GATSBY

# DISSEMINATING IMPROVED RICE VARIETIES

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Demand for rice in West Africa outstrips production, with the region spending billions of dollars a year on imports. There is huge potential to boost domestic output through higher-yielding, drought-tolerant varieties. Yet farmers often reject such varieties when they are introduced because a locally important characteristic, such as taste or cooking qualities, has been overlooked.

- Between 1999 and 2007 Gatsby funded the West Africa Rice Development Association to continue its development of improved rice materials and expand their uptake by farmers across Nigeria and Ghana through participatory varietal selection
- The projects worked with 3,200 farmers. The new varieties increased yields by between 50 and 200% and uptake reached 70% in some areas
- Gatsby also funded work to improve local rice value chains across four regions of Ghana, and has since researched constraints and opportunities in East African rice sectors with the Kilimo Trust

## THE RICE SUPPLY DEFICIT

Demand for rice in West Africa continues to outstrip domestic production. At the turn of the millennium over half of the rice being consumed by the region was imported at a cost of more than US$1 billion a year.

There is huge potential to boost domestic production. The Asian rice genotypes which are generally grown yield poorly in the prevalent low-input conditions in West Africa, especially given that half the rice produced in the region is rainfed. Moreover such varieties are susceptible to pests and diseases. This means yields are often under 1 tonne per hectare, and have remained virtually static since the 1960s.

New varieties offer the potential to produce 2.5 tonnes per hectare with low use of inputs, and 5 tonnes per hectare or more with minimal extra application of fertiliser. Furthermore, these new varieties have higher drought-tolerance. This vastly increases the area they can be planted on – by up to 30% in Nigeria, for example.

## NEW RICE FOR AFRICA

Development of the new varieties began in 1991 when researchers at the West Africa Rice Development Association (WARDA) began using 'embryo rescue' to cross Asian rice (Oryza sativa) with African rice (Oryza glaberrima). Embryo rescue is an in-vitro culture technique used in plant breeding to protect the progeny of initial crosses between plant species that would not otherwise survive to produce viable seed.

Using the technique, researchers were able to begin a breeding programme aiming to combine the best characteristics of the two species of rice.

African rice is tough, growing vigorously even on poor soils, and producing numerous stems and wide, drooping leaves that successfully compete against weeds. It is also more resistant to pests and diseases.

However its tall stems tend to buckle under the weight of grain and the seed heads shatter when they are ripe, dropping the seeds from the plant. This is the natural behaviour of a wild grass, but it costs farmers grain, and African rice already tends to yield less than its Asian relative.

The new varieties produced by the programme combine the vigorous weed-suppressing, pest- and disease-resistant characteristics of the African plant type with the larger heads and non-shattering grain of the Asian species. The plants are taller than Asian rice, making them easier to harvest by hand, and their grain contains some 2% more protein than that of either parent. Despite a shorter growing period, yields are better too. The varieties are called NERICA – NEw RIce for AfriCA.

## DISSEMINATION

In 1999 Gatsby began supporting WARDA to continue its development of new NERICA varieties while expanding their dissemination across Nigeria and Ghana.

Gatsby and WARDA were conscious that while many promising agricultural technologies are developed, not all are adopted by farmers, even when significant efforts are made to disseminate them.

This happens for a variety of reasons, including the fact that farmers often reject new varieties because a locally important characteristic - such as taste, cooking qualities or suitability for intercropping - has been overlooked when agencies decide which varieties to focus dissemination efforts on.

To avoid this, WARDA and its partners implemented a system of participatory varietal selection through a three-year rolling programme.

In the first year WARDA travelled from village to village establishing rice gardens of 20 or more varieties, including previously released varieties familiar to farmers and new varieties (both NERICA and other promising conventional selections). A group of nearby farmers was invited to visit each site twice during the first growing season – first as the grain began to fill and then again at harvest. Working side by side, researchers, extension workers and farmers evaluated the materials on offer – not just for yield but for other criteria too.

Based on the first year's evaluation, the farmers chose the five or six varieties that seemed best suited to their needs and local conditions, taking away seed and planting on their own land. Researchers and extension workers continued to work with the farmers to establish the most appropriate sowing dates and the fertilisers and pesticides needed to maximise output.

In the third year farmers were able to access more of the same planting material but on the basis of paying for it. Extension workers established community-based seed production facilities to increase availability of the one or two best performing varieties and marketed them to other farmers in the area.

"Previously, the first that most farmers heard of a new variety was when the radio announced that they could go and buy it at the agro-service centre. After so many disappointments, many farmers would not even bother to go. Now they are seeing and testing new varieties in their own fields – and the best varieties are already spreading from farmer to farmer." – Dr Adeoti of the University of Agriculture, Abeokuta

Overall, WARDA and its partners worked with more than 3,200 farmers across 24 of the 36 states of Nigeria and six of the 10 regions of Ghana.

The new varieties increased yields by between 50 and 200% and uptake reached 70% in some areas.

## LESSONS

The WARDA projects demonstrate the value of using participatory varietal selection to ensure advances in agricultural technology are adopted by farmers and improve livelihoods.

However, in surveys 30 to 90% of farmers (depending on variety adopted and location) cited the inconsistent supply of affordable seed as the main reason for not further expanding production of the new varieties. This highlights the underdevelopment of the commercial seed sector in both countries – for example, in Nigeria between a third and 60% of farmers relied on state governments for seed at the time of the project.

Furthermore, rice requires considerable processing before consumption, and to maximise the benefits of introducing new varieties it is necessary to address constraints across the whole value chain.

In Ghana, Gatsby funded the Council for Scientific and Industrial Research to help improve the competitiveness and profitability of locally-produced rice through a number of interventions across the production, processing and marketing sections of the value chain in Tono and Nyankpala in Upper East and Northern Regions, and Bibiani and Hohoe in Ashanti and Volta Regions.

Major obstacles to progress included the difficulty in drawing banks into credit arrangements, the lack of managed water control to combat drought, the lack of quality seed to scale up production, and continued inefficiencies in the processing system. Further efforts to boost rice production need to address such concerns to be truly effective on a large scale.

Across 2012/13 Gatsby worked with the independent, Gatsby-founded Kilimo Trust to research the constraints and opportunities in rice sectors across East Africa. Kilimo is now taking this work forward with the Bill and Melinda Gates Foundation and other partners on the Competitive Rice for Africa Initiative. In Tanzania, the Initiative is looking to double the incomes of 30,000 rice growers by improving productivity, processing, access to finance, and the enabling environment at national and regional levels.

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