Africa Agri-Biotech Updates

Status of Research and Development on GM Crops in Africa, 2011

Africa has made steady progress in planting, regulatory and research on biotech crops. Three countries namely Burkina Faso, Egypt and South Africa are planting biotech crops commercially while Kenya, Uganda and Nigeria in addition to the latter three are conducting confined field trials(CFTs). Malawi has also approved confined field trials for biotech cotton (Table 1).

A number of trials focusing on Africa's pro-poor priority staple crops such as cassava, banana and sweet potato are at an advanced stage. Most of the new trials have paid attention to traits of high relevance to challenges facing Africa such as drought tolerance and nutritional enhancement.

The expanding number of confined field trials is a clear indication that Africa is progressively moving towards placing important food security biotech crops in the market. The vibrant research is taking place either using existing legislation or stand-alone biosafety structures with promising results.

Benefits of Modern Agricultural Biotechnology

Biotech crops continue to contribute immensely towards the realization of the Millennium Development Goals of reducing poverty and hunger by 50% by the year 2015. Adoption of GM crops has continued to increase significantly since the first year of commercialization. For instance, between 1996 and 2011, an accumulated 1.25 billion hectares of land were under biotech crops in 29 countries. This reflects the trust and confidence of farmers, mostly known to be risk-averse, in the technology. This is attributed to the fact that biotech crops contribute solutions to some of the major challenges facing global society including food insecurity, poverty and climate change.

Modern biotechnology is helping the agricultural sector grow more and better food while helping protect the environment. The technology has resulted in the development of superior crop varieties. The first generation of biotech crops had traits that were more beneficial to farmers compared to consumers, like herbicide-tolerance and insect-resistance. These traits led to increased productivity, reduced chemical usage and improved profits. For example, in 2011, the global market value of biotech crops was $160 billion.

The second generation of agricultural biotechnology products, currently in their final stage of development will be of more direct benefit to consumers. These products include fresh fruits and vegetables that have extended shelf lives and oil crops that are lower in cholesterol. Examples of products being developed with improved nutritional qualities include:

(i) Biotech (golden) rice enriched with beta carotene which can stimulate the production of vitamin A. Each year, vitamin A deficiency causes blindness in 500,000 children and 1-2 million deaths.
(ii) Tomatoes enriched with lycopene that prevents heart diseases and cancer.
(iii) Sorghum with enhanced iron and zinc micronutrient levels and highly digestible protein quality.
(iv) Wheat and peanuts modified to reduce allergic reactions,
(v) Nutriceuticals- biotech crops engineered to include disease-preventing or disease-curing traits.
(vi) Cassava enriched with micronutrients

Scientists also envision biotechnology giving us the ability to create unlimited sources of energy from organic waste such as yard trash and agricultural feed stocks. This will provide a sustainable alternative to fossil fuel.

Table 1: GM Research Activities in Africa

Country	Crop	Trait	*Institutions involved	Stage as in 2011
Burkina Faso Bt cotton commercialized in 2008	Cowpea	Insect resistance	INERA, AATF, NGICA, CSIRO, PBS, MONSANTO	Confined Field Trials (CFT) 1st season
Egypt Bt maize approved for commercialization in 2008	Maize	Insect resistance	Pioneer	Open field trials- 4th season
	Cotton	Insect resistance	ARC	Open field trials, F10 stage waiting approval
	Wheat	Drought and salt tolerance	AGERI	Open field trials, 9th season
		Fungal resistance	AGERI	Open field trials, 2nd season
	Potato	Viral resistance	AGERI	CGH
		Insect resistance	AGERI	Field trials, 10th season
	Tomato	Viral resistance	AGERI, Cairo University	CGH, 2nd season
	Sugarcane	Insect resistance	AGERI, Cairo University	Experimental field trial, 1st season
		Fungal resistance	AGERI	Experimental field trial, 1st season
Kenya Biosafety Act approved in 2009, Four biosafety implementing regulations published as of 2012	Maize	Drought tolerance (WEMA)	AATF, CIMMYT, KARI, Monsanto	CFT, 2nd season
	Cotton	Insect resistance	KARI, Monsanto	CFTs completed
	Cassava	Viral resistance	KARI, DDPSC	CFT, 1st season
		Enhanced micronutrient levels	KARI, DDPSC, IITA, CIAT	CFT, 1st season
	Sweet potato	Viral diseases	KARI, Monsanto	CFT, 1st season
		Weevil resistance	CIP, Kenyatta University	Lab and GH transformation approved by NBA in April 2011
	Sorghum	Enhanced micronutrient levels	Africa Harvest, Pioneer Hi-bred, DuPont business, KARI	Approved for contained greenhouse trial by NBA
	Pigeon pea	Insect resistance	Kenyatta University	Lab and GH transformation approved by NBA in March 2011
Uganda	Maize	Drought tolerance	NARO, AATF, Monsanto	CFT, 2nd season
	Banana	Bacterial wilt resistance	NARO, AATF, IITA	CFT, 1st season
		Enhanced micronutrients	NARO, Queensland University of Technology	CFT, 1st season
	Cassava	Viral resistance	NARO, DDPSC, IITA	CFT, 2nd season
	Cotton	Insect resistance and herbicide tolerance	NARO, Monsanto	CFT, 3rd season
	Sweet potato	Weevil resistance	NARO, CIP	Contained GH trials

Malawi	Cotton	Insect resistance and herbicide tolerance	Bunda university, Monsanto, Ministry of Agric, Envi. Affairs Dept, National Commission for S&T	CFT approved in August 2011
South Africa 1st commercialization in 1997	Maize	Drought tolerance	Monsanto	CFT
		Herbicide tolerance	Pioneer Hi-Bred	CFT
		Insect resistance and herbicide tolerance	Monsanto	CFT
			Pioneer Hi-Bred	CFT
	Cassava	Starch enhanced	ARC-Industrial Crops Research Institute	CFT
	Cotton	Insect resistance and herbicide tolerance	Bayer	CFT
		Herbicide tolerance		CFT
	Potato	Insect resistance	ARC-OVI	CFT
	Bulb flower	Viral resistance	Agricultural Research Council- Vegetable and Ornamental Plants Institute	CFT
	Sugarcane	Alternate sugar (rattoon); increased yield and sugars; increased cellulose; increased starch; decreased starch	South African Sugar research Institute	CFT
	Sorghum	Micronutrient enhanced	Africa Harvest, Pioneer Hi-Bred, DuPont business, CSIR	CGH

Source: James, 2011

***Acronyms**

AATF: African Agricultural Technology Foundation
AGERI: Agricultural Genetic Engineering Institute
ARC: Agricultural Research Center (Egypt)
ARC: Agricultural Research Council (South Africa)
ARC-OVI: Agricultural Research Council-Onderstepoort Veterinary Institute
CIAT: International Centre for Tropical Agriculture
CIMMYT: International Maize and Wheat Improvement Center
CIP: International Potato Center
CSIR: Council for Scientific and Industrial Research
CSIRO: Commonwealth Scientific and Industrial Research Organisation
DDPSC: Donald Danforth Plant Science Center
IITA: International Institute of Tropical Agriculture
INERA: Institute of Environmental and Agricultural Research
KARI: Kenya Agricultural Research Institute
NARO: National Agricultural Research Organization
NGICA: Network for the Genetic Improvement of Cowpea for Africa
PBS: Program for Biosafety Systems

CONCLUSION

Modern biotechnology is one of the technologies that Africa needs to embrace to be able to address mounting challenges in the agricultural sector. Adoption of biotechnology will certainly make a significant contribution to improved crop productivity, improved farmer livelihoods and ensure environmental sustainability. The continent has made promising developments in agri-biotech research, however, the full potential of this technology is yet to be realized as only three countries – South Africa, Egypt and Burkina Faso are commercially growing biotech crops. This slow adoption can be attributed to skepticism towards the technology and limited understanding which has derailed enactment of requisite policies and regulatory frameworks needed for biotechnology to take center stage in the continent's agriculture. Countries that are yet to enact biosafety legislations should expedite the process so as to provide an enabling environment for research and trade. Additionally, African nations should look for strategic partnerships and invest more in biotechnology research and development. A high degree of political good will and commitment is also essential if the continent is to fully realize the potential of this technology.

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Open Forum on Agricultural Biotechnology in Africa

ISAAA
International Service for the Acquisition of Agri-biotech Applications

PBS

AATF
African Agricultural Technology Foundation
Fondation Africaine pour les Technologies Agricoles

ABOUT OFAB

OFAB is a platform that brings together stakeholders in agricultural biotechnology to share knowledge and experiences on all aspects of the technology. It is currently operational in seven countries- Burkina Faso, Egypt, Ghana, Kenya, Nigeria, Tanzania and Uganda. The Kenya Chapter is hosted by the International Service for the Acquisition of Agri-biotech Applications (ISAAA) *Afri*Center under a collaborative agreement with the African Agricultural Technology Foundation (AATF).

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