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Biotechnology

Biotechnology in Kenya

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Report Highlights:
Kenya is one of the few African countries that have developed a significant capacity for agribiotechnology research and development. Biotech is viewed as a development tool for poverty alleviation and food security. At present there is very little commercial utilization of results from modern biotechnology research in Kenya. The first Biotechnology sweet potato crop has been harvested.

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Executive Summary

Kenya is one of the few African countries that have developed a significant capacity for agribiotechnology research and development. The Kenya Agricultural Research Institute (KARI) leads the national program in this field. Biotech is viewed as a development tool for poverty alleviation and food security.

At present there is very little commercial utilization of results from modern biotechnology research in Kenya. The first biotechnology sweet potato crop has been harvested while trials on Bt-cotton may start as soon as the National Bio-safety Committee approves.

The Problem

Kenya's farmers comprise of both large and small scale with over three quarters being smallholders. The farmers are faced with many problems ranging from pre- and post harvest crop losses (due to insects, diseases, weeds, and droughts result in low and fluctuating yields) to risks and fluctuations in income and food availability. Most of the farmers are smallholders with an average acreage of about one acre. This has further been compounded by the diminishing sizes of individual land holdings brought by rapidly increasing population (about 30 million). This pressure together with customary values relating to inheritance and survivorship has necessitated increasing sub division of land. This has led to widespread intercropping engendered by the need for farmers systems principally that of food security. The above socio-economic setting poses problems for the adoption of biotechnology.

In maize, yields world wide average 4 tonnes per hectare whereas Kenya averages 1.6 tonnes per hectare. In some food crops such as banana, yields are also declining and this is all against an increasing human population. The potential of biotechnology to increase production in Kenya of basic food staples assumes tremendous significance. It is reported by analysts that in traditional crops such as sweet potato and cassava only about 7 percent of the farmers have access to improved planting material. Adoption of tissue culture combined with effective distribution and proper monitoring will go along way in sorting out planting material shortages.

Farmers presently lose an estimated 40 percent of their maize crop to maize stem borer. The smallholder banana growing sector is highly susceptible to black *sigatoka* which can wipe away the entire harvest. Transferring of genes into maize to protect against this pest and a GM banana variety resistant to the *sigatoka* would work to these losses.

Among the urban poor in Kenya round 80 percent of family income goes directly on the purchases of food and in the rural areas few households have reached self sufficiency. In both urban and rural areas malnutrition is widespread, with mothers, children and the elderly at risk. These farmers and other rural and urban poor suffer from food insecurity and poor nutrition caused in a large measure by poverty and lack of nutritional balance in the diet they can afford. Deficiencies of micro nutrients such as iron and vitamin A are a common occurrence among children and adults. This is mainly due to the high unit costs of food translating to reduced consumer purchasing power.

The above factors make the adoption of biotechnology to be viewed as a development tool for alleviating poverty and improving food security and general malnutrition.

Agricultural Biotechnology in Kenya

It was not until the late 80s and early 90s that biotechnology became an issue to be discussed, which was a departure from the 70s and 80s when agricultural research concentrated on the farmers needs. This was after it became clear that the farmers were not adopting new technologies. During the late 80s KARI took its first steps focusing biotechnology. The pioneer crops were pyrethrum and Irish potato. During the same period the private sector put efforts in mass propagation of flowers for export. Over the last decade tissue culture research has gradually expanded into sugarcane, coffee, banana and citrus fruits among others. Due to the high expenses of the diagnostic kits of virus indexing, adoption of the technology has been slow. It is mainly done on citrus and some vegetables.

In the late 90s molecular markers started at KARI. Individual scientists at the Tea Research Foundation and the Coffee Research Foundation were the pioneers in this area and have made good progress in gaining experience with this tool. KARI has put lots of efforts on maize (the staple food) during the second half of the 90s. A lot of emphasis is being put on the so called orphan crops such as cassava and millet. These are critical staples in the diet of many poor people. Efforts to develop disease resistant cassava or drought tolerant millet, whether through genetic modification or conventional breeding is essential. KARI scientists are also using molecular markers in their research on cassava, sweet potato, Phaseolus beans, cowpea among others. The institute partners works in collaboration with several centers of the Consultative Group on International Agricultural Research (CGIAR), in addition to private and public-sector laboratories in the developed countries.

The country has had more results in livestock than in crops research which could be attributed to the presence of the International Livestock Research Institute(ILRI) in Nairobi and the collaboration of KARI's livestock scientists with several international partners on the development of more vaccines against major diseases (rinderpest and East coast fever).

Achievements

The question among Kenyans is whether potential social and economic benefits are likely to exceed potential risks or costs. Although conventional applications of biotechnology such as tissue culture and fermentation amongst others, is underway in Kenya, little genetically improved (transgenic) seed material has been produced. To some extent biotechnology has already accomplished the desired effect, awareness is widespread among the elite population albeit not to a level that has triggered any significant new activities on the farmers fields.

GM Sweet Potato

The first genetically modified research to be implemented in Kenya is sweet potato (resistant to the feathery mottle virus, an aphid borne disease that can destroy up to 80 percent of any crop). The first GM sweet potato crop has been harvested. The GM sweet potato was developed in partnership with Monsanto in the US. However the yields have to undergo tests to evaluate environmental consequences and adherence to biosafety protocol before being distributed to farmers. The National Council for Science and technology ensured stringent Bio safety regulations and had been observed all along the project.

Bt Cotton

KARI has applied for the introduction of Bt cotton and it is assumed that it will be approved. This is good news to Kenyan cotton farmers who spend about 32 per cent of their total production costs on pest control.

KARI is coordinating with the Cotton Board of Kenya in establishing a system that will ensure that there are certified cotton seeds in the country. Kenya stands to gain from biotechnology as it is the only country in the region that produces long fibre cotton. The success of this project will lead to benefits from AGOA.

Book launch: modifying Africa, by Dr Florence Wambugu

The launch of this book is a great achievement in biotechnology awareness. The book deals with the laboratory based agribiotechnology used to develop and disseminate new crop varieties. It restricts itself to three main group of tools or processes namely; tissue culture, genetic markers and genetic modification. Dr Florence Wambugu works with ISAAA (International Service for the Acquisition of Agri-biotech Applications) a program directed at public/private sector linkages that transfer and deliver appropriate biotechnology applications to developing countries and builds partnerships among institutions.

The benefits of biotechnology can be summed up as follows;

< Transforming the food deficit areas into surplus for market
< Reduce cost of production leading to surplus production and consequently reduced prices at the consumer level.
< Food surplus will lead to job creation (processing, marketing etc) and increase demand for other goods and services.
< Besides food staples the potential of biotechnology to increase production can be applied to a host of other food and non food commodities that are also vital to incomes, job opportunities and living standards. These include essentials such as firewood for cooking, timber for building, alongside cash crops for the domestic or export markets, such as cut flowers, tea, coffee and sugar cane.
< Preservation of natural resources which are presently under threat i.e soils, water, forests, rangeland.

Over the years the policy of the Kenya Government - vide biotechnology has not been very clear though in a way emphasized its adoption. There is increased dialogue and good cooperation amongst the scientists, the GOK and other scientific interest in the field of biotechnology. Kenya has draft guidelines which are official but has no GMO act though plans are underway.