

Why Iowa State 'fortified' GM banana trials are vital to Uganda

Uganda was in the spotlight in the United States this past week because of [research](#) being done at Iowa State University, which involved a genetically modified banana that produces higher levels of Pro-vitamin A.

The most noticeable part of this story was the mobilization of innocent well-fed American students protesting the fruit which could help the innocent ill-fed Ugandan children and pregnant mothers evade the deficiency of vitamin A syndromes.

Students and activists in particular were gathering signatures and protesting a planned study that involved feeding student volunteers the GM banana to test whether the banana produced enough vitamin A in the consumer to be effective at treating nutrient deficiency. But what is missing from their petition is that this research is vital to Uganda's future, but cannot be done in the country.

Vitamin A deficiency is responsible for retarded growth and development, and impaired vision. In Uganda's recent elementary level exams, students in rural schools performed worst, with some districts recording only one first grade ([a passing grade on the primary leaving examination](#) in Uganda) compared to urban districts where most registered schools had all pupils in first grade. A large percentage of Ugandans in rural areas are at risk of malnutrition. There has been a constant push for school feeding programs, but they have not taken root. Imagine a 7 year-old who leaves home in the morning, walks 3 kilometers to school, studies with an empty stomach for 8 hours only to return home and find only a banana which is devoid of the nutrients that the child needs to develop properly. How is that child expected to succeed?

As a way to help nutrition in the country, particularly the youth, Uganda came up with the Nutrition Action Plan (2011-2016) with a main purpose of scaling up multisectoral efforts to establish a strong nutrition foundation for Uganda's development. The main sectoral players being the Ministry of Agriculture, Animal Industries and Fisheries; Ministry of Health; Ministry of Trade; and the Private Sector. The Ministry of Health was to handle the issues of food supplements, while Trade was to ensure foods were fortified with necessary micronutrients, in particular to enforce a requirement for every salt imported in Uganda be iodized. The role of the Ministry of Agriculture through its research arm, the National Agricultural Research Organization (NARO), was to enhance the quality of crops through [biofortification](#). These are crops which have been improved to produce a nutrient that is normally not in the crop, or is there but not in high enough levels to be a significant source of the nutrient.

Uganda's Nutrition Action Plan emphasizes promotion of bio-fortified varieties through: establishing policy to promote bio-fortification, increasing varieties of bio-fortified foods, scaling up bio-fortification of foods nationwide, increasing and strengthening public-private food bio-fortification partnerships. This would contribute to ensuring availability, accessibility, and affordability of food in the quantities and qualities sufficient to satisfy the dietary needs of individuals sustainably.

According to Uganda Demographic and Health Survey in [2011](#) there were high levels of childhood under-

nutrition. Over 33 percent of the children under 5 years exhibited stunted growth, 5 percent showed signs of [wasting syndrome](#) and 14 percent were underweight. Vitamin A deficiency affects one out of five young children and women of reproductive age, resulting in impaired resistance to infection and consequently higher levels of illness and mortality, as well as potentially severe eye problems. It is therefore out of need that all Uganda's crop breeding programs are prioritizing enhancing crops with beta-carotene (a biological precursor to vitamin A) and iron.

Ongoing biofortification efforts

All crop varieties developed by NARO and released by the National Variety Release committee are high yielding. NARO has embarked now on improving the quality of those crops enriching them with micronutrients and minerals which are essential for human development especially for pregnant mothers and infants. There are beans rich in iron, and sweet potato rich in beta-carotene commonly referred to as orange fleshed sweet potato (beta-carotene is what makes carrots orange hence the orange flesh).

Orange fleshed sweet potato, which contains more beta-carotene than other sweet potatoes, is being rolled out to potato growing areas of Uganda. This effort, though good, may not meet all the vitamin A requirements needed in Uganda as sweet potato is not as widely eaten in Uganda as bananas and it is seasonal in rural areas. Farmers boil sweet potato and they do not like it when the crop is soft and mushy. Sweet potato breeders say the higher the level of beta-carotene the lower the dry matter content which leads to softness of orange fleshed sweet potato when boiled. This makes a biofortified sweet potato a less desirable option for treating malnutrition. This is what makes beta carotene enhanced bananas key to reducing vitamin A deficiency in Uganda.

Banana is Uganda's major staple food consumed by over 70 percent of Uganda's population with almost every meal. Uganda is only second to India in banana production and nearly all bananas in Uganda are grown and consumed locally. The estimated consumption is between 220-460 kg per person per year. Uganda consume bananas in a variety of ways: cooked, beer, roasting, and desserts. The cooked type is the most popular and is a part of every meal in Uganda. Enhancing beta-carotene levels in banana would be instrumental in addressing vitamin A deficiency in Ugandan, particularly for pregnant mothers and infants who are the most prone to the deficiency.

Most of the crops in Uganda are biofortified through conventional breeding methods like crossing and artificial selection but according to banana breeders, the technicalities in banana breeding presents challenges that genetic engineering has helped to overcome which has made it possible to develop these bananas when traditional breeding methods failed.

Many Ugandans (including me) are ready to eat this vitamin enhanced banana. Unlike the orange fleshed sweet potato that was developed through conventional breeding, the extra beta-carotene that was introduced into Uganda's local varieties was through genetic engineering from a wild relative of banana. The anti-GM activists do not like the process and they choose to believe there is no science available to support the crops safety but at the same time, as they are doing in Iowa, any attempt to test for safety is always resisted.

The problem is that Uganda does not have a biosafety law that would enable scientists to do human trials. Attempts to pass the law that would allow this have always been resisted by the anti-GM activists through scare campaigns, like the [one they](#) have organized in the U.S. The need to have the biosafety law has been understood by most Ugandan Stakeholders including the Uganda's President. This leads many to believe that Uganda will soon have the law and will be able to test this banana on Ugandans.

Students from the U.S. who had volunteered to participate in this trial (reportedly 500 volunteers for 12 spaces) should be applauded for their courage to stand in the face of intimidation as they help speed this process of having a better banana served in Uganda. Their effort is in solidarity with Article 11(2) of the International Covenant on Economic, Social and Cultural Rights that recognizes the need for more immediate and urgent steps to ensure the fundamental right to freedom from hunger and malnutrition.

Isaac Ongu is an agriculturist, science writer and an advocate for science based interventions in solving agricultural challenges in developing countries. Follow Isaac on twitter [@onguisaac](#).