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AFRICA'S MINDS

BUILD A BETTER FUTURE

African Science,
Technology & Innovation
Success Stories

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Foreword

MANY COUNTRIES IN AFRICA ARE EXPERIENCING SUSTAINED ECONOMIC GROWTH, and the whole continent has demonstrated remarkable progress on many socio-economic indicators in a relatively short period of time.

Despite this optimistic picture, Africa is still lagging behind other regions when it comes to achieving the Millennium Development Goals. The ambitions for Africa would continue to fall short of expectations if the vital role of science, technology and innovation (STI) is not recognized and embedded in the socio-economic development process.

STI is one of the main drivers of sustainable growth, and it has a fundamental importance in tackling the host of problems that Africa is facing today. Although Africa has yet to benefit from the advantages of STI, the groundwork has already been laid.

The continent is blessed with indigenous knowledge that could be harnessed and developed with benefits accruing to its peoples. Besides, its young and dynamic population has the willingness to learn and adapt scientific and technological solutions to their specific needs. Therefore, it is not far-fetched anymore to believe that Africa will become the next hub for global science and technology. The Islamic Development Bank's (IDB) four decades of extensive work in Africa strengthens our faith in the ability of the continent's women and men to make this dream possible.

This brochure, prepared in collaboration with UNESCO, showcases success stories that highlight the African-led scientific and technological solutions to the continent's various problems. All the stories provide empirical evidence on how STI can ensure success and sustainability in Africa's development process while sensitivity toward social and cultural diversity is kept in view.

I firmly believe that the stories will be a source of inspiration for many, and will offer opportunities for replication, most notably under the IDB's Reverse Linkage program and thus help to unleash Africa's full potential.



Ahmad Mohamed Ali
President, IDB

A handwritten signature in blue ink, reading "Ahmad Mohamed Ali". The signature is stylized and fluid, with a long horizontal stroke extending to the left.

Foreword

SCIENCE, TECHNOLOGY AND INNOVATION (STI) HAS THE POWER TO TRANSFORM HOW WE LIVE.

It can enhance the quality of life and life expectancy. It can provide clean drinking water and strengthen health care and medical services. It can improve and make more accessible communication and information technologies. It is also essential for sustainable economic development. Evidence shows that investing in scientific knowledge and new forms of innovation and technology are powerful contributors to inclusive growth. For all these reasons, STI plays a key role in building knowledge societies, founded on human rights and dignity, where all citizens have access to knowledge and share in its creation.



Across Africa, governments are acting to harness the power of STI for the benefit of all – through development projects tackling challenges in such a diverse fields as agriculture, food security, disease control, sanitation and environmental sustainability. The success of these projects has depended on the creativity of individual women and men, working together to design sustainable solutions to everyday problems.

This booklet tells the story of these men and women. It showcases eleven success stories, from Morocco to Kenya, from Nigeria to Mali – to highlight how these projects have improved daily life, how they have propelled local industries, how they have fostered cooperation and knowledge-sharing at all levels. This is the result of cooperation with the Islamic Development Bank, for which I am very grateful, and reflects expertise and reach of the SciDev.Net. I am confident that the spirit of innovation driving these stories will inspire others and stimulate new successes across Africa.

Irina Bokova

Director-General of UNESCO

A handwritten signature of Irina Bokova in black ink.

RESEARCH TURNS OIL INTO MARKET HIT, EMPOWERS WOMEN

Author: Rasha Dewedar, *SciDev.Net* correspondent in Egypt

Location: Morocco
From: 1988 to present
Implementing Agency: Ibn Al-Baytar

Argan oil – the unique product of an endemic tree – underpins one of Morocco’s most successful, science-driven development projects run solely by women.

Rasha Dewedar is an Egyptian journalist who has written extensively on science, culture and women’s rights in the Middle East for the past seven years. Her articles are published in a variety of publications, including *Nature Middle East*, *Alarabiya.net*, *Common Ground News* and *Egypt Independent*. She has written a range of news stories for *SciDev.Net* since 2011, as well as contributing to events blogs and features, focusing mainly on scientific issues in the Arab world.



ENDANGERED TREE, CHEAP OIL

For centuries, the drought-tolerant argan tree, endemic to Morocco, has acted as a ‘green curtain’ against desertification by the encroaching Sahara. Argan oil is the tree’s most valuable product. Known for its light, nutty flavour, the oil is used for salad dressing and cooking, and is also reputed to have medicinal and cosmetic properties.

But over the twentieth century Morocco lost around half its argan trees to deforestation, overgrazing and agricultural land clearances. Part of the problem was that the production of argan oil was not providing enough incentive for local people to protect the trees: the extraction process was difficult, time-consuming and required strenuous manual work, and there was little available scientific evidence of the oil’s nutritional value – meaning it did not sell well.

As a result, locals would often clear the trees to make way for more lucrative and less labour-intensive crops, such as oranges, bananas and tomatoes. But Zoubida Charrouf, a chemistry professor at Mohammed V University in Rabat, Morocco, saw strong economic and ecological potential in the tree, by partly mechanising traditional oil production processes and involving local communities. “The idea was to transform the environmental problem into an economic opportunity, and invest in nature,” Charrouf says.

SCIENCE TO THE RESCUE

In 1986, Charrouf began researching argan oil production processes and traditional techniques. Using new technology developed in her Rabat laboratory, Charrouf mechanised part of the production process: she found that automating the pressing of the oil helped

speed up operations, improve oil quality, reduce waste and prolong the oil’s shelf life, hence reducing production costs and improving income from oil sales. She also discovered molecular substances unique to the argan oil – including antioxidants and antimicrobial agents – and undertook field work, during which she consulted local oil producers to help devise an innovative plan to improve the entire production process and make it more sustainable and lucrative.

The project also aimed to establish an industry run and owned by local people, thereby encouraging them to feel responsible for protecting and sustainably managing the trees. This new industry is based on a strong scientific base and years of research. In 1998, with a four-year research grant from Canada’s International Development Research Centre (IDRC), Charrouf started rolling out the project. She began to bring together illiterate women experienced in argan oil production by establishing cooperatives through which local people create businesses that they then own and run. She created the first cooperative in Tamanar, south-western Morocco. By 2002, this had been followed by four more cooperatives, each involving 45–60 women, in cities across the country.

Charrouf is now president of Ibn Al-Baytar, a Rabat-based association set up in 1999 with funding from national and international donors that aims to develop and improve argan oil production and business management. “IDRC decided to fund the project because it had strong potential to protect biodiversity and improve the livelihoods of poor people,” says Bruce Currie-Alder, IDRC’s regional director for the Middle East and North Africa.



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INTERNATIONAL ACCLAIM, LOCAL BENEFITS

The project is now supported by the government, local people, embassies and international funders, including the European Union. "Involving different stakeholders from the beginning was very important to the project's success and sustainability," Charrouf says. The project succeeded in developing and launching three new products: argan oil for cosmetic use, edible oil made from toasted seeds, and an edible spread made from argan, honey and almonds.

These products sell well in shops across Morocco, generating at least €150 (around US\$207) per household a month and creating a €20 million (around US\$28 million) a year industry, with links to international markets and cosmetics companies. Some 5,000 women work in the cooperatives, each of them earning about US\$5-8 daily, which is far more than their income before the project started. Locally, it has reaped diverse rewards.

Amina Ben Taleb, manager of a cooperative called Taitmatine, explains that the project provides both employment and education. "Women in the cooperative not only learn how to read and write; it's also a comprehensive capacity-building atmosphere where you continuously learn and practise," she says. The project has also helped break taboos and allowed otherwise marginalised women to work, generate their own incomes and invest in their children's education. According to Fatima, one of the women at the Taitmatine cooperative: "It has always been a taboo for rural women to leave their homes for work, but after seeing the success of the argan cooperatives,

people have changed their minds and now keenly support women's work."

Scientifically, the project has conserved and approved many traditional practices, with some 100 related scientific papers published. And there are now other scientists, both from Morocco and further afield, involved in additional aspects of argan tree research, Charrouf says. Discussing argan oil at scientific conferences and cultural events has also attracted global interest and boosted sales across the world. "The price of argan oil has increased from €2.5 to €25 per litre in the space of ten years," Charrouf says. Currie-Alder adds: "I believe that a great success was improving the quality of production, such that the product became more marketable and was able to command a premium price". And the argan cooperatives have successfully pulled in tourists keen to learn about the process and to buy oil from the source.

From an ecological perspective, the period 2000 to 2010 witnessed a 100-fold increase in argan reforestation, and there are plans to plant 60,000 further hectares each year.

The project, and Charrouf herself, have received a slew of awards, including the International Slow Food Award for Biodiversity, awarded to the Tamanar Amal Cooperative in 2001, and Morocco's Grand Prize for Invention and Research in Science and Technology, awarded to Charrouf in 2010.

In 2011, Charrouf also won the Islamic Development Bank Prize for Women's Contribution to Development. "It was a great recognition of our work in the Arab region, especially Gulf countries," Charrouf

says. Charrouf inspired many women to get education and work: many of the women working in the cooperatives had never accessed good education or previously had a job. Charrouf had also broken the taboo that women should not work outside their house in a practical way – by action rather than just by talking about it.

And in April 2009, argan oil was the first African product to be certified internationally as a Protected Geographical Indication (PGI) product, a labelling system established by the European Union.

THE WAY FORWARD

"The project is sustainable when it is well-managed, together with good governance and loyal customers," Charrouf says. The project is also sustainable because it is supported by continuous scientific research on the potential of argan oil.

A few women in each cooperative work as managers, without any interference from Charrouf, which means the idea is expanding in a less centralised and more sustainable way, says Ben Taleb.

Charrouf explains that the argan project has been replicated by cooperatives working on other Moroccan products that are organised in the same way as the argan cooperatives. "Local communities anywhere can benefit from natural resources they know and master; this is how we eradicate poverty and ensure food security," Charrouf says.

LINKING RESEARCH AND LOCAL PEOPLE THROUGH ORGANIC AGRICULTURE

Author: Rehab Abd Almohsen, *SciDev.Net* correspondent in Egypt

Location: 60 km north-east of Cairo in rural Egypt
From: 1977 to present
Implementing Agency: SEKEM (www.sekem.com)

Since 1977, a modest organic farming project in Egypt has grown into a global enterprise reaping rewards across industry and agriculture.

Rehab Abd Almohsen is an Egyptian science writer and member of the International Science Writers Association and The Arab Association of Science Journalists. She spent almost six years as the managing editor of the health and science section of *Islamonline.net*, an Arabic media website, and did a stint in 2009 as a senior editor at MBC group. Rehab honed her skills in news and feature writing with a science journalism internship awarded by IDRC/SciDev.Net in 2013. She has also worked as a freelance news reporter for *SciDev.Net* and *Nature*.



OUT OF THE DESERT

[CAIRO] During a visit to Egypt in 1975, chemical engineer and medical scientist Ibrahim Abouleish was inspired to help improve the economic and social conditions in his home country. Two years later, after 21 years spent working in Austria, Abouleish moved home to Egypt with a vision: to create a business that would both achieve economic success and promote sustainable social development.

He decided to found a sustainable community based on organic agriculture, to improve soil fertility and increase crop yields. Abouleish bought a 300-hectare site of semi-desert land near the town of Belbeis, 60 kilometres north-east of Cairo, and named the project SEKEM – an ancient Egyptian word meaning ‘vitality from the sun’. “It was not easy to implement this in a country like Egypt, where back in 1977, few people had heard about the concept of sustainability, or even of organic food,” says Helmy Abouleish, the SEKEM Group’s deputy chairperson and managing director.

Helmy describes sustainable development as an approach through which “every human being can develop his or her individual potential, can live together in a way that reflects human dignity and can conduct economic activity in accordance with ecological and ethical principles”. And he points out that scientific research is high on SEKEM’s strategy for promoting community development: “From the very beginning, research and innovation have been two of the main drivers,” he says.

One of SEKEM’s greatest research achievements has been its contribution to the huge reduction in artificial fertiliser and

pesticide use in Egypt’s cotton industry, while boosting the yields by up to 30 per cent. SEKEM research has also helped drive the reclamation of desert land by transforming sand into fertile soil through the use of biodynamic agriculture, a method of organic farming that uses manures and composts to maintain soil fertility and keep microorganisms alive.

BUILDING A NEW COMMUNITY

With the aim of helping local communities meet their needs, SEKEM began bringing local Bedouin tribes into the project and giving them work.

And to achieve its broader social goals of education and empowerment, SEKEM carries out its development work through seven organisations: the SEKEM Development Foundation; a medical centre; a community school; a school for disabled children; a vocational training centre; the University for Arts, Science and Technology; and several departments of medical, pharmaceutical and agricultural research.

It strives to meet its social and cultural objectives through projects such as a programme to combat the exploitation of child labour by only allowing children aged between 12 and 16 to work in the fields for a maximum of two hours a day. The rest of the day is spent in the SEKEM school where, in addition to studying the usual subjects, they spend time learning to express themselves through activities such as theatre, drawing and singing.

LINKS WITH THE UNIVERSITY

Rigorous scientific research – mostly undertaken at the Heliopolis University for Sustainable Development, of which SEKEM is a strategic partner – is also central to the



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project. “The two organisations work hand-in-hand,” says Helmy.

Kadria Abdel-Motaal, the university’s director of academic research, is also head of the Special & Sponsored Programs Department, a SEKEM-supported unit established in 2008 to help initiate innovative sustainable development research activities, encourage interdisciplinary research and disseminate new best practices based on its findings.

Abdel-Motaal says that one of the department’s main roles is to strengthen links between development-oriented researchers and practitioners, and to bring them together with new technology stakeholders via workshops. So far, the department has funded 23 university research projects, spanning organic agriculture, phyto-pharmaceuticals, education for sustainable development, social development and environmental sustainability.

● HOLISTIC DEVELOPMENT SUCCESSES

Since 1977, SEKEM has grown into a multifaceted agro-industrial group of companies and non-governmental organisations that is widely regarded as one of the world’s leading social enterprises. Today, it has more than 2,000 employees and a network of more than 3,000 farmers who produce the food that SEKEM then processes. The SEKEM group includes ten

industrial companies that together produce 150 different types of organic products, including food, herbal teas, medicines and cotton products.

Thomas Abouleish, the SEKEM Group’s new media and communication director, points out that, through the Egyptian Biodynamic Association established by SEKEM, the company has been able to help thousands of Egyptian farmers switch from conventional to organic agriculture. As a result, hundreds of organic products are available on the Egyptian market, produced both by SEKEM’s companies and others.

Ten per cent of profits from the SEKEM companies go towards social development projects, which also raise money by collaborating with international and national funding partners.

Through its medical centre, SEKEM also offers healthcare using holistic medicinal approaches to therapy. In 2011, the centre treated almost 4,000 SEKEM employees and almost 30,000 individuals from surrounding communities.

At the heart of SEKEM’s activities is a commitment to promote every individual’s right to equal treatment, as well as the equality of women in society and the workplace. In all SEKEM institutions, for example, intercultural and religious

differences are respected and valued, with both Muslim and Christian rituals being practised. In recognition of its role in promoting women’s rights, in 2009 SEKEM was awarded the Gender Equality Award by the UN Development Fund for Women (UNIFEM).

COMPLETING THE CYCLE

Thomas sees SEKEM as a model that can inspire other communities to put their faith in sustainable development and organic agriculture. He describes the company’s economic success as resulting from “the ability to complete the cycle between agriculture and industry”. The biggest challenge now, Helmy says, is to “maintain or improve our competitive position, attracting and training the necessary workforce”.

Ibrahim has received wide international recognition for his efforts. In 2003, he received the Right Livelihood Award, sometimes referred to as the ‘Alternative Nobel Prize’. The award committee stated that SEKEM had shown “how a modern business model can combine profitability and success in world markets with a humane and spiritual approach to people while maintaining respect for the environment”. Ibrahim’s early vision has been amply fulfilled.

A MAGIC WAND FOR NUTRITION AND INCOMES IN MOZAMBIQUE

Authors: Arsenio Manhice, Leonel Muchano and Ntaryike Divine Jr, *SciDev.Net* correspondents in Mozambique and Cameroon

Location: Mozambique
From: 1997–2013
Implementing Agency: Mozambique's government and USAID (plus other country-wide partners)

For the past 15 years, smallholder farmers in Mozambique have been growing the orange-fleshed sweet potato, with promising results for yields and nutrition.

RESPONDING TO MALNUTRITION

Some 135,000 smallholder farmers in Mozambique, around half of them women, are currently eager to plant vitamin-enriched varieties of sweet potato, developed in the country over the past 15 years to help alleviate malnutrition. The demand for the new varieties is the result of good yields, as well as a campaign to engage farmers and educate consumers about the benefits of the new crop.

The orange sweet potato, a rich source of vitamin A, was first brought into the country in the late 1990s, following reports of high levels of vitamin A deficiency, mainly among women and children aged under five.

A group of Mozambican researchers from different disciplines discussed setting up the Orange-fleshed sweet potatoes (OFSP) initiative, and decided that investing in production of the crop would help address the problem of vitamin A deficiency. The initiative quickly gained momentum because female farmers were already familiar with growing sweet potatoes, and the new variety could easily be distributed to farmers across the country, according to Maria Isabel Andrade, the initiative's Maputo-based lead

researcher, and Mozambique's representative at the International Potato Center (CIP).

GLOBAL INPUT

Fifty-eight samples, representing a wide variety of the crop, were imported from countries including China, Kenya, Tanzania and the United States. The first large-scale field testing was carried out by the south Mozambique branch of the CIP, a global research-for-development organisation focused on roots and tubers, based in Peru. Financial support from the US Agency for International Development (USAID) helped extend the testing further to additional parts of the country.

CIP's initiative enabled the researchers to identify eight varieties possessing good yields. But the widespread floods of 2000 caused the destruction of all varieties undergoing tests in low-lying areas in the worst-affected provinces. After the flood waters had subsided, the Mozambican government, in partnership with USAID, drew up a plan to distribute the eight top-yielding varieties to around 123,000 households.

USAID then scaled up investment in the production of both the orange-fleshed sweet

Arsénio Manhice works at the Mozambique Media Strengthening Program to improve Mozambican media through professional

training and education. His previous roles included Senior Communication and Advocacy Officer at Elizabeth Glaser Pediatric AIDS Foundation and senior journalist at *Notícias*, the main newspaper in Mozambique, where he received nine journalism awards. Arsénio holds a journalism diploma from the School of Journalism of Maputo and a BA in Law from Eduardo Mondlane University.



Leonel Machano

is a journalist with Mozambique News Agency (AIM) who has shown a special and growing interest on agriculture and food matters, in his home country as well as Africa in general. Although he has a university degree in Translation and Interpretation of English to Portuguese, he has been writing more about food security, that remains of concern in Mozambique.



Ntaryike Divine Jr

is a journalist and alumnus of the US State Department's International Visitor Leadership Programme for investigative journalism. He is the *Voice of America's* correspondent in Cameroon and a stringer for several news outlets, including the *Associated Press*, *SciDev.Net*, *Think Africa Press* and *Africa Report*. He was named Cameroon Journalist of the Year in 2009 and won an award for Best Discovery Story in 2010. He graduated in October 2012 with a distinction in science journalism cooperation.





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potato varieties and for another staple crop, cassava. CIP extensively promoted the two crops, with the aim of reaching half a million growers between 2000 and 2003, a target attained with the help of other partners, such as Helen Keller International in 98 of Mozambique's 123 districts.

CLIMATIC CHALLENGES

Apart from the devastating floods at the turn of the century, drought, recurring at intervals of three to four years in the country's southern and central regions, encouraged advanced research to produce new sweet potato varieties.

Fifteen strains were developed with initial financial support from Helen Keller International. According to project leader, Andrade, Oxfam GB intervened, funding the multiplication of the eight high-yielding, drought-resilient orange-fleshed sweet potato clones successfully trialled in seven of the country's 11 provinces in 1999. The home-grown varieties were distributed to 122,000 families in four flood-affected provinces. They were found to yield 20-25 tonnes a hectare, compared with the ten-tonne average of ordinary varieties. The sweet potatoes are also easy to cultivate and to harvest, compared with ordinary varieties, and they allow farmers to improve incomes, too, as demand for the vitamin A-rich sweet potatoes grows.

ROOTS OF SUCCESS

Andrade attributes the success of the programme to the know-how and strong commitment of Mozambique's scientists. In collaboration with them, she carried out during the research phase a wide range of lab and field studies to identify the most suitable varieties for Mozambique's needs. And she says the expertise of local scientists

could be tapped further to help solve other prevailing food problems.

The testing period, Andrade says, has proved that an integrated approach – involving researchers, smallholders and other stakeholders in the orange-fleshed sweet potato market – could be a starting point for the continued nutritional education of farmers and rural communities.

The nutritional value of the orange-fleshed sweet potato has helped to reduce chronic malnutrition as well as drive progress in Mozambique towards achieving Millennium Development Goals (MDGs) one to four, by:

providing people with enough to eat; encouraging children to stay at school; empowering women; and reducing child mortality. Achieving the MDGs requires more than sweet potatoes, Andrade says. But coupled with other interventions, the orange-fleshed sweet potato has been a strong catalyst to progress.

But despite the successes of the orange-fleshed sweet potato project so far, other challenges to efficient crop production in the country remain. Among these, Andrade particularly highlights power cuts, low levels of mechanisation and poor irrigation schemes.

SUSTAINABLE FUTURES

The project's sustainability is another important consideration. Andrade adds that if at least 30 per cent of smallholders continue using the sweet potato after the programme's end in 2013, this in itself would be a great achievement.

Manuel Mutua has been a smallholder farmer since the 1980s in the fertile district of Boane, in southern Mozambique, about 40 kilometres from the capital, Maputo. Until a few years ago, Mutua grew a wide variety of fruits and vegetables. But in 2012, he began growing orange-fleshed sweet potato, after signing a contract with CIP for the supply of plants for testing in his fields.

"I am very happy with the promoting campaigns, but I believe that there's still a lot to be done as far as marketing is concerned, to open space for this new crop," says Mutua. This is because most

people are accustomed to eating normal sweet potatoes, rather than the new and nutritious variety, he says.

But he also believes there will be a slow change of hearts and minds, translated into a wider market openness to the new crop, and consumers eventually preferring the orange-fleshed sweet potato.

From the beginning of the initiative in the 1990s, partners such as USAID as well as the Mozambican government have provided more than US\$1 million in funds. The most recent OFSP research programme has been coordinated by CIP under the National Institute for Agronomic Research, funded by USAID, the Rockefeller Foundation, Harvest Plus and AGRA. Around one million farmers have benefitted from OFSP since dissemination started in 2000. The dissemination process is primarily done through the public rural extension systems and NGOs.

TRANSFORMING NIGERIA THROUGH FAIR TECHNOLOGY TRANSFER

Author: Emeka Johnkingsley, *SciDev.Net* correspondent in Nigeria

Location: Abuja, Nigeria
From: 1979 to present
Implementing Agency: National Office for Technology Acquisition and Promotion (NOTAP) (notap.gov.ng)

For 35 years, a Nigerian intellectual property project has been helping local firms safeguard software from foreign exploitation, while helping them become global players.

Emeka Johnkingsley Anuforo is a

science and health journalist at *The Guardian Newspapers* in Nigeria. In

2011, Emeka did a six-month science journalism fellowship at *SciDev.Net* in London on scholarship from Canada's IDRC. Emeka is the founding vice-president of the Nigerian Association of Science Journalists, which is affiliated to the World Federation of Science Journalists.



GUIDELINES FOR CHANGE

[ABUJA] In the 1970s, Nigeria's technology industry was largely dominated by foreign companies. To counter this trend, the government established the National Office for Technology Acquisition and Promotion (NOTAP) in 1979. It aimed to regulate the inflow of foreign technology into Nigeria, through new policies which promote the establishment and growth of local software and innovation firms.

Yet as recently as 2006, a NOTAP study found a gap between Nigeria's research sector and industries. "We realised that Nigerians were not converting research outputs into intellectual property, patents, trademarks, industrial designs and knowledge at the highest level," says Umar Bindir, NOTAP's director-general.

"The country's know-how – the culture of creating intellectual property and protecting it as intellectual property rights as well as transferring it into industries – was very weak."

For this reason, NOTAP has published a manual on the basic requirements and procedures for technology transfer agreements and projects to guide those involved in transferring and licensing through negotiation, registration and monitoring and in aligning those projects with the needs of the country, Bindir says. Until then, Nigerians were largely dependent on foreign expertise in high-tech fields such as computer software.

"The pattern was that firms would acquire software from abroad and foreigners would come and implement it," says Bindir. "Whenever there was a problem with viruses, or an upgrade was required, foreigners would come and solve the problem. Everything was

one-way traffic." These new guidelines have allowed for the "fair" transfer of knowledge and technology coming to Nigeria.

BUILDING LOCAL KNOWLEDGE

"We ensure that the charges [to Nigeria] for technology transfer agreements are fair," Bindir explains. "Based on these agreements, NOTAP now facilitates the movement of many industries into Nigeria."

NOTAP has successfully created many more opportunities for Nigerian companies and people to build their capacity in technology know-how through technology transfer agreements. For example, NOTAP's guidelines stipulate that a minimum of 40 per cent of annual technical maintenance paid to a foreign software-technology vendor should go to a local partner, so it can develop skills for implementing, customising, integrating and supporting foreign technology. This aims to ensure that local vendors are involved in maintaining the software in the country and hence reduce the cost of involving expatriates in local processes and enhance the capacity of nationals.

Bindir stresses that many Nigerian software companies are now involved in executing software projects, coding software and providing technical services that only foreign companies used to provide. For example, the Computer Warehouse Group (CWG), a leading Nigerian software company, has learned so much that it has matured into a small multinational company. With operations in 18 of the 36 Nigerian states, and regional offices in West, East and Central Africa (Ghana, Uganda and Cameroon).

CWG's CEO, Austin Okere, says that NOTAP's intervention in the domestication of software



knowledge was largely responsible for the growth of his firm. "NOTAP has been a strong catalyst in the growth of local content in software in Nigeria, including the phenomenal growth of CWG," he says.

Bindir says such companies are expanding regionally. "They are going to Kenya, Uganda and other countries, establishing their offices and providing the kind of services that, a few years ago, only foreign companies would provide," he says. And it has saved Nigeria an estimated 500 billion naira (just over US\$3 billion) over the past decade by preventing unnecessary or overly steep charges for foreign technology transfer, Bindir says. "If NOTAP did not exist, foreign technology service providers would have charged anything and Nigerian firms would have paid," he says.

LINKING UNIVERSITIES WITH INDUSTRY

Since 2006, NOTAP has also been facilitating the establishment of Intellectual Property and Technology Transfer Offices (IPTTOs) in more than 40 universities, polytechnics and research institutions in Nigeria. These provide research organisations with training, in collaboration with the World Intellectual Property Organization.

"I am happy that so many of the universities, which previously had survived for 30 years without a single Nigeria-registered patent, have now patented ten to 20 innovations within the first six months of introducing this scheme," Bindir says. The number of Nigerian-registered patents has increased from 100 per year in 2006, to 400 per year today. "If you go to the industrial sector, you will see the level of capacity that we have been able to build, to the extent that many of

these systems can be run, and, to an extent, maintained by Nigerians," Bindir says.

Suleiman Aruwa, coordinator of the IPTTO office at the Nasarawa State University set up in 2012, says the office has already helped the university formulate its policies on links with start-up companies, copyright and intellectual property. And Martins Emeje, IPTTO office coordinator at the National Institute for Pharmaceutical Research and Development, says that his office has filed two patent applications in the United States since its establishment. Emeje adds that technology is relevant to Nigeria's achievement of the Millennium Development Goals (MDGs).

Bindir agrees. "There is no way the MDGs can be achieved without technology," he says. "All of them depend on technology. Our projects in education, technology acquisition and science promotion all affect the MDGs. The more progress we make, the more skills we get out of the system and the more we contribute to the MDGs. The whole idea is to reduce poverty to the level that it does not pinch our economy. Over the years, we have also focused on increasing the number of women in our programmes."

BUMPS ON THE WAY

But it has not always been an easy journey. NOTAP operates in what is still a relatively weak knowledge system and in a country where public institutions are often criticised for excessive bureaucracy, delays, poor expertise and unmotivated workforces. "We are doing our best to ensure that we boost public belief in our institution, to ensure that we are a transparent institution, with high-calibre, highly trained and well-qualified men and women," he adds.

Another challenge is better equipping NOTAP to deliver its mandate. For example, NOTAP needs a large technology exhibition centre where entrepreneurs can come and see global technology, domesticate these technologies and establish businesses, says Bindir.

He would also like to see a library to provide technological information to researchers, entrepreneurs and schools; and an online database providing information on where to access technologies.

STRENGTHENING LINKS

NOTAP has a steady income from the national budget, as well as fees from organisations wishing to register patents, so it has a sustainable future. Bindir says the NOTAP initiative is also becoming a model for a number of other African countries, and is working with institutions in Ghana, Kenya and Tanzania, among others, to establish science and technology parks, and enhance the impact of intellectual property.

"For instance, our recent collaboration with Tanzania in promoting science and technology in both countries has resulted in a positive drive to set up an organ similar to NOTAP in Tanzania and other similar initiatives for promoting the establishment of science and technology parks and enhancing the impact of intellectual property," Bindir says. "We are sharing some of our skills and also learning from some of these countries."

PROLIFERATION OF SOFTWARE INNOVATION IN KENYA

Authors: George Achia, *SciDev.Net* correspondent in Sub-Saharan Africa

Location: Nairobi, Kenya
From: 2010 to present
Implementing Agency: N/A

In just three years, a Nairobi-based innovation hub has expanded to drive innovation across farming, finance and crisis reporting, in Kenya and beyond.

George Achia

is a science journalist with all-round practical experience and skills in science writing and editing, augmented by several stints of hands-on training in science reporting and communication, most recently an IDRC/SciDev.Net science journalism fellowship. These have sharpened his skills, gained in four years as a science writer and subeditor with *ScienceAfrica* – Africa's publication on science, innovation and development. He has also worked as a correspondent for other publications in Africa and beyond, including *SciDev.Net* and *AfricaSTI.com*, all focusing on various aspects of science, research and development in Africa.



FROM ELECTORAL CRISIS TO SOFTWARE HUB

On the fourth floor of the Bishop Magua Centre on Nairobi's Ngong Road, young men and women busily work on their laptops. The group includes entrepreneurs, web and mobile phone programmers, designers and researchers – part of a vibrant technology community that meets regularly to share ideas and work together on common interests.

This is Nairobi's innovation Hub (iHub) (ihub.co.ke), which opened its doors in March 2010. The initiative drew inspiration from an earlier project, launched in the aftermath of post-election violence in Kenya in 2008, when Nairobi-based IT specialists Juliana Rotich and Erik Hersman developed a website to map reports of violence, naming it *Ushahidi* – Swahili for 'testimony'. "The original website was used to map incidents of violence and peace efforts throughout the country, based on reports submitted via the web and mobile phones," says Jimmy Gitonga, iHub's manager.

Ushahidi now has more than 45,000 users in Kenya, and its popularity has led to the development of a platform that can be used in different global contexts. It has since been used to monitor crises across the world, including the earthquake in Haiti in 2010, the Japanese tsunami in 2011 and violent incidents during Egypt's 2011 revolution. "It has become a new way of mapping a crisis and documenting what is happening," says Gitonga.

He explains that, inspired by *Ushahidi's* success, Hersman thought: "What if we open a space that would allow different technology people to come together and do something that would affect the world as *Ushahidi* did?" And from the kernel of this idea, and with funding from the philanthropic investment

firm Omidyar Network and the international development organization Hivos, the iHub was born.

SHARED SPACE FOR INNOVATIVE IDEAS

The iHub works through open innovation. The space enables members to build the skills required to turn ideas into actions, via an in-house business unit that helps them develop a vision, business plan and team.

A key feature of the iHub community is the knowledge-sharing culture developed through collaboration, skill sharing and mentorship. Membership is open and free to those who work in information technology programming, design or research. It has three levels: 'white' for members who use the service virtually; 'green' for those working on specific collaborative projects, who can use the iHub for face-to-face meetings and networking; and 'red', for those who have completed six months of green membership, and have used this time to produce a viable product or service. Red membership requires a monthly payment of 15,000 Kenyan shillings (around US\$170), and includes a desk, locker and priority meeting room use.

NURTURING ENTREPRENEURS

Three years down the line, Gitonga says, the iHub has been a huge success. "Ten viable start-ups have come from here, and some members have been funded to set up companies that are about to become global," he says.

One of these is M-Farm (mfarm.co.ke), launched by three young Kenyan women: Jamila Abass, Linda Kwamboka and Susan Oguya. Kwamboka, M-Farm's marketing officer, explains: "M-Farm is a mobile phone



service that delivers real-time information to farmers on current market prices, weather alerts and local agro-suppliers”.

“It also brings farmers together to buy or sell their products in groups, helping them to gain access to larger markets,” and carry out cost-benefit analyses – based on their specific business profile and market prices in different countries – before deciding where to sell the product, Kwamboka says. An interactive voice-response mechanism – operating in both English and Swahili – answers farmers’ queries.

Another innovation – now a fully fledged business – is Kopo Kopo (kopokopo.com), a platform that small and medium-sized enterprises (SMEs) can use to manage payments via mobile phones and to build customer relationships. Kopo Kopo has partnered with Safaricom, a leading Kenyan mobile network operator, to allow users of Safaricom’s M-PESA money transfer service to buy goods from SMEs throughout Kenya.

And the mobile phone application iCow (icow.co.ke) helps smallholder farmers

by providing them with innovative tools to reduce risks in their day to day activities production. Dairy and poultry farmers have access to knowledge as well as experts and customised calendars for their livestock on the mobile phone platform. iCow prides itself in building ecosystems for farmers and brings intentionality to their work, resulting in improved yields and incomes. Farmers pay three Kenyan shillings for each SMS received from the iCow agricultural platform and on average pay half a dollar a month for each subscription.

OPPORTUNITIES AND CHALLENGES

Gitonga says the iHub has been so successful that people from other African countries have come forward to enquire how they can replicate it. Rotich, *Ushahidi’s* co-founder, notes that iHub projects outside Kenya are at different levels of development, and that some countries do not have an iHub at all because of the weakness of their information and communications technology (ICT) sectors. Different plans are in place to help them obtain funding and provide free ICT courses to communities.

For example, she says Zambia has little in the way of an ICT sector. Rotich adds that iHub will help Zambia seek funding to offer ICT courses at a subsidised cost and, later on, for free.

Back home in Kenya, space has been a key challenge. “When we opened, we thought the space was much larger than we needed,” says Gitonga. “But within three months, it was too small for us and we could not allow more than 50 people to use it concurrently. So we came up with our membership system to ensure that those who really need the space are hosted here.”

Other challenges are financial viability and sustainability. “We started with an initial grant from Omidyar and Hivos, but we needed to make this initiative sustainable,” explains Gitonga. “So we set up initiatives that offer services to the tech community, with any profit being ploughed back to the iHub.”

These include M-Lab, launched in 2011 – a collaboration between the iHub, the

University of Nairobi and the World Bank that offers mobile phone-based training on developing applications, for a fee. “Many people who want to be developers come in, but we train them beyond software development to start viable businesses,” says Gitonga. So far, 150 people have been trained at the M-Lab and, out of those, about 20 have gone on to set up their own businesses.

Overall, the iHub’s success hinges on collaborative efforts between individuals in the technology sector who come together to share innovation for the benefit of many. Whatever the sector – from farming to health – if context and need are well-defined, such initiatives can easily be replicated across the entire African continent.

SOWING THE SEEDS OF STABLE AGRICULTURE

Author: Théodore Kouadio, *SciDev.Net* correspondent in Côte d'Ivoire

Location: Senegal
From: 1963 to present
Implementing Agency:
Institute of Food Technology (ITA)
(www.ita.sn)

Senegal's food tech institute helps train local women and farmers so they can add value to their products and earn a better living.

Théodore Kouadio studied law and marketing at the University of Côte d'Ivoire

and in Greece and then, in 1998, began working as a journalist for *Fraternité Matin*, where he became online editor in 2003. He was one of the mentors for a programme on science journalism run by the World Federation of Science Journalists from 2010 to 2012.

Théodore has won several international journalism prizes, including: a WASH Media Award in Senegal (handed out by the Water Supply and Sanitation Collaborative Council), the African ICT-Media prize in 2005, best journalist of West Africa 2008 and the 2010 Lorenzo Natali prize. He has been *SciDev.Net's* correspondent in West Africa for the past three years.



FOCUS ON WOMEN

The Institute of Food Technology (ITA) has about 90 researchers and scientists 19 per cent of whom are women, and has developed many technologies in the area of food processing. Using 'training of the trainers' approach, the ITA is managing to train more than 100 women farmers per year.

The ITA trains women on quality standards and technology for food processing. This training strengthens the economic power of women in Senegal. The institute also helps women's associations to develop and professionalise small-scale food processing, while offering women a vital source of income. "Previously, some worked for three weeks to earn just 1,300 CFA francs [less than US\$3]. Now they earn over 2,000 CFA francs [over US\$4] per day," says the director of the NGO, African Renaissance Women of West Africa (RAFAO), Ms Khady Fall Tall.

For example, Sofie Seck owns a small grain-processing business. Before she started it, Seck had attended a training course at the ITA, which allowed her to master new processing techniques.

She began her business with a single product, cracked corn. The processing was done at the ITA before the company had its own equipment and premises. She quickly diversified production, introducing, for example, cornflour for children. The company started with a production of 50 kilograms per month. It now has the capacity to produce between seven and 11 tonnes of flour per month depending on the time of year. Seck has also hired 15 employees – ten permanent and five temporary staff.

Today, the company exports its products in French, Ivorian and US markets, mainly selling to Senegalese immigrant communities there.

The fruit sector is another big area where women, from both villages and cities, are very involved in ITA's work through marketing and processing. To fully benefit from the economic value of locally-grown fruit, ITA and some NGOs train women's groups on the processing fruit to make value-added products such as drinks, jams and syrups. "Women use traditional techniques to produce drinks," explains Malick N'dao.

"AFBARD, the Association of Women Bassire Resident in Dakar, is a small structured economic interest group business involving 30 women from the same village in Casamance. This association has benefited from training run by ITA," N'dao adds. This training enabled the association to transform fruits more effectively into value-added products, including hibiscus syrups and juices made from monkey bread, ginger and tamarind. The level of the association's monthly production was between 600 and 700 units of juice at the beginning. The level is now between 1,000 and 1,200 units per month.

SWEET DEAL

Since 2009 the ITA has also been implementing another major project to train women farmers in the north of Senegal on producing new varieties of sweet potato and using them for producing several products such as sweet potato puree, flour, jams, scones, cookies and cakes. For the director general of ITA, Ababacar Sadih Ndoye, there are several economic benefits of this project, such as increasing the value of a primary agricultural commodity, local production of food products and reducing imports of equivalent ones. New sweet potato-based products became very important for Senegal, according to Ndoye.

"Yields increased from 30 to 40 tonnes per hectare. Today the sweet potato ranks fifth

among food products in the country behind the onion, cherry tomatoes, industrial tomato and cabbage. This strong growth in production has been accompanied by improvements in quality that allows producers to earn revenues ranging between 2.5 and 4.5 million CFA francs [US\$5,240-9,400] per hectare,” Ndoye says.

The project also aimed to promote the sweet potato in the context of crop diversification in the Senegal River Valley. “It is mainly a question of the achievement of food security and poverty reduction,” says Mamoudou Dème, director-general of the Senegal River Delta development and exploitation company (SAED). Sweet potato agriculture occupies about 4,000 hectares of the river valley. Therefore, Dème considers the initiative to have been motivated by an insistent demand from producers of the valley, particularly those living around the Lake Guiers, who are major producers of sweet potato in Senegal.

Sadiarra Niang has got a field of eight hectares around the village of Pakh. He explains that, the production of sweet potato has become the main agricultural activity of the population. According to Niang, the business is growing and attracting large number of workers, so it has become a cash crop. Workers come from several areas of Senegal. “Our workers come from Luga, Tambacounda and sometimes from Gambia during harvest periods,” says Sadiarra Niang.



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ENSURING QUALITY IN THE FACE OF CHALLENGES

Agriculture in Senegal is famously precarious, with production and livelihoods vulnerable to fluctuations in weather and global commodity prices. To ensure the high quality of Senegalese agricultural products and keep them competitive in today’s highly dynamic market, ITA has five research laboratories focused on: phytosanitary analysis; microbiology; chemistry; mycotoxins (harmful chemicals produced by fungi); and biotechnology.

“Our vision is to become a centre of excellence, providing targeted research for

sustainable development, and ensuring training [for food professionals] and quality assurance for the public and private sectors in Senegal and Sub-Saharan Africa,” explains Ndoye.

The ITA is awarded an average of 50 contracts a year, both from the private sector and in public development projects, to carry out research and develop products. It won the Islamic Development Bank’s Prize for Science and Technology in 2007 in view of the importance of the research it is doing and its contribution to the development in Senegal in general. Receiving this prize has given ITA a greater

profile within the community, and the prize money was used to support the institute’s operations and invested in initiatives to motivate staff.

It also offers technical assistance to small and medium-sized enterprises and training of technicians in the farming industry, women’s organisations and agricultural extension workers, among others. Ndoye believes the ITA can serve as an exchange platform for all actors involved in the food production industry, from agriculture and agroforestry to cattle-rearing and fishing.

EQUIPPING GIRLS WITH SCIENCE TO DRIVE CHANGE

Authors: Ntaryike Divine Jr, *SciDev.Net* correspondent in Cameroon

Location: Doula, Cameroon
From: 2001 to present
Implementing Agency:
The Rubisadt Foundation
(<http://rubisadt.org>)

For the past ten years, an NGO in Cameroon has been educating female students in science and technology to help them shape a brighter future.

Ntaryike Divine

Jr is a journalist and alumnus of the US State Department's International Visitor Leadership Programme for investigative journalism. He is the *Voice of America's* correspondent in Cameroon and a stringer for several news outlets, including the *Associated Press*, *SciDev.Net*, *Think Africa Press* and *Africa Report*. He was named Cameroon Journalist of the Year in 2009 and won an award for Best Discovery Story in 2010. He graduated in October 2012 with a distinction in science journalism cooperation.



FROM FRUSTRATION TO HOPE

[DOULA] From behind the walls of a humble-looking building in Bali, a residential neighbourhood of Doula, Cameroon's fast-paced economic hub, comes a steady, low hum. It emanates from around 20 women – avid learners immersed in science theory and hands-on practice.

They are just a small fraction of an emerging generation of women scientists soon to hit the ground running after graduating from an education programme initiated in 2001 by a local NGO, the Rubisadt Foundation. Officials say its genesis was motivated by a conspicuous apathy towards science and technology education demonstrated by girls in Cameroon. "I was not happy with the way the sciences were taught," says Florence Tobe Lobe, founder of the foundation and a PhD graduate from the University of Paris-Sud, France, who returned home to Cameroon in the late 1990s to find what she termed "appalling realities demanding urgent change".

"Students just memorised concepts they didn't understand," Lobe says. "They didn't do any practicals and had no real-world experience of what they were learning." She says that, despite their brilliance at primary school level, an alarming number of girls were forced to quit secondary school as a result of soaring financial burdens and social pressures.

Figures from the UN Children's Fund (UNICEF) indicate that, despite constituting more than half of the population, women make up only 4.5 per cent of the country's university student population. Most end up as key drivers of the country's flourishing informal economy, where they control more than 80 per cent of activity. Lobe says the Cameroonian trend is representative of Sub-Saharan Africa, where girls are generally blocked from their potential contribution to growth and development.

FINE-TUNED FOR SUCCESS

In the dozen years since its inception, the Rubisadt Foundation has been fine-tuning its curriculum. It now offers a holistic learning package, blending pragmatic science and technology lessons with career development programmes. Its sessions target secondary school girls aged 11 to 19, selected on the basis of interest and potential to excel in science, through supplementary after-school classes.

"Before starting the foundation, I saved my earnings because I wanted the project to be self-sustaining," Lobe says. She funded a team of 12 specialised educators, instilled with the foundation's methodology of mentoring girls in analytical thinking and autonomous problem-solving – important additional skills to the country's formal secondary education curriculum. The educators lead the students through small-scale laboratory experiments, and take them on excursions to engineering firms, public debates and scientific conferences to help bridge gaps between concepts and reality, and complement the effort of the formal education system.

Bintu Coulibaly, one of the foundation's students from Mali, says: "I have gained a lot of self-confidence. I used to be very timid. But today, I can talk science and technology anywhere with a lot of self-assurance, because I have mastered what I've learned. Science is no longer abstract to me."

SHINING EXAMPLES

There are 300 official alumni, though the school has seen up to 1,000 girls taking part in some courses and conferences. Among them, are many who have not only lifted themselves out of the prevalent poverty ensnaring especially Cameroonian women, but are also contributing to boosting the living conditions of their siblings as they find jobs both within and without Cameroon.



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Others are currently flourishing in several universities and in the corporate arena worldwide. Among them is Jessie Wamal, a 2011 graduate who is soon to graduate with a degree in computer sciences from HEC Paris, in France. Another, Judith Joëlle Mbondji, spent five years working at the African Union, after graduating with a BSc in computer science and an MBA from Kenya. She returned to Cameroon in 2011 and currently devotes part of her time to volunteering as a mentor at the foundation.

"We have big dreams for our next generation of girls to become real actors in the country, in Africa and in the world," Lobe adds. Its success, according to Lobe, is hinged on the choice of its instructors. "These are young women who go through a particular training fashioned by Rubisadt according to their needs. So, the teachers not only come to school to teach, but also to build one-to-one relations with the children and that way they can identify their individual problems and work towards giving them confidence alongside the learning process. It works very well," she says.

Lobe's dream is to scale up the initiative by opening other Rubisadt schools in Cameroon and across Africa, to help lift more and more girls out of poverty by empowering them with science and technology knowledge. She says that, over the past decade, the Rubisadt Foundation model has proven feasible and is replicable anywhere worldwide.

The graduated Rubisadt girls have been making regular financial contributions to ensure the sustainability of the school. Lobe believes the increasing alumni numbers implies bigger charitable donations in



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coming years. "Most of them currently working or furthering their education both in Cameroon and abroad have expressed strong desires to contribute financially,

materially and even personally to our plans to open similar institutions across Africa and make them sustainable" says Lobe.

FUNDING THE FUTURE

The Rubisadt Foundation's space is being fitted with a live-in centre for girls from particularly impoverished backgrounds. It already operates a micro-science laboratory for basic applied science lessons, a multimedia computer laboratory offering possibilities for distance-learning, a science library, and medical and cultural centres. This is funded by the foundation's membership fees, as well as financial support from family, friends and international donors.

UNESCO, for example, through the TVE Rubisadt-UNESCO Gender Pilot Project, is working with the Rubisadt Foundation alongside the government and local communities to train marginalised girls and women aged 15-35 to help reduce early school drop-outs living in rural areas. The aim is to help them develop an entrepreneurial mind and to be creative and autonomous, serving communal interests while improving their living conditions and social status.

But Lobe says that amid the venture's local and global praise, diminishing funds represent a huge challenge. She hopes that new funding models will guarantee sustainability. "People now need to know that this quality of education cannot be free of charge," she says, adding that eventually students will be expected to pay comparatively reduced tuition fees of between US\$550 and US\$1,000 each year. "It's not that expensive if you compare it with private secondary schools," she says.

David Mbiba, an education inspector, says he thinks it is worth the sum. "It's a complete education on offer for our girls, who always shy away from the sciences," he says. The Cameroonian government has also provided support, and has granted the Foundation authorisation to open a conventional school for girls taking scientific courses, "which will have a specific Rubisadt flavour with a focus on science and technology", Lobe says. It is now in negotiations with local companies and multinationals over scholarship funds and guarantees of future employment for graduates.

BUILDING A BRIGHTER FUTURE FOR AFRICAN RESEARCHERS

Authors: Maina Waruru, *SciDev.Net* correspondent in Kenya

Location: Headquartered in Nairobi, Kenya
From: 1980 to present
Implementing Agency: ANSTI (www.ansti.org)

Since 1980, an African academic network has been supporting scholars across the continent to achieve their postgraduate study goals.

Maina Waruru

is a Nairobi-based freelance journalist with 15 years of experience specialising in science, higher education and development. He previously worked for Kenya's leading dailies, including *The Daily Nation* and *The Standard*, and currently writes for *SciDev.Net*, *University World News*, the *Indo Asia News Service* and Reuters Foundation's *AlertNet* among other online publications. Maina is one of *SciDev.Net's* most prolific writers, contributing regularly since 2009.



● A LUCKY BREAK

For many years, Irene Wattanga has been one of only a handful of women working as a university mathematics lecturer in Kenya. She first worked as an assistant lecturer at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) in Nairobi, before becoming a fully fledged lecturer in the late 1990s.

But her desire to become a more accomplished master of mathematics – a subject widely shunned due to its perceived difficulty – kept growing. So she applied for a doctoral scholarship, an award that many crave but few achieve. Wattanga's lucky break came in 2000, when the African Network of Scientific and Technological Institutions (ANSTI), an NGO that promotes the development of African science and technology through training and research, awarded her a three-year PhD scholarship to study at the University of Botswana, Gabarone.

● LONG ROAD TO SUCCESS

Established by UNESCO in 1980 with funding from the UN Development Programme (UNDP) and the German government, ANSTI has spent the past 30 years providing postgraduate scholarships, short-term training, visiting fellowships and grants to African scholars to help build their capacity in science, technology, engineering and mathematics (STEM).

The network was conceived in response to the outcomes of the Conference of African Ministers of Science and Technology, held in Dakar, Senegal, in 1974. At that meeting, the African ministers urged UNESCO to help African universities and research organisations engaged in training and

research in science and technology to link-up to enable them to pool their human and material resources and contribute more effectively to the application of science and technology to development in Africa.

According to ANSTI's coordinator, Peggy Oti-Boateng at UNESCO's Nairobi office, its initial aims were to develop a "critical mass of scientists and engineers" by establishing centres of excellence within the ANSTI network's member universities, by promoting research and through collaboration on research projects, and producing textbooks and publications. "ANSTI regularly commissions member institutions to publish policy briefs, discussion papers and books on emerging issues in science and engineering" Oti-Boateng says. There are more than 100 such policy briefs and text books, as well as electronic curricula in science and engineering, and the *African Journal of Science and Technology*.

Oti-Boateng explains that "Since 2005, ANSTI has hosted a biennial Conference of Vice-Chancellors, Provosts and Deans of Science, Engineering and Technology (COVIDSET) to provide a platform for university leaders, policymakers, development partners, international scientific and engineering networks and the private sector to exchange ideas, examine challenges and opportunities, explore solutions and forge ahead to ensure the relevance of these fields in our new and changing world." One of its key outputs is the qualitative and quantitative analyses of science and engineering university training in Africa. In 2005, based on such analysis the Dutch government provided a grant of US\$ 1.3 million to enhance the capacities in training and research for African universities. Other development partners such as the

African Development Bank continue to fund the ANSTI publication of the *African Journal of Science and Technology* on the recommendation of COVIDSET 2011.

The fifth conference took place in 2013, alongside a meeting for Africa's education, science and technology ministers – an indication that governments appreciate ANSTI's role and continue to recognise the critical part that science plays in Africa's economic transformation and in attaining its development goals, says Oti-Boateng.

● NURTURING POSTGRADUATES

But it is the mobilisation of resources for postgraduate grants such as Wattanga's that has created the most impact. Since its inception, ANSTI has awarded more than 300 master's and PhD scholarships to students across Africa. They are part of the critical mass of Africa's scientists and engineers. They work on teaching the application of science and engineering across various fields of academia and industry both in the private and public sectors. Among them, there are vice-chancellors of prestigious African universities and directors of research institutions, ministers of education, science and energy, and policymakers.

Competition for scholarships has been stiff, with stringent selection criteria. In 2013, for example, there were 150 applications – with ten of them from women – for just eight places. And the small number of women applicants reflects the fact that there are not that many women in STEM, but, according to Oti-Boateng, more women are now being encouraged to further their science careers after their first degree. They are being given priority in awarding of scholarships, and a percentage of available places are reserved exclusively for them. A lack of funds is still "a huge challenge, as demonstrated by the high number of applicants and the few we are able to take," Oti-Boateng says.

The grants programme's main funders are UNESCO and the German Academic Exchange Service (DAAD), with the Carnegie Corporation of New York and the government of the Netherlands also making substantial contributions over the past five years. And, more recently, African governments and regional bodies have also been showing interest. With what Oti-Boateng describes



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as an increased realisation among African governments that science and technology are critical to attaining development goals, ANSTI is now working more closely with the African Union, the African Development Bank, and the UN's Economic Commission for Africa.

● SPOTLIGHT ON WOMEN

Private-sector bodies are also getting on board, with a special spotlight on women. In 2011, the European beauty product corporation L'Oréal joined ANSTI's list of partners, launching the L'Oréal Fellowship for Women Scientists in Sub-Saharan Africa. Since 2011, in partnership with UNESCO, the L'Oréal fellowship has supported 35 PhD scholarships for women, with grants of US\$20,000 committed to each student. "This project targets young women and those in mid-level careers aged below 40 years to help them complete their PhD studies," says Oti-Boateng. And the scholarships have proved popular: 500 women applied in 2013 alone.

● HURDLES TO PROGRESS

Besides the struggle to find funding, ANSTI has found that some countries have been slow to engage with the programme, with the result that these countries have fewer engineers and scientists than others, Oti-Boateng says. ANSTI is now trying to encourage more universities from these countries to become members. Other challenges include the low numbers of journals produced by African universities, the lack of adequate, relevant and updated textbooks, and the scarcity of science and engineering faculties.

Inadequate pay for university teachers, a failure to align training with industry needs

and the fact that many science graduates seek careers in more lucrative fields such as banking are also major hurdles to the growth of science in Africa. In response, ANSTI has been encouraging universities to improve working conditions to retain teachers and has been encouraging undergraduates to pursue careers in science, a difficult task since sectors such as banking also prefer analytically minded people like science graduates.

SHINING EXAMPLES

The ANSTI network encompasses close to 200 faculties and institutions in 35 countries. Wattanga is a shining example of ANSTI's ability to help scholars – and women – attain their academic ambitions. She is now an associate dean at the engineering faculty of Kenya's Multimedia University and says her doctorate enabled her to improve her research skills and use modern scientific methods to mentor young scientists.

Having succeeded in a subject "considered a male preserve", she says that her teaching mathematics is an inspiration to her students both female and male. And she has ideas for how ANSTI can continue to empower its students.

"I wish to see ANSTI plan more workshops to enable its alumni to meet and encourage and mentor prospective beneficiaries; see a proper alumni association formed; and for joint community projects to be initiated," she says. "This way, the benefits of ANSTI will be felt more widely."

A WEST AFRICAN SOLAR REVOLUTION

Authors: Christophe Assogba, *SciDev.Net* correspondent in West Africa and Ntaryike Divine Jr, *SciDev.Net* correspondent in Cameroon

Location: Benin, Burkina Faso and Mali

From: 2009 to present
Implementing Agency: UN Development Programme (www.undp.org)

Benin: Agence Béninoise de l'Électrification Rurale et de la Maîtrise d'Énergie (ABERME) (<http://aberm.org/>)

Mali: Centre National de l'Énergie Solaire et des Énergies Renouvelables (CNESOLER)

Burkina Faso: Société Nationale d'Électricité Burkinabè (SONABEL) (www.sonabel.bf)

In 14 off-grid villages across West Africa, the Sun is being harnessed to provide energy for lighting, cooking and even community television.

Christophe D. Assogba

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FROM DARKNESS TO LIGHT

When the Sun goes down in many villages across Benin, Burkina Faso and Mali, most activities cease. Shops close, business stops for the day, and children are forced to do their homework by the light of polluting and hazardous kerosene lamps or candles. Rural connection to the national power grid in these countries is expensive and a logistical minefield. But there is a realistic solution, which some remote communities are beginning to embrace: solar power. Benin, Burkina Faso and Mali are ideally suited to solar photovoltaic power: every year, they receive up to 3,000 hours of intense sunlight, which could be harnessed to provide much-needed energy to isolated communities.

Supported by the UN Development Programme (UNDP), 14 villages across the region – Hon, Koussoukpa, Sirakorola, Tinkaré, Bilinga, Bougouré, Fili, Kalsagado, Kayéré, Kire, Son, Yallé, Ziga, Leba – now have access to life-changing solar power.

POWERING WEST AFRICA

Since 2009, when the project launched, much has changed. The villages now have solar-powered lights and cookers, can charge their mobile telephones and even watch television on their communal set.

In Hon and Koussoukpa, Benin, 308 of around 1,000 households are now solar-powered. In Sirakorola, in southwestern Mali, the

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administrative headquarters, school, town hall and mosque are powered by solar energy. And so is the village's health centre, which is equipped with a refrigerator, freezer and solar water heaters. Solar street lights illuminate the marketplace and the villagers have solar-powered cookers, units for keeping milk cool and facilities for charging batteries.

Three hundred kilometres away, in Tinkaré, Mali, solar power activates the village wells' water pumps, now making the two poorly kept gasoline- and diesel-powered generators unnecessary. In Burkina Faso, some 600 households in six villages have been fitted with solar power. "Life now goes on well beyond nightfall and children can read and revise for their lessons for longer periods," says Rosalie Congo, country coordinator of the Global Environment Fund. At Boala in the north of the country, household breadwinners say they are spending less on kerosene and torch batteries.

COMMUNITY OWNERSHIP

These solar electrification projects are mostly funded by the UNDP, but community donations are also a key component: most of the population pay small, voluntary subscriptions, which has the added benefit of boosting community involvement and ownership of the projects. In Sirakorola, for example, villagers contributed ten per cent of the total production costs, which are estimated at 34 million CFA francs (around US\$70,000). People also contribute towards the costs of maintenance and infrastructure renewal. In participating communities, each beneficiary family pays a monthly fee for the technical maintenance of solar installations. In Burkina Faso's solar villages, for example, the amount per family is US\$10.

Solar electrification requires thorough maintenance and therefore training. Funded by the UNDP and national governments, solar power specialists train villagers in installation, maintenance, network operations

and equipment renewal. Prior to the implementation phase of the project in Burkina Faso, six illiterate rural women aged between 40 and 50 were selected from across the country and sent to the Barefoot College in New Delhi, India, for six months hands-on training on solar energy systems installation, maintenance and network expansion. "The women, all mothers, were selected by their various communities in a democratic manner and basically on the basis of their contribution to the growth of their communities," explains Congo.

Upon completion of the course, each of the women returned home to install solar power units that are now supplying electricity to some 100 homes in each of the six villages. They are now qualified solar engineers and work almost full time in electronic workshops built for the participating villages. They are tasked with maintaining the units and they get ten per cent of the monthly 5,000 CFA francs [about US\$10] paid by every household connected to the supply grid as a monthly fee. In addition, each of the newly trained engineers must train another woman from their community as their assistant.

The UNDP says that in Mali, with 99 per cent of rural communities off the national electricity grid, the advent of solar power is encouraging economic activities. Women are watering their small-scale vegetable farms with solar-powered pumps and saving



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on money they would have spent buying kerosene and charcoal.

Nana Sangaré, deputy mayor and chair of a women's association in Sirakorola situated some 120 kilometres from the capital Bamako says she now comfortably provides for her seven children's needs from increased income she makes from selling vegetables and locally made yoghurt. "Before this project, we didn't have any income at all. Now I earn 3,000 CFA francs daily (around US\$6)."

In Benin, Burkina Faso and Mali, the UNDP provides the bulk of financial support for the projects with the rest coming from the various country governments and community contributions.

The technical problems that face communities using solar power include the delay in the delivery of some replacement parts and equipment; which can leave the public places or families without light for months. "If we have a mechanical breakdown," says Sangaré, "we don't need to go all the way to Bamako to find a technician anymore". In fact, we have our own spare parts stores. In Burkina Faso, village spare parts supply shops and maintenance workshops set up as part of the project are mostly run by women. When revenues fail to cover the costs of maintenance and spare parts, communities turn to the government or NGOs to help them. Sometimes, local authorities step in to fix technical problems.

REAPING THE BENEFITS

Greeted with joy by the villagers, the introduction of solar energy has given rise to popular festivals of culture and art. And Fatoumata Sangaré, president of Sirakorola's Women's Association, says the solar equipment helps greatly with women's daily tasks. The villagers say solar electrification has generated additional revenue through a "virtuous circle of local development".

Seydou Coulibaly, a shopkeeper in Sirakorola's market, explains: "Since we had solar energy in the village, my business has been more successful. Before, when the darkness set in, I closed my shop. But now I sell late into the night and my business has grown."

And Buchi Sane, a Sirakorola vegetable seller, says: "With the electricity, I keep my

products refrigerated and I sell them the next day. But before, I just threw the spoiled ones away unsold and suffered much loss. The electricity has helped me to improve my income." Sane is now even considering going further afield to sell her products.

At the solar power project launch in Burkina Faso's northern region, Khalil Boukari Bara, the regional governor, said: "The electrification of these areas provides benefits, and access to modern opportunities, production and marketing. It contributes to job creation, and the determination of young people to stay on their land and fight against poverty."

For Rudolph Attédé, an electronics engineer specialising in renewable energy in Benin's economic capital, Cotonou, solar energy's advantages for rural communities are well established. "Firstly, the material

is not too expensive, requires no major maintenance and the average lifetime of a PV [photovoltaic] module is 20 years. The only difficulty is the management of end-of-life materials that are hazardous waste," he says.

There are plans afoot to roll out the project to other parts of Benin, but the UNDP warns that there must be clear signs of feasibility. To ensure sustainability at la Boucle du Mouhoun community in southwest Burkina Faso, for example, villagers have set up a seven-member management committee that include four women to manage subscriptions and maintenance spending. The example has been replicated in all the country's six beneficiary communities, with the goal of using generated profit to purchase more material for network extension.

MOBILE TECHNOLOGY SUPPORTS FRONT-LINE HEALTH WORKERS

Author: Munyaradzi Makoni, *SciDev.Net* correspondent in South Africa

Location: Cape Town, South Africa
From: 2012 to present
Implementing Agency:
South African Medical Research Council (www.mrc.ac.za),
University of Western Cape (www.uwc.ac.za),
Health Systems Trust (www.hst.org.za), and
North West Department of Health (www.dohsoc.nwpg.gov.za)

South Africa's overstretched primary healthcare service is being reshaped by a project that uses mobile technology to improve people's health.

Munyaradzi Makoni writes about science from Cape Town, South Africa. He mainly writes about African science research for *SciDev.Net*, about higher education for *University World News* and about the research funding landscape in Africa for *Research Africa*. His articles have appeared in *Research Caribbean* and other outlets. In 2011, he was awarded a Research Africa/IDRC science journalism fellowship. He is one of *SciDev.Net's* most regular contributors, continuously reporting in news, blog posts and features since 2008.



POWERING THE COMMUNITY

Primary healthcare in South Africa is notoriously overstretched and under-resourced, making the daily demands of record-keeping, home visits and patient monitoring a challenge for workers. Telemedicine – the remote provision of healthcare using information and communications technology (ICT) – holds great promise for a country with a healthcare worker shortage. It is also an opportunity for innovative private service providers.

Mobenzi (www.mobenzi.com) – a company that provides technology and professional services to organisations involved in research, statistics collection, logistics and community service delivery – provided the answer. Using a mobile-powered programme that aims to manage healthcare more efficiently, Mobenzi has become the backbone of a project to reengineer public healthcare. Previously, all record-keeping, reporting and planning was paper-based, severely limiting timely access to information, says Andi Friedman, Mobenzi's director.

"The logistical and administrative burden on public healthcare workers jeopardises the ability of these teams to deliver on their mandate to provide efficient primary healthcare, and lack of data makes decision-making difficult," he says. Mobenzi has radically streamlined this process. A portmanteau of 'mobile' and the Zulu word 'umsebenzi' (which means work), Mobenzi enables community health workers to feed information into their mobile phones, which then sends state of patient's health to a centralised computer system.

Mobenzi itself dates back to 2004, when it was developed by Clyral, a Durban-based

software development company initially set up to support organisations that wanted to collect various data using mobile technology in fields including healthcare. In 2006, Clyral created Mobenzi Researcher, which allows organisations to capture relevant statistics in remote locations using standard mobile phones. So when, in 2007, the Health Systems Trust (HST) – a South African non-profit organisation that promotes primary healthcare delivery across Southern Africa – needed to collect primary healthcare information in rural communities, it turned to Mobenzi.

The Mobenzi team used mobile phones to collect data on health from communities – and was so successful that Clyral's engineers went on to develop a full-scale generic platform to collect information from the field through mobiles. Friedman says the organisation has been expanding its capabilities ever since.

PILOTING INNOVATION

In 2012, a pilot project, using a refined version of Mobenzi, was launched in the country's North West province. The project was commissioned by the Medical Research Council and the University of the Western Cape in collaboration with the North West Department of Health and HST.

It aimed to demonstrate the role mobile technology can play in supporting the work of community health workers – the majority of whom are women. These are the outreach teams that provide services to communities otherwise lacking healthcare access.

The project involves three clinics, one team leader, and ten community health workers who service more than 1,600 households.



Patients' records are centralised and accessed through Mobenzi, which community health workers can update from the field, and the programme has become a management tool for their workflow and patient visit scheduling.

The programme has support tools that enable community health workers to identify and treat conditions, while allowing for remote consultations and the referral of cases to specialists electronically. Inbuilt text messaging enables interaction with patients as well as appointment reminders. Community health worker activities, workloads and data verification are recorded, and the web interface allows for supervision, reporting and entry of new information. Mobenzi supports 500 different handset models, including most low-cost feature phones.

● STREAMLINING HEALTHCARE

Friedman explains that, to date, the Mobenzi pilot scheme has enabled automated visit scheduling in accordance with the latest government guidelines for prenatal and postnatal care for children under five. The project has facilitated electronic referrals and feedback on referral outcomes, and healthcare workers can now manage their entire workload, including helping patients comply with treatment plans, Friedman says.

Mobenzi also enables the submission of official reports of workers' rosters and care monitoring distribution. And clinics can

now report births with an automated text message notification sent to community health workers. The outreach team piloting the project currently services more than 1,200 patients and more than 8,000 patient visits have taken place. They have facilitated more than 250 clinic referrals, with 70 per cent of clients taking up referrals.

● REAPING THE REWARDS OF INNOVATION

In May 2013, Mobenzi was shortlisted for the second Innovation Prize for Africa, which celebrates practical solutions to some of the continent's most intractable problems. Friedman says the success of the project hinges on its participatory approach, with feedback from all stakeholders – particularly those on the ground – being used to guide each iteration.

The approach accommodates a flexible technology platform, enabling quick configuration as requirements change. In addition, a multidisciplinary team – including health experts, research scientists and engineers – enables rapid decision-making, he says. "Outreach teams are the primary stakeholders impacted by the technology. By empowering these teams to be more effective, improving links to primary healthcare facilities and providing support to front-line care workers, the communities they serve will benefit," says Friedman.

Ronel Visser, HST's acting chief executive officer, says good-quality data is crucial for

the successful planning and implementation of public health projects, and that initiatives such as Mobenzi will play a more prominent role in future health interventions.

As personal health information will be transmitted remotely, fears have been raised on how this data will be shared, stored and managed by health practitioners. To protect people's right to privacy Visser says they took measures to safeguarding patients' health information falling into wrong hands. "Issues such as standards, data security, confidentiality and ensuring valid and reliable back-up systems were important considerations when planning projects of such nature," she says.

COSTS AND SUSTAINABILITY

Friedman says South Africa's national development plan has committed to the community health worker-based approach, and that the anticipated costs for empowering these workers using mobile technology will be a fraction of what it costs to run the primary healthcare programme.


The project is already being replicated, with training under way for two additional teams in the Western Cape that will focus on detecting tuberculosis and providing treatment support.

DIGITISING MALARIA HOTSPOT MAPS SAVES LIVES

Author: Munyaradzi Makoni, *SciDev.Net* correspondent in South Africa

Location: South Africa, Africa (phase I); Swiss Tropical and Public Health Institute (Swiss TPH), Basel, Switzerland (phase II)
From: 1996 to 2010
Implementing Agency: The Special Programme for Research and Training in Tropical Diseases (TDR), a co-sponsored programme of UNICEF, UNDP, the World Bank and WHO (www.who.int/tdr)

Since 1996, an African-European collaboration has been collecting widespread data on malaria to help map prevalence and drive appropriate health responses.



Munyaradzi Makoni writes about science from Cape Town, South Africa. He mainly writes about African science research for *SciDev.Net*, about higher education for *University World News* and about the research funding landscape in Africa for *Research Africa*. His articles have appeared in *Research Caribbean* and other outlets. In 2011, he was awarded a Research Africa/IDRC science journalism fellowship. He is one of *SciDev.Net's* most regular contributors, continuously reporting in news, blog posts and features since 2008.

MAPMAKING FOR MALARIA CONTROL

[CAPE TOWN] Malaria is one of the world's biggest killers. In 2010, an estimated 660,000 people lost their lives to the disease – most of them children in Africa, where a child dies from malaria every minute. Until recently, however, it was difficult to access information about the locations of Africa's malarial hotspots or how they are influenced by the weather there. Information about the continent's malaria distribution was scattered across published and unpublished documents, often gathering dust in libraries.

But now, thanks to a digitised malaria mapping database that brings together all available malaria data, the disease no longer has the 'blind killer' status of past decades. MARA – Mapping Malaria Risk in Africa (www.mara.org.za) – was launched in 1996, with initial support of US\$10,000 from the WHO's Special Programme for Research and Training in Tropical Diseases (TDR) to map information on malaria prevalence across Africa. The project's first phase (1997-1998) aimed to produce an accurate atlas of malaria risk for Sub-Saharan Africa.

The project was set up as a pan-African enterprise, not owned by any specific organisation but coordinated by South Africa's Medical Research Council, in the spirit of open collaboration. A group of scientists, based at institutions across Africa and Europe, worked together on the project. Further funding came from donors including Canada's International Development Research Centre (IDRC), the Wellcome Trust, TDR and the Multilateral Initiative on Malaria (MIM), and the Roll Back Malaria Partnership. African institutions contributed through expertise, staff time and facilities.

Five regional centres – each using a standardised data collection system, were established across Africa. French-speaking

West had an office in Bamako, Mali, while English-speaking West had a base in Navrongo, Ghana. Yaoundé, Cameroon hosted the Central Africa office, Nairobi, Kenya hosted the East Africa post and Durban in South Africa became home to the Southern Africa centre.

The project built expertise among local malaria control staff to enable them to reference the collected data, and it trained epidemiologists, medical doctors and researchers. In total it trained: 33 people to use GIS (geographic information systems) and databases, 23 to study climate change effects on the spread of the disease and 45 to interpret the results for people who might want to use them. Eight people got master's degrees and PhDs on malaria.

MALARIA IN BITS AND BYTES

The mapping project tracked down information on malaria prevalence from both published and unpublished sources to identify malarial mosquito hotspots, disease prevalence and the weather conditions that fuel transmission. The MARA database contains more than 13,000 malaria prevalence surveys collected over 12,000 locations – with 37 per cent in Southern Africa, 33 per cent in West Africa, 25 per cent in East Africa and five per cent in Central Africa. The data remains live but no new material is being added.

The project then disseminated this information to national and international policymakers, distributing 3,000 poster-sized malaria distribution maps to malaria control programmes, health departments and research institutions in malaria endemic countries.

Whereas previously the absence of centralised records had made choosing appropriate solutions very difficult, the



© Sarah Filbey



© Millennium Villages Project

new data systems help countries identify transmission periods, implement control programmes and tailor control measures according to individual contexts – which also saves valuable resources. Rajendra Maharaj, director of the Malaria Research Unit at South Africa’s Medical Research Council, says the project has a strong legacy in the support it provides for the planning of malaria control programmes.

Konstantina Boutsika, an epidemiology and public health researcher from the Swiss Tropical and Public Health Institute (Swiss TPH), in Basel, Switzerland, where the database is now hosted, says the original maps are still available as downloads from the MARA website, as is a CD-rom developed by South Africa’s Medical Research Council to enable easy access to MARA project data.

● COUNTING THE SCORE

Boutsika, who has been at MARA’s helm from 2006, says a project highlight is the first accurate assessment of the malaria burden in Africa, which has been made possible by advances in geographical modelling. “We can now give useful answers with regards to malaria,” she says.

MARA has made its results available through the technical reports published regularly on its website in both English and French. The programme’s main beneficiaries have been identified as scientists, malaria control programme staff and local communities.

Maharaj says the scheme helps alleviate disease and death, especially in children and pregnant women, and has contributed to the efforts to reach the sixth Millennium Development Goal (MDGs) on combating

HIV/AIDS, malaria and other diseases. MARA was also one of 700 projects – selected for their exemplification of practical solutions to challenges – presented at the EXPO2000 world fair in Hanover, Germany. The programme owes its success to its strong team of investigators from participating organisations, Maharaj says: “The big lesson was inter-country collaboration, which is essential for malaria control.”

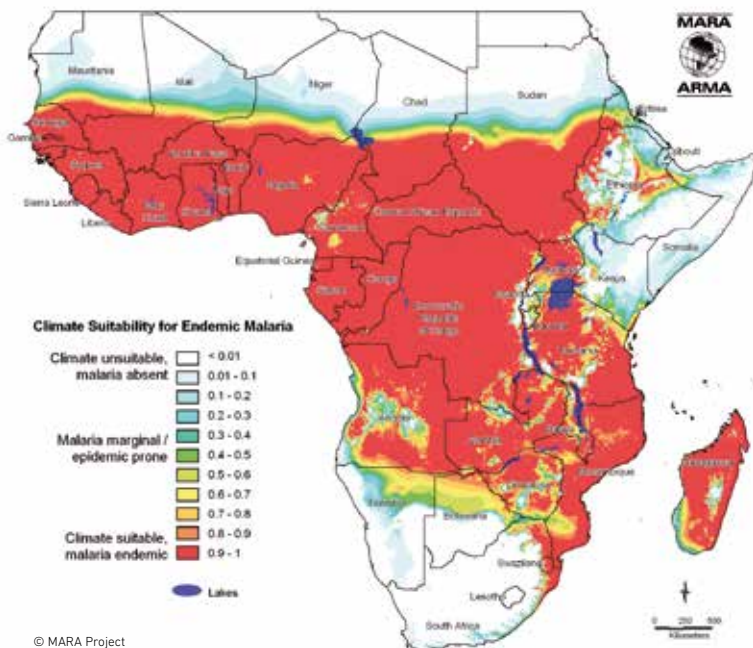
FROM STRUGGLES TO SUCCESS

It has not all been smooth sailing, however. The main challenge was the collection of non-digitised data, explains Maharaj. “But this was overcome by teamwork, whereby malariologists from all walks of life worked within ministries, academic and scientific institutions to source data that was stored in archive boxes, university libraries and government storerooms,” he says. And Boutsika adds that obtaining funding to sustain the programme was difficult because harmonising various databases required a heavy investment.

When funding for research ran dry in 2006, the project was given a new lease of life by the Bill & Melinda Gates Foundation and Swiss TPH, and moved from Durban to Basel, where phase II was launched. In 2009, the software team at Swiss TPH merged the MARA databases from phases I and II and developed a new web interface.

Since then, the MARA database has been in the public domain accessible to registered users and can be downloaded in different formats. Boutsika says researchers individually continue to collect data in Africa and use the MARA database as a sounding board.

Distribution of Endemic Malaria



© MARA Project

Africa: A poster child for putting science to the heart of global development

At SciDev.Net we have been reporting on the role of science and technology in Africa's development since the launch of the website in 2001. At the time we saw the opportunity the internet offered to disseminate freely information about scientific and technical innovation for an audience that would not normally have easy access to journals or research papers.

There are now countless websites posting stories about science, and those posting on global development. But we remain one of the few bringing news and analysis, through the eyes and work of people living and working in developing world regions.

Africa has always been an important site for us, and we now have three regional desks, in Cairo, Nairobi and Dakar, covering stories in English, French and Arabic. This growth in coverage has followed the boom of Africa's economies and support for science.

Over the past twelve years we have reported on thousands of initiatives, and have mapped their rise, and sometimes demise. There have been hopes, grand plans, fears, setbacks and outright failures. But to ensure none of this has been in vain, we must be vigilant about documenting our collective human effort and learning from its result.

In this booklet we focus on the success stories. Those that showed how science and technology can, indeed, help drive local development, providing a range of outcomes from equitable employment to education and affordable energy. We worked hard with our network of local correspondents to identify these stories and examine what it is that made them successful. How is it that they have managed to grow and stand out, winning awards and support from local populations?

But it also looks at the challenges they had to face, in their struggle for sustainable and equitable development.

We would like to thank UNESCO and IDB for this initiative and the scientists and entrepreneurs, citizens and journalists that made each of these stories possible.

Nick Perkins, Director
Mičo Tatalović, News Editor



There is a growing consensus that the incorporation of science, technology and innovation in the development process is an essential component to addressing the needs of underserved populations. It is also recognized that gaps and bottlenecks in various fields such as education, health, agriculture and energy can be resolved with applied technologies and innovations adapted in a sustainable manner to the local environment.

Over the past decade, many science and technology projects in Africa that address development have been initiated with great success and creative innovation. This explosion of activity has created an opportunity for the Islamic Development Bank (IDB), in partnership with the United Nations Educational, Scientific and Cultural Organization (UNESCO) to document the results and processes of these initiatives so that other African countries can also benefit from the lessons and experiences of others. In collaboration with *SciDev.Net* and their network of local correspondents in Africa, these eleven stories from throughout the continent aim to share the various achievements, challenges and ideas on how science, technology and innovation can contribute to a better quality of life and sustainable development.



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