrated pest management (IPM) options for maize, sugarcane, pigeonpea, sorghum, pearl millet, groundnut, chickpea and beans. I did this work at the national (Ministry of Agriculture, Tropical Pesticides Research Institute-TPRI, Arusha) and regional programme (International Crops Research Institute for the Semi-Arid Tropics-ICRISAT, International Centre for Tropical Agriculture-CIAT) levels.

I have also participated in training smallholder rural farmers, national research and extension workers and other stakeholders in IPM practices for target cropping systems.

In addition, I have supervised bachelors, masters and doctoral students from national, open and overseas universities in IPM uptake and socio-economic evaluation of

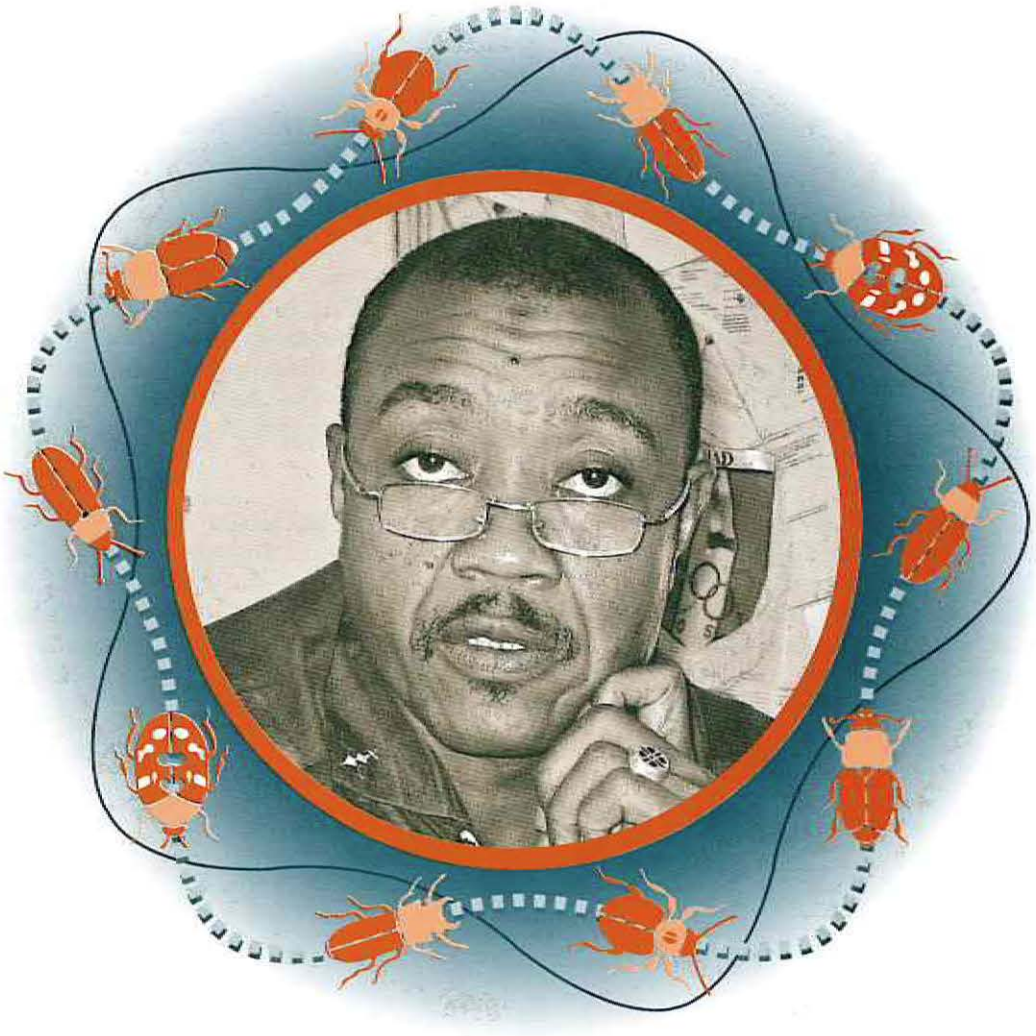
Eliaineny Mose MINJA
(ARPPIS Scholar 1986–1989)

IPM practices. I have also helped to implement institutional building with the target participating farming communities, national research and extension systems, policy makers, universities, some collaborating NGOs and private institutions.

In terms of policy advocacy, our research work with rural smallholder farming communities has helped to sensitise policy makers, including grassroots leaders, on the importance of men as well as women to be involved in the development, decision making and implementation of projects.

Our project activities contributed to the socio-economic development of target communities through training and awareness creation. This led to the formation of farmers' research groups, which in turn facilitated experimentation and adaptation of traditional as well as modern technologies. The processes also enhanced knowledge and skills, and increased food production and nutrition. The participants are now able to meet their day-to-day needs, such as feeding their families, improving their housing and paying school fees for their children.

Communities that participated in the research project activities steadily gained confidence and pride through group work, formal and informal training, field experimentation and evaluation, frequent dialogue with different stakeholders, and organised tours for knowledge sharing and exchange of experiences. These and other activities demanded by the participants have enhanced the capacity of individuals and groups to communicate and demand for services, and empowered them to seek for assistance while owning their problems and solutions.



Hassane Mahamat HASSANE
(ARPPIS Scholar 1987–1990)
Sponsor: The German Academic Exchange Service (DAAD)

As a young boy in the early 1970s, Hassane Mahamat Hassane used to visit the Laboratoire de Recherches Vétérinaires et Zootechniques de Farcha, a station of the France-based Institut d'Elevage et de Medecine Vétérinaire Tropical (IEMVT) in his home town of N'Djaména, Chad. Back then there were hardly any local scientists in the institute. Young Hassane promised himself that he would study to a level where he could lead the institution. He narrates his long journey to realising that dream, and even one that he never dreamt of, that of being cited in the 'Who is Who in the World of Science' and how not even civil war could disrupt this vision.

Hassane Mahamat HASSANE
(ARPPIS Scholar 1987–1990)

I was born in N'Djaména (formerly Fort Lamy), the capital of Chad in Central Africa. I grew up with friends with whom I shared common values, and still have strong relations with to-date. We went to the same *'madrasa'* (Koran-teaching school and primary school). We, the children of the Hillé Leclerc area, believed that all the older people were mothers, fathers, grandparents, uncles and aunts. We did not know of tribes. It was only after civil war broke out in the country that I discovered from which tribe my friends came from.

In my childhood, I lived in a society where children were important. My late grandmother, Zenaba Abderahman, with whom I spent most of my early years, was both my friend and mentor. She told me her life story, which I believe contributed towards making me the person I am today. She always said that one had to have faith in themselves and be independent, helpful and respectful of all human beings.

My grandmother was among the few people in those days that believed in the power of the white man's school. She was instrumental in getting me into school at an early age (in 1967). I went to the Ecole Hillé Leclerc, the first post-independence school in N'Djaména, which was about two kilometres from our house. My grandmother took me there, talked to the teacher and instructed him to take care of me. I was the smallest, shortest and youngest in the class. My friends fondly called me 'Hassane Pygmy'. I had fun attending this school and I have good memories of the six years I spent there until my certificate of primary education and the entrance exam to the secondary school.

In primary school, I was a junior member of the school's Scout Association, which contributed a great deal to moulding my character. The Scouts Movement instilled in us important human values such as brotherhood, solidarity, unity and team spirit. We practised sports such as football and short distance running, which all contributed to our well-being.

I had an equally great time in secondary and high school at the Collège d'Enseignement Général and the Lycée Felix Ebouée, respectively, which I attended from 1967 to 1974. I had a family that cared for me and that motivated me. Any good results at school were rewarded with a present: a bicycle, a motorcycle... But all the same, I discovered the value of good work for the sheer sake of it.

I was motivated to study veterinary medicine by members of my extended family, who were pastoralists and cattle traders, exporting animals by foot to Nigeria. Frustrated by the delay caused by the veterinary officers in treating or vaccinating their animals, they often wished they had a veterinarian in the family. For this reason, I started getting interested in biology in secondary school, often visiting a world-class veterinary research institution based in N'Djaména (the Laboratoire de Recherches Vétérinaires et Zootechniques de Farcha, a station of the France-based Institut d'Elevage et de Medecine Vétérinaire Tropical-IEMVT).

During these visits, the staff of the institution often impressed me. The name of the director of the institution, the late Dr Alain Provost was everywhere. The laboratory had only one Chadian scientist—the late Dr Noukouri Goukouni—who I later learned was a microbiologist.

I therefore realised that my only chance to be like the people I saw in the laboratories would be to pursue veterinary studies to doctoral level—like Dr Provost. I promised myself that after achieving that goal I would come back and work in the veterinary laboratory in Farcha.

After my baccalaureate in 1974, I was awarded a scholarship from the Chadian government and the German Democratic Republic (GDR) to study veterinary medicine in the Karl Marx University of Leipzig. I made this choice based on the sporting prowess that country had shown during the 1972 Munich Summer Olympics, and during the football World Cup of 1974. Also, I knew that unlike the African universities, the Federal Republic of Germany had no incidents of student strikes. I stayed there for five years. My objective was to study, graduate and come back to work for my country. In those days we were nationalists.

Hassane Mahamat HASSANE (ARPPIS Scholar 1987–1990)

The time spent in the GDR was great. I had good teachers and mentors. Prof. Kolb, Prof. Guertler, Prof. Rommel and Dr Kurt Bremmer, among others, were instrumental in my decision to stick with the sciences. We had opportunities to visit other countries in eastern and western Europe. These were eye openers. The African community in the GDR was united. Every year, on the 25th of May, we celebrated the Organisation of African Unity (OAU) day.

One of the most challenging moments during my study period was the start of the civil war in N'Djamena in 1979. We were in a far away country, with no news from our families and less than two years to graduate. It was difficult, but due to the support of our friends and colleagues from countries like Mali, Guinea and Congo, we, the several Chad nationals who were there at that time, were able to concentrate on our studies.

I graduated in August 1980, with an MSc degree (*magna cum laude* [with great praise]). However, the civil war dashed my hope of returning home to serve my country. But this gave me the opportunity to seek alternative plans. I visited the IEMVT, and met with the director of the institution, who was my idol. He advised me to go for a higher degree, to build capacity to be a scientist in the future.

In 1980, I made a visit to the University of Munich. Within a short time, I was able to meet the person in charge of graduate foreign students, and found a professor in the veterinary faculty who could supervise me as a doctoral student. I was oriented to the head of the Institute of Hygiene, who was looking for promising graduates for further training. The same day, after an hour and a half of being interviewed, I was offered a place as a doctoral student at the university. After a meeting with the regional director of the Otto Benecke Stiftung, a foundation supporting students from East Europe, I was awarded a scholarship.

I started my work at the Hygiene Institute but soon realised that what I was working on could not be of use in Africa. I therefore switched to the Institute of Parasitology, Infectious Diseases and Comparative Tropical Medicine in Munich. This was a better option, because I had to explain to visitors to Africa about many issues on tropical diseases. I had colleagues, senior staff and others, who encouraged me to work hard so that we could collaborate when I eventually returned to Africa. I discovered that Africa offered great potential for scientists in many fields of learning.

My thesis on the immunodiagnostics of babesiosis and to some extent my acquaintance with ticks as vectors of cattle, horses and dogs diseases brought me closer to my dream of working at the veterinary laboratory in Farcha. I graduated in 1983 with the title of Doctor of Veterinary Medicine (Doctorae Medeciniae Veterinariae). I then took short courses on how to write project proposals, how to develop curricula and also acquired some basic management techniques at the German Institute for Tropical Agriculture in Witzenhausen (Germany).

I then learned about some research fellowships being offered by the International Laboratory for Research on Animal Diseases (ILRAD), in Nairobi, Kenya. I applied and managed to secure one of the positions, as a research fellow starting in January 1984. The time at ILRAD exposed me to competitive scientific research and even as a junior I still believed that I could contribute to science in Africa. I worked with a group of immunologists to study the trypanotolerance of wild Bovidae to trypanosomosis, in the quest of a vaccine.

However, I always believed that to control tsetse, it was imperative to get rid of the flies themselves, and my interest in science grew, particularly towards understanding the vectors of diseases. I therefore decided to seek a scholarship to undertake a PhD in insect science.

I was lucky that *icipe* was just a few miles away from ILRAD. After a series of meetings and discussions with the then Training Officer, Dr Michael Smalley, I applied for a DAAD/ARPPIS scholarship, which I was awarded in 1987. My former experience helped me to work with my supervisors Dr Mutuku Mutinga and Prof. Ahmed Hassanali. The latter was instrumental in my strong attachment to science.

Hassane Mahamat HASSANE
(ARPPIS Scholar 1987–1990)

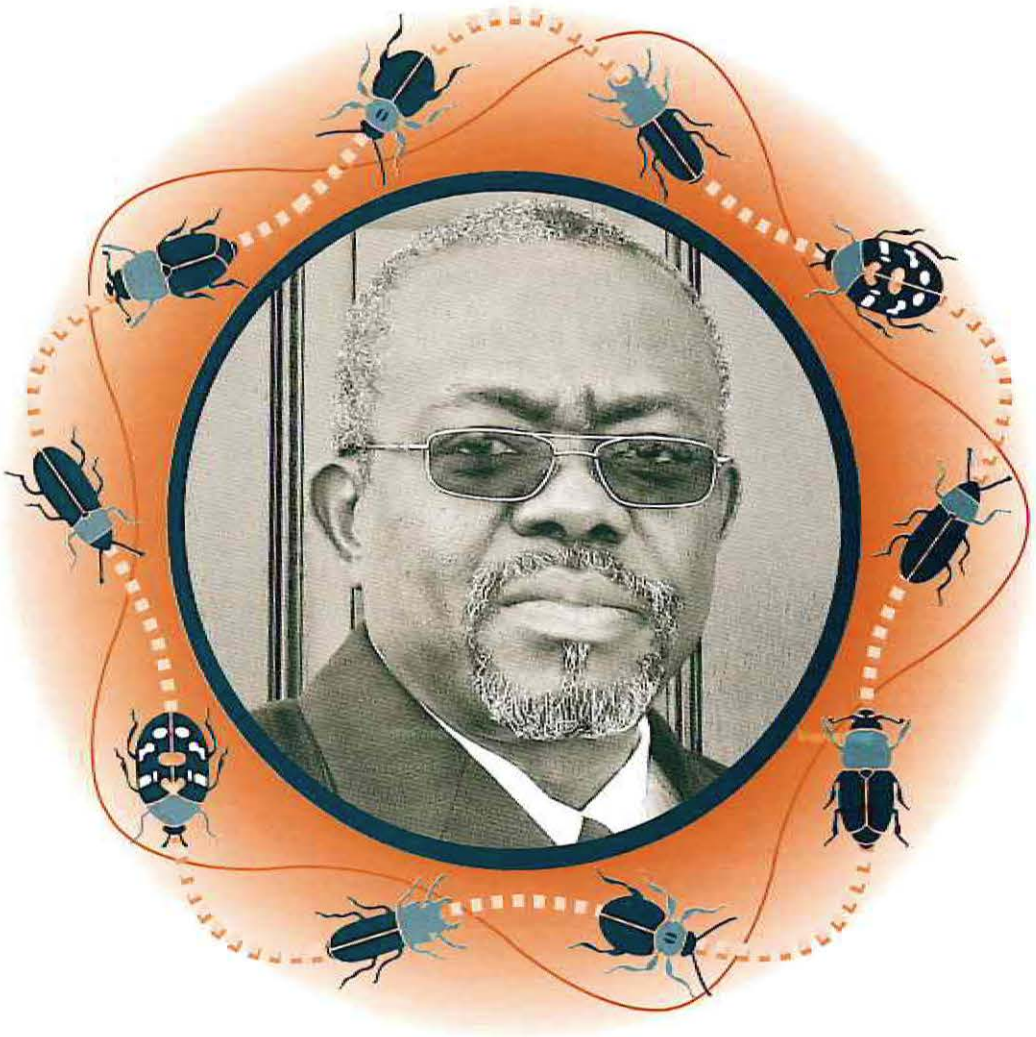
After many years of perseverance during which my wife Rose, like my grandmother in my childhood years, motivated me to do the best that I could, my dream of becoming a scientist finally came true.

The late Prof. Thomas R. Odhiambo founder Director of *icipe* and the late Mrs Rhoda Odingo encouraged me to aspire higher, so as to be more useful for Africa. I followed their advice and later studied management. Prof. Odhiambo would often say: "We Africans can also do it".

The time I spent at *icipe* contributed greatly to what I am today. I got very good academic credentials and training that allow me to compete for any scientific position. ARPPIS and *icipe* increased my number of friends, many of whom I share a vision in regard to the future of research in Africa, and the improvement of the living conditions of its people. *icipe* also increased my network of colleagues in the field of science and other fields. Furthermore, with these experiences, I was able to realise my dream to be not only a scientist at the Laboratoire de Recherches Vétérinaires et Zootechniques de Farcha, but to become its Director. I held that position from 2003 to 2006, during which period I turned the institution around, from one that was not working to one that is starting to gain recognition among other national agricultural research institutes. By 2006, the veterinary laboratory in Farcha had become a base centre of the West and Central African Council for Agricultural Research for Development (CORAF/WECARD). *icipe* contributed to my being cited in the 'Who is Who in the World of Science'. Moreover, I remain attached to research, in particular to science-led development, an idea that was dear to the late Prof. Thomas R. Odhiambo, and that can contribute today and in the future to reduce food insecurity and poverty in the continent.

In March 2006, I was appointed the Deputy Director General in charge of livestock development in the Ministry of Livestock. Concurrently, I was put at the disposal of the FAO Country Office, which in May 2008, recruited me as the National Programme Officer. While holding the FAO/NPO position, I contributed greatly to the visibility of the organisation in my country, and also supported all its activities in various fields of rural development. I left the FAO and requested the Ministry of Livestock to allow me to concentrate more on field and research oriented work. I wanted to join a team of experts within the Pan African Tsetse and Trypanosomosis Eradication Campaign (PATTEC) coordination office at the commission of the African Union, who are trying to turn the decision to eradicate tsetse and trypanosomosis into action. This noble decision was taken by African Heads of State and Government during the Organisation of African Unity Summit of Lomé, Togo in July 2000. In October 2008, I was appointed as the monitoring and evaluation expert at the PATTEC coordination office, where I am working right now.

INTERVIEW



John DAVIES-COLE

(ARPPIS Scholar 1987–1990)
Sponsor: The German Academic Exchange Service (DAAD)

When ARPPIS scholar John Davies-Cole obtained his PhD in 1992, civil war in his home country Sierra Leone prevented him from going back and carrying out the programmes that his training had prepared him for. In the interview below, John, who currently heads the Centre for Policy, Planning and Epidemiology at the District of Columbia Department of Health, United States of America, tells the story of how he turned this unfortunate scenario into a blessing, for himself, his country, the continent—and indeed the world!

John
DAVIES-COLE
(ARPPIS Scholar
1987–1990)

Q. What is your personal background?

A. I was born in Freetown, Sierra Leone, West Africa. My father was an Anglican priest and my mother was a teacher. I graduated with a BSc degree (Zoology) from the University of Sierra Leone in 1980, and then went on to study for a Diploma in Education the following year. In 1985, I obtained an MSc (Applied Entomology and Parasitology) from the University of Jos in Nigeria. I came to *icipe* in 1992 as a DAAD-sponsored PhD ARPPIS scholar, registered at the University of Sierra Leone. I graduated with a Master of Public Health degree (MPH) at the George Washington University School of Public Health and Health Services in 2000 and became a Certified Public Manager (CPM) in 2004, also from the same university. I am married with two children who have graduated from university.

Q. What motivated you into getting into scientific research?

A. In the 1980s, Sierra Leone had limited capacity in medical entomology, with only one government official working at the Ministry of Health. At the same time, Sierra Leone was about to join several other West African countries who were involved in a World Health Organization (WHO)/World Bank programme for the control of onchocerciasis. Also known as river blindness, this disease is ranked second among infectious causes of eyesight loss, with its effects being permanent. Its severity had in fact rendered many villages in West Africa uninhabitable. It was this scenario that motivated me to apply for a fellowship through the WHO to pursue an MSc in medical entomology. My focus was on the research and control of the black flies that transmit the disease. Later, the University of Sierra Leone joined the ARPPIS programme as one of the collaborating universities, targeting at least one Sierra Leonean trained through it in 1987. I was invited by the university to join the programme.

Q. What were your challenges?

A. I had several challenges. Although my MSc fellowship had been arranged through the Government of Sierra Leone, it appeared as if the relevant officials were not prepared for my return. In fact, it took eight months after I got back home for me to start working. Even then, the shortage of resources hindered my efforts to embark on a comprehensive vector control activity in the country. Even simple things like typing paper were hard to come by. Eventually, I was not able to implement any control programme for onchocerciasis.

This was very discouraging, but even worse was the fact that after obtaining my PhD in 1992, I was completely unable to go back to Sierra Leone because by then the country was in the throes of a civil war.

Q. Within this scenario, how were you able to salvage your career?

A. A key advantage was that my training and experience had prepared me to take up an appointment in the international scientific arena. Prior to coming to ARPPIS (after my MSc programme), I was attached to the WHO/Onchocerciasis Control Programme in Burkina Faso, Mali and the Ivory Coast.

In addition, the ARPPIS programme gave me exceptional training; it was rigorous and the interaction with *icipe* scientists, their presentations, and research outputs made a lasting impression. I learned how to write 'serious' scientific papers for publication. Through dry runs, I quickly learned how to do scientific presentations and I was able to participate in various national and international conferences.

My experience at *icipe* also strengthened my international exposure, not only by affording me the opportunity to understand the functions of an international organisation, but also the opportunity to work with people from various parts of the world who were involved in other research areas.

John DAVIES-COLE (ARPPIS Scholar 1987–1990)

In 1992, as a postdoctoral researcher of *icipe*, I undertook research at the University of Oldenburg, Germany, further widening my horizons.

I left *icipe* confident and ready for an academic career in research anywhere in the world and in 1999, I left to pursue further studies in public health in the United States of America. In 2000, I was involved in the development of the first syndromic surveillance system in the United States National Capital Region to detect bioterrorism. We conducted research to assess the performance of the system and evaluated specific algorithms through both abstract simulations and simulations based on actual data. These studies were published as a book chapter in *Statistical Methods for Counterterrorism* in 2006.

I also developed and taught students in the university's School of Public Health and Health Services from 2000 to 2008 in the Department of Global Health. Additionally, I run new courses on the prevention and control of vector-borne and tropical diseases.

Currently, I head the Centre for Policy, Planning and Epidemiology at the district of Columbia Department of Health, United States of America. Examples of our work include working with the Department of Health Programmes and the Washington DC community to collect and analyse data for translation into health policies in the district. For instance, in 2007, we provided data to the Department of Health's Community Health Administration to develop a plan towards the implementation of new policies to reduce the infant mortality rate to no more than 10 per 1000 live births. The average US rate is 6 per 1000 live births.

I should mention that in my current position, my job description does not include collaboration/research. However, due to the experience I gained in the ARPPIS programme, I have collaborated with various universities and continue to do research and publish as often as possible.

Some of the publications resulting from this include, 'Demographics and tumour characteristics of colorectal cancers in the United States' in the journal *Cancer* in 2006. I have also co-authored an article on 'Medicaid patient asthma-related acute care visits and their associations with ozone and particulates in Washington DC from 1994–2005', which was published in the *International Journal of Environmental Health Research.*

Q. Do you feel that your career and achievements have benefited the African continent?

A. It is sad that my own country did not benefit much from my expertise. But other African countries did. Prior to coming to America, I carried out training programmes for government officials and community management committees in Kenya, Uganda, Tanzania and the Sudan, on management for sustainability of water supply and sanitation programmes. According to UNICEF, more than 2.6 billion people—40 percent of the world's population—lack basic sanitation facilities, and over one billion people still use drinking water from unsafe sources. As a result, thousands of children die everyday from diarrhoea and other water-, sanitation- and hygiene-related diseases. Some of the programmes I was involved in include the Muthambi Water Supply Committee in Meru, Kenya, where we helpéd the community to take control of their water and sanitation facilities. I was also involved in developing and training Southern Sudanese nationals in plans to provide and manage safe water supply and sanitation in their country. Between 1995 and 1998, I developed and facilitated training courses in Management for Sustainability in Water Supply and Sanitation Programmes in partnership with the International Water and Sanitation Centre in The Hague, Netherlands. I was a facilitator for Participatory Hygiene Education Course and Use of Participatory Hygiene and Sanitation Transformation (PHAST methodology) in Tanzania in 1997 (for UNICEF/Dar es Salaam).

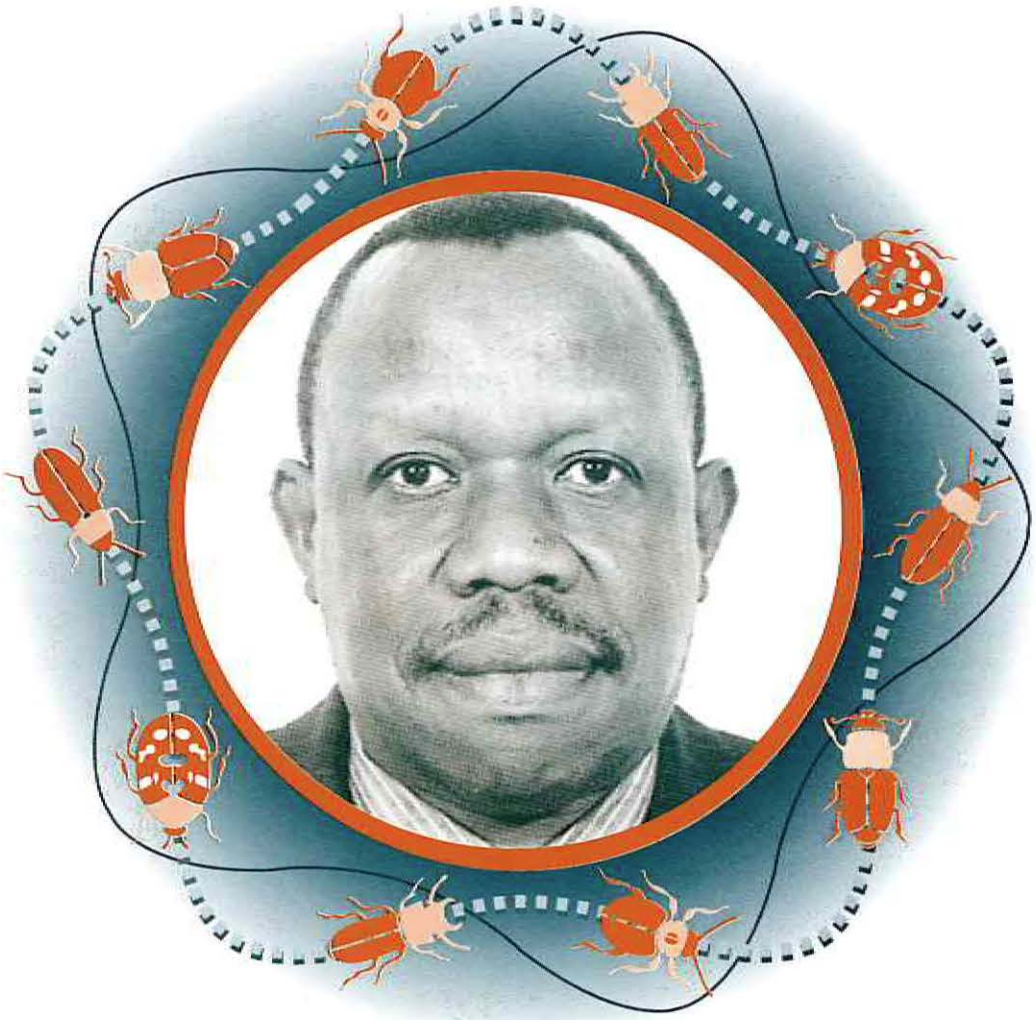
We achieved a lot in this way. I remember one incident where, after training about 30 government workers, they went on to train over 2000 of their colleagues before

coming back for a refresher course! I feel proud that even though I am not in my own country, I have been able to assist other African nations and therefore contributed to the development of the continent as a whole.

Q. In this regard, what are your comments on brain drain/brain circulation?

A. I prefer to go with the term brain circulation, which is the excellent opportunity for one to gain a completely different perspective personally and professionally. This concept can in fact be beneficial for Africa, for instance by helping to reduce shortages of researchers and expertise in different regions. Although I have not been working in Sierra Leone, I believe, I am more equipped to assist my country than I was, or would have been if I had immediately returned home. As I mentioned before, the resources were quite limited and the war made it worse. I am also now in a position where I can influence support for Sierra Leone even at high levels. The knowledge I have gained in seeing how developed countries handle disease control has prepared me to assist Sierra Leone in ways that I would never have imagined. I have now joined a group of Sierra Leone nationals living in North America who are working to assist the country in various spheres including the health sector. One of the things I am involved in is a plan to solicit the help of various congressmen in the US to assist Sierra Leone in various sectors. My own focus will be on the control of vector-borne diseases, especially malaria and diarrhoeal diseases to improve maternal and child health in the developing world.

INTERVIEW



James OGWANG
(ARPPIS Scholar 1987–1991)
Sponsor: Africa-Wide Biological Control Programme—IITA

Growing up in northern Uganda in the early 1970s, James Ogwang's brother drilled into him that the world belonged to those who were trained adequately to embrace and practice science. That was at a time when news that a man had landed on the moon was a wonder in itself. Three decades later, James' own scientific achievements are grabbing international headlines. He explains in the interview below.

James OGWANG
(ARPPIS Scholar 1987–1991)

Q. What is your background?

A. I was born the eighth child in a family of nine in Omoro Primary School in Lira District in northern Uganda where my father, the late Daudi Ongeng was headmaster. My mother, the late Mrs Lucy Atim Ongeng was a housewife.

I attended Apala Primary School, where my father had been transferred by then, after which I went to Kitgum High School and Jinja Secondary School for 'O' and 'A' levels respectively. I later joined Makerere University in October 1976, graduating with a Bachelor of Science degree in botany and zoology.

In 1982, I travelled to London, where I joined Imperial College, where, two years later, I obtained a Master of Science degree in applied entomology.

Q. What motivated you into scientific research?

A. I got motivated into studying science by my elder brother William Olal who had graduated earlier from Makerere University with a Bachelor of Science degree and a Diploma in Education in 1971. He drilled into us, his younger siblings, that the world belonged to those who were adequately trained to embrace science. He urged us all to do science-related courses. That was at a time when news that a man had landed on the moon was a wonder of the world in itself!

Just after returning from England after completing my masters degree, turmoil broke out in Uganda. Namulonge Research Station, where I worked, was in an area controlled by rebels. In search of another job, I went to see Prof. John Okedi, one of the first ARPPIS Coordinators. After I stated my case, he asked me: "Young man, do you want to pursue a PhD?" I answered in the affirmative after which he gave me application forms for admission to the *icipe* ARPPIS programme.

I obtained the doctorate degree in applied entomology from Rivers State University of Science and Technology, Nigeria after completing my research at *icipe* between 1987 and 1991.

Q. How did you benefit from the experience at *icipe*?

A. The opportunity at *icipe* opened my horizons to practical research to solve the many problems faced by Africans. Today I am very contented with my practical contribution to solving a number of problems that threaten the environment, for instance the biocontrol of water hyacinth, and also in the area of food security where I have worked on the biocontrol of cassava pests and cereals in Uganda. The success of this project has been the focus of two scientific documentaries. One of them, entitled *Strange Days on Planet Earth* was done by the world renowned National Geographic TV in 2005. The South African Broadcasting Corporation TV filmed the second documentary in 2006 under the title *Africa Rising*.

Q. Comment on the inter-relation between scientific research, industry and policy

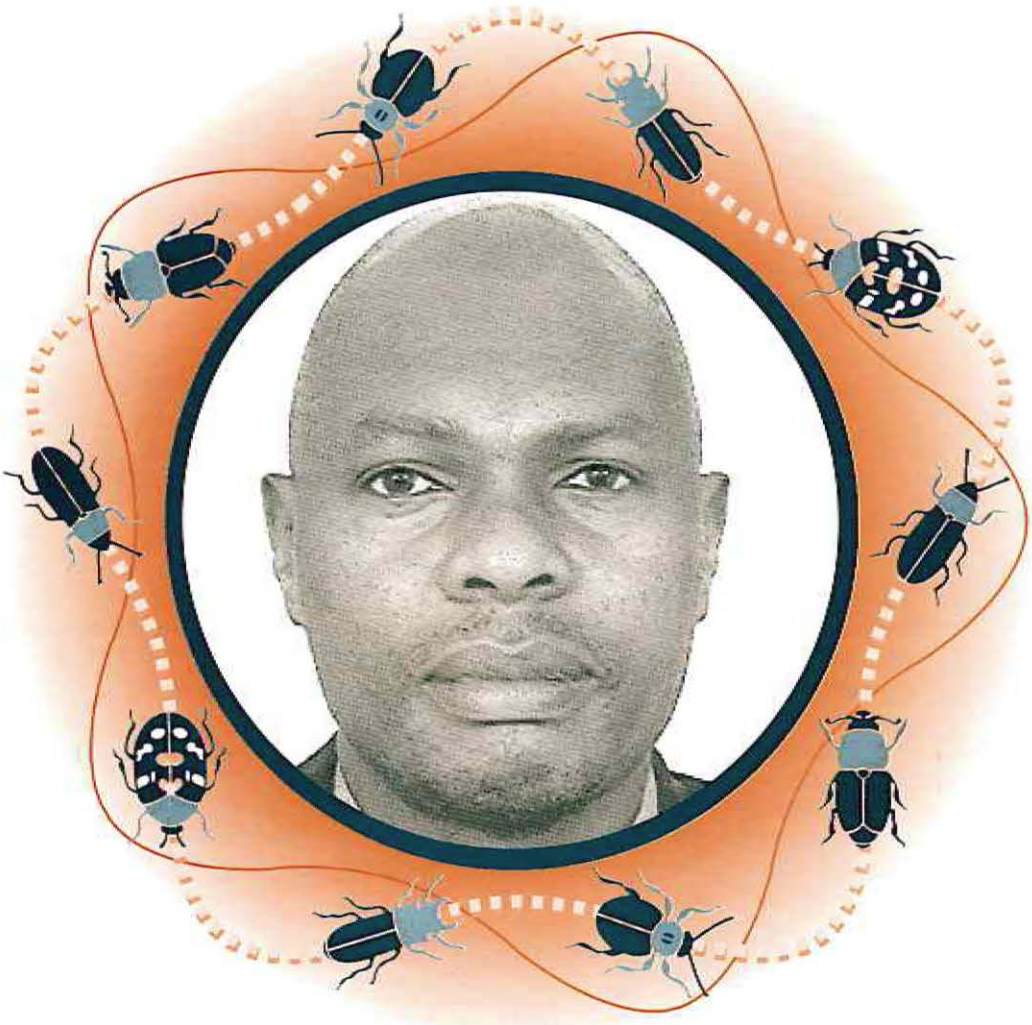
A. I think the intersection between policy, industry and research is being achieved because today's politicians, in Uganda for example, are more educated and able to appreciate the contribution to the well-being of their people. As I have illustrated above, the biocontrol of the water hyacinth was one achievement that brought to attention the benefits of having a well-trained scientific cadre.

Currently, in Uganda, we have a fairly reasonable budgetary allocation for scientific research and the government has a policy to promote training of young people in scientific subjects. Besides, a number of members of parliament are former agricultural research practitioners, which means they can effectively articulate the case for scientific research.

James OGWANG
(ARPPIS Scholar 1987–1991).

The main obstacle to the promotion of democratic space within the scientific agenda is poverty and illiteracy. Most rural people are poor farmers who find it difficult to transcend the ladder to modern farming. This makes them susceptible to politicians, who take advantage of their plight, by making them empty promises just to win votes.

Scientists can help the situation by getting more involved in strengthening the community voice, by involving people at the grassroot level in identifying and addressing problems, that is, making reality of the often-talked about 'bottom-up' approach. One of the ways that this can be achieved is by organising farmers into farmers' schools, so as to empower them. In addition, the media can be an effective intermediary, for instance through broadcasting programmes that sensitise farmers. Finally, more and more scientists should join politics to articulate issues that affect communities.



Kenneth KAMBONA
(ARPPIS Scholar 1988–1993)
Sponsors: The International Fund for Agricultural Development (IFAD), Dutch Scholarship

Kenneth Kambona... a nationalist, scientist, politician, community developer and more

It is almost impossible to sum up Kenneth Kambona in a word. Born about 47 years ago in Rachuonyo District of Nyanza Province, along the shores of Lake Victoria, Kenneth is a mixture of many things, from a personal as well as a professional point of view.

Kenneth KAMBONA (ARPPIS Scholar 1988–1993)

The first child in a family of eight, Kenneth's childhood was spent moving from one part of Kenya to another. This is because his father, James Oyugi, was an education officer whose job necessitated regular transfers across the country. As a result, young Kenneth became a 'nationalist' at a very early age, as he virtually experienced life in most parts of Kenya.

Moreover, because his father's various postings would be either in urban or in rural areas, Kenneth became a mixture of both. "I grew up very much aware of the challenges in both the towns and villages. During the holidays, I could milk cows with the same ease that I could play 'juke boxes' in town, depending on where we were living at a given time", he recalls.

Today, Kenneth, who has 20 years working experience behind him and is currently the Regional Agricultural and Policy Advisor at the United States Agency for International Development (USAID), has the unique distinction of having worked in three sectors in the area of agriculture. Having started off in scientific research, Kenneth moved to the private sector where he worked in various industries before getting into the public sector. He is also a politician and a community developer.

Kenneth's multi-purposed journey has been interesting. He recalls, for instance, that he did not instantly take to education. "As a small child, when I enrolled in standard one, at the Aga Khan Primary School in Kisumu, I did not understand why I was being 'tortured' into going to school. In fact it was only after secondary school that I developed a keen interest in studies, and became fascinated by scientific phenomena," he muses.

At that point, he wanted to become a rocket scientist. However, word was that there was only one such professional in Kenya, Hilary Ngweno, who had in any event turned into a journalist because in his own words "there were no jobs for rocket scientists in Kenya". Therefore, when Kenneth joined university, he opted to do biological sciences, graduating from the University of Nairobi with a Bachelors of Science degree in zoology.

Upon graduation, the Kenya Wildlife Service (KWS) offered Kenneth a job as a ranger, but he declined and decided to join *icipe* instead. The Centre sponsored him to pursue an MSc in entomology in Nigeria. Then he pursued a PhD in entomology, under the ARPPIS programme.

Between 1988 and 1993, he worked as a research scientist at the Centre, an opportunity that enabled him to develop a strong background in sustainable agricultural research and natural resource management. "I was involved in the planning and operation of management of adaptive research in sustainable agriculture. In this way I was instrumental in formulating agricultural policies in sustainable agriculture and integrated rural development in Kenya, Uganda, Somalia, Nigeria and Zambia," he explains.

During this time, Kenneth was a key member of an Africa-wide biological pest management programme, funded by the International Fund for Agricultural Development (IFAD). This culminated into a posting to Somalia, to advise the government on post-conflict rehabilitation of agriculture.

Kenneth joined Farmchem Agrochemical Company as a technical manager. "My job was to coordinate the technical department. I also served as the company's Research and Development Manager, with the responsibility of planning and implementing programmes for agrochemical evaluation, registration and commercial development," he notes.

After this, Kenneth took on an interesting assignment for a scientist—that of marketing and corporate affairs at Syngenta East Africa Ltd. From 1996 to 2005, he oversaw the company's regional activities in this regard, including the development of agricultural input markets aimed at promoting commercial and subsistence agriculture in the region.

As a business manager, Kenneth established a strong local biocontrol division at Syngenta. This incorporated the marketing of biocontrol products alongside agrochemicals. "Previously, Syngenta had mainly marketed agrochemicals, due to lack of local expertise on biopesticides. Since I had gained knowledge in this area from *icipe*, I was able

to introduce a new range of environmentally friendly chemicals, that are now being marketed by Syngenta and other companies in the East African region," he says.

In addition, Kenneth helped to turn Syngenta East Africa into an agribusiness company, by introducing Syngenta Seeds, which complemented Syngenta's agrochemical line. The seeds included two maize hybrid varieties (Duma and Simba), which not only mature quickly, but are resistant to maize streak virus. This was a pioneering move, which compelled other players in the industry to introduce seed lines, selling them to farmers alongside chemicals. Kambona's training background at *icipe* provided the necessary experience in implementing this project.

In addition, Kenneth's position at Syngenta gave him the opportunity to strengthen collaborations between research, the academia and industry. "I got the company to sponsor key scientific forums and research activities. These sponsorships promoted better understanding between industry and research, which in Africa tend to operate in parallel. This was significant because, unlike in the developed world, in Africa the linkages between the two sectors are weak because neither sector fully understands the other. As a result most research findings end up on shelves and are not adapted by industry for commercialisation and thereby for the economic growth of the continent," he explains. His other contributions have included seminars on industry and research, and major scientific and industry forums.

In his current position at USAID, Kenneth holds the portfolio of Regional Economic Growth and Integration, a division that covers East, Central and southern Africa. He leads and manages the implementation of a Regional Agricultural Trade Expansion Programme. Among his roles are programme design and strategy development, programme implementation and management, and trade and policy reform. His skills portfolio includes project evaluation, market analysis and development, planning, administration and communication capabilities, set against a background of agronomic expertise and experience in agricultural development.

Kenneth has also tried his hand in politics. He was involved in the historical 2002 general elections in Kenya, which ushered in the National Rainbow Coalition (NARC) regime. Kenneth was a campaigner for NARC's presidential candidate in Nyanza province. From 2003–2005, Kenneth served as the Secretary and Coordinator of the Constituencies Development Fund (CDF) for Kasipul-Kabondo. During his leadership this particular CDF was ranked as one of the most successful in the country. In the 2007 general election, he unsuccessfully contested for nominations for parliamentary candidacy for Kasipul-Kabondo, a constituency on the shores of Lake Victoria in Kenya's Nyanza province. He was later appointed as an ODM Presidential Campaign Coordinator for Nyanza province.

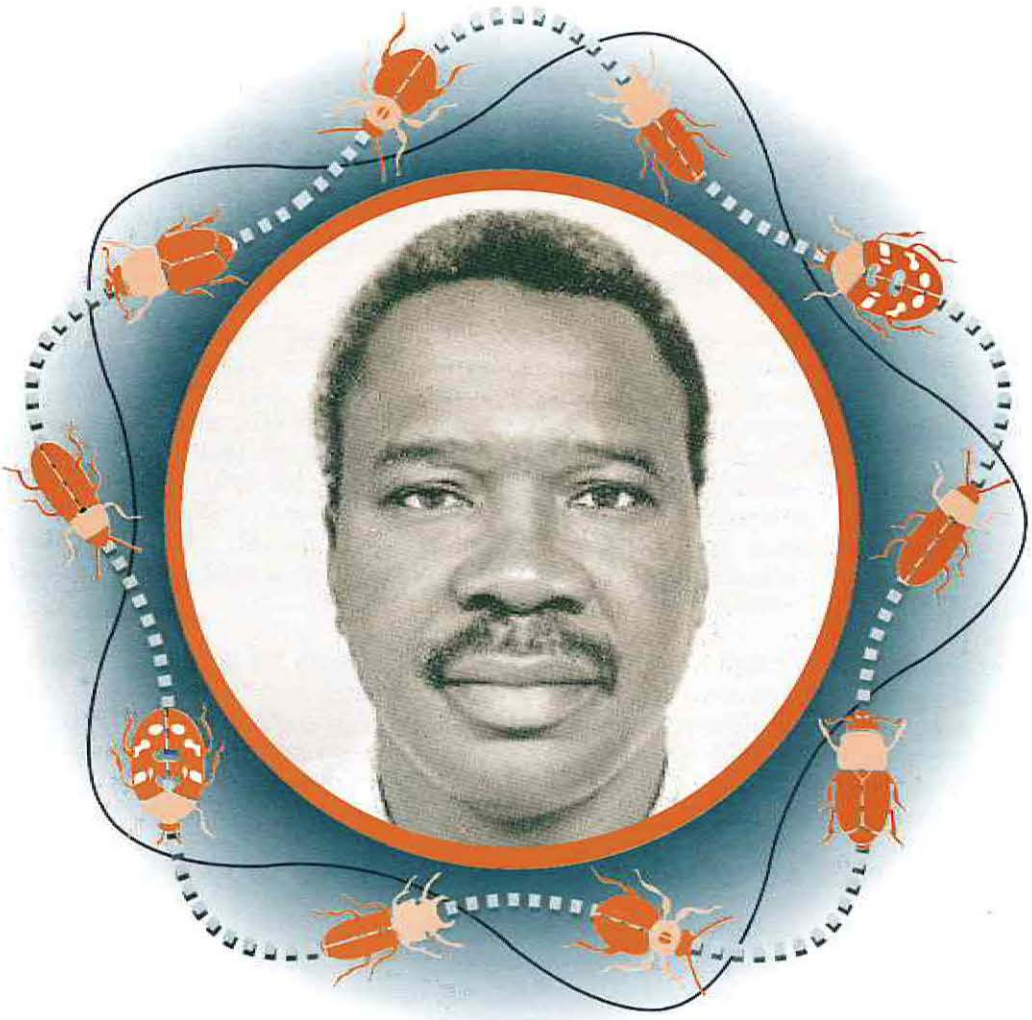
Kenneth remains at the centre of grassroots development in Kasipul-Kabondo, where he has initiated successful agricultural programmes. An example is the Constituency Export Chili Programme, which is the most successful poverty eradication programme in the constituency. This is implemented through a 1000-member strong Kasipul-Kabondo horticulture group.

He is also passionate about improving the education standards of schools in the constituency, and serves in a number of school boards. One of his proudest achievements is steering the Ober Secondary School, as chairman of its board, to become the top performing district school in Kenya in 2006, a feat never before achieved in Nyanza. "I have a strategy where I 'adopt' candidate classes in the constituency, by providing science books and materials to improve performance. As a result, most schools in Kasipul-Kabondo now attain better examination results than other schools in Nyanza province," he explains.

Kenneth's efforts have made him popular with the youth, and he organises youth congresses in the constituency to address youth entrepreneurship and development.

"My hope is to play a greater role in future in national and international agricultural and scientific development and I am grateful to *icipe* for having helped nurture this ambition in me," he concludes.

INTERVIEW



Dona DAKOUO

(ARPPIS Scholar 1990–1994)

Sponsor: *icipe*

Dona Dakouo is currently Director of Research at the Institut de l'Environnement et de Recherches Agricoles (INERA), Burkina Faso. In the interview below, the presidential, and multi-award winning scientist talks of his cross-regional and cross-continental training, and his strong desire to help African farmers.

Dona
DAKOUO
(ARPPIS Scholar
1990–1994)

Q. What is your background?

A. I was born on 31 December 1951 in Burkina Faso (former Upper Volta) in a family of eight—two sisters and six brothers. My parents were smallscale farmers. My father passed away in 1995. I got married in 1982 and have three lovely daughters, Sterenn, Mailys and Armelle who are 15, 24 and 25 years old respectively. My last born, Sterenn was born in Nairobi in 1993, when I was undergoing the ARPPIS programme at *icipe*.

I was educated in three different countries in Africa and in Europe (France). I did my primary and secondary school education in Côte d'Ivoire from 1960 to 1972. It is important to mention that I started my primary school when I was nine years old—two years above the normal school-going age. This was because I refused to go to school in Burkina Faso. It was only when I moved to neighbouring Côte d'Ivoire to live with my uncle who had settled there, that I agreed to go to school.

Q. What motivated you into getting into scientific research?

A. When I was young, I was always excited and curious about living things around me. So when I went to university, I decided to concentrate on biology. In my second year, I decided to branch into agronomy, driven by the desire to help my parents and other farmers in the neighbourhood improve their farming practices to realise increased crop yields, and to protect their crops using affordable natural methods (e.g. cultural practices and plant-based products).

After I obtained my last secondary school diploma "Baccalauréat" with major subjects in mathematics and biology in June 1972 in Bouaké (Côte d'Ivoire), I proceeded to the University of Niamey in Niger where, after two years, I obtained the University Diploma for Scientific Studies (DUES). As it was not possible to study agronomy in Niamey, I proceeded to France for further studies.

However, on reaching there, I realised that it was not possible to study agronomy straight away and I had to do two additional years in biology, ecology and biochemistry before being allowed to study agronomy.

I therefore spent eight years at university, from September 1972 to November 1980, obtaining three degrees at the Université de Rennes I (in Brittany, France), obtaining the "Licence" (1975) and "Maîtrise" (1976) in biological sciences, then the "Diplôme d'Etudes Approfondies" (DEA) in 1977 and the "Doctorat de 3e cycle" in agronomy (plant protection) in November 1980 in collaboration with the Ecole Nationale Supérieure Agronomique de Rennes.

During the first year for the "Diplôme d'Etudes Approfondies (DEA)" in 1977, I did a six-month intensive course in plant pathology, entomology, weed sciences, nematology, bacteriology and virology. I then conducted research on pests of maize and potatoes. This was my first experience in scientific research. For the doctorate degree "Doctorat de 3e cycle", which I undertook between October 1977 and November 1980, I implemented a research project on the frit fly, a major pest of maize crop and cultivated grasses, which got me fully involved and motivated in research.

I returned to Burkina Faso in March 1981 and took up a position at the Ministry of Higher Education and Scientific Research as a Research Officer. For seven months (March to November 1985) I went for an in-service training course at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Hyderabad, India. In addition, I improved my English and learned to use a computer.

Q. How did you join the ARPPIS programme?

A. In 1986, I had the opportunity to attend the First International Conference on Tropical Entomology, which was held at the Kenyatta International Conference Centre (KICC) in Nairobi. It was during this occasion that I learned about ARPPIS. I applied for the programme three years later and obtained an admission for the 1990 ARPPIS class.

Dona
DAKOUO
(ARPPIS Scholar
1990–1994)

I did my research work at *icipe* headquarters in Nairobi, at the Biological Control Unit (Locust Research Programme) under the supervision of Dr Suresh Raina. My research topic was on 'Immune defence mechanisms of the desert locust, *Schistocerca gregaria* against the protozoan, *Malamoeba locustae*'. I started my training programme in March 1990 and completed it in August 1994. I then went back to INERA in Burkina Faso, where I finalised my "Doctorat d'Etat" (PhD) thesis, which I defended in May 1995 at the University of Abidjan, Côte d'Ivoire, at which I was registered.

Q. How successful have you been in your initial objective of helping smallscale farmers?

A. I have been able to develop several technologies to address the challenges that smallscale farmers face in Burkina Faso.

Rice farmers in Burkina Faso, just like elsewhere, must apply pesticides to keep pests in check. I enlightened them on a useful technology, that is, crop spraying only after conducting an on-farm survey and then applying insecticide according to the thresholds of insect damage. Between 1987 and 1990, approximately 1000 farmers at the Valley du Kou rice irrigation scheme successfully implemented this phytosanitary measure. The strategy helped farmers to reduce insecticide applications in their fields from three times to just once or none per season. This approach also helped to protect the farmers' health and the environment.

Secondly, between 2000 and 2003 and in collaboration with colleagues in Plant Pathology, Nematology and Weed Sciences, we developed an IPM technology that simultaneously controls insects, pests, diseases, nematodes and weeds of rice. This approach, known as the integrated protection of rice (IPR), only requires plant-based pest control products, for instance neem and ashes (from rice residues after threshing), and organic manure application. This strategy is still in use in different rice growing areas in Burkina Faso. It has helped farmers to save money, which they previously spent on expensive (but toxic) pesticides. IPM strategy is now a major policy of the Strategic Scientific Research Plan in Burkina Faso that was adopted in 1995 and updated in 2003.

Another achievement was my contribution to solving insect problems affecting the production of sorghum, among them the sorghum midge *Stenodiplosis sorghicola*, which was a major threat in the central and eastern regions of the country. Farmers had started abandoning the cultivation of sorghum, in particular the white grain cultivars, which mature late and are heavily damaged by the insect. The introduction of resistant varieties from abroad (India and USA) had not solved the problem because these introduced varieties were susceptible to other biotic constraints (e.g. diseases and other insects) and had poor grain quality. Between 1994 and 2000, in collaboration with a sorghum breeder, we developed the first two varieties that were resistant to the sorghum midge. These varieties are productive, tolerant to other biotic constraints and have good grain quality. Because of this, farmers have regained confidence in growing sorghum in these regions. For this major scientific achievement, I received a presidential award in 2002.

I also contributed, as a member of a multidisciplinary team led by Dr Sie Moussa, to the development and release of seven rice varieties known as NERICA in 2005 for lowland and irrigated rice in Burkina Faso. This new type of rice, made from crosses of the two cultivated rice species, *Oryza sativa* (from Asia) and *O. glaberrima* (from Africa), combines the best traits from the two parents, e.g. productivity, tolerance to more abiotic and biotic constraints and good taste. This accomplishment was yet again honoured through a presidential award in 2006.

Through my scientist career (over the period 1990–2008) I have authored more than 25 scientific papers and 30 conference papers, submitted at international meetings. I have written and co-edited a 560-page book entitled, *IPM in the Global Arena* in collaboration with Drs Karim Maredia and David Mota-Sanchez, two scientists from Michigan State University, USA. This book was published by CABI (UK) in 2003.

I have been involved in training and institutional building at national and regional levels, and served as the principal technical advisor of the ADB/IPM pilot project in Lake Chad Basin (Cameroon, Chad, Niger and Nigeria) in 2004–2005. I teach an entomology course at Université Polytechnique de Bobo-Dioulasso (Burkina Faso). Several MSc and PhD students are under my supervision. I have been a scientific adviser of young scientists at INERA since 1999.

Currently, I am the Editor-in-Chief of the scientific journal *Science et Technique* at CNRST, Burkina Faso. I was the chairman of the IPM Task Force and Steering Committee Member of the Rice Research Network (ROCARIZ) from 2000 to 2004 and was involved in linking rice scientists from the West African Rice Development Association (WARDA) 17-member countries.

Q. As a person trained both abroad and in Africa what would you say are the benefits?

A. Being trained in Europe (France) and in Africa, I think there are advantages both ways. In addition to the knowledge gained through training, I have had the opportunity to develop a network of friends and colleagues. In France, I had the opportunity to make friends among students from all over the world, and particularly from Africa and Latin America. I even got married to a French woman.

At *icipe*, I also made friends with people from different parts of Africa (West, North, East and South) and of course from Kenya. I still have close links with many of them. My best friend was a Muslim girl, and being a Catholic, I discovered that everybody can be a good friend in this Earth, whatever the religion.

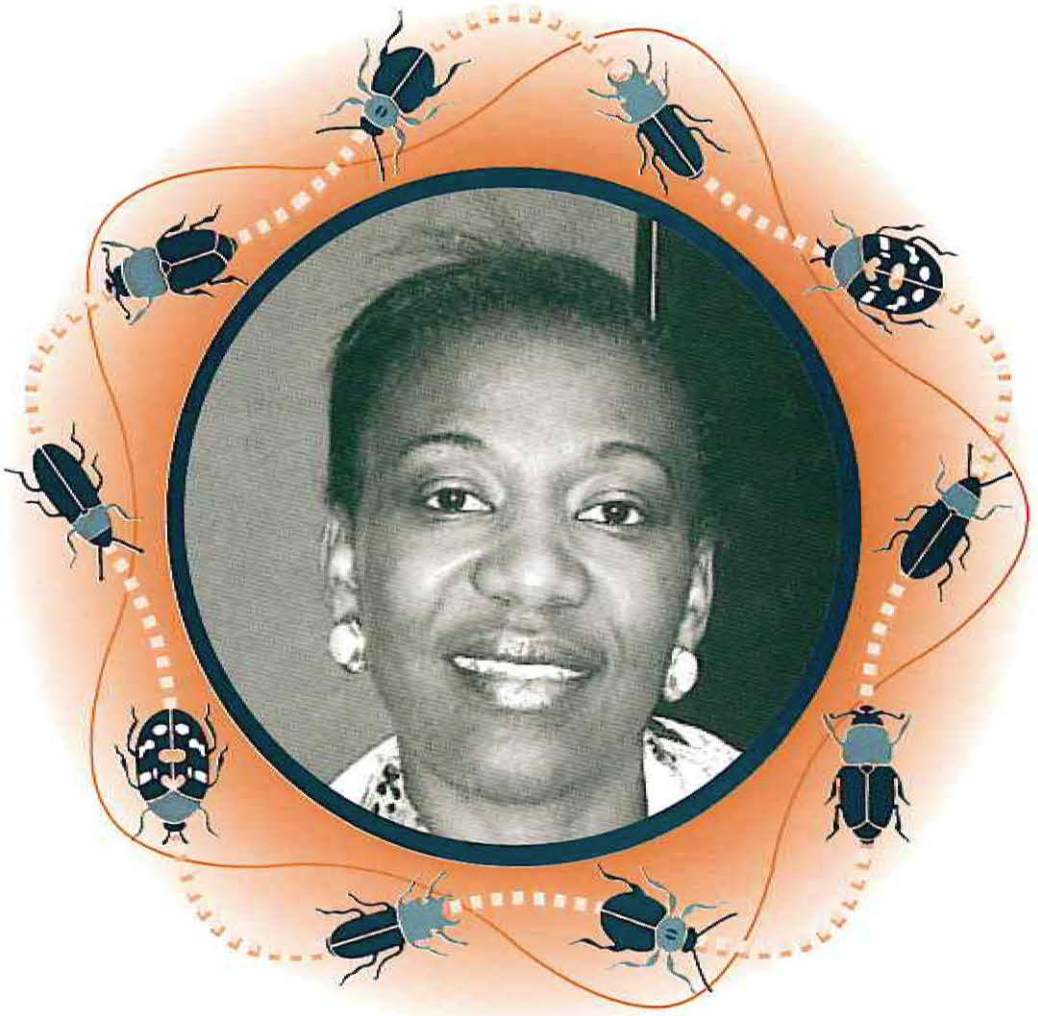
Q. How did the ARPPIS experience benefit you as a person and from a career point of view?

A. The experience has been very useful because of the knowledge I have gained. I am now a member of one of the widest and most active networks of entomologists and scientists in Africa.

From a career point of view, the exposure in ARPPIS earned me a promotion twice at INERA: in 1998 as a senior research scientist and in 2005 as Director of Research.

It also helped me to be the recipient of several awards: the best scientific award in 2002 by the West Africa Rice Development Association (WARDA), a presidential award in 2002 (as team leader) for the development of resistant sorghum varieties to insect pests, an award from the West and Central Africa Rice Research Network (ROCARIZ) for my work as the chairman of its IPM task force (2000–2004), and a second presidential award in 2006 as a member of the team that developed and released seven NERICA varieties for lowland and irrigated rice in Burkina Faso.

INTERVIEW



Adèle Ngi-Song

(ARPPIS Scholar 1991–1995)

Sponsors: Dutch DSO (Direct Support to Training Institutions in Developing Countries Programme) and The German Academic Exchange Service (DAAD)

As a young girl growing up in Cameroon, Adèle Ngi-Song wanted to become a medical doctor. That dream did not materialise, at least not directly. In the interview below, Adèle explains how, after a successful tenure as an entomologist, she has found her way into the world of health.

Adele
NGI-SONG
(ARPPIS Scholar
1991–1995)

Q. What is your background?

A. I was born in Cameroon, the second born in a family of six. My mother was a police officer and my father worked for the Ministry of Youth and Sports. I studied in the French-speaking part of Cameroon, in the capital city of Yaoundé, where I attended a Catholic primary school, Ecole Sacré-coeur de Mokolo. I proceeded to a public secondary school, Lycee Général Leclerc in the same city between 1975 and 1979 and then again between 1981 and 1982. For two years, 1979 to 1981, I studied in Kribi, in the coastal area of Cameroon, where my father had been posted.

After completing secondary education, I joined the University of Yaoundé from where I graduated in natural science with a major in zoology in 1985.

Q. What motivated you into getting into scientific research?

A. When I was young, I wanted to be a medical doctor, and indeed during my early post-secondary education, I had planned on joining medical school. However, this dream did not materialise as my father died in 1984, a year before I completed my first degree. After graduation from the university, the Ministry of Agriculture hired me in the Department of Crop Protection as a Training Officer. I taught general entomology and other topics such as phytosanitary regulations mainly to the technical staff in the ministry. While at this job, I was looking for opportunities to further my education. In 1986, *icipe* held a regional pest management training course in our training centre. That is how I came to learn about *icipe* and specifically of a training opportunity for a masters degree in biological control. I applied for it and was accepted in October 1987. I spent a year in Nigeria doing the coursework and another at *icipe*'s Mbita Point Field Station, in western Kenya. I graduated with an M. Phil in entomology in February 1990 from the Rivers State University of Science and Technology, Port Harcourt, Nigeria.

While at *icipe*, one of my supervisors encouraged me to apply for an ARPPIS PhD fellowship, which I did in 1990 after completing the masters programme. I started the PhD the following year and after I graduated, in June 1995, I was immediately hired as a postdoctoral fellow in the project in which I was training. Three years later, I was promoted to a research scientist and in 1994, I moved up to the senior research scientist position.

Q. What were your challenges?

A. Coming from the French-speaking part of the country, my main challenge was to study in English. But it was a challenge that I welcomed, and soon I became fluent in it. The other challenge was to live far from my family and home. Finally, *icipe* had a competitive and quite a demanding working environment.

Q. How did that experience benefit you as a person and from a career point of view?

A. The ARPPIS programme has provided me with some rare and unique opportunities. First, postgraduate studies are very expensive in any part of the world. However, through ARPPIS, I was able to study without worrying about how I was going to pay my school fees.

Second, during my studies and while working at *icipe*, I had the privilege to work with the world's leading scientists in America and Europe in the area of biological control of insect pests and insect behaviour. This experience has equipped me to be competitive in my field.

Third, I was able to explore my potential and reach a level that I would otherwise not have achieved. I am fluent in English and French, which is an advantage in the job market. I have also shared my experiences with young African scientists and instilled a love of insect science on their minds. Now, they too are working as scientists or are completing their doctorate degrees. For these reasons, I am grateful to the ARPPIS programme and its promoters.

Adele
NGI-SONG
(ARPPIS Scholar
1991–1995)

Q. How would you say that experience would have differed had you trained abroad?

A. At *icipe*, the research activities are geared towards solving insect problems of the tropics. This requires a deep knowledge of these issues. Therefore, studying in Africa has provided me with the unique opportunity to learn about the continent and most importantly, to contribute to solving the insect and food shortage problems unique to the continent. I was involved in both fundamental and applied research. I worked in laboratories similar to those found abroad. So really, it was an advantage to study in Africa under the ARPPIS programme. Had I gone abroad, I would not have had the chance of working with the African farmer and his problems, and in his field. I would have probably worked on a theoretical model.

Q. What were the benefits of your training and achievements for your country Cameroon?

A. There were many direct and indirect benefits for my country. For example, it did not cost them to train another entomologist. Then, I worked in Cameroon after my masters and I encouraged other colleagues to join the programme and finally, findings from my research work were used to initiate a biological control project for the reduction of cereal stemborers in Cameroon.

Q. What would you say have been your key achievements and career highlights?

A. I was responsible for planning and implementing a collaborative research project between *icipe* and Texas A&M University (USA) as a visiting scientist between 1995 and 1997. This project, which was funded by the Rockefeller Foundation under the Agricultural Sciences Career Fellowship, enabled me to study the efficiency of New and Old World natural enemies for the control of pests in corn.

Between 1995 and 2004, I contributed to the development and implementation of a Dutch funded regional project on the classical biological control of an invasive pest of maize, involving 11 countries in East and southern Africa, and Europe. I was one of the lead scientists on a study on risk assessment, which allowed the successful release of an exotic natural enemy in East Africa, leading to the reduction of crop losses due to maize stemborers in the region.

Under this project, I trained and supervised two PhD and seven MSc students, as well as technicians from the partnering countries. I have published over 20 papers in refereed journals of international repute and contributed in writing a scientific guide on genetically modified organisms (GMO).

I also developed and contributed to the implementation of a collaborative project with Makerere University, Uganda, funded by the Rockefeller Foundation in 2001 to 2003.

Partnerships were developed with organisations such as the Institut de Recherche pour le Développement (IRD), Gif-sur-Yvette, France.

As an executive member of the African Association of Insect Scientists (AAIS), I organised three international conferences: in Ouagadougou, Burkina Faso in 1999; Addis Ababa, Ethiopia in 2001 and Nairobi, Kenya in 2003. I was elected the Honorary Secretary of AAIS between 1997 and 2001, Vice-President between 2001 and 2003, and President between 2003 and 2005.

In 2003, I initiated a unique entomology club in primary schools in Nairobi.

Q. Comment on you career shift

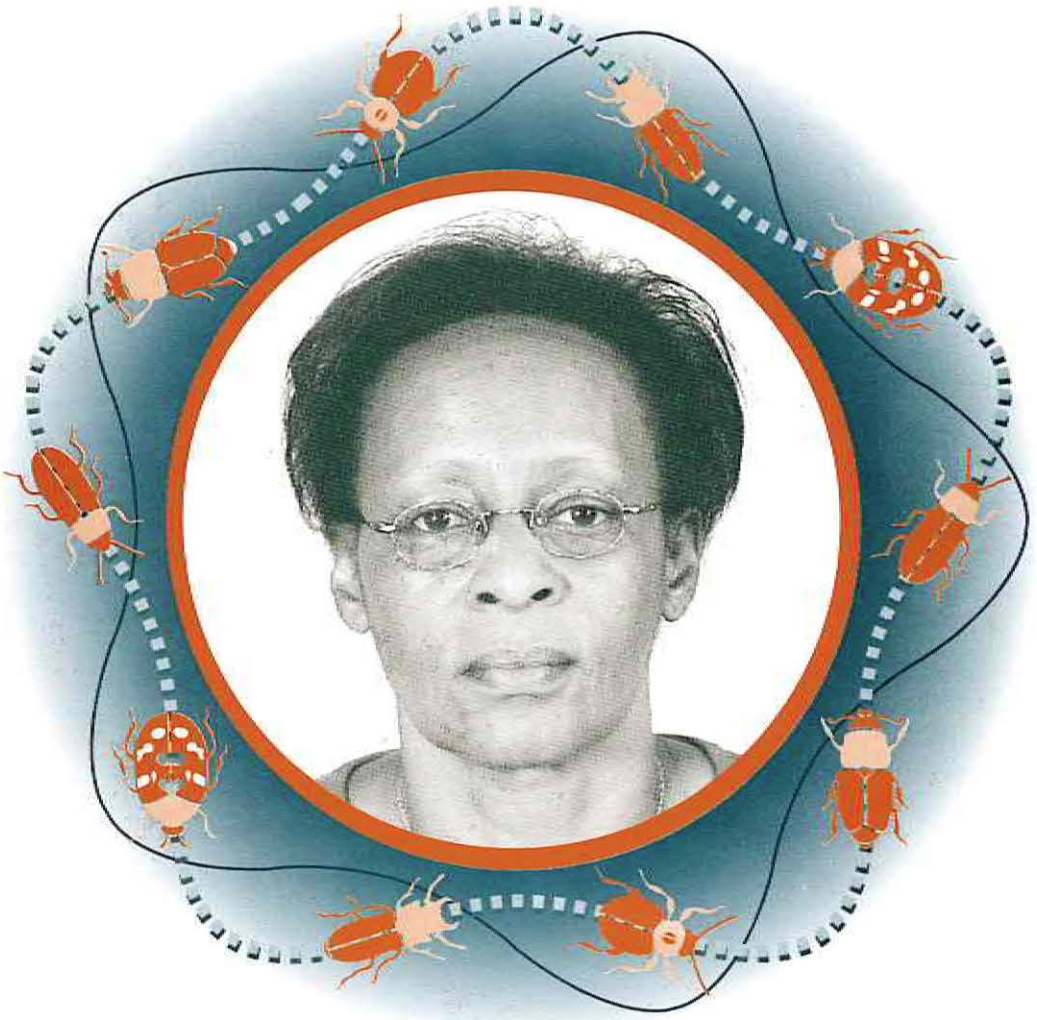
A. To upgrade my managerial skills, I enrolled on a full-time basis for an MBA programme at the University of Sherbrooke in Québec, Canada. I successfully completed the course in December 2005.

Adele
NGI-SONG
(ARPPIS Scholar
1991–1995)

Q. Please comment on brain drain vs brain circulation

A. I guess the question to answer here is whether ARPPIS scholars leave their home countries or even Africa, once they are trained, for greener pastures in Europe and America. My observation is that many ARPPIS scholars go back to their home countries after completing their programme and work there in government institutions, in research organisations or in universities. A few others join international organisations within the continent, eventually going back to their countries. As a result the training received in ARPPIS has benefited the whole continent and not only the country of origin of the scholar. I would call it brain circulation because the scholar eventually returns home with the extensive experience gathered abroad.

A few scholars leave their countries for much longer periods. Usually, it is because they have not found a favourable ground for the advancement of their career at home. Therefore, they go elsewhere hoping to find a good job and raise their families. I believe that African governments should make real efforts to create attractive working environments in the universities and in various institutions within their countries. I also think that every scholar's wish is to work in and to help his or her country and Africa at large. They should be given that chance and they will go home.



Rosemary SANG

(ARPPIS Scholar 1992–1995)

Sponsor: *icipe*

Mapping a path in arbovirology and virology...

When Rosemary Sang completed her 'A' level education, her late father urged her to pursue a degree in the medical profession. She therefore applied to study pharmacy. However, she was admitted for a Bachelor of Science degree at the University of Nairobi. But Rosemary was far from disappointed. In fact, she assured her father that with a degree in the sciences she would still be able to contribute to the medical field. And as she explains below, she was right.

Since leaving university, Rosemary, today a Principal Research Scientist at the Kenya Medical Research Institute (KEMRI), has been actively engaged in medical research in the field of virology and other aspects of tropical infectious diseases.

She has developed research proposals and made significant accomplishments, with her work attracting funding of up to US$ 705,000 from donors including the World Health Organization (WHO), the United States Army Medical Research Unit (USAMRU), the United States Department of Agriculture (USDA), Centres for Disease Control (CDC) and Nagasaki University, Japan.

Her research has been published widely, i.e. over 20 papers in peer-reviewed scientific journals and a chapter contribution to a book on emerging infections, which is now in press.

As Head of the Department of Arbovirology and Viral Haemorrhagic Fevers, Rosemary spends most of her time in the arbovirus laboratory of KEMRI, which now serves as a WHO collaborating centre for arbovirus and haemorrhagic fevers reference and research. KEMRI acts as a point of reference and research, serving Kenya and the eastern Africa region in outbreak response and surveillance.

In this position, which she has held since 2002, Rosemary has led research teams in providing support in outbreak investigation and control of these fevers in Kenya and other countries in the region including the Sudan, Somalia, Union of Comoros and Ethiopia.

But for this scientist, it has been a career marked by foresight. After her first degree, Rosemary went back to the University of Nairobi to pursue an MSc in effects of arbovirus infections on behavioural aspects of the mosquito *Aedes aegypti*, which she completed in 1986.

Later, through one of the scientists at KEMRI, she learned about the ARPPIS programme, which she applied for to pursue a PhD. This opened the door to a whole new experience on a personal and professional level. "First, I felt that the coursework was tailored in an enriching and unique way. With the help of senior *icipe* scientists, I selected a course that took into consideration my background in virology. This gave me an opportunity to study viruses using the electron microscope as a tool, a unique practical experience that I have treasured very much in my profession as an arbovirologist," Rosemary explains.

The ARPPIS programme, Rosemary adds, also provided her a great opportunity to interact with scientists of diverse nationalities and pursuits, which was enriching to her as a person and as a scientist. In turn, this taught her to have a wider perspective and to appreciate other people's diversity of views and practices. "The setting of the ARPPIS training programme at *icipe* provided an academic environment that was very conducive for great scientific achievement," she says.

When Rosemary joined KEMRI in 1983 she was posted to the Centre for Virus Research. As she had a background in medical entomology from undergraduate programmes in the University of Nairobi, she was asked to work on the area of vector-borne viruses, better known as arboviruses. At the time, these viruses were not considered to be of significant public health importance. However, things took a different turn when haemorrhagic fever virus diseases started causing outbreaks in East Africa. This presented challenges in prediction, detection, response, interventions and control. "This necessitated research programmes to carry out surveillance and find ways and strategies to better respond and control these viruses, programmes that have taken up much of my attention," explains Rosemary. Through her work, Rosemary has come to greatly appreciate the importance of North–South collaboration, which she considers vital for growth of science.

On a personal level, Rosemary has found her journey to this level of scientific achievement to be a mixed bag. Born in the larger Kericho District to a family of four sisters and two brothers, Rosemary's late father was a civil servant in provincial

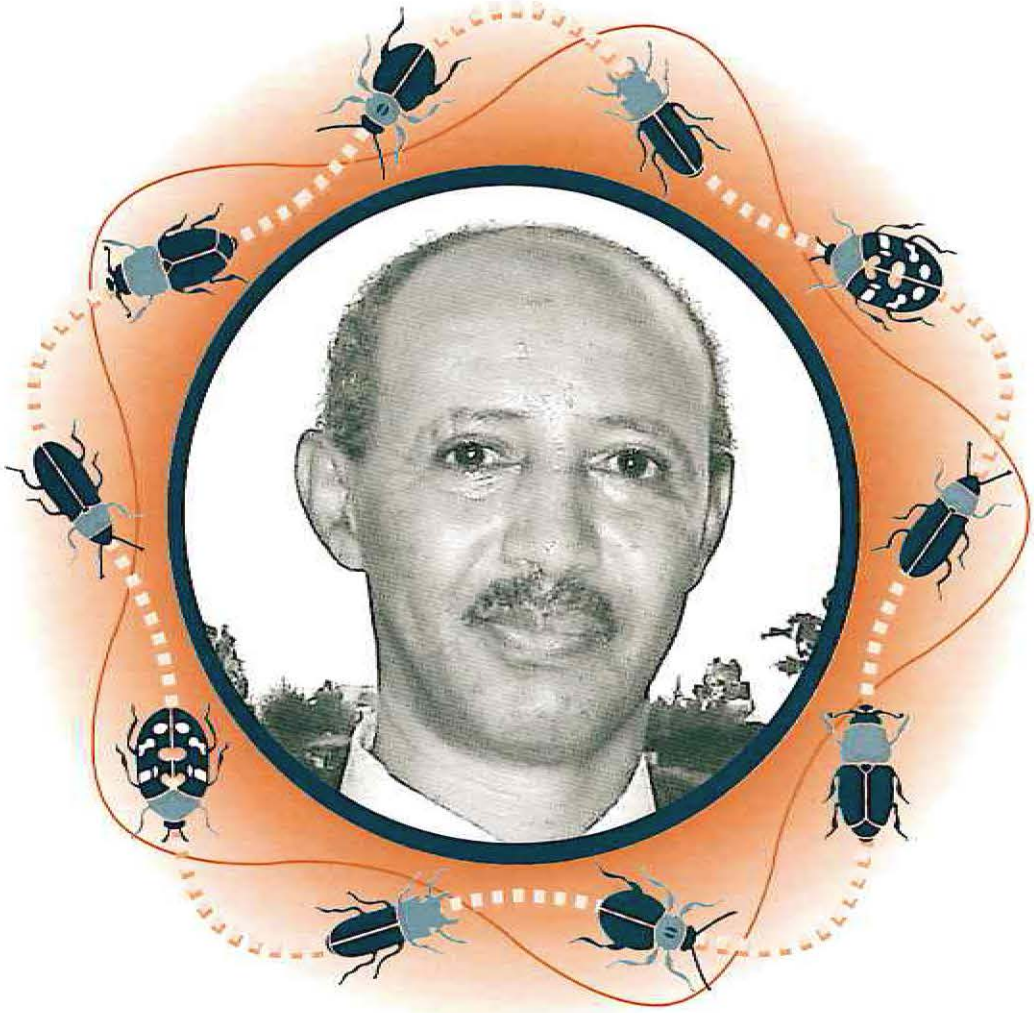
Rosemary SANG (ARPPIS Scholar 1992–1995)

administration while her mother was a housewife who dedicated her time to taking care of her family.

After attending Kericho Township Primary School, she proceeded to Kipsigis Girls' High School for secondary school, and then moved to Eldoret for 'A' levels at the former Highlands School (now Moi Girls Eldoret).

But as she notes, right from college and at the workplace especially during field expeditions, the major challenge was being able to fit in a male-dominated situation. Often, she would find herself as the only woman and felt that she had to do a lot more than her male colleagues to gain acceptance and recognition.

"I also had to struggle with juggling the responsibilities of motherhood, being a housewife and performing to expectation in academia. However, I thank my husband and children who have always remained supportive and understanding even when work has demanded that I leave home for extended periods of time or with little notice," she concludes.



Tekie HABTE

(ARPPIS Scholar 1992–1997)
Sponsor: Dutch DSO (Direct Support to Training Institutions in Developing Countries Programme)

Tekie Habte went to university at a time when his country, Ethiopia, was in political upheaval, which disrupted normal life as well as learning. Today, this distinguished scientist is helping to build his country by training and mentoring young scientists in their careers.

Tekie HABTE
(ARPPIS Scholar 1992–1997)

I was born in the provincial town of Gondar, northwestern Ethiopia, on 1 May 1954. I was the eldest of seven children in a family of three boys and four girls. Five of us survive to this day. Four live in the Diaspora and I live in Addis Ababa. I was brought up in Gondar town where I started formal schooling at the age of seven.

I attended elementary education at Meseret Elementary School in Gondar. I then joined the Haile Selassie I Comprehensive Secondary School in the same town, where I sat the Ethiopian School Leaving Certificate Examination (ESLCE) in 1973. I passed the ESLCE with very good grades and joined university. I was interested in the health profession and was lucky to be admitted to the Gondar Public Health College (Haile Selassie I University) as a freshman.

Unfortunately, this coincided with a period of nationwide unrest in Ethiopia, which culminated in the overthrowing of Emperor Haile Selassie I, and the takeover of power by Mengistu Haile Mariam in 1974. This era was marked by widespread disruption of normal life, including the functioning of most institutions of learning, with students widely boycotting classes. It took some years for life to return to normal, and it was only in 1980 that I was re-admitted to the now Addis Ababa University (AAU), in the Science Faculty's Department of Biology, as a sophomore.

Still, I managed to graduate with a distinction in July 1983. Upon graduation, I was employed as a Graduate Assistant in the Department of Biology, as part of the university's staff development scheme. A year later, I was promoted to Assistant Lecturer.

My career in entomology started with an assignment to assist in practical laboratory teaching and lectures in general entomology to undergraduate students, and medical entomology to postgraduates.

In 1984, I enrolled for an MSc in the AAU's School of Graduate Studies. Prof. Teferi Gemetchu who was the Head of Department motivated me to work on mosquito vectors of malaria. Under his supervision, I researched on 'the ecology of anthropophilic *Anopheles* mosquitoes in Ghibe Horticulture Development Farm'. I graduated with an MSc degree in 1989 and then rose to the position of lecturer.

Prof. Gemetchu, who was at the time working closely with *icipe* in the initiation of the ARPPIS programme, encouraged me to apply for an ARPPIS PhD scholarship. I was granted the award, enabling me to join the ARPPIS programme in March 1992. I researched on 'Neem *Azadirachta indica* (A. Juss.) seed powder and extracts for the control of the spotted stemborer *Chilo partellus* (Swinhoe), on maize and its potential for pest management' and published two papers in international journals. I did most of the field and laboratory research work at the *icipe* Mbita Point Field Station in South Nyanza, western Kenya. I then returned to Ethiopia in 1997 to complete part of the field research work, where I also did the data analysis and write-up of my thesis in the Department of Biology, at the AAU in 1999.

Pending the defence of my thesis and graduation, I resumed my position at the university as a lecturer. I formally received the PhD in July 2000, and was promoted to Assistant Professor. I continue my teaching and research career in the Department of Biology (AAU).

The rich experience I gained at *icipe* has benefited me immensely in advancing my career. The courses offered at *icipe,* which covered basic theoretical and practical entomology, helped me to consolidate my scope and experience in different core areas in insect science. The training also involved using different entomological techniques, designing and conducting of laboratory and field experiments, as well as analysis of biological data from field and laboratory experiments. I consider working at *icipe*'s facilities a lifetime experience. Moreover, being able to participate in scientific presentations, conferences and other symposia greatly widened my scope in different fields of insect science.

The AAU's Department of Biology is structured into eight streams, one of them being Insect Science. Students are trained up to PhD level in various areas of specialisation. The Department also hosts the ARPPIS Sub-Regional Centre for Northern and Eastern Africa.

Tekie HABTE
(ARPPIS Scholar 1992–1997)

I am the coordinator of both the Insect Sciences stream and the activities of the ARPPIS Sub-Regional Centre. I also served for two years in the Department's Academic Committee and as the Acting Head.

I am also involved in teaching at undergraduate and postgraduate levels, in the supervision and advising of graduate students in their thesis work. I teach general entomology, which is offered to undergraduate students, and medical and veterinary entomology and insect ecology to postgraduate students. Most of the MSc graduates in Insect Science are employed in other universities in Ethiopia and/or working in national programmes and research institutions in areas such as agriculture and health. A good number of BSc graduates in biology are also employed as entomologists in the national programmes and the private sector. In this regard, I believe that I have contributed towards producing trained manpower in insect sciences and related biological fields to meet the demand in the public and private sectors.

I also participated in the ARPPIS Coordinators' Workshop aimed at revitalisation of the ARPPIS programme in 2005. I have also participated in Semio 2008 International Conference on Chemical Ecology and numerous workshops and conferences. I am also a founding member of the Biological Society of Ethiopia.

My training in *icipe* and Addis Ababa University has created a chance for me to work on problems that are relevant for my country. And I believe that working on African problems under African situations builds the confidence and experience to remain and work in Africa and to serve the African people. It is an excellent way of reducing the brain drain.

Arop Leek DENG
(ARPPIS Scholar 1992–1997)
Sponsor: International Fund for Agricultural Development (IFAD)

Arop Leek Deng was born, raised and schooled under constant civil strife, the result of the civil war that has ravaged his birth country of Sudan for 38 out of the 52 years of its independence. His life and achievements represent the life of a poor rural child, an IDP (a refugee), indeed that of many people in Africa, who are constantly struggling for a decent livelihood, against many odds. He tells his story, a story that should inspire millions of African children and young scientists.

Arop Leek
DENG
(ARPPIS Scholar
1992–1997)

I was born in 1961 in Duk Payuel, Jonglei State, Southern Sudan about seven years into the first phase of the civil war (commonly known as 'Anya nya I war'), which lasted between 1955 to 1972. My exact date of birth is not known, as my parents were illiterate and could not keep records of the birth of their children. Secondly, the health centre where I was born was destroyed, and with it many birth records, when most villages were burnt down during the war. Therefore, and like any other child born in rural Sudan during the civil war, I rely on the 'Assessment of Age Certificate' from the Ministry of Health, which shows January 1st as the date of birth for those whose records are unknown.

My father was polygamous and my mother was the first of his four wives. I am the tenth child of her five sons and five daughters. My community practised, and still practices, cattle herding, subsistence farming, hunting and fishing in the swamps of the Sudd, along the Nile River. When I was young, my parents wanted me to be in charge of their livestock—their wealth—since my stepbrothers were all in school.

I went to Jonglei Primary School in 1968 in Malakal town, Upper Nile State, a town that was established by Egypt during the Anglo-Egyptian rule in the Sudan, as a station for monitoring the flow of the White Nile waters northwards. The language of instruction was Arabic, which was a challenge for me because English schools were the most common in Southern Sudan. In 1975, I moved to Malut and finally Bor Primary School, as a result of my guardian's transfer there. During the civil war, life in boarding schools that were outside the towns was extremely difficult. In case of random shootings, we pupils would have to escape from the dormitories and spend the night hiding in bushes around the schools. During days of heightened insecurity, pupils would sleep with their shoes on, for emergency take off.

During school holidays I would walk with the other boys and girls back to my village, 200 km away, a journey that took up to three days, and one that became a more arduous journey during the rainy season. After completion of the sixth year of primary school in Bor, I qualified to attend junior secondary school in the same town between 1974 to 1976. After emerging the fourth best student in Southern Sudan in the final examinations, I joined the prestigious Atbara Secondary School (now converted to University of Northern Sudan) in Northern Sudan from 1977 to 1980.

I then travelled to Egypt, where I joined the Faculty of Agriculture in the University of Alexandria where between 1981 and 1985, I studied crop protection, with pesticides chemistry as a major option and entomology and plant pathology as minor subjects. This choice was influenced by my childhood and early school life in Malakal, Malut and Bor towns, which are the main centres for irrigated and rain-fed mechanised farming of cereals, cotton, sugarcane and groundnuts in Southern Sudan. In addition, the approaches that were being employed to protect cotton and sorghum against field insect pests, for instance through spraying using fixed wing aircraft, as well as the exclusive luxurious staff houses for agriculturists in the pristine green surroundings in these towns fascinated me from an early age. In addition to this special love for agriculture and biology, I also had a natural affinity for chemistry, which stemmed from the fact that I had always perceived it as a science of precision and truth (it does not lie). This perception pushed me to major in pesticides chemistry in my first degree and later in chemical ecology (semiochemistry) in my third degree.

Immediately after completion of my undergraduate course, the university offered me a partial scholarship to undertake a masters degree while teaching in the Department of Pesticides Chemistry. This was as a reward for my high academic performance and research project on evaluation of 114 coded insecticides against the cotton bollworm *Spodoptera littoralis*. In this project, I selected the 20 most effective insecticides to be used against the insect countrywide. This was the first offer of its kind for an African student from sub-Saharan Africa. I, however, could not take up the university's offer due to lack of accommodation and subsistence, which were conditions for my admission. This was because by that time, a new phase of the civil war had broken out in Sudan, which lasted 21 years and only ended in 2005. My district, which was the first to be affected by the war was left out of the government of Sudan control. It was therefore difficult to get to my home village and to my parents, and therefore I could not raise

Arop Leek DENG
(ARPPIS Scholar 1992–1997)

the required funds, including my return ticket to Egypt. Even more unfortunate was the fact that I lost both my loving and dedicated parents during the war; father in 1991 and mother in 1993. I was almost becoming a refugee (or internally displaced person, as is the term these days) when I arrived in Khartoum after completion of my first degree.

Thereafter I was employed by the Upper Nile State Ministry of Agriculture in 1985 and posted to Renk town, a citadel of mechanised cereal production in Southern Sudan. On the 16th of August 1986, the youth and elders of this town were targeted by government security forces under accusation of being Sudan Peoples' Liberation Army (SPLA) supporters. About 22 of us were placed in army custody for a period ranging between three days and four months. I was lucky to be among those who cheated death, having been set free after the third day of arrest. Some of my friends who remained in custody were later tortured to the point where some of them lost their lives. As a result, I had to abandon my job to move to the capital, Khartoum, which was more secure. This move triggered my quest to seek postgraduate studies.

Indeed, I learned about ARPPIS and *icipe* when I was a postgraduate student at the University of Khartoum, which was among the founding institutions of the programme. Some of my colleagues and faculty members had graduated from the programme. Indeed at the time of my application to the ARPPIS programme, Sudan, and specifically the University of Khartoum, was the second beneficiary of ARPPIS fellowships, after Kenya. As a result, the ARPPIS Academic Board decided that the University of Khartoum and all the universities in Kenya would not benefit from the 1991 admissions, to give other institutions and countries a fair chance. In line with this, the only applications that were being considered were those from the University of Gezira, Sudan, which had joined the ARPPIS academic network that year. However, the University of Khartoum representative on the ARPPIS Academic Board, Prof. Imam El-Khidir, made an appeal for my application to be considered. He pointed out that I hailed from Southern Sudan and was the first applicant from that region. He reiterated that all the previous admissions were from Northern Sudan. Prof. El-Khidir's appeal was so strong that all the Board members unanimously approved my admission into the 1992 ARPPIS class.

The ARPPIS and *icipe* experience will always remain a milestone in my life. It benefited me tremendously through training and career development. It was through ARPPIS that I learned how to use computers for the first time, as well as sophisticated research and analytical techniques to decipher insect chemical language, and data analysis. The annual scientific seminars at *icipe* contributed immensely towards sharpening my information delivery skills. I credit the training that I received from ARRPIS and *icipe* as a scholar, and later as a postdoctoral research associate under my mentors, Prof. A. Hassanali, Dr Baldwyn Torto and Dr Peter Njagi, for having changed my life to the level that I am currently in. In a nutshell, ARPPIS sparked my career as a researcher and as an academician. Working in a multicultural society such as the one that the ARPPIS programme offered, enabled me to fit in with ease in any multinational institution or environment that I have since visited. I consider the network of alumni and friends that one gains through ARPPIS an invaluable treasure, unmatched to any other.

After leaving *icipe* in 1997 after my tenure as a Postdoctoral Research Associate, I joined my current employer, Egerton University as a lecturer and rose through the ranks to the position of Associate Professor. I have been involved in several funded collaborative research projects, supported by various donors, including *icipe*, AICAD, USAID-CDR Israel and Egerton University and IUCEA-VicRes. My collaborative research efforts have earned me, jointly with colleagues, who include my mentors, Prof. A. Hassanali and Dr B. Torto, over a dozen published manuscripts in peer-reviewed journals and two inventions (patents). Furthermore, I have reviewed a number of grant proposals and journal articles, and examined several postgraduate students' theses. I have also attended over 15 scientific and non-scientific meetings and workshops in different countries. I am serving as external examiner for the Department of Zoology, Makerere University, Uganda. I am currently Secretary General of the ARPPIS alumni and member of the Board of Trustees of Padak Fisheries Training Centre in Southern Sudan.

My contribution to training and institutional capacity development is ingrained in the number of supervised research projects, currently standing at 20. These include 12 postgraduate and eight undergraduate students, with four others under conceptualisation.

Arop Leek
DENG
(ARPPIS Scholar
1992–1997)

As a member of a number of professional societies and career groups (AAIS, ESK, ACSS, and others), I have helped to influence policies that advocate for the conservation and commercial utilisation of arthropods and natural resources. I have also been in the frontline in advocating for the use of environmentally safe, non-chemical management options or the judicious application of synthetics to combat arthropod pests and vectors. Moreover, I have held different administrative and research positions, as an Acting Chairman (Head) of Department, Dean of Faculty, Director of Graduate School, and member and chair of various university standing committees. These roles have enabled me to influence policies on employment, promotion of indigenous knowledge, product development, and the design of new academic programmes that are demand-driven and responsive to the private sector and which also advocate for stronger linkages with public institutions. These efforts aim at speeding up the development and adoption of technologies generated in the public institutions.

In the area of socio-economic development and community empowerment, I have worked with small-scale farmers around the Lake Victoria region to control post-harvest grain pests. In Southern Sudan, I co-founded a local non-governmental organisation, Sudd Development Agency (SUDA), focusing on the fishery sector, with the overall aim of improving the livelihood of the riparian communities. The Sudd region has since 2004 been designated as the second largest wetland in the world. Through *icipe*'s Commercial Insects Programme (CIP), I have helped to improve apiculture through the New Sudan Beekeepers Association (NSBA). This has led to the construction of a honey marketplace in Maridi and the introduction of mulberry sericulture into Yei, in Southern Sudan. As a leader of the Sudanese community in Nakuru, I have also contributed towards student placement in various schools and institutions of higher learning in the region, and encouraged them to seize the opportunities available to them so that they can contribute positively to development of post-war Southern Sudan. I have also offered intellectual and financial assistance when needed. Some of my mentees have now completed their studies and are working in high-ranking positions in the public and private sectors in Southern Sudan.

Sudan has been at war for 38 out of its 52 years of independence. Having been born, raised and schooled under constant civil strife, and having risen in science and development to the level I am in today, my life depicts the struggle for a decent life in Africa against all odds. I bear testimony to the saying that "with God all things are possible". As a scientist trained exclusively, from bachelors to the doctoral degree, in Africa (in Sudan, Egypt and Kenya) and given the level of my global interactions and perception by peers today, my story could be a source of inspiration for millions of African children and young scientists. My life represents the life of a poor rural child, an IDP (a refugee) and a scientist, a scenario experienced by most children in war ravaged regions of the world.

INTERVIEW

Jean Joseph RANDRIAMANANORO

(ARPPIS Scholar 1993–1997)
Sponsor: The German Academic Exchange Service (DAAD)

Jean Joseph Randriamananoro was inspired into studying science by the desire to help his parents and fellow villagers improve their yields. Today, he boasts comprehensive knowledge of most major pests of maize, cassava and potatoes. In addition, he is conversant with beneficial insects, such as bees and silkworms. In the interview below, he discusses how he is applying his all-round knowledge.

Jean Joseph
RANDRIAMANANORO
(ARPPIS Scholar
1993–1997)

Q. What is your background?

A. I was born in a village called Ambohibao, 40 km from Antananarivo, the capital of Madagascar. I attended public primary schools in the same village, before moving to a public secondary school in Ambohimanarivo, and to the high school at the Lycee Ampefiloha.

Q. What inspired you into scientific research?

A. My parents were farmers who practised traditional farming methods, and often got low harvests from their crops. I felt challenged to assist them, as well as other farmers in the village, to better their yields. I thought that this could be achieved through the use of improved crop varieties and through the introduction of modern farming methods, including mechanisation. My desire was to see the whole village develop. The main crop in the area is still rice but people also grow crops such as maize, cassava and Irish potatoes. People would often use traditional means, including animal draft power for land preparation, which limits the area cultivated. I recognised that mechanised agriculture would help to increase production.

So, when I joined the College of Agriculture at the University of Madagascar, I opted to study agricultural engineering. I then proceeded to do a masters degree at the University of the Philippines at Los Baños, and at the International Rice Research Institute (IRRI). I went to the latter institute to specialise in rice development.

Q. How did your training at *icipe* fit in with your initial goals?

A. I joined *icipe* in 1993 as a PhD ARPPIS scholar, under a DAAD scholarship, registered at the Rivers State University of Science and Technology, Nigeria. I opted to do research on maize and sorghum, to complete my knowledge of the cereal crops. I graduated right on schedule in 1997.

I went back home in 1997 and started working in rural development. I joined a private organisation called Bureau d'Etudes ADRE, an organisation supporting rural and environmental development. My objectives were to develop rural development projects, and train farmers and their groups on different cropping systems and also assist them in the implementation of their projects.

In the course of this job, numerous farmers sought my assistance on modern beekeeping and silkworm rearing. Once more, I felt challenged and in 2001, when I was offered a postdoctoral position at *icipe* under the ARPPIS programme in the Commercial Insects Programme, I decided to concentrate my efforts on beekeeping and sericulture.

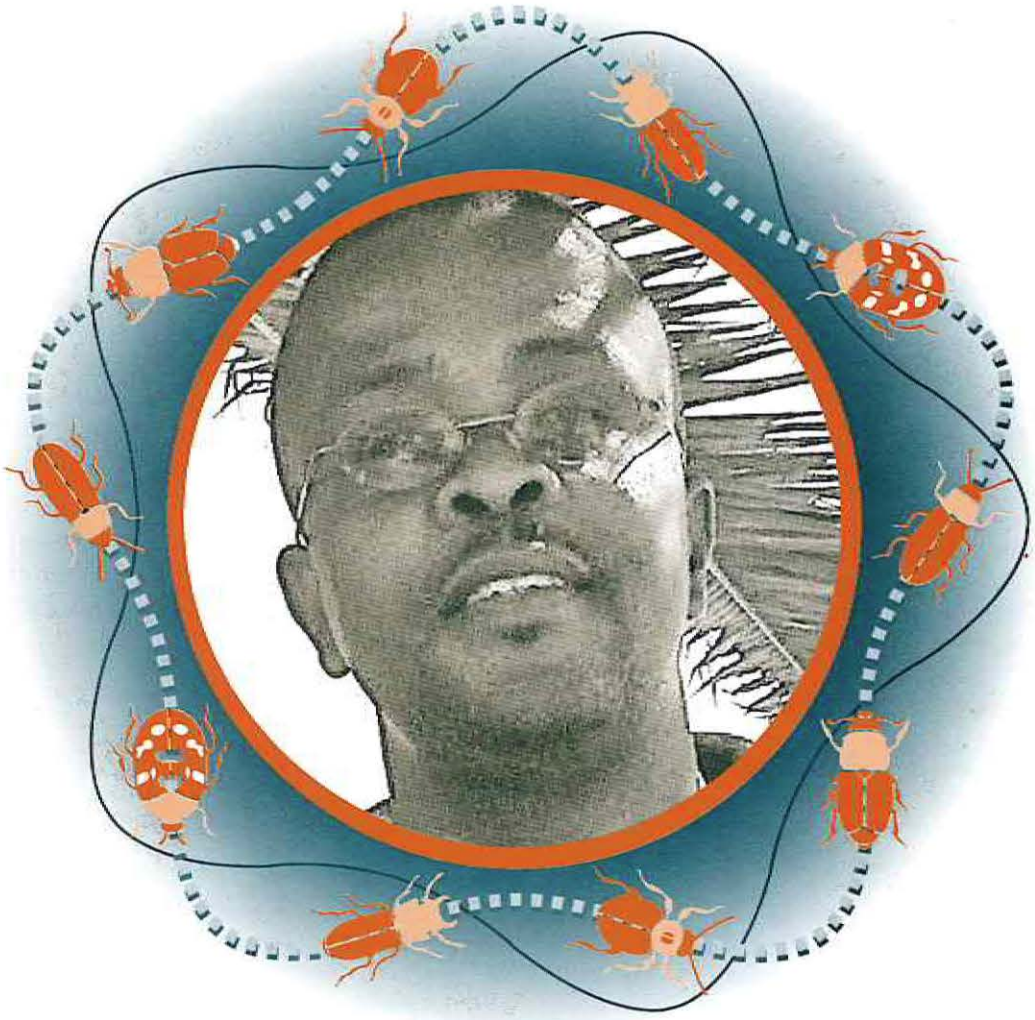
The knowledge acquired at *icipe* placed me among the top development practitioners, particularly in rural issues, in my country. Therefore, back home in 2002, I enhanced my rural development activities even more. Since then, I have been working on different development projects, such as the Programme de Soutien au Développement Rural (PSDR) under the Ministry of Agriculture and Livestock co-financed by the government of Madagascar, the World Bank, and the Suisse Inter-cooperation Programme, the PPRR project financed by IFAD, the ANGAP project, the Feedback Madagascar project, and others.

Q. Describe your current work

A. Through this project I give technical training, and follow-up, to farmers. I also do project or association management, where I assist them to look for markets for their produce. ADRE is very important in the area of capacity building in the rural community in Madagascar. So far we have trained more than 160 farmers' groups, with each group consisting of about 15 members, on apiculture, sericulture, rice and other food crops production. We have also trained more than 50 technicians in apiculture, as well as sericulture trainers.

The role of the organisation is even more critical in view of the current global food crisis. We hope to contribute more towards the improvement of food crop production and to assist farmers to develop sustainable and profitable activities through training, technical assistance and relationship with donors.

INTERVIEW



Fanuel Afrika DEMAS

(ARPPIS Scholar 1994–1997)
Sponsor: The German Academic Exchange Service (DAAD)

'There is no excuse whatsoever for Africa not to take proper care of its natural resources', so proclaims Fanuel Demas. In the interview below the Namibian scientist explains how he is combining this tough talk with his love for nature and training as an entomologist to guide one of the most successful community-based natural resources management projects in Africa.

Faneul Afrika DEMAS
(ARPPIS Scholar 1994–1997)

Q. What is your background?

A. I was born in Okombahe, Namibia and went to Concordia College, in Windhoek, which is the capital city. I grew up on a farm where I developed a love for nature. At school, I enjoyed science subjects more and therefore decided to study science further at university level. The more I learned about science, the more I tried to find out about it, which led me to a career in scientific research.

Q. How did you end up at *icipe*?

A. After completing the ARPPIS MSc programme at the University of Zimbabwe under DAAD sponsorship, I approached DAAD to fund my PhD studies at the London School of Hygiene and Tropical Medicine. They referred me to *icipe*, who offered to pay for my PhD studies.

Q. How did that experience benefit you as a person and from a career point of view?

A. *icipe* exposed me to a number of dedicated entomologists from various corners of the world. By being at an international centre, I gained tremendous knowledge and experience through the well-resourced library and its staff, and the vast experience of the scientists at *icipe*. I also acquired diverse perspectives on various countries on the continent and beyond from my ARPPIS colleagues. I appreciated this cultural diversity, and even more so now whenever I attend international meetings. I know that *icipe* was instrumental in preparing me for interaction with personalities from various countries and backgrounds.

Q. What were the benefits for your country?

A. There were few entomologists in Namibia, and therefore the country benefited from my training at *icipe*. I was the first Namibian to train under the ARRPIS programme. In turn, I have trained many students in agricultural entomology at undergraduate level. Furthermore, I have supervised students at MSc and PhD levels in entomology and related fields. I recommended some of these students to train through the ARPPIS MSc programme at the University of Zimbabwe. I am an external moderator for the Polytechnic of Namibia and I serve on the Board of the Faculty of Agriculture and Natural Resources at the University of Namibia. This is because I want to plough back the knowledge and experience I gained through *icipe* as well as other training and work environments into the youth of Namibia.

Q. What were your challenges?

A. After completing studies at *icipe*, I taught entomology at the University of Namibia. This was an interesting challenge since the Faculty of Agriculture and Natural Resources, to which I was assigned, was new. In fact, I was the first entomology lecturer. I was involved in the development of the curriculum, teaching material, as well as guides for practical lessons. In general, I made sure that entomology was given due recognition in the university, as an important field in agriculture and natural resources management.

Q. Comment on the need for African countries to build capacity in environmental management, based on your own experience

A. There is a serious need for African countries to build capacity in environmental management. Africa has one of the most interesting mixes of wildlife and other natural resources in the world. There is no excuse whatsoever for Africa not to take proper care of these resources. Africa has fallen into a 'begging attitude' to the extent that we neglect our resources and even fail to do what we can easily do on our own to demonstrate to the donors that 'we do have the capacity and the resources needed'. Hand-in-hand with scientific training, the minds of our people should be refreshed and reinvigorated to realise that we are the first line of defence

Faneul Afrika DEMAS
(ARPPIS Scholar 1994–1997)

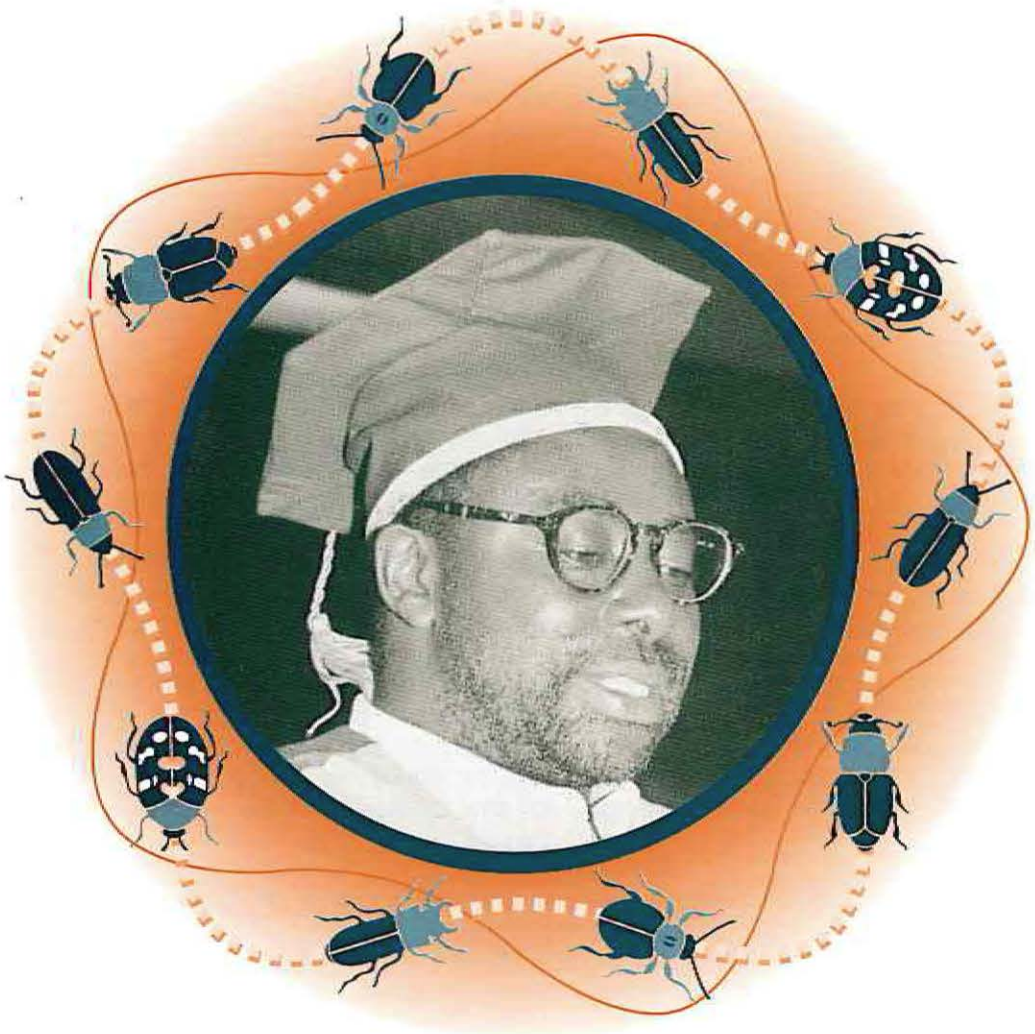
for African resources and that good, sustainable environmental practices are within our reach.

Q. What is your own contribution in this regard?

A. For the past six or so years, I have been part of the Ministry of Environment and Tourism where I joined as a Deputy Director for Monitoring, Research and Planning in the Directorate of Scientific Services. In January 2008, I was promoted to the position of Director. I am responsible for all wildlife related permit control, wildlife trade, CITES and RAMSAR Conventions, game capture and translocation, research and planning, and wildlife survey and monitoring.

Although I do not get much time to do entomological research due to the administrative side of my job, all research proposals on wildlife, including entomological research by Namibian and international institutions, and researchers, are cleared through my Directorate.

I also travel extensively internationally to represent my country at various forums. Thanks to the wildlife translocations done through my Directorate, Namibia has earned a good reputation in community-based natural resource management initiatives. We receive visits from stakeholders in various countries on the continent, who are keen to learn from our successes. Namibia also has a well-respected conservation standing internationally despite being one of the youngest nations on the continent, being only 18 years from the time when we gained independence.



Jean-Berckmans Bahananga MUHIGWA

(ARPPIS Scholar 1994–1998)

Sponsor: The German Academic Exchange Service (DAAD)

Jean-Berckmans Bahananga Muhigwa is currently the Dean, Faculty of Sciences, at the State University of Bukavu in the Democratic Republic of Congo (DRC). He was also the Director of the Rural Studies and Development Centre (CERPRU Bukavu). In his own words, he tells the story of his long walk, from a mountainous village on the shores of Lake Kivu, to become a successful scientist.

Jean-Berckmans Bahanaga MUHIGWA (ARPPIS Scholar 1994–1998)

I was born in Kaziba, 60 km west of Lake Kivu, on the fringes of Bukavu city, in the Democratic Republic of Congo (DRC) on 2 May 1961. I am the second child in a family of four sons and four daughters. My mother is a smallscale farmer. My father was a primary school teacher and a catechist. He was also a local chief, by virtue of having married the first daughter of a traditional chief, who gave him responsibility over several villages.

Life in this mountainous region was idyllic, and included eating ripe guava fruits, fresh off the trees, Sunday trips to a church 5 km away and Christmas and Easter holidays spent sightseeing and running after the Belgian priest's 'Beetle' car or motorcycle. The only downside was the hectic affair of collecting water, which involved ferrying 10-litre containers up a hill from a spring in the valley.

But this was also the onset of the civil war in the DRC, following the assassination of Patrice Lumumba, our national hero. So the mountains became a hiding place for my family from the rebels. When there was some temporary respite from the fighting, my father would cycle to his school 25 km away, and would come back on weekends.

I was eager to go to school too, and at age five, I followed my brother to the Catholic church-run school. I sat in the classroom until the teacher allowed me to enroll as a grade one pupil. At the end of grade five, I transferred to a school owned by the Protestant church, a 30-minute walk from my village. After primary school, my father decided to send me to the Marist Brothers Missionary School, 25 km from Kaziba. He had noticed that since grade one, I had always been among the top five pupils. For this reason, he thought I deserved to study at his *alma mater*, a famous institution, which was still headed by Europeans. But he could not afford the boarding fees (around US$ 28 per term). So he arranged for me to stay with his godchild, who was also a teacher.

It was a hard life. Food was scarce; just one meal a day late in the evenings, and long treks to and from school. Even worse, the prevalence of malaria in this area was alarming. I remember shivering miserably with fever in the school playground on many occasions. But my school grades remained as good as ever. I was always topping the class, over even the students from a privileged background, including some who had undertaken their elementary studies in Belgium.

In the second half of form three, I secured a place in the boarding section of the school. There was a lot of pressure to learn, sports to play and watch, and plenty of other leisure activities. We had efficient teachers. My favourite subjects were physics, literature and biology. Science was considered the choice for the brightest students. The mathematics and physics teacher was harsh, which somewhat reduced my attraction towards physics. On the other hand, the Peace Corps volunteer who was teaching 'A' levels biology liked me and even sponsored part of my boarding fees. So, at the end of form four, I opted for biology and chemistry for my 'A' levels.

Indeed, biology became my life, and I had a big book entitled *Life: An Introduction to Biology*. It was my main luggage when I travelled to Kisangani University, 1000 km away from home, after emerging the best student in the A-level exams in my school in November of 1979. I was very happy to be registered at the Faculty of Sciences to study biology. While plant organisms such as cells seemed uninteresting, animals and their behaviour seemed more attractive to me and less confusing. Therefore, in the second year, I opted to study zoology and ecology. I chose Prof. Wlodek Slanislaw, a Polish lecturer, as my supervisor for my 5th year thesis, which was on the responses of zooplankton in fertilised fishponds. My supervisor and his colleagues advised me to pursue doctoral studies too.

After graduation, despite having recommendation letters from the chancellor of the university, I was unsuccessful in getting a job. After a stint of part-time work for meagre pay, I finally secured a well-paying job as a biogas technician at the EGL, the energy organisation for the then Economic Community of Congo–Rwanda–Burundi. I married and bought a four-bedroom house in the suburbs of Bukavu.

Jean-Berckmans Bahanaga MUHIGWA (ARPPIS Scholar 1994–1998)

In 1988, I moved on to become a lecturer at the Rural Development College, teaching about biogas and biomass energy. I spent 1992 in Austria, at the Institute of Limnology in Mondsee and Lunz where I studied black flies, and in the Czec Republic at Trebon near the University of Ceské, Budejovice. In August of the same year I secured a scholarship through the SIL Secretary General Prof. R. Wetzel, pending a few official documents from home. Unfortunately, upon my return to the DRC in December 1992, all the scholarship documents were lost in the Post Office, and I missed that chance.

Fortunately, in 1993, I learned of the ARPPIS programme and applied for it. I was very fortunate to be accepted as a DAAD scholar.

The training at *icipe* was beneficial. Aside from the lectures on insect science, I acquired skills in computer science and statistics that empowered me in data analysis and experimental design. I was also trained in project management and on how to write a scientific dissertation. I published two papers by then, and had two more accepted for publication, while still in the programme.

The experience sharing with other Africans, as well as with international scientists was most enriching. Aside from the PhD, I consider the benefits of this experience to my family a key and long-term investment. Because of the foundation they had in the Kenyan education system, my children still shine in their schools, especially in the English language.

I became familiar with Kenya and its people. I got to know Ethiopia via a tsetse conference at Axum. I attended seminars in the Sudan and defended my thesis at the University of Khartoum. In this way, I learned a great deal on how the Sudanese scientists could still produce PhDs on national issues, despite political, economic and social crises. I really liked their hospitality and human simplicity.

The lessons I learned became even more evident when I returned to the DRC in June 1998. I realised that in environments where there are a few academics, the impact of an individual could be quite high. During the war years, between 1998 and 2004, I worked as the dean of the Faculty of Science, where I founded the Department of Hydrobiology, with a focus on aquatic stages of vectors (mosquitoes, black flies) and other aspects of water biodiversity.

I have been teaching entomology to agricultural and medical students. Many of them are now practicing professionals. Some have gone on to masters and PhD programmes. I am a member of the commission set up to design a modern university after 10 years of rapid growth of the State University of Bukavu. I am a representative of the DRC in two major scientific SADCC country networks: SIMDAS and SAFNET (South African Fire Network).

My own research career has also been fruitful. I was involved in the discovery of a new version of the biconical trap—a blue/purple combination—which catches the riverine tsetse fly *Glossina fuscipes fuscipes* with an increase up to 10-fold as compared to the Challier-Laveissiere (1976) blue/black reference trap. The biophysical basis of colour attraction of riverine tsetse flies, showing reflectance in the blue ranges of wavebands explains up to 80% of the landing responses on traps and targets, whereas reflectance in the near infrared ranges of wavebands explains up to 80% of the long-range attraction towards traps and targets. This knowledge opened up possibilities to model/predict in the laboratory the attractiveness of candidate cloth fabrics for trap manufacture. The innovative trap is a life-saver for the African communities threatened by riverine tsetse flies. I was also involved in the elaboration of a tsetse control project in the DRC, which was submitted with *icipe* for sponsorship. I have also conducted research to explain an important question in the behaviour of riverine tsetse. When there are high densities of *Glossina fuscipes fuscipes* flies on a site, the catch index of an improved trap is reduced. Our work found the reason for this to be the tendency for tsetse, which are solitary rather than gregarious, to fly away from conspecifics when they meet on or around a trap. In addition, I have been involved in the mapping of the distribution in the Albertine Rift Region of 24,000 butterflies and moths in a collection at the Royal Museum of Central Africa, Tervuren, Belgium. The Albertine Rift region extends from just

Jean-Berckmans Bahanaga MUHIGWA
(ARPPIS Scholar 1994–1998)

north of Lake Albert in northern Uganda down to the southern tip of Lake Tanganyika, including the escarpment and associated protected areas. The area encompasses all or part of six different countries: eastern Democratic Republic of Congo (DRC), western Uganda, Rwanda, Burundi, western Tanzania and northern Zambia.

On a community level, (through CERPRU), we provide consultancy services to farmers' organisations and Park Conservation Groups who require some survey designs or data analyses. We have worked with farmers on tobacco-based products against sweet potato pests and provided training of beekeepers in hive improvement and queen-selection. These activities have led to publications on the following topics:

- The production of sweet potatoes by Rwandese refugees
- GIS databases on rape victims during the wars in the Kivu region
- The socio-economics of farmers around Bukavu including data on crop losses
- The socio-economics of farmers in the new Itombwe reserve and the relationships with the forest and perception of conservation imperatives
- Contribution to several conservation and GIS reports of Kahuzi-Biega National Park, a reserve of world importance.

Through the CERPRU projects we have tried to contribute to the intersection between policy, industry and research. But a lot more still needs to be done, including the decentralisation of scientific research. The DRC has about 1300 PhDs, with an average age beyond 60. But almost all of them are based in Kinshasa. It is important that we strengthen our postgraduate programmes all over the country. *icipe* has a good model: A headquarters in Nairobi with modern laboratories, insectaries and administration and well organised field stations. I look forward to a time when such field stations will exist in Congo's tsetse-infested and other vectors, or crop pest-stricken areas. In addition, most of the industries in our country operate without any interaction with scientists because of gaps in the policy frameworks. Moreover, the place of entomologists has to be strengthened especially in French-speaking Africa. This role should be clear in the definition of institutional agendas. This is the one way in which we can give the communities at grassroots level democratic space on scientific research agendas and that is how scientists can get more involved in strengthening the community voice.

Esther KIOKO

(ARPPIS Scholar 1995–1999)
Sponsor: International Fund for Agricultural Development (IFAD)

Model of hard work, brilliance and a love for nature...

Esther Kioko's parents raised her to believe that she was bright and hardworking. Today, Esther, who is a Senior Research Scientist of the National Museums of Kenya (NMK), currently on secondment to the icipe Commercial Insects Programme, combines this believe with her love for nature to improve the livelihoods of communities across Africa.

Esther KIOKO (ARPPIS Scholar 1995–1999)

As a little girl growing up in rural eastern Kenya, Esther Kioko overhead her mother emphatically telling an aunt, who had made a visit to their home, that Esther was very hard working and very bright. This moment marked a turning point in Esther's life. "I grew up believing that I was bright and hard working. After all my mother had said it!" she asserts.

Indeed, Esther, who was born in Machakos District in the 1960s, describes her parents, Phoebe Yula Kamuti, a pre-school teacher in Ithaeni village and her father, Jeremiah Kamuti Kioko, who worked for a motor company in Nairobi, as two people who had total confidence in her.

Moreover, Esther discovered her love for nature at a young age. "I attended local elementary schools in our village. After classes, I would be in the fields collecting firewood or walking down to the river to fetch water. I also took time to play, chasing butterflies, grasshoppers and other insects."

These elements form the basis of her successful career today. For instance, when Esther sat for the Certificate of Primary Education (CPE) in 1976, she passed extremely well, winning herself a place in the Kenya High School, a prestigious national institution, where she sat for both O and A level examinations. "During my O-level, I excelled in both art and science subjects but the career teacher advised me to take sciences for the A-level," she explains.

While at Kenya High, yet another influence came into Esther's life, in the way of Prof. Wangari Maathai, then a renowned scientist, and the 2004 Nobel Peace Prize laureate. "Prof. Maathai came to speak to us during a general paper session. She told us that the world was not an easy place to live in, and that we had to face it head-on, by being principled and diligent in our work. She shared with us her endurance in the turmoil that had marked her own remarkable career. I was really impressed by her and she remains one of my role models to this day."

Esther took these facts of life with her when she joined Kenyatta University (KU) for a degree in botany, zoology and education in 1984. She cultivated a deep love for entomology and eagerly took all the courses offered on the topic. Upon graduation in 1987, she taught biology, chemistry and geography at Dandora Secondary School in Nairobi for one year. But what her heart really yearned for was a career in scientific research. So, she responded to an advertisement by the National Museums of Kenya (NMK) for a post in the Department of Invertebrate Zoology, Entomology section. She was hired in May 1988, to research on the insect order Lepidoptera [scaly insects that include butterflies and moths].

Just months after joining the organisation, the NMK gave Esther the opportunity to undertake a one-year postgraduate course in insect taxonomy at Cardiff College, University of Wales. A further chance to indulge more in the world of insects came through a three-week long attachment at the world renowned British Museum of Natural History, London, where Esther acquired skills in taxonomic and laboratory techniques applied to the Lepidoptera.

Esther explains that, much as she appreciated these opportunities, the encounters with the 'outside world' made her appreciate her country and 'aspects of it that we often take for granted'.

So, although she desired to do MSc and PhD studies; she made a decision to undertake these courses locally in a way that would address local issues. True to this determination, in 1992, she went back to her alma mater, Kenyatta University, and enrolled for an MSc in agricultural entomology.

It was as an MSc scholar that Esther first came across *icipe*. Her study programme got her involved in a research project with *icipe* on 'Biosystematics studies of the graminaceous stemborers, *Chilo partellus* (Swinhoe) and *Chilo orichalcociliellus* (Strand) (Lepidoptera: Pyralidae)'. "We visited *icipe* during the annual research week and I was extremely impressed by the scientific presentations given by the institute's scientists, in

particular Prof. Thomas R. Odhiambo who was the director then. I desired to one day be part of this great institution," she remembers.

As a result, when *icipe* advertised the ARPPIS scholarships for 1995, Esther was delighted to see that one of the research topics available was on wild silkmoths, an area she had experience on through her work at the NMK. "I was fortunate enough to be admitted as an ARPPIS scholar to research on the 'Biodiversity of wild silkmoths (Lepidoptera) and their potential for silk production in East Africa' and I was excited, as my dream to study in Africa had come true!", she recalls.

Moreover, because of the relationship between silkmoths, people's livelihoods and the environment, Esther's research involved working with communities. "These silkmoths live on forest trees. These people, their farms, and their livelihoods depend on the forests, in which these moths thrive. I got to share in their day-to-day lives. My own childhood background helped me to easily identify with their challenges," Esther explains.

One place where Esther focused her research, and therefore spent a considerable amount of time, was Mwingi, an arid and semi-arid district in her own eastern Kenya region. Even after being awarded her PhD in October 1999, Esther continued to work in this place. Today, she is proud of the achievements her research through *icipe*'s Commercial Insects Programme, has had in this region.

"We have touched the lives of the people in this fragile ecosystem through projects on wild silk farming and beekeeping," she notes.

"Using funding from the International Fund for Agricultural Development (IFAD) and other partners, our main objective is to improve productivity through biological research, to add value to the products, and to facilitate farmers to access markets. Mwingi beekeepers are now pioneer organic honey producers in Kenya," she further explains.

The CIP programme, Esther further notes, also develops incentives for forest-adjacent communities to participate in forest conservation, an aspect that is funded by the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP).

In addition, in 2004–2006, Esther was involved in a research programme supported by the Swedish International Development Agency and the Swedish Agency for Research and Co-operation (SIDA/SAREC) through the Research Programme on Sustainable Use of Dryland Biodiversity (RPSUD). . This work looked at the status of pollinators in the dryland Kima area in Makueni District, Kenya. It also focused on the conservation of useful insects and their food plants for the eco-development of these regions.

Esther has also contributed to project trials and validations of promising income generation options based on sericulture and apiculture technologies in projects where the CIP team has helped groups in various parts of Kenya to generate income from beekeeping ,silk farming and processing through marketplace development.

She has also acted as a grant proposal reviewer for the National Geographic Society. In addition, in 2005, she was part of a Beekeeping Evaluation Mission that looked at projects in Kenya that are funded by the Government of the Republic of Kenya and the European Commission through the Community Development Trust Fund Biodiversity Conservation Programme (CDTF-BCP).

Last year, Esther was part of a team that met in Cairo to put together a project concept note on the 'Development of Community-driven Income Generating, Integrated Use of Commercial Insects' for several countries in the Near East and North African (NENA) region. These include the Sudan, Yemen and Egypt.

Esther, who is a member of the *icipe* Board of Training and Postgraduate Studies (IBTPS), has supervised students at MSc and PhD levels, and has, since 1999, been involved in the Training of Trainers Course in Commercial Insects, which is held every May and October at *icipe*'s headquarters and field sites.

Esther KIOKO (ARPPIS Scholar 1995–1999)

She has published over 30 articles in peer-reviewed scientific journals, book chapters and conference proceedings books.

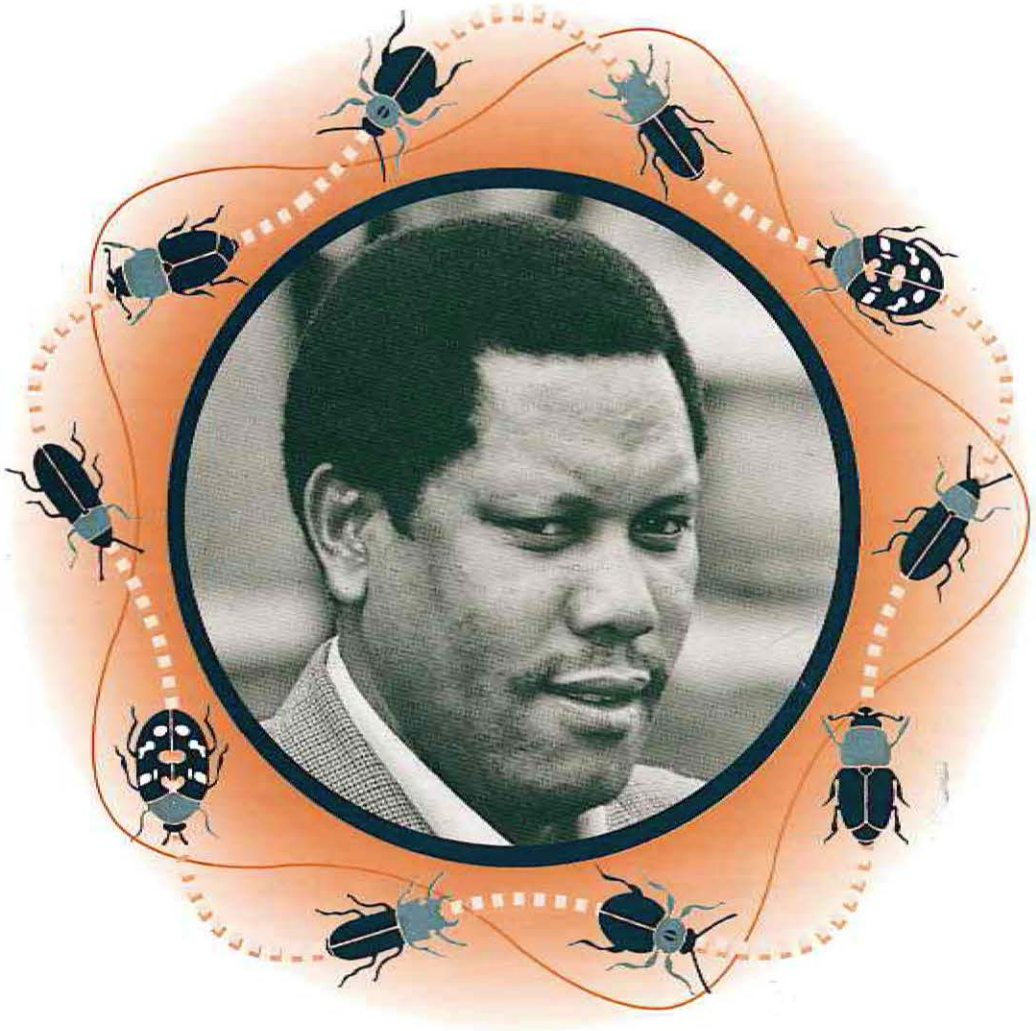
Aside from these professional and career duties, Esther also acts as the Honorary Treasurer of the African Association of Insect Scientists (AAIS), a role she has executed for the past five years. She also served as the Honorary Secretary General of the ARPPIS Scholars Association from 2001 to 2004.

Esther is quick to share credit for these achievements with people who have influenced and motivated her. Indeed she notes a moment of honour, when she took Prof. Maathai on a tour of the CIP activities, when the professor visited *icipe* in 2004 during a workshop. "Over lunch, I reminded her of my first encounter with her way back in the 1980s, and she was excited that she touched my life," Esther says.

Her other role models include her two PhD supervisors, Prof. Suresh K. Raina, the Programme Leader of CIP and Prof. Jones M. Mueke of Kenyatta University. She terms them as "two professors who work hard and always encourage their students to reach out to greater heights".

Esther's other role model has been her husband, Joel Kioko, a Metrology and Testing General Manager at the Kenya Bureau of Standards. "Joel is very time conscious, humble and always gives his best. He has given me quality support and guidance in my career development and family life", Esther says.

Outside her work and career, Esther enjoys giving back to the community in various ways. Just like her own family supported her when she was young, she is a pillar of strength to her three daughters, Ndinda, Mueni and Yula, and her husband. She is also closely linked to her extended family and the community at large and is often a guest speaker in many forums, from village community meetings, school functions to wedding parties. She is also the coordinator of her residential estate's mid-week Bible study group and treasurer of her church's ladies committee. To mentor and ensure that young girls grow up with the self-belief like she did, Esther sits on the board of governors for Vyulya Girls' Secondary School in Machakos.



Nicholas Kamindu GIKONYO
(ARPPIS Scholar 1996–1999)
Sponsor: German Academic Exchange Service (DAAD)

One with nature...

Dr Nicholas Kamindu Gikonyo, a Senior Lecturer and Coordinator of Pharmacy and Complementary/ Alternative Medicine at Kenyatta University tells how growing up in close interaction with wild nature formed the basis for a prolific career.

Nicholas Kamindu GIKONYO (ARPPIS Scholar 1996–1999)

As a young boy, Nicholas grew up interacting closely with nature. His family's farm in Amboni village, in Mweiga, Nyeri District, bordered the Aberdare forest, a haven for wild animals, including lions, leopards, elephants, rhinos, buffaloes, waterbuck, elands, rare bongos, baboons, monkeys, warthogs, giant hogs, porcupines and all types of birds.

Moreover, his father had other farms in Laikipia District, where Nicholas, the youngest child of a freedom fighter, the late Geoffrey Gikonyo, and his wife Loice Kirigo, would be charged with herding livestock. The arid terrain in this area made it an ideal home for other wildlife such as zebras, giraffes, snakes, geckos and scorpions.

Though this coexistence with nature was quite frightening and even dangerous (at times the animals would kill people he knew), it had an enduring benefit. "Laikipia was not only arid, but also remote and away from civilisation. I learned how to treat our livestock using herbal medicine. Soon, I started to use similar treatment on myself, then on my friends. I also quickly learned how to utilise the wild leaves, bark, fruit and roots as food and beverages," he recalls.

Perhaps this experience is the basis for what has become a prolific career. Nicholas is today a leading scientist whose research interests include chemical ecology and pharmacognosy (the study of the natural sources of drugs). Indeed, through his work as a senior university lecturer, Nicholas is in the frontline towards helping young scholars, higher institutes of learning, as well as communities in Kenya and the region embrace the globally emerging field of natural medicines.

Nicholas explains that over the past two decades, the practice in traditional systems of medicine, which is often referred to as natural, complementary or alternative medicine and, in particular, herbal medicines, has increased substantially in both the developed and developing nations.

"The World Health Organization (WHO) estimates that in some developing countries, 70–90% of the rural population relies on traditional medicine to meet partially or all of its health needs. The WHO indeed recognises traditional medicines as an essential component of primary health care," he notes.

He adds that today, with the concept of 'natural lifestyles' becoming in vogue, alternative medicines have gained popularity as a mainstream therapy especially among young people. As a result, national as well as global markets for medicinal herbs have been growing rapidly. The WHO estimates that sales of herbal products in western countries totalled US$ 60,000 million in the year 2000, with Germany and France making up 70% of the market.

But the young boy from Amboni was clearly ahead of this game. After attending local primary schools, Nicholas joined Kagumo High School, Nyeri, for both 'O' and 'A' levels. He then joined the University of Nairobi where he obtained a BSc in chemistry before proceeding for an MSc degree in natural products chemistry 'flavoured with entomology' in the same institute.

The same university offered Nicholas his first job as a Graduate Assistant in the Department of Chemistry in 1991. But he quickly moved on to take up a position as an Associate Scientific Officer in *icipe*, researching on the maize stemborer pest *Chilo partellus* under Dr Wilber Lwande and Prof. Ahmed Hassanali.

Five years later, Nicholas was awarded an ARRPIS scholarship to work on semiochemicals from his old childhood acquaintances—wild animals. His research was on how buffaloes, waterbuck and cattle influence tsetse flies (*Glossina*) behaviour. On completion of his PhD, Nicholas earned a postdoctoral fellowship in *icipe*'s African Fruit Fly Initiative under Dr Slawomir Lux, where he stayed until 2001. This research earned him an award at an African Association of Insect Scientists' conference for the 'Best Scientific Conference Paper'.

"In these capacities, I benefited from working in two of *icipe*'s four health divisions (4Hs)—animal and plant".

"With the knowledge I obtained from *icipe*, I quickly secured a job as a Tutorial Fellow (rising to the level of lecturer) in the Department of Pharmacology and Pharmacognosy, School of Pharmacy of the University of Nairobi where I taught pharmacognosy and pharmaceutical chemistry," he explains.

While at the University of Nairobi, Nicholas supervised nine Bachelor of Pharmacy projects, a responsibility which provided him yet another dimension of research—the utilisation of natural resources (mainly herbs) for the cure and prevention of human diseases. He also chaired the review of the university's pharmacy curriculum.

It is no wonder then that in 2006, Nicholas joined Kenyatta University as a Senior Lecturer to spearhead the establishment of the Department of Pharmacy and Complementary Medicine in the School of Health Sciences. "This assignment involved developing three Pharmacy Degree Programmes, from curriculum to strategic planning for their implementation," Nicholas explains. He also developed a policy document on 'Traditional Medical Practitioners and Their Role in Kenyatta University'.

In addition, at Kenyatta University, Nicholas teaches undergraduate students and has supervised six Bachelor of Science students in Public Health, in addition to three Master of Science (Chemistry) students at the neighbouring Jomo Kenyatta University of Agriculture and Technology (JKUAT).

Nicholas is also currently working on a consultancy basis on two proposed universities in Kenya. His own research has included being a principal investigator on a World Bank funded project on the 'Integration of Production, Value Addition and Marketing of Grain Amaranth to Sustainably Manage Household Health including HIV/AIDS in Kenya', which started in 2007.

In addition, he is the Principal Investigator of a Kenyatta University Vice-Chancellor's Research Grant project entitled 'Poverty Reduction, Household Nutritional Security and Sustainable HIV/AIDS Management through Grain Amaranth'.

Last year Nicholas travelled to China, under a fellowship from the Chinese government, to undertake an Advanced Training Programme of Research and Development of Medicinal Plants at the Tianjin University of Traditional Chinese Medicine.

Nicholas is encouraged that herbal products from local and international markets have been increasing in the last decade in most countries of Africa. But he is concerned about the absence of a regulatory body on these medicinal products. "There are increasing and warranted concerns on the efficacy, safety and quality of these products, especially among the general public and these factors need to be researched on", he says.

Moreover, unlike in some developed countries where certain herbs are commercially cultivated, most African herbalists collect their raw materials from undesignated areas. This, Nicholas says, adds to the worries related to global, regional and/or local over-harvesting and protection of endangered species and so cultivation of medicinal plants must be enforced.

He adds that in most African countries, documentation of medicinal herbs is scanty and therefore must be accorded first priority. He also notes that most genuine traditional medical practitioners are now old and in many cases their knowledge of herbs with therapeutic properties is not recorded. There is, therefore, a danger that this cultural heritage and the basis for future research may be lost forever.

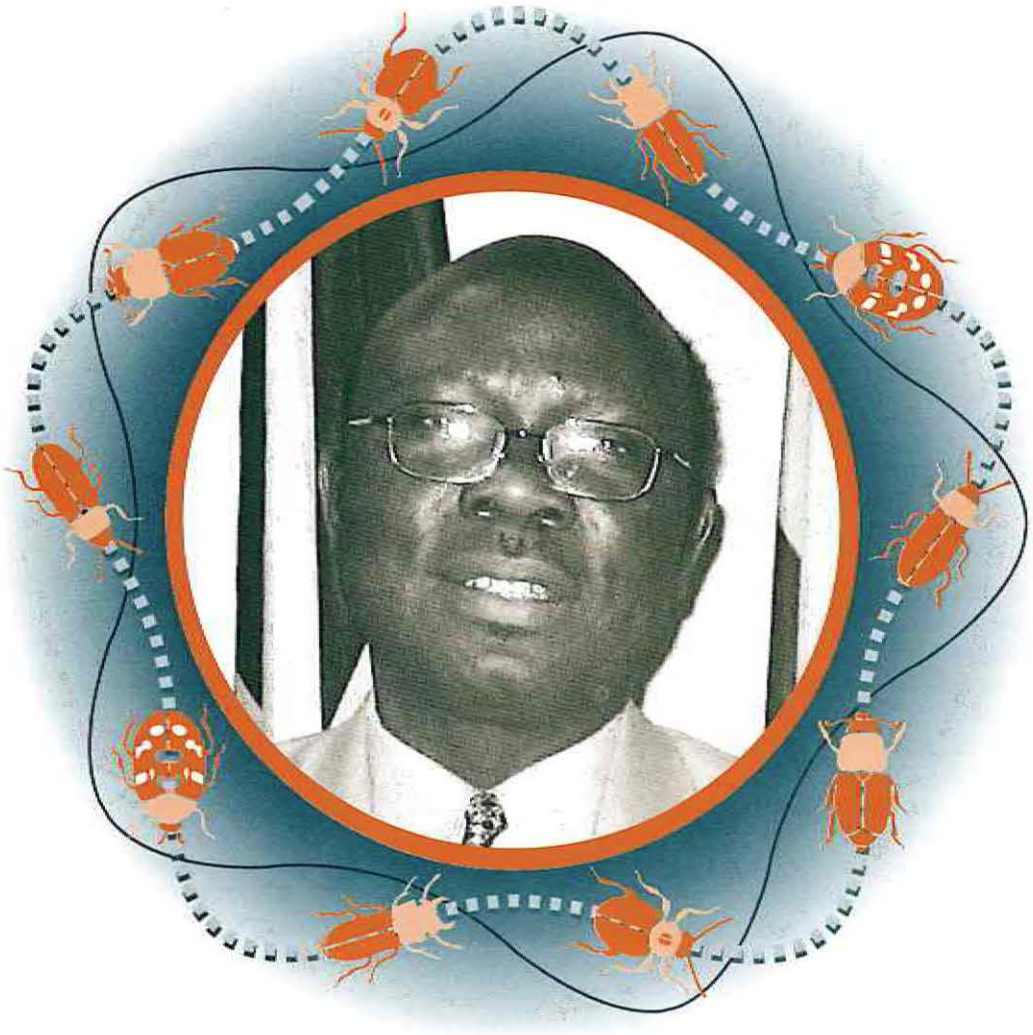
"Regional countries of the South must embrace the documentation of useful herbs, cultivation/domestication in medicinal gardens and in herbaria, and research into the efficacy, safety and quality of resulting products," Nicholas emphasises.

Despite these challenges, Nicholas firmly believes that human health based on natural pharmaceuticals is a priority. This is "because natural human health (NHH) is tantamount to a healthy Earth, whichever way one may want to look at it" he says.

"It is no wonder that the number one selling products in the world have a label 'natural'. NHH has found a seat in all spheres of research and academia and I think that *icipe* should continue to steer its research towards this 'environment friendly' route," he notes.

Nicholas also agrees with other researchers that to sustain NHH, proper nutrition is critical. In this regard, he is now researching on nutraceuticals for the management of HIV/AIDS and the opportunistic diseases.

Nicholas is the Vice President of the ARPPIS Scholars Association (ASA) and a former member of the Inaugural Governing Council of the Kenya Chemical Society. He is also a member of the African Association of Insect Scientists (AAIS), Strategic Poverty Alleviation System (SPAS), Natural Products Research Network for Eastern and Central Africa (NAPRECA) and Nature Kenya.



Thaddée MUSABYIMANA

(ARPPIS Scholar 1996–1999)

Sponsors: *icipe* Neem Project, FINNIDA and Government of Finland

Rwandese scientist, Thaddée Musabyimana, is currently a Senior Researcher at the Compagnie de Recherche Phytodata Inc., Canada. In his own words, he tells his story towards becoming a neem expert in a Northern country and why he believes home is best.

Thaddée MUSABYIMANA (ARPPIS Scholar 1996–1999)

I was born in western Rwanda and grew up in the rural area. Since my youth, I was very concerned about the food shortages in my country, which I later came to learn were due to inappropriate agricultural practices, including the use of low yielding varieties, coupled with poor management of insect pests and diseases, and poor soil fertility.

I always felt there was a way I could contribute to solving these problems. Therefore, after obtaining a diploma from a teachers' training college in Rwanda in 1974, I went on to study for BSc and MSc degrees in plant protection. I received both these degrees from the Ukrainian Agricultural Academy, Kiev, in 1980 and 1983 respectively.

I returned to Rwanda and took up a position as a research scientist in the Institut des Sciences Agronomiques du Rwanda (ISAR), where I performed varied research and held several management positions. I worked as a Potato Pathologist for two years, as the Head of the Plant Protection Department for four years, Head of the Fruit and Horticultural Programme for 4 years, and then as the Coordinator of the Banana Programme for 3 years before finally becoming the Director of Research until 1994. During this period, I was also a Visiting Lecturer of Plant Nematology at the Institut Supérieur d'Agriculture et d'Elevage (ISAE), an agricultural college in Busogo.

Unfortunately, following the Rwandan genocide and ensuing unrest, I had to flee to Kenya in 1995. While awaiting the opportunity to return home, I got a nine-month fellowship from International Research Development Centre (IDRC) in Nairobi to conduct research on the banana weevil and the parasitic nematodes complex. *icipe* kindly agreed to accommodate me and provided me with the research facilities. Moreover, Dr Hans Herren, the then Director General of *icipe,* arranged additional funding for my work. He also asked Dr R.C. Saxena, who was at the time coordinating a neem awareness project, to supervise my research for a PhD thesis. I completed the study on time and successfully presented it to Kenyatta University in December 1999, becoming the first scientist to work on the effectiveness of neem on banana weevil and parasitic nematodes complex in sub-Saharan Africa. After completion of my thesis, the farmer on whose land I had conducted trials planted five neem trees to use in future control of the two pests.

But even though I was happy to get a PhD, I still wanted to deepen my understanding of the potential of neem extracts in integrated pest management (IPM). I worked hard and in January 2000 I managed to secure a new grant from the IDRC to pursue postdoctoral research studies on neem in Canada at the Horticultural Research and Development Centre (HRDC) in Quebec, Canada. I was a key scientist in a three-year collaborative project between the IDRC and the Institut de Recherches en Sciences Appliqués et Technologies (IRSAT), Ouagadougou, Burkina Faso. Our work was aimed at developing bioassays with neem derivatives to promote their use and commercialisation in Africa. Two scientists from Burkina Faso spent three months working with me. We tested three formulations and proved their efficacy against various insect pests. To transfer the technologies we had developed to Burkina Faso, my research assistant visited IRSAT to conduct on-farm training courses.

Between 2001 and 2004, I conducted indoor and outdoor experiments with these neem formulations, specifically against insect pests attacking vegetable crops and ornamental plants. I obtained results, which were used to support the registration in Canada of neem extracts as natural insecticides. We filed an application for registration in 2005 and are expecting the approval this year.

Next, I was hired by Montreal Botanical Garden, one of the world's largest botanical gardens, which has a collection of 22,000 plant species and 10 exhibition greenhouses, for two years, to promote the use of neem as a natural pesticide in the urban areas. The objective was to reduce the use of toxic pesticides, which was one of the concerns of the city of Montreal. As the IPM specialist, I introduced the use of neem in greenhouses, as well as in the city gardens, to manage insects, especially aphids (*Macrosiphum rosea*), which attack roses, and *Eucallipterus tilia*, pests of the linden tree (an ornamental tree). I was also able to establish the potential of neem cake against the white grub (*Phyllophaga* spp.), which causes significant damage to lawns by chewing on grassroots.

Today, I am one of the most knowledgeable scientists in Canada on neem and its use. It is indeed based on my expertise that Pronatex Inc., the research company dealing with neem formulations and commercialisation in Québec, employed me as Director of Research for three years. Since 2007, another research company, Phytodata Inc., hired me. My work is aimed at helping vegetable producers to implement good agricultural practices using neem extracts as ecofriendly IPM method, through on-farm trials.

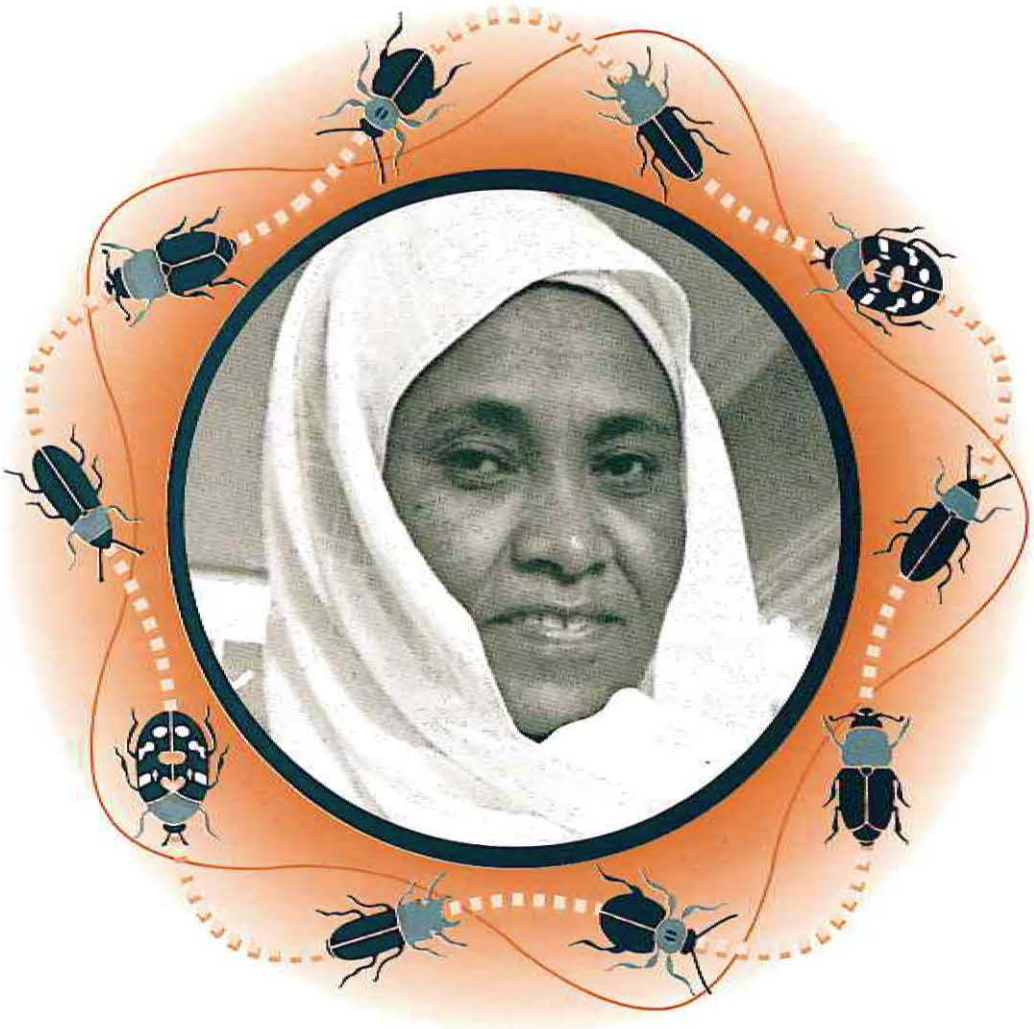
In addition, I act as a consultant to farmers as well as the private sector, on how to use neem extracts. During my time in Canada, I have supervised two MSc theses, one on the effectiveness of neem on potato aphids and the second on the parasitoid *Myzus persicae*.

I have published five papers in peer-reviewed journals, and three scientific notes and attended various conferences in Canada as an invited speaker, where I have presented 12 oral and three poster papers on the use of neem. I also recently reviewed an article to be published in the journal *Phytoparasitica*.

My goal at the moment is to keep raising the awareness on the use of neem derivatives as alternatives to synthetic pesticides, and to have azadirachtin registered in Canada. I believe it is only time before this happens, since its efficacy on many noxious arthropods is well documented worldwide and its use has been approved in the United States of America.

As an African working in the North, I often feel proud and happy to stand in front of a gathering of scientists, farmers and policymakers, all listening with great interest to what I have to say.

I believe that science has no borders. In addition, Canada is one of the best multicultural and multiethnic societies in the world. My experience has been a success and I would encourage scientists from developing countries to circulate within developed countries to gain more experience and skills. But I would urge them, whenever possible, to return home to serve their countries of origin. My motto is: "There is no better place than home".



Samira Abuelgasim MOHAMED

(ARPPIS Scholar 1998–2002)

Sponsors: The German Academic Exchange Service (DAAD) and the United States Department of Agriculture (USDA)

Sudanese alumna, Samira Abuelgasim Mohamed, was one of the first women in her village to join university. She discusses her challenges towards realising her childhood dream for a career in agricultural entomology, the need for science in the development of her country and the encouraging trends for women scientists.

Samira Abuelgasim MOHAMED
(ARPPIS Scholar 1998–2002)

I was born in Eltimirab, a small village on the west bank of the Nile River, 370 km north of Khartoum city. I attended a primary school in the same village before proceeding to boarding school for intermediate education in Elzéidab, at the age of 12 years. I then joined Shendi High School, which was 170 km away from home.

I obtained my first degree from the University of Gezira, in central Sudan, the home of the famous Gezira Irrigation Scheme, which is the biggest scheme under one administration in the world, and which was established in 1927.

As a child, I was fascinated by the farming activities that my father practised on his farm. His '*hwasha*' (farm) was in the Elzéidab scheme, the first agricultural irrigated scheme in Sudan, which was established in 1902, when Sudan was under Anglo-Egyptian rule. Being a government-managed scheme, agricultural extension workers and researchers from Hudeiba Research Station, which was just across the riverbank from the village, often visited the farmers to advise them on crop production. They paid particular emphasis on pest control on cotton, faba bean and wheat, which are the major crops grown in the scheme. The way in which these officers carried out their work, not to mention the big cars that they drove caught my attention as a child. I always wished to be like them and this was the beginning of my keen interest in agricultural entomology.

However, being a girl and a child of a peasant farmer in a very conservative society, this posed a great challenge for me. Moreover, I was the first woman from the village to join university, which was a whole 500 km away. Also, at the university I faced a language barrier because, unlike in both primary and secondary schools where Arabic (my mother tongue), had been the language of instruction, only English was used. So bad was the situation that when during the admission interview I was asked to give the English name of '*fool mursari*' (Arabic for faba bean), I literally translated it to 'Egyptian fool'. I was embarrassed to later learn the proper meaning. As a result, I obtained a grade that was only slightly above the probation threshold. I cried daily and even considered dropping out of university.

However, I gained confidence as time went on and by the time I was in my second year, I was among the top three students. In fact, I graduated top of my class, for which I was awarded a prize.

After graduation, I ventured outside Sudan, to undertake an MSc at the Wageningen University in the Netherlands. Upon my return to Sudan, I was posted as a junior entomologist at Hudeiba Research Station, of the Agricultural Research Corporation (ARC) of the Sudan, which dates back to 1902. It was while working at the station that my boss, Prof. Elamin Mohamed Elamin, nominated me for the ARPPIS programme to pursue my PhD studies. I joined *icipe* in February 1998, under the sponsorship of DAAD and USDA. I was supervised by Dr William Overholt, by then, the head of the Plant Health Division and leader of the Biological Control of Stemborers Project, and Dr Slawomir Lux, leader of the African Fruit Fly Initiative. My thesis research was on the biological control of African fruit flies. I was able to identify and establish a laboratory culture of four parasitoid species, which we used to ship parasitoids to our collaborators in Hawaii and Latin America. While at *icipe* I got valuable experience in research besides interacting with colleagues and professionals from different fields and backgrounds. After successfully completing my studies in 2003, I briefly reported back to my home station (Hudeiba) where I was promoted to a senior researcher. I started implementing some of the knowledge and skills that I had acquired at *icipe* with the aim of benefiting my community and my country at large. Between December 2005 and June 2006 I was the Head of the Entomological Research Section at the Station.

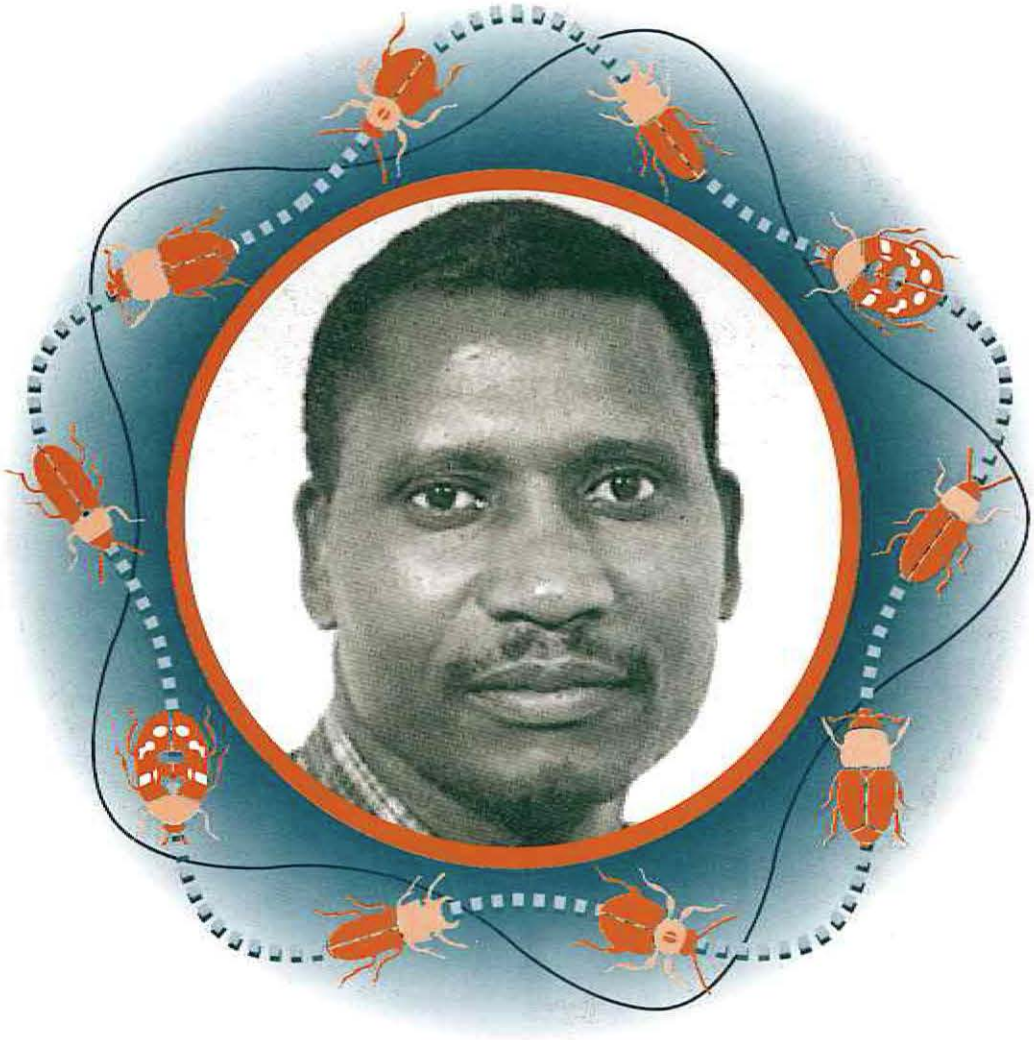
I have also conducted several consultancy projects under *icipe*. For instance in 2003, between February and October, I worked as a consultant for the Texas/*icipe* Joint Project on the African Tephritidae Invasive Species Threatening US Fruit and Vegetable Products. From June 2004 to October 2005, I consulted for the African Fruit Fly Initiative (AFFI) at *icipe*, for the exploration of parasitoids for classical biological control of *Bactrocera invadens*. Since September 2007, I have been undertaking a postdoctoral fellowship within AFFI, working mainly on biological control of native and invasive fruit flies and the mango mealybug.

Samira Abuelgasim MOHAMED
(ARPPIS Scholar 1998–2002)

From my personal, academic and professional experience, I believe that science and development are interlinked. For instance, most of Sudan is either desert or semi-desert, which means that farming is done mainly through irrigation. This requires scientific input to develop better farming techniques and pest control strategies. The country also needs science for the development of drought and heat resistant crop varieties, among other needs. Also, scientific innovations are necessary in the exploration of the country's oil resources, which have had a significant impact on the country's socio-economic prosperity.

In general, I think that the number of women in science in Africa is relatively small. In the African society, women bear the responsibility of taking care of the home and children, making it difficult for them to excel in the fields they like. In most African families, after school hours, the girls are assigned duties like collecting firewood, fetching water and cooking, making it difficult for them to concentrate on their studies. There are also cultural concerns, where the girl child is made to believe from the start that her role in society is to become a home keeper while boys are encouraged to go to school at the expense of the girl. Girls also tend to develop an attitude towards science, terming it as a field for men. Fortunately, lately things have improved following numerous campaigns by different organisations on the need to educate and empower women especially in science subjects. Indeed, the impact of women in science in many African countries is being recognised and appreciated.

However, in the Sudan, contrary to the general misconception that women in Islamic countries are suppressed, girls are in fact encouraged (with few exceptions) to go as far as they possibly can with their education. For example, when I was at university, and that was in the early eighties, the girls outnumbered the boys and this trend continues up to now.



INTERVIEW

Emmanuel Iyamulemye NIYIBIGIRA
(DRIP Scholar 1999–2003)
Sponsors: Netherlands Foundation for the Advancement of Tropical Research (WOTRO WB 89-118) with a subsidy from the Directorate General for International Cooperation (DGIS)

Emmanuel Niyibigira is currently a Programme Assistant in the Agrobiodiversity and Biotechnology Programme of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). In this interview, he discusses challenges between scientific research and policy, and the role of scientists within these complexities.

Emmanuel Iyamulemye NIYIBIGIRA (DRIP Scholar 1999–2003)

Q. What is your background?

A. I was born on 18 December 1964 in Kisoro District, South West Uganda to Dominic Sebishoma Kagiyingani and Johanina Nyirangoboka Kagiyingani. My father was a catechist of the Catholic Church while my mother was a housewife. I am the sixth born in a family of seven children—five boys and two girls.

I can say that I was motivated into scientific research right from childhood. Growing up in a farming community, I would be in charge of scaring away birds and putting up scarecrows in the sorghum fields. As a young boy, I used to tend a sugarcane field to earn pocket money and I was always disturbed by the destruction caused by stemborers. I wished that one day I could find a solution that would reduce yield losses, especially in sorghum.

Q. How has your scientific career training been shaped?

A. After attending Busengo and Rwanzu primary schools and Kigezi College in Butobere for 'O' and 'A' levels respectively, I joined Makerere University to pursue a Bachelor of Science specialising in biochemistry and zoology, and a postgraduate diploma in science education. Between 1995 and 2003, I pursued an MSc, specialising in crop protection. Upon completion, I returned to my job in the National Agricultural Research Organisation (NARO), based at Kawanda Agricultural Research Institute, to conduct research in horticultural crops. In August 1998, I received a scholarship from the Netherlands Foundation for the Advancement of Tropical Research (WOTRO) to pursue a PhD at Wageningen University. The scholarship required me to spend half a year in Africa and the other half in the Netherlands, conducting field and laboratory research on the biological control of cereal stemborers.

This is how I ended up at *icipe*, as a Dissertation Research Internship Programme (DRIP) scholar. I conducted research in the framework of a regional project funded by the Directorate General for International Cooperation (DGIS) funded by the Netherlands Government, which focused on the biological control of cereal stemborers. I also spent three months at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, India. Each year, from 1999–2001, I spent two to three months at *icipe* and at the Plant Protection Department of Zanzibar, Tanzania where I conducted field experiments on the islands of Unguja and Pemba. The field activities included the release of parasitic wasps and seasonal sampling to determine their establishment in maize and sorghum in Unguja and Pemba islands.

Q. How did you find your experience at *icipe*?

A. I must say that I had a fantastic and rewarding experience, particularly working with farmers, and trying to find solutions to the major problems that affect the daily life of the common man, top of which is food security. The student atmosphere at *icipe* was beneficial in terms of interaction, discussions and sharing of experiences. Moreover, the multicultural and multinational setting made me feel part of the global world. The friends I made there have since become professional colleagues with whom I collaborate in my work. I also met some of my countrymen, some of whom I had known earlier and others that I met there for the first time. For the old faces, we became even closer and for the new, it was yet another addition to my pool of friends. Overall, it was a period of soul-searching that eventually helped to shape my career.

Q. How has your career taken shape?

A. After I left *icipe*, I joined the Department of Crop Protection of the Ministry of Agriculture, Animal Industry and Fisheries as a Senior Plant Protection Officer. I contributed to the management of the invasive fruit fly *Bactrocera invadens* in collaboration with the *icipe* African Fruit Fly Initiative (AFFI), CABI, the Kenya Plant Health Inspectorate Service (KEPHIS), the United States Department of Agriculture-Animal Plant and Health Inspection Services (USDA-APHIS), Department of Research and Extension (Tanzania), Royal Museum for Central Africa (Belgium), Makerere University (Uganda) and Kawanda Agricultural Research Institute (Uganda).

Q. What would you say are your key contributions and achievements?

A. In Uganda, I have contributed to the management of banana bacterial wilt and other crop diseases, as well as to the management of invasive alien species. One of these includes the biological control of a potato pest, in collaboration with University of Florida and Makerere University. I have also participated in the development of quarantine pest lists for rice, sunflower, wheat, cassava, Irish potato, soybean and groundnuts. I have provided technical advice for the control of outbreaks of armyworm, variegated grasshoppers, giant loopers, whiteflies and other migratory pests.

Importantly too, I have mentored junior scientists in such fields as plant health, sanitary and phytosanitary (SPS) issues, pest management, pest risk analysis, value chain analysis, and biotechnology and biosafety. I have supervised students at MSc and BSc levels.

My work has extended to the promotion of the export of high quality fruits, vegetables and flowers, and to the development of value chains in the horticultural sector. I have been involved in sanitary and phytosanitary issues in the region to promote plant health. Currently, I am working with the national agricultural research systems (NARS) and the private sector in eastern and central Africa to find low cost biotechnology applications to increase food security, export competitiveness and income for communities in the region and beyond.

Since 2004, I have been a Trainer of Trainers in food safety and hygiene thereby imparting knowledge and skills in training, principles of food safety, risk analysis and HACCP methods, protocols, food safety management system and traceability. In this capacity I have trained plant inspectors, extension agents, processors, growers and exporters of fruits and vegetables and flowers in Eurep-GAP, MPS-GAP and other standard requirements which has contributed to improved access to European markets. This work has supported and guided the formation of farmer groups into 'export villages' of horticultural produce (fruits and vegetables), and training of farmer groups in pre- and post-harvest pest control methods and treatments to prevent food losses and thereby improve food security and increase incomes. I have also participated in developing manuals for phytosanitary and biosafety inspections, risk analysis, codes of practice and good agricultural practices (GAPs).

From a policymaking point of view, I have participated in the formulation of a Biotechnology Biosafety framework, a Plant Protection act, a Seed policy, and the harmonisation of the East African Phytosanitary framework. I issued an import permit and was responsible for inspection of the first-ever confined field trial of genetically modified banana for resistance against black sigatoka.

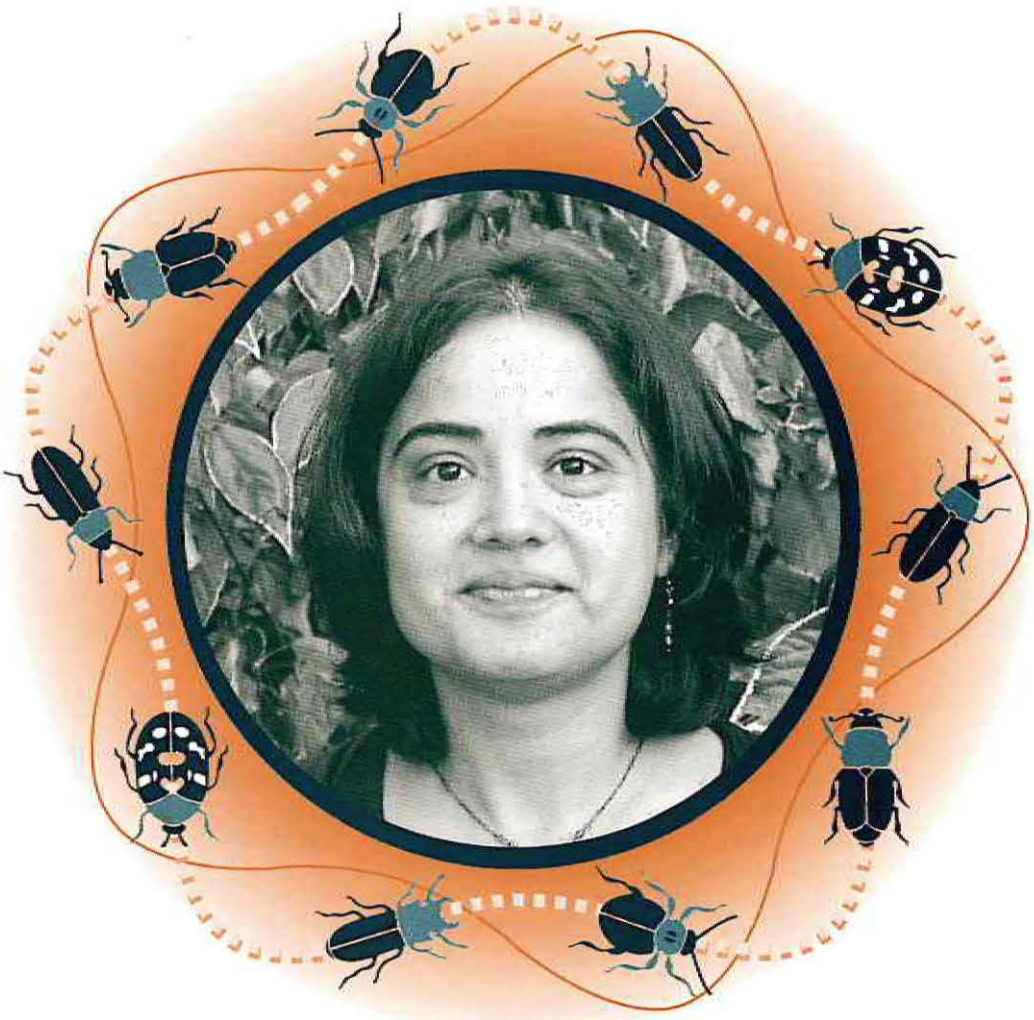
Q. Based on your own experience, what would you say are the opportunities for scientists to be involved in the design of policies that are favourable to poor communities?

A. There are a number of hitches, as well as opportunities for scientists to give grassroots communities democratic space within the scientific research agenda. First of all, scientists need to keep their feet on the ground to address issues that affect the communities, 'while keeping the eye on the ball' so that solutions are practical and in context of the African situation. Although it is important to be cognisant with indigenous knowledge, it is important that scientists are not carried away by the cultural and traditional practices because not all of these approaches offer sustainable solutions, and there is need to consider the current scientific realities and advancements.

Scientists can also get more involved in strengthening the community voice by designing projects with, and for the participation of the farmers, so that they address their priorities and ensure that they are part of the change process.

I believe that *icipe* is achieving the intersection between policy, industry and research. What is required at this point is simply to strengthen and initiate postdoctoral programmes. This would give opportunities to ex-ARPPIS and ex-DRIP scholars to get attachment to specific programmes and projects at *icipe*.

INTERVIEW



Aruna MANRAKHAN

(ARPPIS Scholar 2000–2004)

Sponsors: Dutch DSO (Direct Support to Training Institutions in Developing Countries Programme), Human Resource Development for Scientific and Technological Capability in Arthropod Science in Africa

As a young student, Aruna Manrakhan got intrigued by the questions that scientists asked, and the way they went about answering them. Today, through her own scientific investigations, the scientist from Mauritius has contributed new knowledge on an important agricultural pest in her country, the litchi moth, which affects the production of the country's second major fruit. Aruna, who is currently a research entomologist at the Citrus Research International (Pty) in South Africa, discusses her training and work in the interview below.

Aruna MANRAKHAN (ARPPIS Scholar 2000–2004)

Q. What is your background?

A. I was born in Mauritius, where I attended government primary and secondary schools. I graduated from the University of Mauritius in 1995, with a degree in biology and environmental sciences. I then obtained an MSc degree at the Imperial College of Science, Technology and Medicine, University of London in 1996. I chose to attend this university since it is among the best universities in the United Kingdom in the field of science. Furthermore, the MSc course they were offering, which was in the field of environmental studies, appealed to me.

Q. What motivated you into getting into scientific research?

A. I was always very interested in nature, in particular in marine life since Mauritius is an island whose coral reefs are ideal for this kind of biodiversity. In my first years of secondary school, through the science subjects, I was drawn to the scientific way of thinking. In particular, I was intrigued by the questions that one asks in science and the systematic way that one then goes about answering them. My only challenge was that during my undergraduate days, sometimes access to scientific journals and books was limited.

Q. How did you end up at *icipe*?

A. After my MSc in the UK, I worked as a research entomologist under the Indian Ocean Regional Fruit Fly Programme, funded by the European Union through the Indian Ocean Commission in Mauritius for three years. We had a collaborative project with the *icipe* African Fruit Fly Initiative. It was through this programme that I got to learn about ARPPIS, and I decided to apply for a position. I wanted to continue research on fruit flies and I knew that entomology was the subject I wanted to study. I was sponsored by the Human Resource Development for Scientific and Technological Capability in Arthropod Science in Africa. At *icipe*, I found that the institute offered the right environment in terms of staff and facilities for research in entomology. I did four years of research on fruit fly feeding biology, in particular their behaviour towards food sources and the influence of these food sources on their reproduction and survival. Control of fruit flies relies to a large extent on the use of food baits mixed with insecticides. Understanding the feeding biology of fruit flies provides a rational basis for this type of behavioural control and helps to improve baiting efficiency. I worked under Dr Slawomir Antoni Lux who was at the time the programme leader of the African Fruit Fly Initiative and a senior research scientist at *icipe*.

Q. How did that experience benefit you as a person and from a career point of view?

A. Kenya was the first continental African country I had been to and being far away from home, it made me a very independent person. The lifestyle and culture was also different from the one in Mauritius but I enjoyed the change. Mauritius is a small island with a population of 1 million people. It is a welfare state offering free education until secondary school and free medical services to the general public. The security level in the island is also quite good since differences in standards of living are not wide. Kenya, like other sub-Saharan African countries, has more natural and human resources compared to Mauritius but in my view, the country faces major challenges: lack of free access to education and good quality medical services for combating killer diseases such as malaria, which has been eradicated in Mauritius, and AIDS, and lack of proper infrastructure such as roads as well as good public transport.

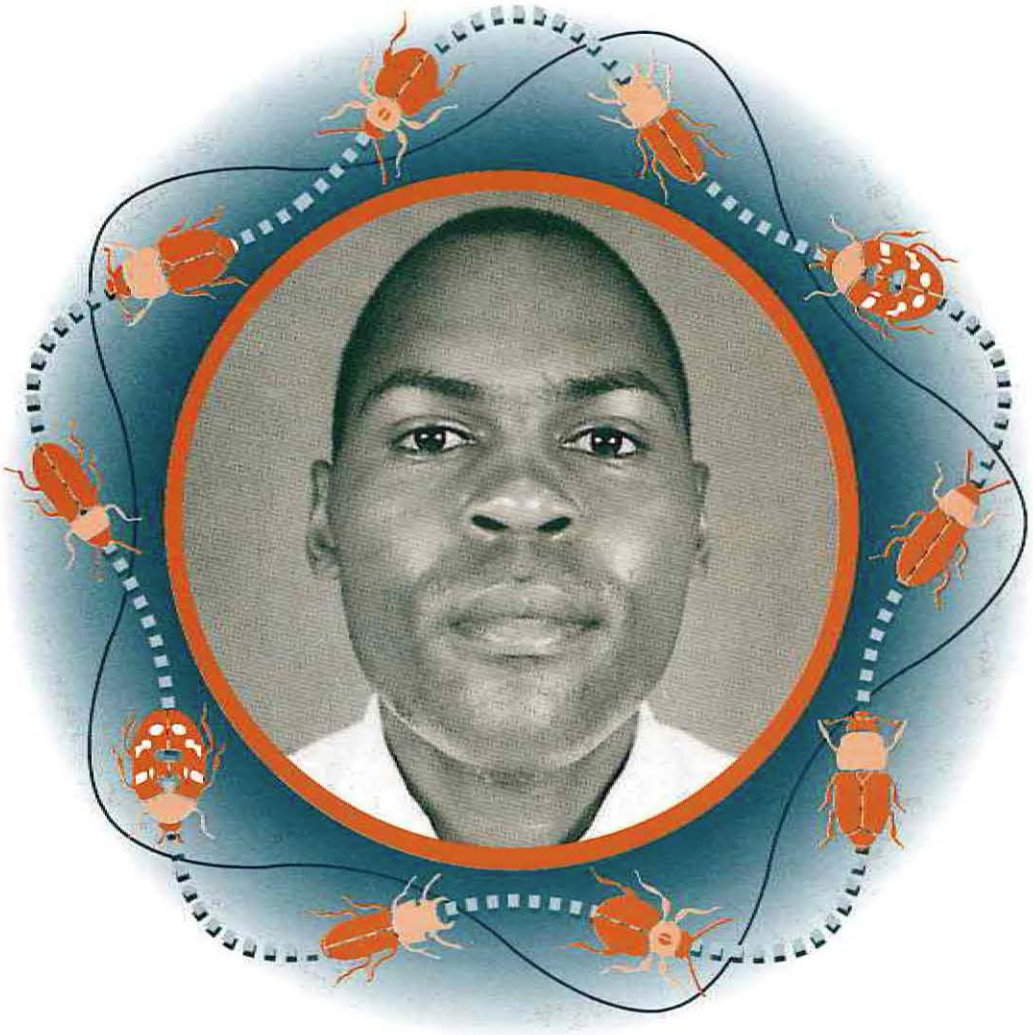
The training I received in Kenya was valuable. I learned how to do research and tackle scientific problems. I also got to expand my knowledge in entomology through the various research projects at *icipe*. The training was applicable to Mauritius given the similarities in agricultural challenges that face Mauritius and sub-Saharan Africa.

Aruna MANRAKHAN (ARPPIS Scholar 2000–2004)

The doctoral degree I obtained helped me to secure a job as a research entomologist at the Agricultural Research and Extension Unit of Mauritius. Later, I was able to take up a postdoctoral position at the University of Stellenbosch in South Africa for two years and now I am working as a research entomologist at the Citrus Research International (Pty) Ltd in South Africa.

Q. What are the benefits for your country?

A. I have contributed new knowledge on an important agricultural pest in Mauritius, the litchi moth, which affects the production of litchi in Mauritius. Litchi is the second major fruit after pineapple that is exported from Mauritius. The losses incurred by this moth can be up to 20%. Through this research, baseline information on the profile of damage of this pest was established and this is now helping litchi growers to time the control actions properly. Between 2005 and 2006, I was involved in the training of litchi growers and extension officers on the management of insect pests on litchi at the Agricultural Research and Extension Unit, Food and Agricultural Research Council of Mauritius.



Stephen Reuben Ger NYANJOM

(ARPPIS PhD Scholar)

Sponsors: Netherlands Ministry of Foreign Affairs' Programme for Cooperation with International Institutions (SII), UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR)

Steven Reuben Ger Nyanjom explains how his ongoing research will contribute to the control of animal African trypanosomosis, one of the neglected diseases in the world, yet one that continues to cause great losses in animal life, and in agriculture and economic development in general in Africa.

Stephen Reuben Ger
NYANJOM
(Ongoing ARPPIS PhD Scholar)

My training as a scientist started at Jomo Kenyatta University of Agriculture and Technology (JKUAT) where I undertook a BSc degree in biochemistry/chemistry between 1996 and 1999. During the programme of study, I got the opportunity to train as an intern at *icipe*, in the Molecular Biology and Biotechnology Department.

This exposure was a turning point in my career: First because I developed an interest in entomology and second, because the techniques and skills I acquired through the attachment laid the foundation for me to become a molecular entomologist.

In September 2000, I was awarded an ARPPIS regional scholarship to study insect science at the programme's sub-regional MSc centre for Eastern Africa, hosted at the Addis Ababa University (AAU) in Ethiopia. The two-year course was intensive and comprehensive with wide coverage on different aspects of insect biology. The university has many leading entomologists from various developed countries. This not only increased my knowledge, but also widened my network of scholars and practising entomologists from around the world. This interaction opened the way for North-South collaboration in my research. For instance, in January 2002, I travelled to the United States of America, where I visited the State University of New York at Buffalo, as a visiting researcher for my MSc thesis.

After completing my MSc in August 2002, I successfully applied for a PhD fellowship still under the ARPPIS programme. I commenced my doctoral studies in February 2005, undertaking research in the characterisation and expression of olfactory genes found in the antennae of *Glossina pallidipes*, which is the main vector of animal African trypanosomosis (AAT). The PhD programme structure is such that students undertake introductory courses in important topics like bioinformatics, biostatistics, biosystematics and taxonomy, science writing and communication. These courses are of tremendous value because they prepare scholars with the vital analytical skills required for undertaking PhD studies. Currently, I am in the final stages of my research study which focuses on identifying the four main olfactory proteins, namely odorant binding proteins, pheromone binding proteins, odorant degrading enzymes and odorant receptors.

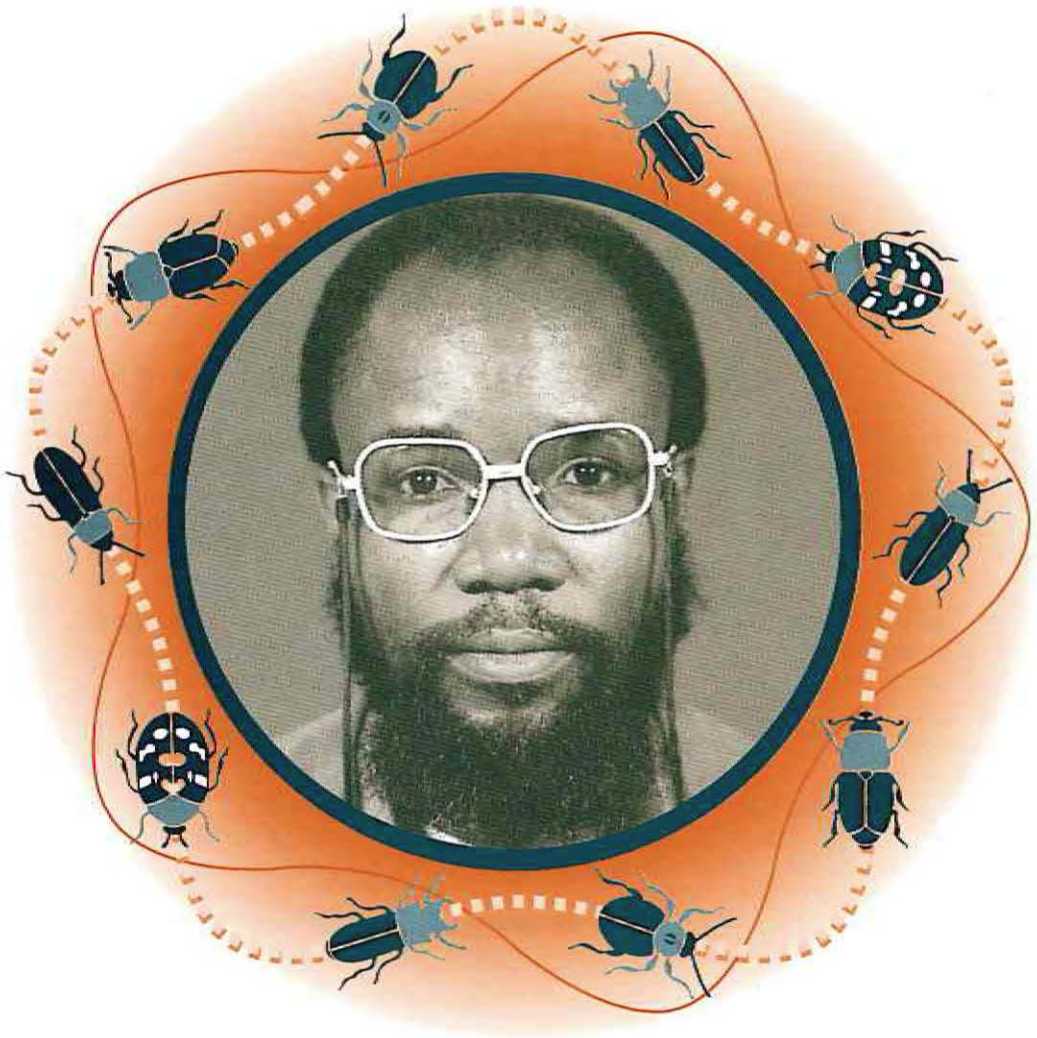
Animal African trypanosomosis (nagana) is one of the neglected diseases in the world, yet it continues to cause great losses in animal life, and also on agriculture and development in general, over much of Africa. The economic losses in cattle production are estimated to be between US$ 1 and 1.2 billion per year, while agricultural losses total about US$ 4.75 billion annually. AAT therefore constrains progress towards achieving the millennium development goals.

To overcome these challenges, the control of AAT vectors is of high priority in livestock health, production and rural development programmes. In Kenya, much research, particularly at *icipe*, is dedicated to improving livestock health and productivity through developing integrated strategies and tools for tsetse fly management.

My study will complement these efforts by exploiting the transcriptome of the *Glossina* vector, in search of novel intervention strategies. In addition, my study will test tissue specificity and quantify expression levels of the identified olfactory proteins in adult male and female tsetse. This could help in identifying sex-specific genes whose role can be vital in the survival of the tsetse fly. The applied aspect of the study aims to harness this information to improve trapping technologies and to develop biologically sound and novel disease control strategies based on olfactory mediated behaviour.

I will personally benefit from the research as it will contribute to my training as a scientist and further enhance my career in bioinformatics. It is my hope that the research will also result in further discoveries and create opportunities for postdoctoral study. Undertaking my research work at *icipe* has allowed me to establish links with different partners and to network with other researchers in the same field for possible future collaboration.

My research is being sponsored by the Netherlands Ministry of Foreign Affairs' Programme for Cooperation with International Institutions (SII), UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR). My collaborators include JKUAT, Kenya, the Wellcome Trust Sanger Institute, Cambridge UK, and the South African National Bioinformatics Institute (SANBI).



Wycliffe WANZALA
(ARPPIS Scholar)
Sponsors: International Foundation for Science (IFS), Organization for the Prohibition of Chemical Weapons (OPCW) and Wageningen University and Research Centre of the Royal Government of the Netherlands

Helping the Bukusu reclaim their 'hoofed' banks

Outgoing ARPPIS scholar, Wycliffe Wanzala talks about his work, which is validating the indigenous knowledge of a community in western Kenya, and helping them tackle the ticks menace.

Wycliffe
WANZALA
(Outgoing
ARPPIS Scholar)

Historically, the life of the people of Mwibale, a tiny village near Bungoma in western Kenya, has always revolved around livestock. As ARPPIS scholar Wycliffe Wanzala explains, cattle, sheep and goats are the centre pin of the village's economy, separating the 'haves' and the 'have-nots'. "These animals are in reality 'hoofed' banks, which can be converted into hard cash on a rainy day," comments Wanzala.

However, as Wanzala further explains, in the past 50 years, this valuable stock has been severely eroded by a combination of factors, including the increase in subsistence farming and land fragmentation. This means that villagers, a majority of whom are smallscale farmers, no longer have enough land for grazing livestock. This in turn has resulted in a decrease of livestock numbers.

An even more serious threat to livestock farming in Mwibale is posed by tick infestations. "Ticks and tick-borne diseases (and related secondary infections) have adversely impeded the development of the livestock industry in the village. On the one hand, ticks cause high morbidity and mortality, and on the other they prevent the introduction of highly productive breeds of cattle into these smallholder production systems. Ticks and their associated dangers are expensive to control and place a huge economic burden on poor smallholder farmers," explains Wycliffe.

Theileriosis is a serious disease of animals belonging to the same genus as cattle due to the infection caused by the protozoan parasite *Theileria parva,* which is transmitted by the brown ear tick *Rhipicephalus appendiculatus*, and causes East Coast fever (ECF). Worldwide, this disease costs over US$ 1 billion annually to control. East Coast fever, is a serious theilerial disease, putting at least 24 million cattle at risk, and killing over 1 million of them each year. Thus, it poses a threat to the livelihoods of smallholder farmers in sub-Saharan Africa. The impact of these losses is magnified by the knock-on effect of lost opportunities for increasing production through the introduction of improved breeds of cattle, which are particularly susceptible to tick-borne diseases.

"ECF, therefore, limits the ability of smallholder farmers to climb out of poverty by moving from subsistence to market-oriented activities. There is a further urgency to control this disease, based on the fact that smallholder farmers are expected to play a major role in meeting the increasing demand for meat and milk in developing countries, which is expected to double by 2020," says Wanzala.

He adds that many livestock farmers in sub-Saharan Africa cannot afford the classical acaricides and drugs to treat tick-borne diseases. Moreover, acaricides do not provide adequate control since they cannot reach the ticks embedded in the vegetation in dense bush and rainforest. Spraying host animals will only target 5% of the ticks, while 95%, which are always found on the vegetation in non-parasitic form, are left unaffected. In addition, not only have ticks developed resistance to many of the existing acaricides, but also the residues of some of these products cause environmental pollution and contaminate food products. Also, adult ticks can survive for more than a year without a blood meal.

A number of alternative strategies for the control of ticks and tick-borne diseases exist. Among those recommended are anti-tick repellents, which have recently been recommended as prophylactics against ticks and the diseases they cause. Repellents prevent tick encounters, attachment and feeding at individual level. As a result they reduce the risk of host animals acquiring tick-borne infections, damage to hides and skins, wounds following secondary infections and related immunological and toxicological reactions.

In Mwibale village, like in many parts of Africa, the ticks' menace is not entirely new. Wanzala's uncle, 80-year-old Mzee Sinino, vividly remembers ticks as the most troublesome livestock pests when he was a child, herding his father's cattle. The villagers had in fact come up with strategies to control the pests. Mzee Sinino has narrated to Wanzala how his father used to join other villagers in the burning of communal grazing pastures in the village to kill ticks prior to the rainy seasons, and in hand picking the insects off the bodies of animals and then burning them.

During his own childhood Wanzala watched Mzee Sinino apply several ethnopractices on tick-infested cattle, including plant-based acaricides in the form of concoctions. These were usually applied as dusting powders, pastes, juice extracts and decoction substances. Other plant treatments included bolus, infusions or smoke. Wanzala would often accompany his uncle on numerous consultation missions in the neighbourhood. His uncle was fondly known as *omulesi wa efiayo* 'the maid of the livestock', which literally means one who provides primary healthcare to the animals in the village and is consulted in major cases involving livestock ill-health.

Consequently, ethnopractices caught Wanzala's eye. "I was fascinated by the rich repertoire of traditional knowledge and techniques applied in almost all spheres of people's lives, be it in agriculture, healthcare, delivery of children, in livestock or in fisheries," he recalls.

Working with nomadic pastoralist communities in Turkana District and in Baragoi division in Samburu District, Kenya, during his research project for his masters thesis, Wanzala encountered many more livestock health 'experts' like Mzee Sinino. This further fuelled his interest in studying indigenous ethnoveterinary practices.

Wanzala joined *icipe*'s ARPPIS programme in 2005 to undertake doctoral studies targeted at identifying plant ethnobotanicals with anti-tick repellent properties within the Bungoma District of western Kenya. International Foundation for Science (IFS), Organization for the Prohibition of Chemical Weapons (OPCW) headquartered at The Hague and the Wageningen University and Research Centre of the Royal Government of the Netherlands fund this project.

His research focuses on an ethnobotanical survey, following a series of experiments in the laboratory and field, through which he has identified essential oils of two plants, 'nanjaka' (*Tagetes minuta*) and 'kamang'ulie' (*Tithonia diversifolia*). The Bukusu traditionally used these plants as anti-tick ethnopesticides.

"In Bungoma District and probably throughout sub-Saharan Africa, *T. diversifolia* shrubs, thick with yellow well-spread star-shaped beautiful wild sunflowers, are found growing along road, river and valley sides as invasive weeds. They are widely distributed along farm boundaries, adding a bright splash of colour to all the surrounding greenery, especially near homesteads. Also in many disturbed sites of Bungoma District, a colourful erect annual herb with creamy-yellow tube-like flower heads, commonly known as marigold (*T. minuta*) is often found growing. The plant is notable for its strong aromatic smell when crushed. It is indeed a troublesome invasive weed, particularly in the agricultural areas of sub-Saharan Africa with enough rainfall for cultivation," says Wanzala.

Wanzala and his research team decided to involve Mzee Sinino and 14 other rural livestock farmers in the project. In laboratory and field experiments, Wanzala reports that the essential oils from these two plants have proved to repel a variety of livestock ticks (e.g. *Rhipicephalus appendiculatus*, the red-legged tick *R. evertsi* and the tropical African bont tick *Amblyomma variegatum*). The essential oil from *T. minuta* appears to protect the animals against tick infestation for a longer period than the essential oil from *T. diversifolia*. Mzee Sinino and his farming colleagues were pleasantly surprised when they observed ticks dropping off their animals' bodies upon application of the essential oils extracted from plants coming from their own locality. The farmers now agree that, compared to the classical expensive and often unavailable synthetic acaricides, these repellents are a more appropriate alternative.

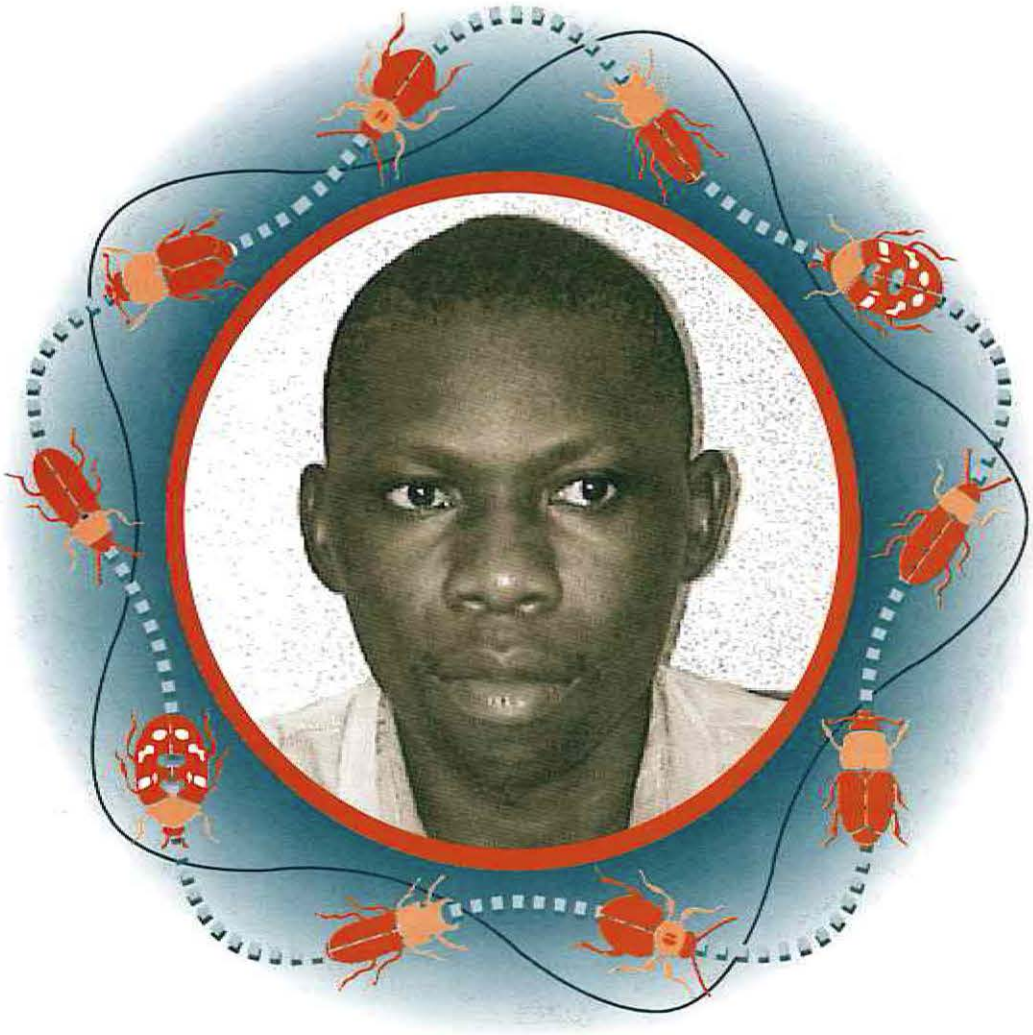
But one question, which requires further investigation, remains: Do such animals, treated with the essential oil of either plant, confer some protection to non-treated animals by virtue of their presence in the herd as is the case in the *icipe* tsetse repellent collar strategy?

In the meantime, Mzee Sinino and his neighbours are all set to learn how to extract and formulate the tick repellents, and to experiment with similar plants on their farms. Already some farmers have shown initiative in this direction, using their own knowledge

Wycliffe
WANZALA
(Outgoing
ARPPIS Scholar)

of plants with medicinal properties, which they have started testing. These initiatives have the potential to become new projects that will validate indigenous knowledge.

Wanzala indeed feels that some of the strengths of his research include the partnerships and capacity building at community level achieved. These aspects have allowed the local people to work alongside scientists and share their expertise. In turn, they have become key ingredients for the development of a self-sustainable ticks control effort under the sole management of the community. Mzee Sinino explains with enthusiasm: "This project has changed the life of the Mwibale community. Not only have the villagers found a way to control ticks without using expensive acaricides, but the study has also led to more people working together to achieve common goals. Yes, people talk more to one another. And more importantly, livestock is quickly regaining its place as the precious asset of this village!".



John BWIRE
(DRIP MSc Scholar)
Sponsor: DuPont Corporation, USA

John Bwire came to *icipe* as an apprentice, looking for a base where he could do scientific research. He found that, and more. His ground breaking MSc level work on scorpion venoms has not only earned him the *icipe* Governing Council award, but a reputation as a leading researcher on the subject in East Africa. In the testimonial below, John shares his dream to advance his skills to doctoral level.

John
BWIRE
(Ongoing DRIP MSc Scholar)

Last year, the *icipe*'s Governing Council awarded me the prize for the best published scientific paper. The news came as a surprise to me, first because the prize is highly coveted and students invest a huge amount of time and effort, and push whatever boundaries they have to, to win it. Second, from the list of papers lined up for competition, mine was the only one based on MSc level project work; the rest were all PhD projects.

The paper, which was entitled 'Identification of insect-selective and mammal-selective toxins from *Parabuthus leiosoma* venom,' published in the journal *Toxicon,* was based on my research, which endeavoured to establish the potency of venom among different scorpion species, with respect to their locality. This was through activity guided separation, purification and identification of an insect-selective toxin. My research was aimed at expressing the gene in the insect-selective toxin by cloning and introducing it into a baculovirus to form a recombinant virus that could be tested in the field for its efficacy, effect to the environment and toxicity to non-target organisms. Once established, this virus could be incorporated into *icipe*'s existing integrated pest management (IPM) strategies. My work would in effect advance the Centre's mandate of searching for effective, affordable and environmentally-friendly ways to control disease vectors as well as pests that are harmful to humans, animals and plants.

I came to *icipe* in 1998, as an 'apprentice' in the Behavioural and Chemical Ecology Department, where I worked on several projects under Dr Zeyaur Khan, Dr Lucie Rogo and Dr Wilber Lwande. Right from the start, I learned that arthropods (insects, ticks, mites, spiders and others), the most diverse and abundant life forms on Earth, are the major contributors to Africa's lack of sustainable growth, because of their ability to severely reduce the output of humans, animals and plants. At the same time, because of their tremendous biodiversity, they also hold great potential for Africa's development. However, the beneficial arthropods of Africa are among the most underutilised and threatened resources of the continent. This knowledge guided me when the *icipe* Capacity Building Programme offered me a DRIP fellowship to undertake an MSc. It led me into unfamiliar ground, to work on one of the most dreaded and feared arthropods—the scorpion. It also led me into the relatively unknown world of bioprospecting, which involves the systematic search, development and commercialisation of useful chemical products from natural sources.

Scorpions are of considerable interest to scientists as well as to laymen, first because of their medical importance (causing envenomation on stinging). Moreover, scorpion venom is a significant cause of morbidity and mortality in some parts of the world. For instance, in Mexico, about 10,000 scorpion stings occur annually, causing the death of as many as 800 people. Scorpion stings and related consequences are also common occurrences in Kenya in the heavily infested areas.

Scorpions are becoming increasingly threatened by habitat destruction and by the growing exotic pet trade. Due to their small litter sizes, long generation times and the slow survivorship among sexually immature females, most scorpions have a low rate of population growth. Many are also extremely habitat-specific and range-restricted, exacerbating the risk of their extinction due to human activities.

The long period of cultural history of scorpions makes them an interesting model for biogeographical and ecological studies, as well as in biodiversity related disciplines. Scorpions are often abundant in suitable habitats and are of considerable importance in ecological food webs, particularly in respect to controlling insect populations.

It is also interesting to note that scorpions are the most unusual arthropods in that all species give birth to young ones and several are asexual. Moreover, scorpions are blind, which is why they have invested heavily in venom for prey capture and defence, a background that motivated the current study. Nevertheless, scorpions are equilibrium species and valuable bioindicators. This means that their disappearance is an indication of habitat degradation. They also hold the status of 'charismatic microfauna', which predisposes them as a flagship species in programmes aimed at conserving terrestrial invertebrates.

John
BWIRE
(Ongoing DRIP MSc Scholar)

My work will contribute new knowledge on scorpions, another reason that makes the award from the *icipe* Governing Council especially thrilling. However, getting the award was not a Sunday walk in the park. The publication of the scientific paper was preceded by a long, challenging journey. Hunting for scorpions is a tiring exercise; you have to lift stones, peel the bark off trees and even travel at night with a UV-lamp (because scorpions have the ability to fluorescence). To withstand the pressure I needed support, which I thankfully got from my supervisors, notably Dr Wilber Lwande, who encouraged me to be focused and not to give up, and Prof. Ndiege who contributed to and assisted me in the research work. Dr Hans Herren, the former director general of *icipe,* also assisted in the collection of scorpions during his excursions. Last but not least, my colleagues in the Bioprospecting Programme went scorpion hunting with me, and also my fellow students provided moral support.

This research has been a worthwhile endeavour, which has seen me branded as the pioneer researcher on the chemical analysis of East African scorpion venoms. I can say that I came to *icipe* in search of a base where I could undertake problem-solving research, and found that and more. I have gained a lot of theoretical, as well as application-oriented knowledge through the Capacity Building Programme. More importantly, the 10 years spent at *icipe* have helped me to focus towards a research perspective.

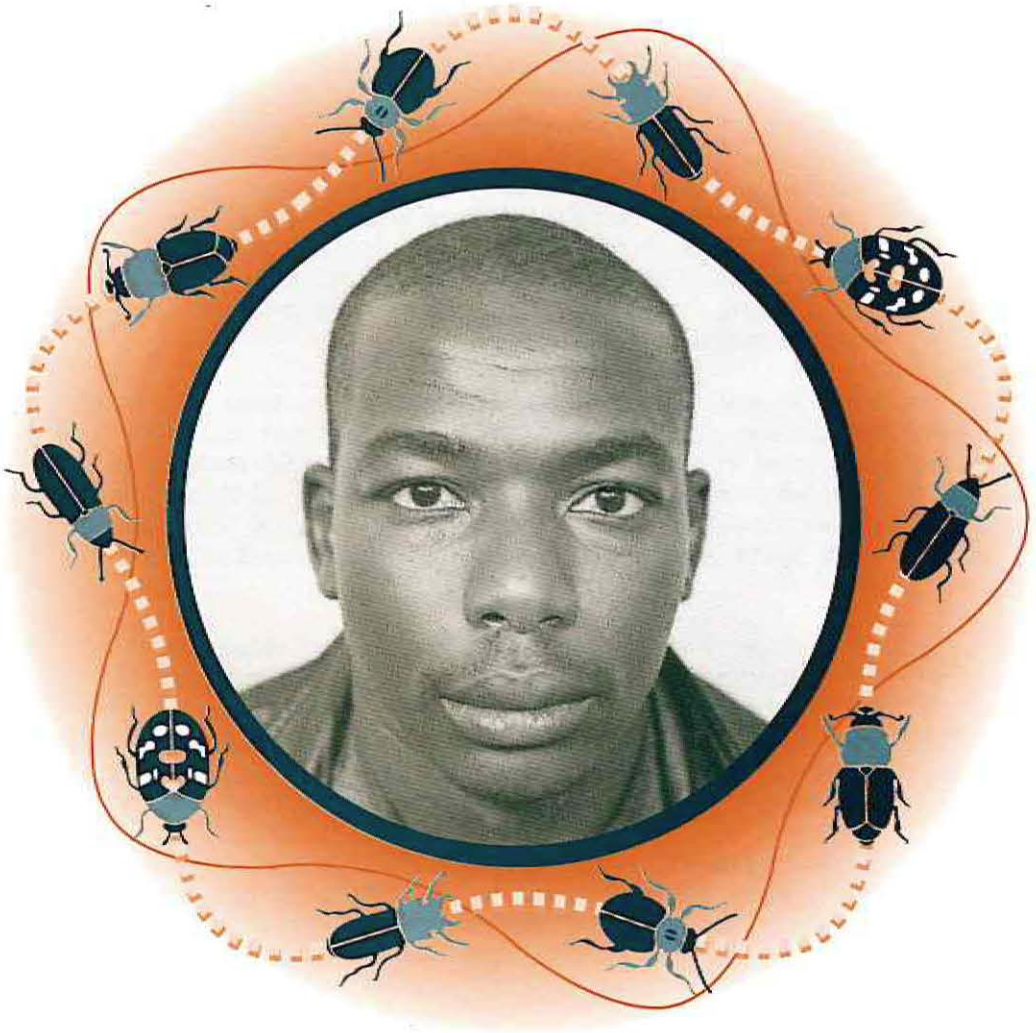
The intellectual setting at *icipe* is extremely useful to a young researcher like myself. It provides not only an opportunity to earn a scientific degree, but also the chance to interact with scientists who are experts in their fields, and to benefit from their knowledge and guidance. The various projects that I have been involved in during the course of my apprenticeship and later when I enrolled for an MSc degree have given me the opportunity to realise the joy in problem-solving oriented research.

Working on multiple research projects simultaneously, which is a unique feature of the *icipe* research approach, is both challenging and fun. By getting immersed in distinct but complementary research areas, students are able to participate in theoretical modelling, field-oriented studies and laboratory work. This approach both broadens and deepens one's scientific understanding. In my view, the graduate programme trains students to be creative, independent and resourceful, qualities that are vital for any scientist. As an experimentalist, *icipe* has taught me how to overcome the inevitable problems that arise in the laboratory. When I need help resolving particularly challenging issues, I have always found my supervisors easy to approach. There is no question that *icipe* is a great research institution in sub-Saharan Africa, and one that has enthusiastic and gifted scientists.

On my part, spurred by my own humble, rural background, I am determined to be part of efforts geared towards empowering resource poor rural communities by providing them with affordable solutions to ensure the security of their livelihoods.

Indeed, I consider my decision to undertake research-oriented graduate study one of the most important decisions of my life. Right from my school days, science, mathematics or in fact, any area requiring analytical thinking has always fascinated me.

In this spirit, I hope to progress my research to PhD level. This will enhance my involvement in the discovery of lead compounds for the development of medicinal drugs and other useful natural products from biological sources. These mainly include plant and arthropod defence secretions which provide us with an, as yet, untapped source of highly specific toxins to use as molecular probes, and lead compounds for development of therapeutic and insecticidal agents.



Abdullahi Ahmed YUSUF
(ARPPIS PhD Scholar)
Sponsor: Netherlands Ministry of Foreign Affairs' Programme for Cooperation with International Institutions (SII) and the German Academic Exchange Service (DAAD)

Ongoing Nigerian scholar, Abdullahi Ahmed Yusuf, is involved in an intriguing research on how Matabele ants raid termites. He talks about this, and his dream of setting up a world-class insect chemical ecology research group.

Abdullahi Ahmed YUSUF
(Ongoing ARPPIS PhD Scholar)

I was born in Zaria, Kaduna, in Nigeria and graduated with a BSc in biological sciences from the University of Abuja, Nigeria. In 2003, I obtained an overseas scholarship, through the Petroleum Technology Development Fund (PTDF) of Nigeria, to undertake an MSc in instrumental analytical sciences with speciality in environmental analysis at the Robert Gordon University, United Kingdom. After completion of the programme I continued to teach and research at the same university, until 2006, when I left after securing an ARPPIS PhD fellowship.

My research is on 'Understanding the behaviour and chemical ecology of the African termite-raiding ant (*Pachycondyla analis*) that could lead to the development of a novel termiticide'. This topic appealed to me because it involves both biology and practical analytical chemistry. Right from the early stages of my studies as a scientist I always wanted to be involved in research that seeks solutions to problems by incorporating basic biology and chemistry.

Moreover, termites are an interesting group of arthropods as they have both positive and negative roles in the ecosystem. My research work is looking at turning the negative roles of termites into positive use. Termites are more widely known for their destructive nature. In their quest to acquire cellulose, they are capable of ruining crops and wooden structures (like electric poles and houses), and even books and stationery.

In tropical countries, termites have co-existed with ants for over 100 million years and as a result have engaged each other in a co-evolutionary arms race. Thus, some ants have specialised as predators of termites (or even of arthropods in general). Conversely, termites have developed mechanisms for resisting these predatory strategies of ants.

One of the specialist termite-raiding ants is *P. analis*, commonly known as the Matabele ant. Matabele ants raid termites when the designated scout detects the presence of termite nests or foraging galleries. The scout then recruits a group of its mates who attack the termites by breaking open their galleries and taking both the workers and soldiers as prey back to their nest.

My study is exploring the *P. analis* and termite communication system; therefore, I am conducting field and semi-field observations of these raids on the termites. In addition, I will also analyse the semiochemical blends used during the raids to identify their potential as termite repellents.

Between April and September 2007, from a study site at the Mpala Research Centre (MRC), Nanyuki, Kenya, I observed over 330 different raids on termites from 34 different nests of Matebele ants located within the property.

So far, we have established the raiding dynamics of *P. analis* at Mpala. Based on this we have commenced work on the chemical ecological part, which entails the identification of semiochemical cues involved in the ant's raiding behaviour.

Understanding the behaviour and chemical ecology of the Matebele ant is of considerable theoretical interest from the perspective of evolutionary biology and may have potential in the control of termite pests.

I am looking forward to going back to my teaching and researching job, so as to contribute towards building capacity in insect science. My dream is to set up a world-class insect chemical ecology research group, specifically tailored to addressing African problems.

My research is a collaborative effort between *icipe* and the Department of Zoology and Entomology of the University of Pretoria in South Africa. It is funded by the Dutch SII funds for capacity building and the German Academic Exchange Service (DAAD) through *icipe*. The Mpala Research Centre is acknowledged for allowing us to conduct this research on their rich ecosystem. Field help is provided by Raphael Erangae of MRC and is highly appreciated.

ANNEX 1

Donors to ARPPIS (1983–2008)

- African Development Bank (ADB)
- Australian Development Assistance Bureau (ADAB)
- Australian Development Administration (ADA)
- Biodiversity Monitoring Transect Analysis (Biota)
- BioVision
- Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)
- Directorate-General for Development Cooperation (DGDC)
- Dudutech
- DuPont Aid to Education
- Diversa Corporation
- Development Cooperation of the Ministry of Foreign Affairs of the Netherlands
- European Community
- Ford Foundation
- German Academic Exchange Service (DAAD)
- German Federal Ministry for Economic Cooperation and Development (BMZ)
- Institut de Recherché pour le Développement (IRD)
- International Development Research Centre (IDRC)
- International Fund for Agricultural Development (IFAD)
- International Institute of Tropical Agriculture (IITA)
- International Livestock Research Institute (ILRI) (formerly ILRAD)
- International Foundation for Science (IFS)
- Japan International Research Centre for Agricultural Sciences (JIRCAS)
- Kirkhouse Trust
- Multilateral Initiative on Malaria in Africa/Tropical Diseases Research (MIM/TDR)
- National Institutes of Health (NIH)
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- PEW Charitable Trust
- Rockefeller Foundation
- Scientific Technical and Research Commission of the African Union (AU/STRC)
- Singenberg-Stiflung
- Swiss Agency for Development (SDC)
- Third World Organisation for Women in Science (TWOWS)
- Tropical Biology Association
- UNDP/World Bank/WHO/TDR Special Programme for Research and Training in Tropical Diseases
- United Nations Development Programme (UNDP)
- United Nations Educational, Scientific and Cultural Organization (UNESCO)
- United States Agency for International Development (USAID)
- World Federation of Scientists (WFS)
- World Health Organization (WHO)
- Zanzibar Government (Plant Protection Department)

Current ARPPIS partners and collaborators

- **Academies of Science and Networks**

African Academy of Sciences (AAS)
African Association of Insect Scientists (AAIS)
African Association of Universities (AAU)
African Forestry Research Network (AFORNET)
African Institute for Capacity Development (AICAD)
African Network for Agriculture, Forestry and Environment Education (ANAFE)
ARPPIS Scholars Association (ASA)
African Network of Scientific and Technology Institution (ANSTI)
East African Regional Programme and Research Network for Biotechnology, Biosafety, and Biotechnology Policy Development (BIO-EARN)
International Foundation for Science (IFS)
Lake Victoria Research (VicRes) Initiative
Natural Products Research Network for Eastern and Central Africa (NAPRECA)
Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)
Third World Academy of Sciences (TWAS)
Third World Organisation for Women in Science (TWOWS)

- **Collaboration with advanced laboratories:**

Brazil: Federal Rural University of Pernambuco, University of Sao Paulo, University of Vicosa, Regional University of Cariri
France: ENSA Montpellier
Netherlands: University of Amsterdam
Germany: Universities of Constance, Kiel, Hannover and Zena
USA: Miami, Pennsylvania, Michigan State and Yale universities
Sweden: Swedish University of Agricultural Sciences
UK: University of Newcastle-upon-Tyne, Rothamsted Research

- **National Research Organisations in African countries signatory to the icipe Charter**

- **International agricultural research centres (IARCs),** e.g. ICRAF, ILRI, IITA.

ANNEX 2

ARPPIS Participating Universities, 2008

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Update as of 11 February, 2008.

Acronyms and abbreviations

AAB	ARPPIS Academic Board
AAIS	African Association of Insect Scientists
AAT	animal African trypanosomosis
AAU	Addis Ababa University
ADRE	Bureau d'Etudes Acteur de Développement Rural et Environmental
AFFI	African Fruit Fly Initiative
AICAD	African Institute for Capacity Development
ANGAP	l'Association Nationale pour la Gestion des Aires Protégées (The National Association for the Management of Protected Areas in Madagascar)
ANSTI	African Network of Scientific and Technical Institutions
ARPPIS	African Regional Postgraduate Programme in Insect Science
ASA	ARPPIS Scholars Association
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
CDC	Centers for Disease Control
CDF	Constituencies Development Fund
CDTF-BCP	Community Development Trust Fund-Biodiversity Conservation Programme
CERPRU	Centre d'Études et de Recherches pour la Promotion Rurale (Rural Studies and Development Centre)
CIAT	Centro Internacional de Agricultura Tropical (International Centre for Tropical Agriculture)
CIP	Commercial Insects Programme
CITES	Convention on International Trade in Endangered Species
CMS	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
CNRST	Centre National pour la Recherche Scientifique et Technique
CORAF/WECARD	West and Central African Council for Agricultural Research for Development
CVC	Council of Vice Chancellors
DAAD	German Academic Exchange Service
DGIS	Directorate General for International Cooperation
DRIP	Dissertation Research Internship Programme
DSO	Direct Support to Training Institutions in Developing Countries Programme
EGL	Energie des Grands Lacs
ESK	Entomological Society of Kenya
Eurep-GAP	European Retailers Programme on Good Agricultural Practices
FINNIDA	Finnish International Development Agency
GEF	Global Environment Facility
GIS	geographical information systems
GMO	genetically modified organism
HACCP	Hazard Analysis and Critical Control Points
HIV/AIDS	human immunodeficiency virus/acquired immune deficiency syndrome
HRDC	Horticultural Research and Development Centre
IBTPS	*icipe* Board of Training and Postgraduate Studies
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDP	internally displaced person
IDRC	International Development Research Centre
IEMVT	Institut d'Elevage et de Medecine Vétérinaire Tropical
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
ILRAD	International Laboratory for Research on Animal Diseases (now ILRI-International Livestock Research Institute)
INERA	Institut de l'Environnement et de Recherches Agricoles
IPM	integrated pest management
IPR	integrated protection of rice

ANNEX 3

IRD	Institut de Recherché pour le Développement
IRRI	International Rice Research Institute
IRSAT	Institut de Recherches en Science Appliqués et Technologies
ISAE	Institut Supérieure d'Agriculture et d'Elevage
ISAR	Institut des Sciences Agronomiques du Rwanda
IUCEA	The Inter-University Council for East Africa
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KEMRI	Kenya Medical Research Institute
KEPHIS	Kenya Plant Health Inspectorate Service
KICC	Kenyatta International Conference Centre
KWS	Kenya Wildlife Service
MRC	Mpala Research Centre
NAPRECA	Natural Products Research Network for Eastern and Central Africa
NARC	National Rainbow Coalition
NARO	National Agricultural Research Organisation
NARS	national agricultural research systems
NENA	Near East and North African region
NERICA	New Rice for Africa
NGO	non-governmental organisation
NHH	natural human health
NMK	National Museums of Kenya
NSBA	New Sudan Beekeepers Association
OAU	Organisation of African Unity
ODM	Orange Democratic Party
OPCW	Organization for the Prohibition of Chemical Weapons
OSIENALA	Friends of Lake Victoria Environmental Programme
PATTEC	Pan African Tsetse and Trypanosomosis Eradication Campaign
PHAST	Public Health Action Support Team
PPRR	Programme de Promotion des Revenus Ruraux (Programme for the Promotion of Rural Revenue)
PSDR	Programme de Soutien au Développement Rural (Project for Support to Rural Development)
RAMSAR	Convention on Wetlands of International Importance, especially as Waterfowl Habitat (developed and adopted at Ramsar, Iran)
ROCARIZ	West and Central Africa Rice Research Network
RPSUDB	Research Programme on Sustainable Use of Dryland Biodiversity
SADCC	Southern African Development Coordination Conference
SAFNET	South African Fire Network
SANBI	South African National Bioinformatics Institute
SIDA/SAREC	Department for Research Co-operation/Swedish International Development Agency
SII	Dutch Cooperation Programme with Developing Countries
SIL	Societas Internationalis Limnologiae (International Society for Limnology)
SIMDAS	Sustainable Integrated Management and Development of Arid and Semi-arid Regions of Southern Africa
SPAS	Strategic Poverty Alleviation System
SPS	sanitary and phytosanitary
SUDA	Sudd Development Agency
TPRI	Tropical Pesticides Research Institute
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID-CDR	The US-Israel Cooperative Development Research Program
USAMRU	United States Army Medical Research Unit
USDA-APHIS	United States Department of Agriculture-Animal Plant and Health Inspection Service
VIRED	Victoria Institute for Research on Environment and Development
WARDA	West Africa Rice Development Association
WHO/TDR	World Health Organization/Special Programme for Research and Training in Tropical Diseases Research
WOTRO	Netherlands Organisation for the Advancement of Tropical Research

To mark 25 years of ARPPIS,
the *icipe* is publishing
conversations with
ARPPIS/DRIP alumni
and students