



GATSBY

IMPROVING FARMING SYSTEMS IN WEST AFRICA

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Across the dry savannahs of West Africa, rainfall is scarce, soils have low organic content, and traditional farming systems lead to nutrient losses and a continuous decline in crop yields and incomes, trapping farmers in a vicious circle of poverty.

- From 2002 to 2009, Gatsby supported the International Institute of Tropical Agriculture (IITA) to develop and disseminate improved farming systems in Nigeria and Niger that use livestock and the strip-cropping of cowpea and cereals to prevent nutrient losses
- Participating farmers achieved incomes 300-500% higher than those employing the traditional system, with estimates suggesting that more than 200,000 farmers benefited, both directly and indirectly
- Dissemination was particularly successful as IITA focused on establishing farmers' groups and linking them with participating banks, creating a self-policing and sustainable solution
- The project's emphasis on women's groups was also notable given the conservative Islamic nature of the region



A VICIOUS CIRCLE

Rapidly increasing populations and pressure for food continues to drive an intensification of agriculture in West Africa, pushing farmers onto marginal lands and forcing them to farm when land should be left fallow. The situation is particularly acute in the dry savannahs of Nigeria and throughout Niger, where rainfall is scarce and soils are predominantly sandy with low organic matter, low phosphorus and poor water-holding capacity.

Here, most farmers cannot afford fertiliser or other inputs. Their traditional system of intercropping cereals and legumes on a 1:1 ratio decreases the organic matter in soil, reduces soil's biological diversity, and enhances erosion. Scientists estimate that in this traditional farming system, annual nutrient losses exceed 26 kg of nitrogen, 3 kg of phosphorus, and 19 kg of potassium

per hectare, leading to a continuous decline in crop yields.

Farmers are thus trapped in a vicious circle: lower yields lead to lower incomes lead to lower inputs lead to lower yields. In these areas, more than 70% of the population live below the poverty line.

INTEGRATING LIVESTOCK

In 2002 Gatsby started funding the International Institute of Tropical Agriculture (IITA) to boost integration of livestock into farming systems across the region.

Livestock helps maintain soil fertility through manure, boosts farm efficiency by providing traction and transport, increases incomes through the sale of milk and meat, and contributes to healthier, more balanced diets.

The major constraint to livestock integration in West Africa is the limited availability of crop residues with high nutrient quality. The region's traditional farming system simply does not produce enough fodder to support livestock on a sufficient scale to impact soil fertility, so IITA worked with farmers in different areas to test different systems. Together they identified systems of strip-cropping cowpea and cereals on a 4:2 ratio ideally suited to local conditions.

Cowpea fixes atmospheric nitrogen, causes suicidal germination of *Striga hermonthica* (a parasite of cereals), and contributes to improving soil fertility.

In the Sudan savannah (with about 600mm rainfall), two rows of densely planted improved sorghum variety were intercropped with four rows of densely planted improved medium-maturing cowpea variety.

In the northern Guinea savannah (with about 1,000mm rainfall), two rows of densely planted improved maize variety were intercropped with four rows of densely planted double-crop improved 30-day cowpea.

In these systems the cowpea did not suffer from competition from the cereal rows because of its early maturity compared with the slow initial growth of the cereals. To protect the crop against pod borers, two sprays of insecticide Cypermethrin were also applied.

In trials these systems, when combined

with initial fertiliser application, proved up to 300% more productive and profitable than the traditional 1:1 cereal-legume intercropping system. The systems could support up to 10 sheep or goats per hectare for a year, producing one tonne of manure for recycling through the farm.

DISSEMINATION

IITA disseminated the systems through the region by introducing farmers to improved varieties of the crops, contracting seed companies, facilitating the bulk purchase of fertiliser, and training farmers and extension staff on best practice for managing the crops and livestock. Training covered topics including fodder preservation and feeding strategies for livestock; postharvest handling, processing and commercialisation of cowpea; and the safe use of agro-chemicals.

IITA also helped form farmers' groups so farmers could secure loans from five participating banks to pay for inputs.

IITA particularly emphasised the formation of women's groups, training them not only on crop management, but also on value addition through strategies such as manufacturing and selling soap made from cowpea flour.

OUTCOMES

Studies found that yields of sorghum and cowpea in the region increased threefold, with participating farmers achieving incomes 300-500% higher than those employing the traditional system.

More than 18,000 farmers in Nigeria and 800 in Niger directly participated in the project, with an estimated 200,000 farmers benefitting indirectly through the training of more than 1,900 extension staff plus farmer-to-farmer diffusion of improved seeds and crop-livestock systems.

The project facilitated the registration of more than 350 farmers' groups in Nigeria, including 74 women's groups. In 2007/08, 60 groups successfully applied for bank loans totalling US\$105,000 to purchase inputs. The total cost of purchased inputs was about US\$80/ha, and the total output from the combined grain yields of cowpea and maize/sorghum was equivalent to more than US\$800/ha.

Nigerian farmers began multiplying improved cowpea seeds in 2007. They had earned US\$314,000 from seed sales within two years.

LESSONS

The project demonstrated the vital role agricultural finance can play in Africa. Access to credit can break the vicious circle and turn it into a virtuous one.

The project's emphasis on women's groups was particularly notable given the conservative Islamic nature of the region. Women benefitted in terms of income, nutrition and, most notably, social standing.

Gatsby had funded previous high-level IITA research on cowpea. This kind of research is an important part of the effort to combat hunger and poverty in Africa - and the project benefitted from improved varieties developed through such research - but progress is often slow. This project showed impressive results can often be achieved quickly through a focus on final deployment and the innovative use of existing technologies.

IITA's work in this project has been adopted by national partners across Nigeria and Niger, who have looked to expand its benefits across both countries. Despite its increasing popularity with farmers, cowpea remains underfunded when it comes to research. However, it is one of IITA's six key focus crops. IITA has released improved cowpea varieties in 68 countries and continues to train farmers globally on improved management.

