GATSBY

# COMBATING CASSAVA DISEASES

AUGUST 2014

By the 1980s cassava was one of Africa's most important staple crops, but yields were being greatly reduced by diseases. Researchers developed disease-resistant varieties that out-yielded local ones by up to five times, but struggled to transfer these to farmers. The situation became particularly severe in Uganda after the outbreak of a new variant of Cassava Mosaic Disease (CMD).

- Between 1985 and 2005 Gatsby funded multiple projects to speed up the dissemination of improved cassava varieties in six African countries
- Gatsby funded researchers to take responsibility for technology transfer. Researchers set up new multiplication systems to distribute more than 100 million stems of disease-resistant varieties in response to the Ugandan CMD epidemic. They also trained more than 35,000 farmers and extension workers
- Within five years, 100,000 ha of improved varieties were planted and cassava production exceeded pre-outbreak levels

## CASSAVA IN AFRICA

Cassava can produce good yields with minimal inputs, even in poor soils and under drought conditions where more demanding crops such as maize would fail. Traditional varieties grow their starchy tuberous roots steadily over a period of up to two years – the tubers can then be left in the ground without serious deterioration, ready for harvest when a family needs food or cash.

By the 1980s these qualities meant cassava was one of Africa's most important staple food crops, providing more than half the calorific needs of 200 million people.

However, yields of the crop were being severely reduced by pests - including mealy bugs and green cassava mites - and diseases such as Cassava Bacterial Blight, Brown Streak and CMD.

## CMD

The CMD virus is transmitted by *bemisia tabaci* whiteflies. The flies feed on the underside of leaves, lay their eggs there, and in the course of their 30-day life-cycles can transmit the CMD virus to the plant. With 11 to 12 generations of whitefly produced a year, the virus spreads rapidly.

CMD stunts the growth of leaves and tubers. Symptoms include the yellow mottling of leaves, and CMD became so ubiquitous in parts of Africa that many farmers believed this mottling was a normal feature of the plant.

By crossing African, Asian and South American cultivars, researchers developed disease-resistant varieties that out-yielded local varieties by two to five times. However, the challenge was transferring these new varieties to farmers.

## IN CAMEROON

In 1985 Gatsby funded the International Institute of Tropical Agriculture (IITA) to accelerate the multiplication of disease-resistant varieties of cassava in Cameroon. Generally, an average of six conventional cuttings can be taken from a cassava plant. Each cutting will establish a new plant, even in the face of drought and other stresses. In this instance, IITA instead began to take 'ministem' cuttings, meaning 10 times more cuttings could be taken from a single plant, vastly increasing the potential multiplication rate. However, unlike conventional cuttings, the ministems had to be sprouted and nurtured carefully through their vulnerable early stages on sterile soil and with adequate water.

To achieve this, IITA set-up a cascade system of nurseries, with researchers maintaining the parent stocks of new varieties, inviting farmers to assess them for yield and processing qualities, and sending the preferred varieties on for conventional multiplication at a limited number of sites. Cuttings from these sites were then distributed to farmers and community organisations, with women's groups financed by the Cameroon Gatsby Trust playing a critical role in downstream multiplication. As a result, in South-West Cameroon alone more than half a million cuttings of disease-resistant cassava were distributed per year from 1985 to 1990.

## IN UGANDA

The outbreak of a new variant of CMD in Uganda at the end of the 1980s saw cassava production reduced by up to 70% in some districts. The impact was particularly severe as it took place against continuing instability following a five-year civil war which had seen normal agricultural production plummet, previously cultivated land falling fallow, the theft of cattle to feed the warring factions, and unprecedented food shortages. Added to this, the Ugandan cassava breeding programme was forced to abandon its Serere research station, along with all genetic materials and records, after raids by insurgents opposed to the new government.

Researchers at Serere had assembled a collection of cassava germplasm, including a range of IITA disease-resistant varieties, and begun making crosses to introduce the desirable characteristics into locally acceptable types. A National Agricultural Research Organisation (NARO) researcher risked his life by returning to the station, bringing back four cuttings, from which NARO grew 29 plants.

"Gatsby's involvement in Cameroon and Uganda changed many people's attitudes. As researchers we were trained to evaluate impact, not to create it, but now we see the dissemination of technology as part of an integrated R&D process." - Dr James Whyte, veteran of the cassava projects

In response to the CMD-epidemic, NARO accelerated the normal process of developing and releasing resistant varieties. NARO sent promising clones for on-farm evaluation within a season, training farmers to collect data and listening to their views on the advantages and disadvantages of the new varieties. NARO also sent stems of resistant varieties to a wide range of institutions, including prison farms and schools, with each acting as hubs for local multiplication.

Gatsby funding was also used to mobilise, resource and train extension staff in six target districts, leading to the formation of the researcher-led National Network of Cassava Extension Workers. Researchers retained control of the funds for dissemination, ensuring the task did not fall between the responsibilities of research and extension organisations.

Between 1991 and 1996, 12 high-yielding, resistant varieties were introduced and more than 35,000 farmers and extension workers were trained. More than 100 million stems were distributed and 100,000 hectares of the improved varieties planted. Cassava production quickly exceeded pre-CMD epidemic levels (although many farmers reverted to local varieties once the crisis eased).

## A MOVING FRONT

While the crisis eased in Uganda, the CMD front spread to other countries in East Africa. Gatsby subsequently partnered with the Rockefeller Foundation to fund IITA and the Kenya Agricultural Research Institute to develop and adapt the researcher-led model of dissemination for Western Kenya, areas of Tanzania, the Democratic Republic of Congo and Sudan.

## LESSONS

Many promising technologies fall into the gap between research and extension. These projects challenged researchers to close this gap, believing that researchers themselves are likely to be the most effective 'product champions'.

Researchers were empowered to inform extension staff and farmers about a new variety's potential, conduct trials at farm level, and set-up the first stages of a multiplication system – especially important for a vegetatively propagated crop. Critically, they had control of a fund allowing them to finance each component.

Multiplication proved most successful when undertaken by groups not specifically formed for the purpose of the project, and where members had worked together before. Groups of this kind also proved more efficient and equitable distributors.

NARO's dissemination system allowed smallholder farmers to adopt improved varieties on a scale unprecedented in East Africa, easing the devastating impact of the CMD epidemic and providing a model that was scaled-up across the region.

The Gatsby Charitable Foundation
The Peak, 5 Wilton Road
London SW1V 1AP
T 020 7410 0330 F 020 7410 0332
www.gatsby.org.uk
Registered Charity Number 251988