HOME
INVESTMENT & BANKING
ECONOMY
TOURISM NEWS
CONSUMER INSIGHT
INFRASTRUCTURE
TECHNOLOGY
BUSINESS LIFE
IDEAS & DEBATE
COLUMNISTS
THE EDGE
AGRIBUSINESS
IN THE NEWSPAPER
NATION MEDIA

RSS 2.0

The edge

Africa warms up to biotechnology

Written by Ismail Serageldin and Calestous Juma

Scientists at a Kemri laboratory

November 15, 2007: Much of the debate about biotechnology in Africa assumes that African countries are only being asked to accept products developed elsewhere. To the contrary, Freedom to Innovate: Biotechnology in Africa's Development shows that extensive biotechnology research is under way in Africa.

Africa's governments, its industry and its research institutions are well aware of the potential that agricultural biotechnology holds if applied in other ways and to indigenous crops.

A study of 13 public institutions in Kenya, Zimbabwe, Egypt and South Africa showed that biotechnology applications have been performed on 21 crops.

The genes incorporated into the crops include those that confer insect, fungal, viral and bacterial resistance, protein quality improvements, herbicide tolerance, and salt and drought resistance.

In South Africa, for example, about 20 to 30 per cent of yellow maize and 80 per cent of cotton are now genetically modified varieties.

Estimates for 2004 production showed that about 27 per cent of total yellow maize crop (for animal feed) was genetically-modified (GM).

Less than eight per cent of the white maize grown (for human consumption) is GM.

An insect-resistant potato was developed in South Africa in 2001. The goal was to help small farmers to grow this on a commercial scale. The potatoes performed well in field trials but commercialisation has been delayed.

The first GM biotechnology product to be developed in Kenya was a virus-and weevil-resistant sweet potato. This project began in 1991. The sweet potato trials met some setbacks because it is believed that the construct for the virus resistance was not well tested and it did not perform well under field trials.

In addition, KARI in partnership with the international maize laboratory CYMMIT in Mexico has been developing insect resistant transgenic maize. The maize was tested in field trials in May 2005.

Egypt has worked on more varieties of crops than any other country in Africa. The Genetic Engineering Services Unit (GESU) of the Agricultural Genetic Engineering Research Institute (AGERI) in Egypt has been actively involved in micropropagation of Satavia rebaudiana and mulberry, as well as the production of diagnostic kits for detecting viruses in banana, potato, tomato and beans.

Plant biotechnology research at AGERI also includes transferring genes that confer virus resistance, bacterial resistance, insect resistance, stress tolerance and fungal resistance on such crops as potato, cotton, maize, faba beans, cucurbits, wheat, banana and date palm.

Insect resistant potato is another of the major crops that have been worked on in Egypt by AGERI in partnership with Michigan State University in the USA. Several varieties of potato were transformed for potato tuber moth resistance including a widely grown Dutch variety in Egypt, Spunta. Spunta.

The potato has not been commercialised because of trade concerns in the European Union over GM crops.

The Uganda National Agricultural Research Organisation (NARO) opened a new research laboratory in 2003 to conduct work on the genetic modification of banana. The goal was to insert genes that will confer resistance to Black Sigatoka and banana weevils.

Field trials on Bt cotton have been carried out in several countries including Kenya, Zambia, and Zimbabwe. Tanzania and Burkina Faso have recently started field trials, while Mali was slated to start field trials in 2005. However, a cotton trial in Zambia has had to be halted because biosafety regulations were not ready at the time.

Biotechnology is being employed to improve the nutritional content of sorghum thanks to the work of a consortium of institutions from Africa, Japan and the US.

Funded by the Gates Foundation and led by Kenya-based Africa Harvest, the consortium's members include the South African Council for Scientific and Industrial Research (CSIR), the African Agricultural Technology Foundation, the Forum for Agricultural Research in Africa (FARA), and the Agricultural Research Council (ARC) of South Africa.

Livestock is critical to agriculture and to food production in Africa, as it is elsewhere.

Yet, according to some estimates, Africa's livestock community is expected to become the most important agricultural sector in terms of physical products derived from agriculture, such as meat products and leather.

The International Livestock Research Institute (ILRI) is at the forefront of using biotechnology to develop new and improved animal vaccines as well as developing diagnostic tools to combat livestock diseases. These include in particular the high-priority 'orphan' diseases of Africa and South Asia.

Market Open
NSE Live Feed: 11:43:00 AM

Top 5 Gainers

	Average Price	Change (%)
NIC	166.30	+5.25
REA	21.40	+4.39
XPRS	23.90	+3.91
MSC	14.00	+3.32
BAT	139.00	+2.96

Top 5 Losers

	Average Price	Change (%)
HFCK	35.70	-3.51
JUB	196.00	-0.51
KNRE	15.30	-0.33
ACCS	18.60	-0.27
SCBK	203.70	-0.15

The centre's research is also aimed at conserving the wealth of what is called the 'barnyard' genetic diversity of Africa and other developing nations; and for improving the feed value of crops in crop-livestock systems.

One third of its US$35 million annual budget is spent on research in biotechnology.

More than 100 scientists, technicians and students work in an array of fields including bioinformatics, biometrics, diagnostics, immunology, microbiology, parasitology, and recombinant DNA technology.

Specific ILRI projects include research to identify genetic markers for tolerance to African trypanosomiasis in N'Dama cattle, and for resistance to parasites in Red Maasai sheep.

ILRI is currently looking to develop a vaccine against East Coast Fever (caused by Theileria parva) in cattle and preliminary trials with five candidate vaccines are currently underway. The Laboratoire National de l'Elevage et de Recherches veterinaires (LNERV) in Senegal is West Africa's principal veterinary research laboratory.

Established more than 50 years ago, LNERV has extensive experience of research in animal health and husbandry, particularly in developing vaccines. LNERV is also involved in developing diagnostic tools for better surveillance of animal diseases.

LNERV is also involved in developing and implementing disease control strategies in Senegal and broader West Africa.

LNERV has also produced rinderpest and African swine fever diagnostic kits as well as 25 different types of veterinary vaccines equivalent to some 50 million doses per year. New vaccines in the pipeline include those for anthrax, Newcastle disease in rural poultry and Rift Valley fever.

In South Africa, biotechnology is being used to develop molecular diagnostic kits for tick-borne diseases found in livestock.

Where South Africa leads the way is in bringing together and leading consortia of public and private sector groups in developed and developing countries.

One testing kit that was launched in March 2005, for example, was produced through collaborative work carried out by a consortium comprising the University of Pretoria, Utrecht University, Isogen Life Science and the ARC-Onderstepoort Veterinary Institute.

Work is currently underway to transfer genetic material from the indigenous Bosmara cattle to farmers in developing countries using embryo transfer technology.

The aim here is to transfer useful traits in cattle breeds in other countries using conventional animal breeding methods. Several live recombinant vaccines have been developed for use in primates and livestock.

Ethiopia's National Veterinary Institute (NVI) has the capability to study and screen micro-organisms for biological compounds that could have applications in vaccines and other therapeutic purposes. The institute produces viral vaccines against Rinderpest, Sheep-pox, Newcastle disease, African horse sickness, foot-and-mouth disease.

It also produces bacterial vaccines against contagious Bovine pleuropneumonia, anthrax, and blackleg, among others. NVI developed a recombinant DNA-based vaccine against Rinderpest in collaboration with University of California, Davis.

Vaccine research is also carried out extensively by the University of Ibadan, Nigeria.

The university works on a research project on DNA sequencing of vaccines for the prevention of the infectious Bursal disease (also known as Gumboro disease), a major source of poultry deaths worldwide. There is no known cure for the disease.

Biotechnology in healthcare offers more effective disease diagnosis, prevention and treatment. In the coming years, it is going to change how we understand and treat diseases.

And, as in agriculture, the health biotech sector also offers much potential for boosting Africa's economies. Health biotechnologies allow scientists to identify genes linked to particular diseases. In addition, new technologies allow researchers to develop genetic tests for a range of illnesses.

Several African countries now have programmes dedicated to healthcare biotechnology R&D. These include Egypt, Kenya, South Africa, Tanzania and Uganda.

For example, the application of molecular markers for mapping disease resistance in the malaria parasite Plasmodium falciparum is being carried out at the Tanzania's Ifakara Health Research and Development Centre.

Another activity that has Africa-wide implications is the search for natural products, often used in traditional medicines, but which could have potential uses in modern pharmaceutical research.

A good example is that of NICOSAN, a herbal medicine commonly used in Africa. Nigeria's National Institute for Pharmaceutical Research and Development in Abuja has discovered that it is also effective in treating sickle-cell disorder.

Applications of indigenous knowledge in health biotechnology research and development include isolating and patenting active ingredients from a plant Hoodia gordonii, which has hunger-suppressing properties. This plant has been traditionally used by the San people who live in a semi-desert part of Botswana, to suppress hunger and thirst during long bouts of hunting.

In addition, under the Southern African Biosciences Network (SANBio) the CSIR of South Africa and other collaborations in Southern Africa are engaged in a project to scientifically-validate traditional medicines for their potential to treat infections suffered by people living with HIV/Aids. Kenya has developed an inexpensive but effective diagnostic testing kit for Hepatitis B called Hepcell.

Now in use in all district and provincial hospitals, Hepcell is an indigenous effort led by the Kenya Medical Research Institute (KEMRI) with support from the Japan International Cooperation Agency (JICA).

Egypt also has an active healthcare biotechnology industry. Products have been developed that can treat such conditions as cardiovascular, cancer, anaemia and diabetes.

Africa is claiming its place in the world of biotechnology. The lessons contained in Freedom to Innovate will help policy makers strengthen these efforts, forge greater international partnerships and establish Africa as an emerging player in the biotechnology revolution.

Dr Serageldin is director of the Library of Alexandria and member of the Senate of Egypt, and Prof Juma teaches at Harvard University's Kennedy School of Government. They co-chair the High-Level African Panel on Biotechnology of the AU and NEPAD.

Related story:

Africa Should Bank On Innovation

By Calestous Juma and Ismail Serageldin

Biotechnology offers a wide range of economic growth opportunities for Africa. But as "Freedom to Innovate", a biotechnology report on Africa's Development shows, the continent needs to locate biotechnology policy in the context of wider economic strategies. Technological development goes hand in hand with overall economic growth and not as an isolated activity.

The report addresses critical issues related to Africa's place in a globalising economy. It demonstrates what is needed to build the capacity needed to apply biotechnology in agriculture, health, industry, trade, and environmental conservation (including biodiversity conservation).

"Freedom to Innovate" shows that the measures needed to address biotechnology will strengthen Africa's capacity to adapt other technologies to economic development. This report has placed these wider considerations in the context of the role of innovation in economic transformation.

The main message of "Freedom to Innovate" is that regional economic integration in Africa should embody the building and accumulation of capacities to harness and govern modern biotechnology.

Regional economic integration bodies are key institutional vehicles for mobilising, sharing and using existing scientific and technological capacities, including human and financial resources as well as physical infrastructure for biotechnology R&D and innovation.

International partnerships in biotechnology are critical to the realisation of Africa's biotechnology strategies and should be pursued aggressively.

The panel draws it recommendations from analysis of the current research and development on the continent and outside Africa and some of the emerging social, economic, legal and political issues that surround the development, dissemination and commercialisation of products from biotechnology.

A key outcome of the work of the panel is the creation of what we call "Regional Innovation Communities" involving groups of countries in eastern, western, northern and southern Africa.
The innovation communities may be anchored by geographically-defined "Local Innovation Areas" with the clustering of universities, professional associations, enterprise and other actors with critical capabilities in agricultural, health, industrial and environmental biotechnologies.

Freedom to Innovate identifies five critical areas for action. First, is the need to put science and innovation at the centre of Africa's development, regional integration and trade efforts.

Second, attention should be placed on priority areas in fields such as biopharmaceuticals, health biotechnology, crop biotechnology and forest biotechnology.
Third, Africa needs to build critical capabilities for the development and safe use of biotechnology.

These capabilities include: infrastructure development, reinventing the African university, developing human capacities and engaging the public.

Fourth, Africa should establish continent-wide regulatory measures that are effective, transparent and efficient and are based on the co-evolutionary approach of promoting innovation, while protecting the public.

Fifth, the continent should build regional biotechnology innovation communities, as well as suggesting options for financing biotechnology, engaging the African diaspora, and designing effective collaborations with international partners.

The starting point in implementing the recommendations in Freedom to Innovate is the urgency that African heads of state and government place on the strategic role that technological innovation plays in economic transformation.