

MPs want Govt to bring Biotech Safety Bill to parliament

By Peter Wamboga-Mugirya, Scifode

Members of Parliament (MPs) have called on government to expedite the deployment of biotechnology in the country by enacting enabling laws. Over 20 MPs—who are members of the Committees on Science and Technology, Agriculture, Budget, Natural Resources, Tourism, Trade & Industry; Social Services and National Economy—resolved that Uganda needs biotechnology applications to be deployed in a strategic manner to address immediate needs of the country. This, they stated, must be facilitated by a law in place to regulate this science, adding that biotechnology can promote agricultural production by offering solutions to many pests and diseases as well as combating water stress conditions.

The legislators, who had attended a half-day seminar on best practices in regulating biotechnology, also resolved that Biotechnology is a useful tool that can improve livelihoods of rural Ugandans if fully embraced. The seminar that took place at the National Agricultural Research Laboratories (NARL), Kawanda, was organized by the Uganda National Council for Science and Technology (UNCST), the Program for Biosafety Systems (PBS), Science Foundations for Livelihoods and Development (Scifode), and the National Agricultural Research Organisation (NARO). The legislators confessed they had been enlightened by the seminar and observed that modern biotechnology may offer opportunities to solve some of the pertinent agro-related burdens faced by their predominantly peasant electorates but legislation is critical to ensure safety and sustainability. Currently, Ugandan scientists are researching to produce Genetically Modified (GM) crops which cannot get to the farmers fields and contribute to improvement of their livelihoods without a law to regulate advancement at the various stages of product development. The scientists under the National Agricultural Research Organisation (NARO) are conducting research on GM cassava for resistance to cassava mosaic virus; GM bananas for anti-banana bacterial wilt and other

Cont. on pg.2



Hon. C. Ngabirano (R), Chair S & T committee and Hon. C. Ekemu (C), inside the banana CFT, listen to David Talengera a scientist at Kawanda during the MPs' visit.

GM cotton planted at NaSARRI under confined field trials

By Pius Elobu, NaSARRI

Following the issue of an import permit by Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), for Genetically Modified (GM) cotton to be planted under Confined Field Trials (CFT) in Uganda, seed was imported in June 2009, for planting at the National Semi Arid Resources Institute (NaSARRI) in Soroti district and Mobuku Prison Farm in Kasese. The National Biosafety Committee (NBC) inspected the infrastructure established for confinement at NaSARRI on Saturday 27th June 2009 and gave permission for planting of the trials.

There are two trials in this project and both were planted on 1st July, 2009. The first one involves assessing cotton plants' ability to tolerate application of Roundup as a weed control strategy compared to conventional weeding as

Cont. on pg.4



There is a fence around the trial and full time running water inside . Photo by Pius Elobu

IN THIS ISSUE:

- MPs want Bill in parliament
- GM public awareness in Tanzania
- Salt-tolerant crops developed

EDITORIAL:

Let's not miss the biotech revolution

Theresa Sengooba, PBS

Modern biotech tools have been widely used in agriculture to develop improved crop varieties. The first transgenic crops targeted production constraints and as such, emphasis was on developing cultivars with resistance to biotic and abiotic stresses. The biotech industry is also currently dedicating resources to generate consumer oriented products that entail enhanced nutritive value and vaccine synthesis. Biotic constraints such as diseases and insect pests were addressed with measures that included incorporation of genes from organisms into desired cultivars. For instance, the Bt gene for insect resistance has so far been widely adopted with over 11 million farmers growing Bt cotton around the world in 2008 alone. Herbicide tolerance is yet another trait widely cultivated, covering over 51% of transgenic cropped area in the past year. Transgenic crops are also being developed using gene silencing/promoting technologies that do not necessarily require gene transfer from other organisms.

In Uganda, some progress is being made with two confined field trials (CFTs), banana and cotton, already ongoing and three more in advanced planning phase, including fortified banana with enhanced Vit. A, Fe and Zn. More efforts are needed both on the science and on the regulatory side to strategically tap into these innovations that can increase food and income security among resource poor farmers. Field studies are soon commencing for drought tolerant maize, a crop that has now become an integral component of farming systems (as well diet) in East, Central, and Southern Africa. Drought has currently caused severe famine experienced in Eastern, North-Eastern and Northern Uganda causing several deaths and suffering. With drought tolerant maize, farmers would have a safeguard as some yield will be realised under limited water conditions. Maize exports from Uganda supports various countries including Kenya, Southern Sudan, D. R. Congo, Rwanda, Burundi and Zambia. Some of these countries are experiencing food shortage due to severe drought in Eastern Uganda. Drought torelant maize would be a super product for Uganda but cannot be a reality without increased government support.

Additional research worldwide is investigating crops with tolerance to salt and yet others capable of producing vaccines against common pathogens such as HIV. Such efforts could prove very timely for developing countries such as Uganda but the country needs a well developed biosafety framework and a law to be able to evaluate such upcoming products and commercialize those meeting the people's needs.

It is incumbent upon the government of Uganda, and indeed her people, to strategically embrace and safely deploy biotech tools and technologies to enhance crop productivity and mitigate effects of stresses like drought and salinity. Any time lost means more suffering for the African farmer! ■

MPs demand Biotech Bill - Cont. from pg.1

diseases/pests. They are also exploring biotech tools to improve the nutritional content of staple crops; on GM maize for drought tolerance also referred to as Water Efficient Maize for Africa (WEMA) and on GM cotton for resistance to cotton bollworm among many other innovations.

The MPs recommended that the responsible Ministry (of Finance, Planning and Economic Development) should forward the Biotechnology Safety Bill to Parliament for debate. The legislators also urged the Government to establish a Ministry of Science and Technology. Hon. Wonekha, the Chairperson of Agric. Committee noted that the seminar brought to light key issues of biotechnology which legislators would appreciate, adding that the fears that are peddled around it had been clarified. Dr. Charles F. Mugoya, the Program Manager for Plant Biodiversity and Biotechnology at ASARECA, reminded the MPs that Uganda needs a law to regulate biotechnology as an international obligation, given that countries in the region (eg. Kenya) already have laws in place to commercialise products of modern biotechnology. Dr. Ambrose Agona—the Director of NARL—noted that biotechnology has been in use in Uganda but modern advances in the technology require appropriate laws to regulate and monitor it. “Uganda is now well-placed to deploy biotechnology for development and that respective stakeholders, including law makers and scientists, should perform their roles in domesticating, managing and developing this technology,” Agona, added. Dr. Peter Ndemere, the Executive Secretary of UNCST said the government has already adopted a policy on biotechnology. Delay in establishing legal framework is not helping scientists. UNCST has signed cooperating agreements with several countries such as South Africa, South Korea, and China to strengthen cooperation in S&T. “S&T will be mainstreamed in the new National Development Plan (NDP), so that Uganda can fully benefit from using S&T” added Dr. Ndemere. ■

Can ugandan cotton to GM cotton?

By Miriam Kyotalimye, ASARECA



Non-GM cotton field at NaSARRI, Serere. Photo by Leah Nawegulo

Tanzania Govt needs to increase public awareness on GM

Roshan Abdallah & Gratian Bamwenda, *COSTECH - Tanzania*

The Tanzanian government should conduct public awareness campaigns on modern biotechnologies, a recent study has recommended. The study conducted to establish the extent of public awareness and acceptance of Genetically Modified (GM) technologies in Tanzania was conducted using Dar es Salaam and Arusha regions as representative samples. Primary data was collected using questionnaires administered to individuals in the public and private institutions, NGOs and the general public through face to face and electronic filling of the questions.

Results revealed very low public awareness and public acceptance of GM technologies in both regions. The study also found out that, since 2003, Tanzania government has initiated the National Biosafety Framework (NBF) project in collaboration with UNEP/GEF to develop legal and institutional frameworks for biosafety in the country. Furthermore, the government has also established national committees on biotechnology and biosafety to

oversee safe applications of GM technologies. However, despite all these efforts by the government in preparing the country to safe application of the GM technologies, it was found out that majority of the public in the country are unaware of the initiatives. Moreover, the public is also unaware of benefits of GM technologies and that safe application for agricultural production is possible.

This study made several recommendations to the government to improve public awareness. The government needs to put in its agenda and give high priority, issues of public awareness creation on GM technologies. It also needs to sensitize the public and engage them in national dialogues during national legal and institutional framework and policy making processes. This will improve understanding, create confidence and enhance acceptance of the technology and informed decision making on application of GM technologies in agricultural productions in Tanzania. ■

on farmers benefit from a switch

Cotton production in Uganda is characterized by low profitability, a phenomenon that stems from poor yield performance across sites. Two major constraints further underscore this low profitability, high pest infestations leading to high pesticide costs and the high cost of labor. Analysis of cotton production systems show that expenses on weeding alone account for over 20% of total production costs. Genetically modified (GM) cotton for insect resistance (IR) and herbicide tolerance (HT) has potential to abate some of these challenges.

Would cotton farmers in Uganda gain from a switch from conventional to GM Cotton? The International Food Policy Research Institute (IFPRI) conducted a survey of cotton farmers (conventional and organic) in the cotton growing districts of Kasese and Lira in 2008 to attempt to answer this question. The study simulated four scenarios; 1) Organic cotton production only with a 12.5% price premium above conventional cotton 2) IR-cotton seed in an organic system 3) IR cotton seed adoption 4) HT cotton seed adoption. Evidence from literature and farmer perceptions were used to estimate expected values for critical variables such as yield loss due to bollworm infestations and weeds, technology efficiency, technology fee, increase in herbicide use, reduction in pesticide use, and reduction in labor costs.

Results of the study indicate that the profitability of cotton production is very low for all the scenarios simulated and that none of the scenarios was clearly better than the others. However, the herbicide tolerance scenario has the highest

benefit to cost (B/C) ratio and the highest marginal rate of return over low input or organic production. Unfortunately this is also the weakest scenario due to the low number of farmers who apply herbicides in cotton production.

Farmers reported yield losses due to bollworm as high as 76%, a figure which is in consonant with expert opinion. It is thus not surprising that the margins are also higher for the IR cotton scenario. Farmer perceptions however are usually upwards biased given that it is rather difficult for farmers to isolate the effect of one constraint on overall productivity. The marginal benefits of using GM seed therefore are directly related to the level of incidence of the productivity constraint and the actual damage caused by the biotic constraint (in this case bollworm and weed infestation).

Across all the scenarios the variability in yield and the high production costs (labor charges make up most of this component) are the main determinants of the margins generated. A technology that contributes to reduce this yield variability would definitely have an impact on farmers' welfare. GM seed has this potential to improve cotton profitability and hence livelihoods. However, a mix of institutional and policy interventions is required if Uganda is to maximize the benefits while minimizing the costs and risks (if any) of adopting GM Cotton. GM cotton has already been commercialized in Burkina-Faso, where results showed significant economic benefit to small scale farmers. South Africa is the only country in Africa where GM cotton had previously been commercialized. ■

Summary Results for Partial Budget Simulations

Cost components	Units	IR cotton	HT cotton	Org. + Prem. price	Organic + Bt
Yield	Kg/acre	536.37	543.33	349.4	445.70
Total income	Sh/acre	349,656	354,195	255,520	325,915
Total costs	Sh/acre	267,400	260,137	218,927	220,506
Margin	Sh/acre	82,257	94,059	36,593	105,409
Downside risk	%	30.7	25.5	54	46.4
B/C		1.24	1.27	1.14	0.32

Scientists closer to developing salt-tolerant Crops

Adapted from *ScienceDaily*

An international team of scientists has developed salt-tolerant plants using a new type of genetic modification (GM), bringing salt-tolerant cereal crops a step closer to reality. The research team – based at the University of Adelaide’s Waite Campus in Australia – has used a new GM technique to contain salt in parts of the plant where it does less damage.

Salinity affects agriculture worldwide, which means the results of this research could impact on world food production and security. The work has been led by researchers from the Australian Centre for Plant Functional Genomics and the University of Adelaide’s School of Agriculture, Food and Wine, in collaboration with scientists from the Department of Plant Sciences at the University of Cambridge, UK.

The results of their work are published July 7 in the journal, *The Plant Cell*. “Salinity affects the growth of plants worldwide, particularly in irrigated land where one third of the world’s food is produced. And it is a problem that is only going to get worse, as pressure to use less water increases and quality of water decreases,” says the team’s leader, Professor Mark Tester, from the School of Agriculture, Food and Wine at the University of Adelaide and the Australian Centre for Plant Functional Genomics (ACPGF).

“Helping plants to withstand this salty onslaught will have a significant impact on world food production.” Professor Tester says his team used the technique to keep salt – as sodium ions (Na⁺) – out of the leaves of a model plant species. The researchers modified genes specifically around the plant’s water conducting pipes (xylem) so that salt is removed from the transpiration stream before it gets to the shoot. “This reduces the amount of toxic Na⁺ building up in the shoot and so increases the plant’s tolerance to salinity,” Professor Tester says.

“In doing this, we’ve enhanced a process used naturally by plants to minimize the movement of Na⁺ to the shoot. We’ve used genetic modification to amplify the process, helping plants to do what they already do – but to do it much better.”

The team is now in the process of transferring this technology to crops such as rice, wheat and barley. “Our results in rice already look very promising,” Professor Tester says. ■

“Helping plants to withstand this salty onslaught will have a significant impact on world food production.”

GM cotton planted

Cont. from pg.1

done in Uganda. Roundup is a brand name for a systemic, broad spectrum herbicide produced by the US Company, Monsanto, and contains the active ingredient glyphosate. Glyphosate, when absorbed through the foliage and translocated to the growing points of target plants, operate by inhibiting an enzyme involved in the synthesis of the amino acids tyrosine, tryptophan and phenylalanine. Such plants die within one week. Monsanto also produces genetically engineered seeds which are tolerant to the herbicide and are known as Roundup Ready Cotton. Two of such varieties (SG 125 RF and DP 110 RF) are being tested in this trial for suitability under Ugandan conditions. Appropriate drainage systems have been dug around the trial to safely deliver any residual roundup from within the trial to a septic pit within the confinement area.

The second trial is to demonstrate the effectiveness of GM cotton varieties against the bollworm complex. Cotton is affected by several pests at different growth stages, and among the most serious ones (Aphids, Lygus, Bollworms and Cotton Stainers) bollworms cause greater losses than the others. The most reliable control method which farmers use is spraying with insecticides, but this is expensive. There are GM cotton varieties into which a gene for resistance against the bollworm complex has been introduced, one such variety is SG -125-BGII. This, plus other varieties have been planted at NaSARRI. Treatments have been designed in which each of the varieties will be sprayed or not sprayed against bollworms following results of predetermined scoutings, but will be sprayed against other pests.

Uganda’s cotton variety, BPA 2002, has been planted all around these trials within the confinement, as buffer to trap pollen from the GM plants in the confinement area. All cotton from the confinement area will be destroyed in an incineration pit dug within, after all appropriate data has been taken and no cotton will be planted within 500 metres from the CFT. The CFT is being implemented following regulatory procedures as prescribed by Uganda National Council for Science and Technology. ■



Cotton germinating in the Roundup Ready Trial. Photo by Pius Elobu



Ruth Mbabazi - Tugume
Senior Science Officer - Biosafety
Uganda National Council for Science and Technology
Plot3/5/7 Nasser Road, P. O. Box 6884 Kampala, Uganda
Tel: 256 414 705 500
E-mail: uncst@starcom.co.ug www.uncst.go.ug



Dr. Theresa Sengooba
Regional Coordinator,
Program for Biosafety Systems (Eastern Africa)
P. O. Box 28565 Kampala, Uganda
Tel: 256 414 285 064
E-mail: t.sengooba@cgiar.org

For more information about Biotechnology, partners and stakeholders, its practice and regulation, log on to www.biovisioneastafricacom



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