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Biodiversity and Biosafety Association Kenya

Policy brief: GM Cassava in Kenya

In Kenya, cassava is one of the major root crops, second to Irish potatoes. In the year 2006, the country had a production of about 800,000 MT of cassava valued at 3.8 billion Kenya shillings, and has the potential to produce more that 2 million metric tonnes per year. In Kenya cassava is widely grown in the coastal, western and eastern regions and utilization is mainly for human consumption (Githunguri, C.M et al, 2008). It is grown mainly by smallholder farmers as a famine reserve and food security crop in the humid and sub-humid areas due to its ability to produce reliable yields on marginal land (FAO, 2008). Although it is widely consumed in Kenya, farmers engaged in cassava production face a lot of challenges including lack of market, pests and diseases, and lack of planting materials. According to researchers, diseases such as Cassava Brown Streak Disease (CBSD) and African Cassava Mosaic Virus (ACMV) can lead to loss of up to 60% of the yields. The impact from CBSD is devastating (Legg et al., 2014; Patil et al., 2015) in the regions of Eastern and Central Africa, where the disease is now established and from where it is spreading toward neighboring countries.

The situation has led to scientists at the Kenya Agricultural Research and Livestock Organization (KALRO) developing genetically modified cassava varieties that are resistant to these diseases. An application by KALRO for environmental release and commercialization of CBSD resistant cassava line 4046 has been submitted to the National Biosafety Authority (NBA) to allow for multi-locational field trials and release to Kenyan smallholder farmers who will be basic seed multipliers. Although scientists claim that the new GM cassava variety increases cassava root quality and marketable yield, the negative effects of GMOs on farming systems are well documented.

Concentration and corporate power

Available evidence suggests that since the commercial introduction of GMOs, the formal seed industry has rapidly consolidated. Today, just four companies control almost 60% of the seed market. The “big four” seed companies Bayer, Corteva, ChemChina and BASF own 60% of the global proprietary seed sales (Deconinck, 2019) Consolidation of the seed industry reduces the options for farmers giving them less choice, increasing prices and reduces innovation through restrictive application of proprietary rights. This in turn decreases the democratic space in our seed systems and resilience of our food systems.

It is not known how the introduction of GM cassava will affect the seed market however, owing to the vegetative propagated nature of cassava planting materials, it is likely that only few seed market players may be allowed to produce and multiply planting materials thus locking out smallholder farmers who have traditionally shared cassava stem cuttings through their informal seed networks.

The formal system which comprises of certified seed/ cuttings accounts for less than 2% of the country's cassava seed demand, whereas 98% of cassava planting materials are disseminated through farmer-to-farmer exchanges and sale of cuttings in the local market. It is likely that the market for GM will be highly consolidated among few key players.

Risk of contamination and economic loss

GMO contamination is well documented. According to the International Journal of Food Contamination, almost 400 cases of GMO contamination occurred between 1997 and 2013 in 63 countries (Price & Cotter, 2013). Many plants are pollinated by insects, birds or wind, allowing pollen from a GMO plant to move to neighboring fields or into the wild. This "genetic drift" illustrates the enormous difficulty in containing GMO technology. Cassava is an insect pollinated crop and therefore cross-pollination is likely to occur among the different varieties. Despite the fact that research on GMOs has been ongoing for decades in Kenya, mechanisms have not been put in place to ensure that farmers understand the risks associated with cross contamination or how to manage it.

Farmers grow a multitude of cassava varieties in their farms in order to minimize crop losses (Elias et al., 2000). This is a coping mechanism to manage the risk of a disastrous crop loss. In the event that 4046 is introgressed into farmer preferred cassava varieties they will lose their ability to cope with risks related to crop losses. In addition, GM cassava will most likely be mono-cropped to reduce the risk of contamination. Monocropping discourages farm diversity and exposes farmers to risks of crop losses or incidences of food insecurity.

In addition, the areas affected by the viruses and diseases have not been mapped into hotspots so that the planting materials can be limited to these areas and therefore limit the possibility of cross contamination around the whole country.

The use of GM crops also leads to increased use of pesticides (Benbrook, 2009) which can acidify soils, destroy soil flora and fauna and harm pollinators (Gurian-Sherman, 2012). Destroying biodiversity leads to decreased agricultural productivity.

Risks of novel genetically engineered crops to human and environmental health

Event 4046, unlike current genetically modified (GM) crops widely commercialised, is part of a novel set of crops that utilise the epigenetic mechanism of RNA interference (RNAi). RNAi is a biological mechanism that regulates the expression of genes, in the case of the event 4046, downregulating the expression of viral pathogen genes in the cassava brown streak virus and Ugandan cassava brown streak virus. One potential adverse effect of RNAi is off-target effects on gene expression in people or animals exposed to novel dsRNA molecules in event 4046 which leads to negative effects on health or population sizes. These risks among others have not been addressed in the Kenya Agricultural and Livestock Research Organisation application.

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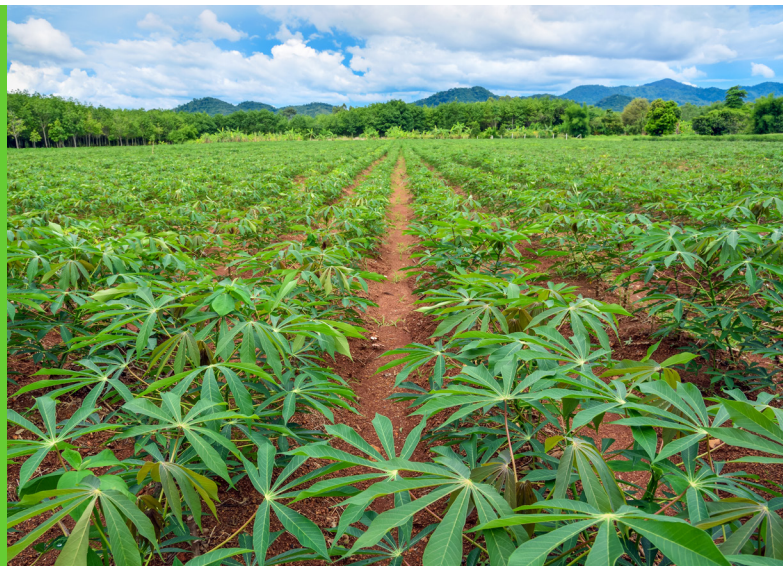

Risk of increased loss of biodiversity

The majority of the African cassava varieties are susceptible to either cassava brown streak virus or Ugandan cassava brown streak virus. In Kenya today, there are local cassava varieties that are resistant to viruses e.g. MM series, MH series, DM 13 and Mighera. Although they may not be high yielding, through conventional breeding their yield response can be improved. Locally adapted cassava varieties include; Kibandameno, Guzo, Pamba, Marere, Karembo, Bwazo ,Nzalauka, Sagalato, Kileso, Gushe (Mwafrika) and Nambari (Saggafu & Saha 2019). The introduction of GM cassava could mean that farmers abandon and subsequently lose the cassava diversity.

The search for CBSD resistance has led researchers to South American cassava germplasm which revealed that most of the 238 South American lines were infected except seven cassava accessions that stayed clear of symptoms on all tissues and organs and were virus free. (Sheat et al, 2019). These 7 varieties that have been identified to be resistant to CBSD can be improved for yield and other attributes through conventional breeding rather than through artificial genetic modification.

Patenting limiting further development of new varieties

Cassava was domesticated 5000 – 7000 years BC in the Amazon, Brazil and has been cultivated and handed over to generations freely mainly by smallholder farmers (Henry and Hershey, 2002). It is concerning that with patenting, genetic resources ownership will move to corporates who will then profiteer from it. This cannot promote social equity which infringes on food sovereignty. Besides this, patents make independent research on GMOs difficult. Farmers must sign agreements that prohibit them from giving seeds to researchers or carrying out their own research. Meanwhile, researchers cannot conduct studies on GMOs without a license from the seed company, allowing companies to restrict the nature of research on their seeds.

In Kenya, according to the application to NBA, event 4046 will not be licensed and will be royalty free. This implies that all products emerging from the research and development work will be unrestricted for royalty-free distribution to smallholder farmers. While this could have been done to reduce the cost of seed and make it more available, there is a risk of seed multiplication being left to too many players making accountability and traceability impossible in case of adverse impact of the GM cassava. It is also unusual that this will happen as Kenya's Intellectual Property Rights (IPRs) regime with respect to breeding is very strict.

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Acceptability, consumption patterns and cultural preferences

How cassava is utilized has slight differences based on regions. For example, in Nyanza and western regions of Kenya, roots are peeled, diced, dried and milled into flour for "Ugali" which is often combined with sorghum and maize. At the coast and in western regions, cassava leaves are used as vegetables, while in eastern parts of the country, roots are consumed either raw or boiled. While the GM cassava primarily targets addressing challenges with the tuber (roots), its impact on the quality/taste of the leaves is unknown. This will affect how consumers and farmers relate culturally to the crop and their source of green vegetables and other local delicacies.

Policy and advocacy recommendations

Before considering rolling out GM cassava to the public, the following policy and regulatory measures are needed:

1. The Constitution of Kenya 2010 assures Kenyans of the right to be free from hunger and to have adequate food of acceptable quality Article 43(c). In view of the lack of independent scientific data and consensus on the safety of GM cassava iRNA technology applied, and the related social economic losses as well as risks to contamination and ultimate loss of cassava diversity contained herein, the Kenyan Government **must shift from a promotional to preventative policy approach** with respect to food safety and labeling and ensure that genetically engineered foods are not found in Kenya and institute a **15-year MORATORIUM** on GMOs in Kenya;
2. Under the **precautionary principle**, the burden of proof lies with the **developer of the GM trait to** substantiate claims of safety and should provide full experimental information to show that the technology does not induce toxicity to people and the environment.

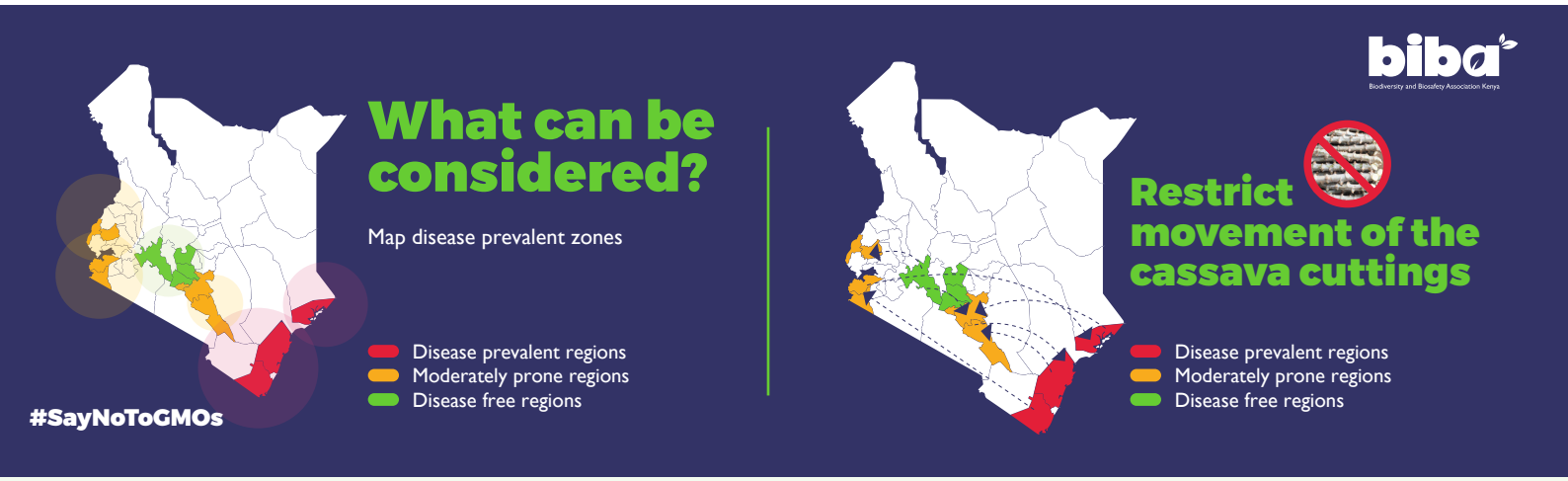
We call for KALRO to provide full disclosure of any results related to toxicity or adverse effects of GM cassava and human and environmental health so that farmers can make a proper informed decision.

3. It is clear from the global genetic resources that 7 CBSD resistant varieties exist in South America that can be used to develop Kenyan hybrids that are resistant and not genetically modified. There is also an **urgent need for investment** in local research capacity for the development and promotion of **agroecological approaches** that tackle pests and diseases, which pose no risk to the environment and human health, and are patent free.

4. The regulatory agencies led by National Biosafety Authority (NBA) **SHOULD NOT APPROVE** the application for environmental release (open field cultivation) and placing on the market of virus resistant genetically modified cassava event 4046 in Kenya and other genetically modified products as the country does not have adequate infrastructure for risk management.

5. GMOs should be subjected to a **rigorous, democratic, participatory and transparent assessment** that includes decision-makers from all stakeholders who will be impacted by the technology. In the case of event 4046 there hasn't been a rigorous public awareness program and public participation in the risk assessment process.

6. In the event that GM cassava is released, KALRO should apply mechanisms of controlling possible contamination such as isolation, spacing and zoning methods. Furthermore, there is urgent need for a mapping of disease prevalent areas and further restricting the movement of GM cassava seedlings to the affected areas only.



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