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Biotechnology is a solution to our perennial hunger but ....

The authorities are forecasting inadequate long rains as some scientists say that biotechnology, in spite of its shortcomings, is the solution to our perennial food shortages. Photo/FILE

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IN SUMMARY

- With the Meteorological Department warning that the expected long rains will not be enough for sustained agricultural production, what is the way forward for Kenya's food security?

Half a century ago, long before the word "biotechnology" turned divisive, a man by the name Steve Eberhart was involved in some form of genetic engineering at the Kitale Research Centre.

The US government had posted him here to transform Kenya's agriculture.

According to documents at the Kenya National Archives, Dr Eberhart was a "maize geneticist" — a gene technician tasked with producing high quality, disease-resistant maize in the rainy Kenyan highlands. That was in the early 1960s.

His employer, US-based Rockefeller Foundation, described the then Kitale maize genetics research as a “project of international theoretical significance but of strong practical value”.

At the time, the controversial phrase “genetically-modified organism” (GMO) did not exist. But the art (or science) of genetic manipulation was present — at least in Kenya.

The Kitale maize genetics project became part of the Kitale Maize Research Programme that produced the now-popular hybrids, a cross-breed between Kenyan variants, including Muranatha, and species from Mexico.

The hybrids, a first in African agriculture, increased maize yield four-fold and made Kenya “the first country to be successful on a large scale with hybrid maize,” Festus Ogada, senior maize researcher, observed in 1966.

He worked with Dr Eberhart in Kitale. Public acceptance of hybrids was so high that acreage under the new varieties increased from 30,000 acres in 1964 to 450,000 three years later.

However, the enthusiasm with which hybrids were received appears to be in sharp contrast to the reaction to Bt (Bacillus thuringiensis) and genetically modified (GM) maize. Trials on Bt as well as GM maize and cotton started in Kenya more than 10 years ago.

Yet, according to Starved for Science: How Biotechnology is Being Kept Out of Africa, a book published in 2008, Kenya’s reaction to the new science has been erratic.

According to the Agricultural Sector Development Strategy (ASDS), that ambitious blueprint launched by President Kibaki in June 2010, the use of modern science and technology in agricultural production is still limited.

So, is biotechnology — defined by the UN Convention on Biological Diversity as “any technological application that uses biological systems, living organisms, or (its) derivatives, to make or modify products or processes for specific use” — the answer to Kenya’s food insufficiency?

Agricultural experts and policymakers interviewed for this report agree that whereas there exists many ways of dealing with food insecurity (that include imports, use of irrigation to turn arid lands into maize plantations, population control, and land consolidation), biotechnology still remains vital to high productivity, whether the food is for home consumption or for export.

Authorities foresaw this many years ago. Indeed, when introducing the hybrids, the then administration’s policy was to “better use the land and the alleviation of famine conditions”, according to the then director of agriculture in a letter to the Kenyan media on 14 November, 1962.

“It means that the country’s requirement can be met from fewer acres of maize, thus releasing land and effort for other farming enterprises.”

Today, the policy appears relevant. Biotechnology could boost production without increase in farmland. “Any new farmlands created through land consolidation or irrigation can be used for

production of export crops, such as flowers, fruits, and vegetables," says John Apati, an agricultural extension officer in Eldoret.

New science can cut costs drastically and at the same time increase maize production by 70 per cent. It not only removes the threat of pests, disease, and erratic rains, it has the potential to produce high yields with more nutrition.

Various study reports indicate that the stem borer ("Scania") takes away 15 per cent of the maize harvest in Kenya, aflatoxin destroys half of the yield (2009 figures), and the maize streak virus (MSV) reduces output by about 30 per cent. This virus increases the cost of production by 20 per cent.

Genetically-modified as well as Bt maize, cassava, sorghum, and banana varieties can alleviate or hugely minimise crop diseases, even as they cut down on use of chemicals.

"(Bt maize) delivers increased yields and a reduced need for insecticide sprays," reports a joint research paper by Peter Mwangi (University of Nairobi, School of Botany) and Adrian Ely (School of Biological Sciences, University of Sussex, United Kingdom).

Thus, new science makes it possible to develop disease-resistant as well as drought-resistant varieties, effectively doing away with chemicals and the reliance on rain-fed farming.

Take the example of the new Gold Finger, a banana variety developed by the Kenya Agricultural Research Institute (Kari). It has a yield that is about 40 per cent higher than the conventional types.

This tissue culture banana, pioneered by Kenyan scientist Esther Kahangi of Jomo Kenyatta University of Agriculture and Technology, is being grown in Maragua. And in 2004, Kenyan scientists produced Njoro BW1 and Njoro BW2, high-yielding and drought-resistant wheat varieties. Njoro BW2 produces 35 bags an acre.

According to Wilson Songa, an agricultural expert, GM technology can increase food production by a staggering 70 per cent without increase in cropland. Implicitly, with GM technology, Kenya can produce 50 million bags, down from 30 million currently.

That the country requires only 40 million bags a year, biotechnology would in effect free 10 million bags for export, thus bringing in more foreign exchange for the country.

"The country's agricultural resource base will be increased and improved through developing diversified, demand-driven crop varieties, intensively applying appropriate technologies, and expanding use of irrigation systems in agricultural production", says the ASDS.

"We have to use modern technologies to boost production," adds Dr Mary Mathenge, the director of Tegemeo Institute of Agricultural Policy and Development, a think-tank of Egerton University. "Maize farming should be a viable business even under prevailing conditions."

Four years ago, Dr Mathenge undertook a study that showed Kenya was a high-cost maize producer compared to neighbouring countries, owing to expensive farm inputs, low seed quality, and weak extension systems.

In the United States, a country that has embraced new forms of technology, maize farmers harvest an average of 9.3 tonnes per hectare (103 bags of 90 kilogrammes), in Kenya it is 1.6 tonnes (17 bags), according to Starved for Science: How Biotechnology is Being Kept out of Africa.

“Yes, technology will save us,” says Prof Christine Onyango, the chairperson of the Department of Food Science and Technology at Jomo Kenyatta University of Science and Technology (JKUAT), who roots for on-farm appropriate post-harvest technology.

JKUAT is among the institutions that have championed biotechnology by cooperating with other leading research centres to produce key breakthroughs in food science.

“Aflatoxin is a bigger worry than the current debate on the wholesomeness of GMOs. Aflatoxin is killing many people, we have to find ways of dealing with it,” says Prof Onyango.

According to experts, Kenya can ill afford to ignore new technologies in food production. Without advances in technology, the country will find it difficult to break the vicious cycle of hunger. “We in Kenya are meant to be advanced in technology, yet we cannot feed ourselves,” says Evans Sikinyi, the chairman of the African Seed Trade Association (Kenyan Chapter).

“The use of quality seed is not optional. We have to enhance our productivity and mitigate against climatic change. We have to have more maize on an acre than before because land is becoming scarce by the day,” says Dr Gospel Omanya, the seed systems manager at the African Agricultural Technology Foundation (AATF).

“The government should put more money in research and the Ministry of Agriculture should implement research findings.”

Kenya has a well-developed research system. State universities, Kari, and international bodies such as the African Agriculture Technology Foundation and the International Livestock Research Institute are involved in agricultural research.

In addition, the country has the structure to isolate harmful technology, which includes a biosafety facility at Kari, the Kenya Land Health Inspectorate Service (Kephis), the Kenya Bureau of Standards (KeBS), the Biosafety Authority, and a raft of legislations, including the Biosafety Law.

However, politicians have opposed GM technology, expressing fears that it may be unwholesome to human health. Indeed, the Kenya Biodiversity Coalition, MP John Mututho (chairman of the parliamentary Committee on Agriculture), and a section of MPs have opposed GMOs. They link GMOs to harm to reproductive health.

Pro-GMO researchers disagree. “Resistance to GMOs is out of ignorance. People have to be open and allow these technologies to be explained.

They should know that we have a lot of GM pharmaceutical drugs in the region," says Dr Elijah Miinda Ateka, head of the horticulture department at JKUAT. Dr Ateka is a plant pathologist.

GM foods undergo stringent food tests, according to Dr Omanya. "Plant breeding is the genetic manipulation to the advantage of humankind. It has been happening since time immemorial."

Even in neighbouring Uganda, the race is on for biotechnology. "Governments have to move fast so that we don't lose out on this new revolution," says Andrew Kiggundu, the head of the Biotechnology Centre at the National Agricultural Research Laboratories (NARL) in Kawanda, Kampala.

"People should avoid unnecessary politics, a scientific phenomenon is a scientific phenomenon, it is bound to happen," he says in reference to opposition to GMOs.

Ugandan researchers have produced a disease-resistant GM banana and cassava. Now, they are involved in what Dr Kiggundu calls bio-fortification — adding improving nutrition as well as taste. For the new banana variety, "we did field trials in 2009 and got interesting data. Now we are adding a new set of genes".

In Tanzania, the Mikocheni Agricultural Research Institute (MARI) is undertaking two trials. One involves the development of a cassava variety resistant to brown streak disease and mosaic disease.

The other is about a drought-resistant maize variety, working in partnership with Water Efficient Maize for Africa (WEMA).

"This is an all-or-nothing situation," says Dr Omanya. "Toyota is biotechnology. But people are free to drive Mercedes Benz. Let us embrace all approaches that can help us feed the nation as well as export."

Two Japanese scholars, Tomoya Matsumoto (of National Graduate Institute of Policy Studies of Japan) and Takashi Yamano (Foundation for Advanced Studies on International Development), who studied soil fertility and returns to technology in Kenya and Uganda in 2008, concluded in their report:

"An African Green Revolution is considered necessary to achieve (the Millennium Development Goals) of halving poverty, because many people are subsistence farmers."