

Farmers and sorghum in Nicaragua's

In some regions of Nicaragua, sorghum used to be the poor man's crop. In recent years, more farmers are growing sorghum, instead of maize, in response to changes in the local climate. A participatory plant breeding programme was set up, looking to improve the sorghum varieties grown. Some varieties have now been registered. With scientists and farmers now working together, further activities are planned, such as selecting suitable bean and maize varieties.

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Back in 2002, a study carried out by different organisations in Madriz, a district in northern Nicaragua, showed that more and more farmers were growing sorghum instead of the main staple crop, maize. Farmers were also willing to talk about growing and eating sorghum, while only a few years ago this would have been equal to admitting they were very poor. The study showed that a large percentage of farmers now grow white-grain short-cycle sorghum varieties (locally known as *sorgo tortillero*), in addition to those growing the daylength-sensitive varieties (or *millón*) that are now restricted to the less fertile fields.

Most farmers remember when these changes started (the first major drought experienced in 1972), and therefore relate the change in their cropping systems to the changes they see in the weather. They also reported that these changes have mainly taken place without the help of the government's extension services, or without involving NGO programmes. As sorghum was not a major national staple crop, most governmental development programmes focused on the production of maize or beans. But farmers feel that sorghum is a major crop in



Photo: Gilles Trouche

Clotilde Soto Vargas, a farmer from Musuli, Palacanguina, selecting some of the best *tortillero* plants in her field.

terms of food security, and therefore expressed their interest in improving the varieties they grow.

Participatory plant breeding

Responding to this, CIRAD (a French agricultural research centre), INTA (Nicaragua's national agricultural research institute), and CIPRES (a local NGO), began implementing a participatory plant breeding programme. Running from 2002 until 2008, it is part of a larger project covering several countries in Central America. The programme focused on diversifying and improving the sorghum varieties so as to match the needs of resource-poor farmers in the dry areas. The research team involved breeders, farmers and extension workers. First they considered the introduction of improved inbred lines or varieties from Africa, representing a wide genetic diversity. Farmers tried them out in their fields and evaluated their agronomic performances and also their culinary qualities. Secondly, crosses were then made between the local varieties and those of African origin with complementary traits. The aim was to develop progenies which would better satisfy the local farmers' requirements.

As a result of this process, farmers now grow new varieties of *tortillero* and *millón* sorghum presenting higher and more stable yields and other quality traits. One was officially registered in 2007 by a smallholder's co-operative, and is now being disseminated in the area covering the south of Honduras and the north of Nicaragua. Known as 'Blanco Tortillero', this variety was originally developed in Burkina Faso, giving excellent results in the low-input cropping systems (see Box). Another new variety highly praised by farmers is 'Coludo Nevado'. At least 10 other lines derived from the crosses formerly mentioned, are currently in the final evaluation stages before being released.

One of the most important results observed is the formation of a core group of farmer-breeders. All of them are capable of selecting plants and progenies, of evaluating varieties with their own criteria, and taking decisions together with researchers and NGO extensionists. A large number of men and women, both

New varieties

Tortillero sorghum 'Blanco Tortillero'

- Improved line developed in Burkina Faso for drought and low soil fertility conditions.
- Excellent combination of earliness, adaptation and yield stability in conditions of abiotic stress (drought or high rainfall, low soil fertility) and grain quality.
- Registered in Nicaragua in 2007 by the co-operative COSENUP R.L. with the technical support of CIPRES, INTA and CIRAD and the financial support of FDN Norway and ACSUR Spain.
- Is now being diffused in the north of Nicaragua and south of Honduras.

Millón sorghum 'Coludo Nevado'

- Daylength-sensitive landrace from Sudan.
- Drought-tolerant and high ratooning capacity after the dry season.
- Good productivity in the maize-sorghum intercropped systems and excellent grain quality for making *tortillas*.
- Rapid adoption in the dry hillsides in the north of Nicaragua.

New *tortillero* and *millón* lines derived from crosses with African progenitors

- Plant types responding better to the farmers' preferences.
- Higher grain yield and forage quality.

northern region

young and old, are involved in these participatory breeding activities, at different steps. According to a female farmer in the village of San Lucas, "This is the first time that I see researchers interested in improving our *millón*, the crop which for a very long time has been our insurance against risk." Many of them are now also involved in evaluating and selecting new progenies of maize and beans, and plan to be further involved in managing trials for new varieties of sisal (*Agave sisalana*) and vegetables.

Strengthening farmer innovation systems

Farmers and technicians are also working together to improve soil fertility and ensure better and more stable yields within the existing sorghum cropping systems. Long-term agronomic trials on agro-ecological techniques have been designed and are being managed locally. These trials are looking at crop associations, locally-produced organic fertilizers and green manures. They mainly focus on techniques derived from the experience of some innovative farmers, with some adjustment. One of these is ratooning in the second cropping season. Ratooning is a technique where a crop is cut down to its base, leaving the roots and allowing new shoots to develop. In sorghum, this technique helps in getting a relatively stable grain and fodder production, even in cases of severe drought (as happened in 2006) or excessive rainfall (as in 2007). Research is currently being done in order to optimise this practice, looking at the best date and stem height for cutting the plants. The team is also interested in the development and selection of lines with better ratooning ability.

Perceptions and motivations

Farmers involved in this work are improving their yields and grain quality while adapting to a changing context. They are not part of a project developed around climate change, but their perceptions on climate change are reflected in the criteria they use for selecting new varieties. Climate change is not seen in terms of major disasters (floods, hurricanes, drought), but rather as increased uncertainty: some years bring excessive rainfall, while others are very dry, with a great irregularity within and between the two annual rain seasons. Farmers are interested in crops which ensure production in all climatic conditions. Breeding new varieties through a participatory and decentralised

approach is a way for farmers to deal with uncertainty, and for anticipating climatic change. In short, they are looking for flexibility in their cropping systems; they do not want very specialised cultivars, preferring varieties able to produce in any weather conditions.

As everywhere in the world, farmers in this region want to avoid risk. They are interested in a healthy and productive system, and thus do not want to return to the farming systems of the past. Since 1972, farmers have actively and independently been changing their cropping systems, through the large scale adoption of *tortillero* varieties complementing the *millón* varieties. From 2002, the development of efficient links between the scientists and farmer organisations has allowed them to increase the diversity of the available varieties, to improve the productivity of their cropping systems, and thus to refine their responses to the climate changes. ■

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FARMING MATTERS

Help us develop a new educational series on LEISA principles

ILEIA has started to develop a new educational series that will make LEISA principles and practices more understandable. It is called Farming Matters. Eventually, Farming Matters will be published as a series of modules to help educators and field workers explain better why to practise more sustainable agriculture, and to put it into a wider perspective.

Before we publish the series on paper, however, we will make it available on-line as it develops. Our hope is that we can partly develop the series on-line, seeking input from LEISA practitioners and readers around the world to make sure that the guide will be relevant to people in the field. Besides this, field testing and access to the on-going developments will be made available on CD-ROM to readers without access to the internet.

The global version of Farming Matters will be developed in English first, though many partners in the LEISA network may eventually develop their own more regionally focused versions in different languages.

Farming Matters approach: learning

We will explain the main principles behind LEISA, give ideas on how to explain scientific concepts (with examples, illustrations and clear definitions), and remind about the wider context of farming (for example, looking at cultural, economic and political factors in addition to the ecological principles). References will be made to both local and scientific knowledge. Finally, rather than giving recipes to solve problems, Farming Matters will keep asking questions, to get people to reflect on the principles within their own situation.

Look for notices about Farming Matters on the LEISA website (<http://www.leisa.info>) in the New Year!