



## RECOVERING LOCAL MAIZE IN BRAZIL

*Angela Cordeiro and Breno de Mello*

The loss of genetic diversity in food crops is a serious threat to agricultural development. In Brazil, a group composed of local associations and farmers' organisations — supported by NGOs of the PTA (Alternative Technologies Project) network and researchers from EMBRAPA (Brazilian Institute for Agricultural Research) — is working to develop farmers' self-sufficiency in good quality maize seed, based on the conservation and use of local maize varieties. To date, the experience is showing that farmers can get equally good yields from locally-controlled maize varieties, debunking the myth about the superiority of hybrids. But the effort is threatened by new Brazilian legislation on patenting life. Angela Cordeiro and Breno de Mello, both involved in the programme, wrote this article for the first issue of *Biodiversidad: Cultivos y Culturas*, a new Latin American magazine co-published by REDES (Friends of the Earth Uruguay) and GRAIN.

The PTA network is composed of 21 non-governmental organisations active in 12 states of Brazil. The network, which was created in 1983, works with small farmers organisations to seek alternatives to the dominant model of agricultural production, alternatives which point to other types of development. With respect to genetic resources, the issue has been taken up from the perspective of the farmers: the need to assure self-sufficiency in seed supply based on incentives to use local varieties and/or introduce other options, be it in terms of species or varieties, in order to reinstate diversity in production systems.

Because of its presence in almost all small farmers' holdings in Brazil, maize cultivation is a prime entry point to discuss production systems as a whole. Since 1990, groups within the PTA network which are active in the south and southeast of Brazil have been dealing collectively with a problem that is common to most farmers in the two regions: self-sufficiency in maize seed supply. The project to attack this issue is being developed with the help of researchers from National Centre for Agrobi-

ological Research (CNPAB, of EMBRAPA) and aims to safeguard and encourage farmer production of maize seed, based on the valorisation and reintroduction of local varieties instead of commercial hybrids.

### **Maize in Brazil**

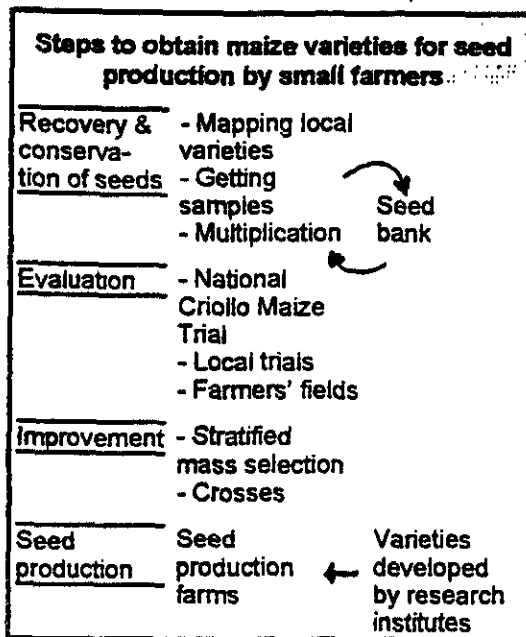
Since 6,000 years ago, when maize started to be domesticated in Central America, this crop expanded out in all directions, resulting in great diversity of varieties within the species. In Brazil, there is evidence of the presence of maize in the Pre-Colombian period. Scientific studies have shown that different races of maize were developed by the Guarani, Tupi, Caicangue and Xavante Indians. After the Portuguese occupation, starting in the early 1500s, new varieties were brought in by immigrants coming from different continents which displaced or meshed in with the indigenous varieties.

After many years the cultivation of maize became a prime activity in Brazilian agriculture. In 1991, around 13 million hectares were sown to this crop. The agricultural census of 1985



shows that nearly 53% of the land area devoted to maize is found in farms of less than 50 hectares, which indicates that most of it is grown by small farmers.

Despite the fact that Brazil was one of the first tropical countries to produce and distribute improved maize varieties, productivity is much lower than the potential offered by hybrids, which were massively adopted from the 1970s onward. In the 1980s, the national average yield remained around 1,800 kilogrammes per hectare.



The reasons for this low productivity level are diverse. The rise in the cost of inputs, coupled with the low price paid to producers and lack of rural credit, has driven farmers to double their efforts in avoiding risk. This means cutting back on as much cash expenses as possible. In the case of maize, many farmers who normally bought hybrid seed annually now do it every second or third year, reusing second and third generation seed of the original hybrids. The low quality of this seed, and related problems with

soil fertility, results in a serious problem of low productivity.

**A strategy for recovering local varieties**

When searching for a solution to the maize seed problem, we found a few farmers who were still maintaining local varieties and getting satisfactory yields despite their poor production conditions. This gave rise to a series of training courses for technicians of the PTA network, with the help of EMBRAPA, to discuss the potential and limitations of promoting the use of local varieties. The results of some of the research conducted through these trainings confirmed the observations of most of the field technicians and encouraged them to continue working with indigenous materials.

As of 1990, the NGOs of the PTA network who are active in the south and southeast — regions where modernisation of agriculture was most intense — defined a joint work strategy. The valorisation of local varieties and farmers' participation were the main principles to guide any search for solutions to the problem of seed dependency. The strategy was divided into four steps (see table). The final objective is that the farmers produce their own seed. For this, it is necessary to substitute hybrids with open-pollinated varieties.

After raising awareness and interest of the farmers in the proposal, the first step was to recuperate local varieties that they were still growing. After mapping out the varieties maintained by farmers in a specific locality, seed samples are obtained for multiplication by farmers groups. To avoid any eventual loss of materials, a part of each sample is maintained in a community seed bank. The banks serve as back-up reserves in case of any problems in the transition period from recovery of, to full conversion to, local varieties.



In a later stage, the recovered varieties are evaluated through comparative trials and farmers' observations from their own holdings. One of the trials is carried out at the network level in cooperation with CNPAB. The trial is called the National Criollo Maize Trial (ENMC) and consists in evaluating the local varieties, with farmers supported by the PTA network, in different regions of the country.

All the seed samples are brought together in one place to prepare two kits for each test. These are then distributed to each location where the trial will take place. Each location tests the same variety under different soil and climate conditions. Through the ENMC, a series of studies on the behaviour of each varieties is conducted. Aside from the national trials, local trials involving a smaller amount of material and following the specific interests of farmers, are conducted locally. Drawing from the national and local trials, farmers take seeds of whatever material interests them and they plant them on their holdings alongside the maize they are used to working with. At this stage they do the "see it to believe it" test, which compliments the evaluation process.

In the process of evaluation, certain varieties present characteristics that the farmers wish to improve. Generally, farmers select ears from the stock, often choosing the best looking ones and taking the kernels from the centre of the cob for use as seed. Some farmers are used to carrying out intentional crosses and trying to improve the varieties they use. The task in this stage is to provide information to the farmers so that they can define, on the basis of their own criteria and needs, the best strategy to pursue. In the training courses, the basics of stratified mass selection and crossing are presented, with strong emphasis on maintaining the widest genetic base possible. In a few cases, crosses are carried out by EMBRAPA plant breeders and the descendants are handed over to the farmers so that they can continue the selection process on their own holdings.

With a greater knowledge about the different varieties and better information about how to work with them, farmers can make their own choices and organise seed production at the community or individual level. The entire process is a dynamic one, with many of these steps and stages going on simultaneously.

#### Lessons from the practical work

The results achieved from this collective experience involving technicians and farmers from the PTA network go much further than the mere quantitative data compiled through the evaluation trials. This has been a great process of learning which already allows us to assert the following:

##### ↳ *Local maize varieties are a viable option*

A series of data obtained independently from different organisations in the PTA network substantiate the potential of indigenous maize varieties. The results coming from six states of Brazil over the past four years of national trials provide a synthesis of these findings. Every year, the local varieties have demonstrated a very promising performance and sometimes equal or even out-yield commercial hybrids (*see table next page*).

These results concern the average yields of local varieties. If they took into account costs of production and other parameters, the advantages of local varieties would be even greater. Evaluating the results individually — location by location — it is easy to see that there are varieties whose yield is superior even to what farmers indicated as ideal.

In sum, both the evaluations carried out in the controlled national trials and the on-farm trials of farmers participating in the programme, confirm the potential of local and improved varieties, demystifying the "taboo" of commercial hybrids.



**Nat'l Criollo Maize Trial, 1993/94 growing season. Average yields in 11 locations.**

Variety	Kg/ha	Type
Carioca	5031	LV
BR 201	4921	H
XL 560	4881	H
IAC-MAIA	4858	LV
BR 106	4658	PUB
Palha Roxa CB	4684	LV
Brancao	4653	LV
Caiano Sobralia	4614	LV
Comp. Sel. Mineiro	4569	LV
Amarelao SC	4561	LV
Astequinha FB	4498	LV
Sol da Manha NF	4494	LV
Bico de Ouro	4470	LV
CMS 5202A	4432	PUB
Caiano AL	4382	LV
Argentino	4375	LV
Campeao	4374	LV
Asteca SC	4364	LV
Sol da Manha ND	4354	PUB
IAC Taiuba	4347	PUB
Maia Antigo	4298	LV
Cunha Branco	4297	LV
Amarelao MC	4284	LV
Vargem Dourada	4281	LV
Cravinho Be	4240	LV
Tabuinha	4240	LV
Pedra Dourada	4142	LV
Asteca ZM	4115	LV
Empasc 151	4107	PUB
Amar. Paulista	4049	LV
Macabu AL	4041	LV
Palha Roxa FB	4040	LV
Asteca VA	3997	LV
Quarentao	3935	LV
Sabugo Fino	3647	LV
Palha Roxa IB	3628	LV

LV = local variety

PUB = public research institute variety

H = hybrid

↳ *Crop improvement can be decentralised*

It is clear that there is a clash between the current plant breeding by agricultural research institutes and conservation of genetic resources. While there is a lot of movement today to strengthen conservation programmes and avoid the loss of diversity, the official plant breeding strategy goes in the opposite direction and contributes to the process of genetic erosion. The basic problems come from the dominant thrust toward uniformity and wide adaptation, the use of a very narrow genetic base as a source of variation and the centralisation of the whole breeding process in experimental stations.

This experience has brought to light the possibility to innovate in plant breeding, in such a way that farmers, technical support people and plant breeders work together, each one having a specific role to play.

↳ *Farmers can produce high quality seed*

When this programme started, in many of the groups the farmers already had much experience in purchasing their maize seed. In the beginning, the possibility to return to farm-based seed production and produce a good quality seed seemed pretty remote. Aside from needing good varieties to start from, it means having the appropriate land for seed production to avoid cross-pollination with other varieties.

Today, the maize seed production holdings are a reality in the PTA network and the demand for seed is growing by the day. In the 1993/1994 growing season, about 150 community seed production holdings were organised, in which 3,000 families are directly involved. The farmers themselves found the solutions to their operational problems. The lack of isolated areas, for example, was overcome by taking a community approach. One appropriate area per community can produce seed for numerous families. The savings that these families are making can now go into improving their soil conditions, which in many cases is a more limiting problem than the quality of the seed.



### New challenges

To carry out a consistent effort on the basis of work focusing on genetic resources one has to overcome a number of operational problems related to access to good information and to genetic resources themselves. But very often these problems seem so minor compared to the legal obstacles which each day seem greater and ever more weighed up against the conservation and use of biological diversity.

In the field of agriculture, this starts with the laws which regulate access to rural credit. There is a huge inconsistency between credit regulations and conservation of local varieties because the credit is always linked to the use of recommended varieties, which in the case of maize are generally commercial hybrids.

An even more extreme example is the Law on Intellectual Property which, in this end of the century, is rapidly spreading to cover all life forms. With the advent of biotechnology, the commercial interest in genetic resources is growing and, as a consequence, effort to legalise monopolies on genetic resources is also growing. Aside from political and economic issues at stake, this is generating an ethical debate which is very serious.

Ever since the draft law 824/91, which aims to amend current Brazilian legislation on intellectual property, was presented to the National Congress in April of 1991, the PTA network has worked to bring the debate to the level of the farmers. The farmers' first reaction, in every instance, was one of fear and consternation because it seemed impossible that someone could outlaw the free exchange of seeds, such a common practice among farmers. So as a first priority, the farmers and their organisations decided to try to put pressure on the deputies to reject the law. Unfortunately, the draft was approved by the Chamber of Deputies. After modifications, which only made it worse, the law is awaiting approval by the Senate.

The question now is: What to do once the law is approved? If we follow the law to the meaning of the letter, initiatives like the PTA network's could become illegal. Will farmers have to pay royalties to save seed from varieties developed by EMBRAPA and other public research institutes? What will happen then with the joint activities between farmers and scientists? Who will guarantee that the material collected with the farmers won't be patented by some third party? What security measures can we take to avoid this?

All of these questions show, very concretely, the negative consequences that this type of legislation can have on initiatives which aim to strengthen collaboration between farmers, NGOs and public research institute on genetic resources activities. These questions are up for debate and are largely unanswered. The only thing for certain is that, once approved, the law will be unjust and the possible reaction — in conformity with the farmers' own perspective — will be peaceful civil disobedience. ❁

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