

Early attempts at stimulating seed flows in Cuba

Since the disintegration of the USSR in 1989, the Cuban agricultural sector has had to cope with a drastic reduction in input and trade support, shifting gradually towards more self-sufficient and rational forms of production. Many remarkable technical and social transformations have occurred as a response to

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this challenge. In the 1980s, Cuba had carried out 87% of its external trade at preferential prices, imported 95% of its fertiliser and herbicide requirements, and owned one tractor for every 125 ha of farmed land. After the collapse of the socialist block, foreign purchase capacity was reduced from US\$ 8,100M in 1989 to US\$ 1,700M in 1993. This greatly affected the country's ability to buy agricultural inputs. Fortunately, since the early 1970s Cuban research institutes had been aware of the concept of low inputs and input substitutions and soon development and diffusion of alternative fertiliser and pest control measures was put into place.

However, the plant breeding sector has been slower to adapt. The solution is not as simple as technology substitution within the existing top-down infrastructure. The industrialised system had encouraged a vulnerable crop genetic framework with a low level of biodiversity. The homogeneous environment previously maintained with a high use of inputs was now no longer able to support the same crop varieties. The national seed supply system urgently needed to expand, but lacked the financial resources to do so. Between 1989 and now, its seed production capacity for maize and bean had fallen 50%.

The seed and breeding sector continues to operate almost wholly within the centralised state planning system, which does not respond comfortably to rural reality. Today, breeding strategies do take indirect yield attributes and regional variability into account but prioritising the breeding of seed for real conditions of low external input has yet to emerge at the institutional level. There is a need to supplement current dependency on the formal seed supply system with a more informal approach.

Lack of appropriate seed has meant that the informal seed system, operated directly by and for farmers, continues to exist although weakened by the dependencies created prior to 1989. The maintenance of wide variability and adaptation is tradition-

ally carried out in small plots where farmers conserve *in vivo* those plants considered useful to the household. Through the informal system, the production of seeds of the basic staples of the Cuban diet has continued in many parts of the country. These genetic resources have provided a basis for plant breeders selecting commercial genotypes. However, relatively little attention has been paid to this informal seed management system in Cuba, and much genetic variability has already been eroded.

Some plant breeders exposed to contemporary concepts and developments have begun searching for alternative approaches. In eastern Cuba, a plant breeding project emphasising participatory approaches has been established. An independent initiative by a maverick plant breeder in the province of Havana started to take forward similar concepts and to develop the project on which this article is based.

This breeder observed striking differences in crop yields between provinces. These were related to differences in management techniques, support and local agroenvironmental conditions. The hypothesis was that high and stable yields necessitate high genetic diversity within a crop. Seed flows help to encourage this diversity, particularly flows from regions of high genetic resource variability to those of low availability. The isolated nature of many of these high genetic resource regions has protected them from the extension programmes of the formal seed sector but has also hindered informal seed flow networks between distant communities.

PPB at INCA

The aim of the project is to diversify and improve the varietal structure of maize and common bean crops for low input conditions. Prior to the start of the Participatory Plant Breeding (PPB) project, the Plant Breeding Department of the National Institute of Agricultural Sciences (INCA) organised a seed workshop and fair, in collaboration with the (then) Cuban Association of Organic Agriculture (CAAO). The two-day workshop was held in April 1999 at the INCA research institute. Focusing on maize, the researchers

hoped to identify the varietal needs of a pre-identified group of small producers, introduce them to a diversity of varieties, encourage the selection of those varieties that were appropriate to their local conditions, and distribute seed for farmer experimentation and multiplication. The role of the seed fair was to facilitate the flow of seed from research institute to farmer,



rather than between farmers themselves. All the farmers invited came from Havana Province, and the core group from three agricultural cooperatives participating in an ongoing programme developing agroecological 'lighthouse' farms. 'Lighthouse' farmers were relatively accustomed to research interaction and intervention.

Havana Province is characterised by a relatively homogeneous environment. For the last few decades production systems have been dependent on high levels of input and are still dependent on the formal seed supply sector. There is little genetic diversity at present. Alternative seed material would have to come from the neighbouring but more remote province of Pinar del Rio. This province is characterised by a low level of external inputs systems and they have a high level of plant genetic resources and independence from the formal sector. Farmers maintain lines brought into the region over 15 years ago, but many reported regularly 'refreshing'

their seeds by introducing desired characteristics from other sources. Many were farming so close to each other that natural cross-pollination occurred easily.

Exchange of maize seed between farmers was common practice, particularly between the drier highland farms where there were two crops a year and the wetter lowland farms.

Preparation and methods

Some months before the workshop, two breeders undertook maize seed collection missions to a farming community in the province of Pinar del Rio. A selection was made for hardiness under low-input conditions and 66 landraces were collected including some from the focus communities in Havana Province. In addition, 4 commercial varieties were selected from research institutes. These were planted in December on an experimental plot at the research institute. Each of the 70 lines was sown in 3 rows, and wide border strips were sown with a mixture of different lines. Because of lack of finances, the experimental plot received only one irrigation and no fertiliser or pest control inputs.

Eighteen farmers, formal-sector maize breeders, soil specialists, social scientists from other research institutes, and representatives from the National Small-Farmer Association and the ACAO attended the workshop. Participants were split into 4 teams to identify and rank general problems associated with seed management and use. Farmers brainstormed over a list of problems and ranked the 6 most critical factors. After this, they were asked to name the 5 crops most affected by these problems.

On the second day of the workshop, the farmers were taken to inspect the maize experimental plot and to examine cobs of all the maize lines from this plot in order for each farmer to select 5 preferred lines. Seeds from these lines would later be given to the farmers for experimentation. Short questionnaires were used to gather information on the farmer's evaluation of each line chosen and the results were discussed.

Selection criteria

The main problems associated with seed management and use were identified as seed quality, seed availability, and the incidence of pests and diseases.

Availability of training and extension, exchange of seeds, and input availability were considered less of a problem. In the field, the farmers rapidly selected from the large number of lines on offer. They showed an immediate preference for the mixed varietal border stands as these showed a better

response to low input conditions than the mono-varietal rows. The importance of each of their selection criteria is shown in Table 1.

In the selection, 80% of the farmers identified different preference criteria for each of the five lines they had selected. Most popular was a landrace from Pinar del Rio province. Landraces from Pinar del Rio province showed a better performance than those from Havana province.

Table 1. Selection criteria for maize varieties, accepted as important by farmer participants.

Criteria	% of farmer acceptance
Plant yield	87.5
Plant height	87.5
Positioning of leaves	62.5
Number of leaves	60.0
Leaf colour	45.5
Leaf size	41.3
Stalk width	76.3
Number of cobs	57.5
Ear colour	32.5
Ear size	40.0
Susceptibility to lodging	31.3
Cob weight	50.0
Cob height	40.0
Cob fullness	40.0
Husk colour	28.7
Cob diameter	37.5
Cob husk cover	55.0
Cob size	42.5
Cob shape	55.0
Insect damage	35.0
Cob length	45.0

Insights

The observed better result from mixed variety rather than single-varietal planting, led researchers to conclude that they would have to work out contradictions using varietal maintenance through strict isolation as advocated by the formal system. It became clear that farmers not only looked at yield but also valued aspects such as plant height, stalk size,

number of cobs, and number and position of leaves. This is an indication of the potential for more alternative breeding strategies. Selection criteria chosen for maize varieties indicated that farmers, in general, did not practice seed saving. In fact, during the discussion period, several of the farmers asked how to save seed. Different choices may be made if the farmers begin saving seed.

Further, farmers used different individual selection criteria for the choice of each variety. Researchers interpreted this as highlighting the fact that even in relatively more homogeneous areas such as Havana Province, the PPB approach favours an increase in diversity.

Positive reaction

The general reception given to this new participatory approach was positive, given that farmers are accustomed to a more top-down management style. Farmers had rapidly and easily selected between the 70 lines on show, and a very large range of new seed lines had been extended to them.

The plant breeders involved felt that this workshop indicated the need for new concept in seed management so yields and cob quality under low input conditions could be improved. Stimulating the flow of genetic resource variability had shown the potential available for increasing yield performance on trial plots and farmer acceptance. Further, they concluded that PPB, which was usually associated with more marginal environments, could also be an important tool in more homogeneous conditions. In Cuba, governmental institutions appear open to an informal seed system, but classical plant breeders may need more convincing arguments.

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*Participatory
varietal selection
in the field*



photo: Julia Wright

