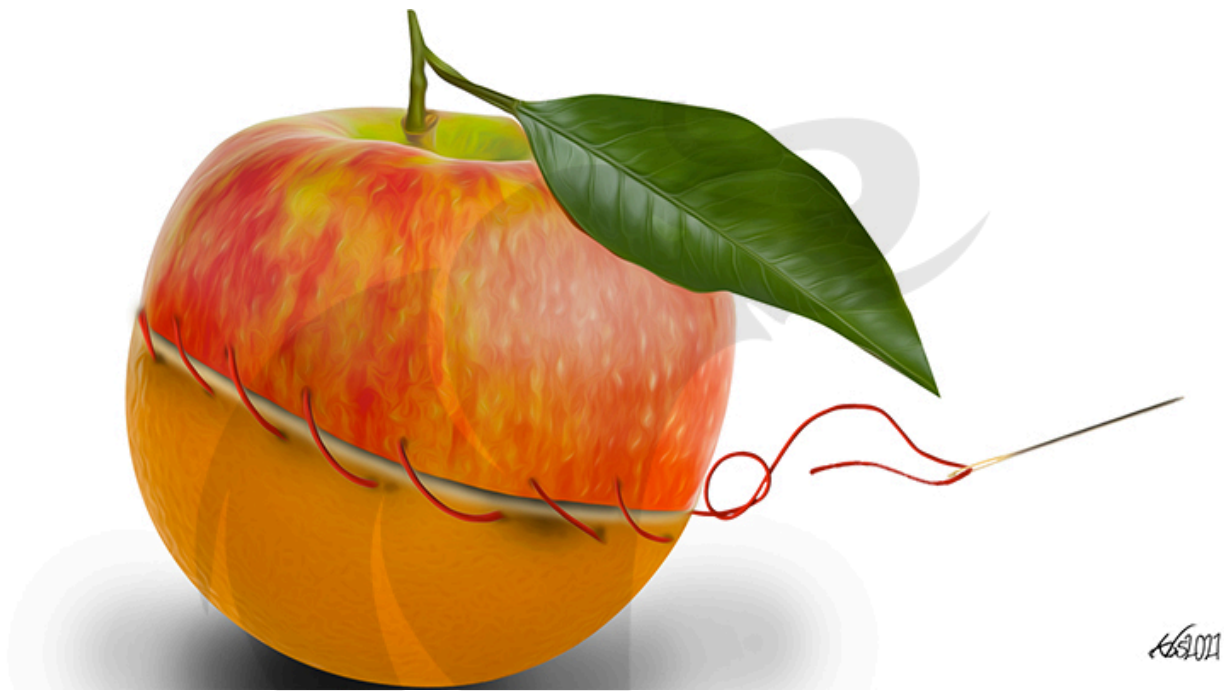




How Biotechnologies are Shaping Kenya's Food Ecosystem

By Daniel Maingi



It has been said that [he who controls the food, controls the people](#). But others have added that [he who controls the seed, controls the food system](#). The race by multinational corporations (MNCs) to own and register patent protection on seeds and genetic traits, including DNA sequences, has led to a hierarchy of big players who now dominate the global markets through national and international legal instruments.

We have reached the stage where only four corporations dominate the global seeds and genetic traits markets, as they roll out patent-protected biotechnologies to both large and smallholder farmers worldwide. This is seen as a critical step in shaping food ecosystems here in Kenya and elsewhere in the world.

Power relations and roles in the biotech industry

During the last three years the world has witnessed spectacular mergers and acquisitions amongst the biggest actors in the industry — DowDuPont now Corteva, Bayer-Monsanto now just Bayer, and Syngenta/ChemChina. Together with BASF, these [merged MNCs now control over 70 per cent of the global seed and pesticides market](#).

Their far-reaching wealth and power has been enabled by states and government actors working

with global organisations such as the WTO (World Trade Organization) and UPOV (Union for the Protection of New Plant Varieties). The consequences have been a concentration of market share and influence, capital accumulation, and unprecedented economies of scale which have led to the marginalisation and the disinheritance of our common seed and genetic resources. The process of agricultural investment in so-called biotech innovation has come to be known as “the Green Revolution” or, increasingly now, the “Gene Revolution”.

Green Revolution (GR) is best understood as the wide-scale adoption and use of disruptive agricultural research and various technologies, including biotech, that are intended to increase agricultural productivity. Green revolutions therefore effectively convert farming and agriculture into an industrial system, because of the extensive adoption and use of new high-yielding seed varieties that often must be accompanied by the intensive use of mechanisation, large volumes of water and expensive irrigation infrastructure, pesticides, and fertilisers. The seed is a critical piece of GR and is the first portal to creating large-scale bio-economies, and imposing and enforcing patent and breeders’ rights protection through national and binding international laws.

The larger GR endeavour was initiated by Norman Borlaug. With funding from the Rockefeller Foundation, Borlaug helped develop high-yielding dwarf varieties of rust-resistant wheat. The Green Revolution’s early success in India was led by the agricultural scientist M. S. Swaminathan. He is known as the “Father of Green Revolution in India” for his role in introducing Borlaug’s dwarf varieties of wheat and rice in India. One of the [impacts of this green revolution](#) was that the yields of wheat and rice doubled, but the production of other food crops such as indigenous rice varieties, sorghums, millets, and pulses declined. This led to the loss of distinct indigenous varieties from cultivation and also caused the [extinction](#) of others.

Seed biotechnologies have profoundly changed consumption patterns over the years; the dietary diversity of India’s population has decreased as Indians eat more wheat and rice devoid of nutritive value. Studies have shown that traditional coarse cereals (complex carbohydrates, high protein) have been permanently replaced by more white wheat and polished rice diets (simple carbohydrate, low protein), with the accompanying effects of obesity and malnutrition. An overweight population (BMI>25) has emerged as a new public health challenge, and this is most evident in large-landholding households, especially in the [high-input agriculture areas](#).

In Africa, the first green revolution was a failure and efforts have been underway for a relaunch. The Alliance for a Green Revolution in Africa (AGRA) was founded in 2006 to bring high-yield agricultural practices and biotechnologies to millions of smallholder farming households. Bill Gates has an absorbed relationship with the wonder of computers and technologies. Fascinated by the possibilities of big data and biotechnologies as the centerpiece for a new disruptive revolution in Africa’s agriculture, Bill Gates, through the Bill & Melinda Gates Foundation, together with partners including the Rockefeller Foundation, have collectively pumped more than US\$1 billion in funding to the Nairobi-based AGRA.

Indians now eat more wheat and white rice devoid of other nutrients that used to come from the inclusion of sorghum, millet and mung beans in traditional diets.

To the delight of agribusiness corporations, GR means an expansion in the use of new biotech seeds, fertilisers, pesticides and, of course, irrigation infrastructure and the related mechanisation. To ensure that new seed technologies are adopted and used on a larger scale, Bill Gates has also channeled significant funding to entities such as the African Agricultural Technology Foundation (AATF), African Seed Trade Association, Kenya’s seed trader associations, and private companies.

The goal is to influence and catalyse the transformation of agriculture policies and legislations and open up Kenya for commercial agriculture.

Together with the World Bank, the Gates Foundation has funded local stakeholders to lobby and advocate for reforms to remove “obstacles” in policies, laws, and regulations in agriculture, in what they term as “enabling the business of agriculture” (EBA). The annual ranking of countries is closely watched by investors and used by the World Bank, USAID, DfID, and other bilateral donors, to guide their funding. As a result, EBA drives the race to deregulate. Governments in poor countries compete with each other to “reform and change their agricultural laws” so that they can be ranked among the [“Doing Business”](#) best performers. [Kenya’s performance](#) in these rankings is also keenly followed by pro-biotech advocacy lobby groups.

The technology is the seed

Seeds carry the genetic traits or DNA sequences claimed as proprietary rights by the breeders or corporations that control them. The technology is in the seed and is the seed. Through stewardship agreements, farmers purchase seed, promise and sign on the dotted line that they are merely renters of the biotechnology and not owners. As such, they cannot multiply that seed for replanting; new seed must be purchased. They can also not store, give to others or even sell their harvested seed. Failure to adhere to these terms is a violation punishable by national and international laws. This means that MNCs are effectively controlling what food ecosystems emerge once a country decides to rely on biotech-gene seeds. It is an effective loss of food sovereignty and an abuse of farmers’ rights to seed, including the right to food at the household level.

Unfortunately, there have been many incidences where seed corporations [systematically replace indigenous seeds with their proprietary hybrids](#) through “generous donations”. After a few seasons, faced with a lack of alternative sources, the users must purchase patent-protected seeds.

Such is the case of the recently rolled-out Bt. cotton hybrids in Kenya. Dubbed first-generation biotech crops, Bt. traits focused on increasing market share and profits to patent holders by promising to eliminate the need for pesticide sprays against a limited range of insects. Another GM crop resistant to Round-up herbicide sprays caused enormous increases in Bayer’s sale of its herbicide, resulting in massive increases in market dominance. Once these crops become entrenched in the market and food ecosystem, farmers are often faced with a serious challenge as there are no alternative versions from other competing companies. In Kenya — as in India — [Bayer-Mahyco](#) has absolute power and market control, a situation enabled by the government with little public discourse.

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In the second-generation biotech crops, there was a focus on the traits desired by farmers, and much of the research was funded by public-private partnerships, as opposed to being funded only by the private sector, as was the case for first-generation GMOs. Virus-resistant cassava and sweet potato, together with GM banana in Uganda, are candidates in the former category, which is seen as an attempt by MNCs to repair their public image with the help of philanthro-capitalists like Bill Gates. These Biotech crops are vegetatively propagated (not grown from seed), and are not amenable to traditional plant breeding, creating an opening for a GM approach. Critically, vegetative propagation also means that [farmers do not need to repurchase seed every year](#). What effect these second-generation feel-good biotech crops will have on the food ecosystems is yet to be ascertained.

Second-generation GMOs in agriculture include “functional” plants designed to produce pharmaceuticals, fuels, and industrial compounds. It is doubtful that these new biotechnologies will have a role in Kenya’s food ecosystem.

The future of GR in Kenya’s food system

In India, GR technologies were rolled out in 1967 when dwarf and rust-resistant wheat varieties were released. The results were so fast and so significant that, just three years later, Norman Borlaug was awarded the Nobel Peace Prize in 1970 in recognition of his contributions to world peace through increasing food supply. It is claimed that he saved a billion people from starvation.

In Africa, it has now been 15 long years since the new GR was launched. AGRA pledged in self-declared milestones that it would double the earnings of 20 million small farmers by 2020 while halving food shortages in 20 African countries. A Tuft University study found little evidence of significant increases in productivity, income, or food security for people in the 13 main AGRA target countries, but rather, demonstrated that [AGRA’s Green Revolution model is failing](#). Between 2013 and 2015, [AGRA and CIMMYT](#) released at least 25 water-efficient drought-tolerant maize hybrids (WEMA) for farmers in Kenya. To date, there have not been any magical yield increases as was evident in India when the hybrid wheat and rice varieties were released. Despite the widespread use of these biotech varieties, the increased use of pesticides and fertilisers, and the extensive use of tractors, GR remains a dream in Kenya’s food economies.

There have been many incidences where MNCs systematically replace farmers’ own indigenous seeds with their proprietary hybrid seeds by providing “generous seed and fertiliser donations”.

Why is it so difficult to ignite a green revolution in Africa? AGRA has funded projects and lobbied African governments for the development of policies and market structures that promote the adoption of Green Revolution technology packages. Kenya has taken the top spot in enabling the business of agriculture, opening its doors to these biotechnologies. It has won praise and accolades from donors and partners. What else is there to be achieved? It is highly doubtful that affixing Bayer’s Bt. insect toxin gene to the drought-tolerant WEMA (now TELA) trait will be the launch of Kenya’s green (maize) revolution. It is also highly uncertain that Kenyans will suddenly change their modern dietary habits and start eating biotech cassava, engineered, not for high yields, but to resist viruses.

There is a wave of “new genetic modification techniques” touted to lead to the third generation of GMOs. These include genome editing using various tools such as special enzymes to cut, repair, or even bring new segments into the DNA of living food organisms. Such technics appear to be science visioning, with biotech supporters saying that one will be able to delete allergy traits from the DNA of peanuts and make lactose-free milk to the joy of lactose-intolerant populations. These modification techniques have already been [tested out in the current roll-out of mRNA-mediated covid-19 vaccines](#), and appear poised to make a thundering entrance into Kenya’s and Uganda’s food ecosystem through [cassava that is protected against viruses](#). Noteworthy is that citizen resistance against this GMO technology will be met with a stern and stark reminder that it is the same GM technology that was used to protect us from the coronavirus and its associated mutations. The new GM technology skipped many important safety and risk assessments and the vaccines were released under public emergency orders worldwide.

In 1967, Norman Borlaug’s GR varieties undoubtedly averted food shortages albeit temporarily. But

they were unable to deter poverty. In fact, GR technologies might have added to it. The high-yielding seeds demand expensive fertilisers and more water. In India, GR led to rural impoverishment, increased debt, social inequality, and the displacement of vast numbers of peasant farmers.

What then must we do to ensure a just and equitable food system in Kenya? What is the way forward for gene and green revolutions in Kenya? It appears that our experts and technologists have had every room and resource to make Kenya food-secure using all forms of modern biotechnologies yet there have been no significant results to phone home about. Perhaps it is time to cut our losses and shirk the industrial-agricultural model that is based on industrial principles. Climate change is not helping Kenyan farmers. Researchers have been unable to come up with solid biotechnologies that can sustainably overcome stresses from our unique harsh farming climates. Perhaps it is time we looked to nature and farmers' know-how in using another branch of science called agroecology.

GR agriculture increased farmer debt, which resulted in increased social inequality, and the displacement of vast numbers of peasant farmers who had to make way for larger farms.

Agroecology encourages the building of resilience through crop and varietal biodiversity on the farm. Monocrops are to be avoided to reduce pests and diseases. Farmers and extensionists teach that planting mixed varieties of locally adapted maize on the same farm creates resilience against pests like stem borers and fall armyworms that GMO Bt. maize seeks to control. Farm-level diversity is the key to survival. Seeds with many traits - drought resistance, early ripening tendencies - make for greater ability to adapt to climate change. Relying on just a few varieties is dangerous and making unending royalty payments to the holders of those food varieties is worse as it undermines food sovereignty at the farm level.

Agroecology encourages the defense of farmers' rights, the rights to nature, and demands the renegotiating of the contract between state and society as stipulated in our 2010 constitution. Farmers have a right to seed for food and livelihoods. They should be able to freely keep, further develop, sell or even gift their planting material as is culturally accepted. The government should be at the forefront of protecting their rights - and not creating skewed power relations between farmers and farm input providers.

Good agroecology practices further demand an accelerated shift towards local food production and short supply chains. The emphasis is on local food sufficiency that encourages ethical consumerism.

There is an urgent need to review, reform, and reconfigure the UN's agri-food agencies to be more responsive to the poor and disadvantaged in the food system. The FAO (Food Agriculture Organization) and the CGIAR (Consultative Group on International Agricultural Research) have received funding from the World Bank and the Bill & Melinda Gates Foundation, [swaying research and policy priorities towards more biotechnologies in our food systems](#). Dr Agnes Kalibata, President of AGRA and board member of the International Fertilizer Development Center, has been appointed as the UN Secretary General's special envoy to the 2021 UN Food Systems Summit to be held in September 2021. This signals that the summit will be yet another forum that advances the interests of MNCs and agribusiness at the expense of farmers.

It is time to put the seed back into the hands of the farmers. Remember, he who controls the seed controls the food system. If Kenya is to take back control of its food system and reassert its sovereignty over its agriculture, its citizens — free from corporate influences — must be at the forefront of any restructuring of the food system. This is the only path to a just and sustainable food

bio-economy that is not subject to the whims and fancies of corporate controllers of biotechnologies.

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