Seeds of Life: A participatory variety selection program with subsistence farmers in East Timor

Robert L. Williams[1], Louren?o B. Fontes[2], Deolindo da Silva[3], Alex G. Dalley[4] and Brian Monaghan[5]

[1] Seeds of Life, East Timor Ministry of Agriculture, Forestry and Fisheries. Email rob.williams@seedsoflifetimor.org
[2] Research Department, East Timor Ministry of Agriculture, Forestry and Fisheries. Email risonlia@yahoo.com
[3] Food Crops Department, East Timor Ministry of Agriculture, Forestry and Fisheries. Email deolindo_dasilva@yahoo.com.sg
[4] Seeds of Life, East Timor Ministry of Agriculture, Forestry and Fisheries. Email alex.dalley@seedsoflifetimor.org
[5] Seeds of Life, East Timor Ministry of Agriculture, Forestry and Fisheries. Email brian.monaghan@seedsoflifetimor.org

Abstract

Seeds of Life is an Australian funded program within the East Timor Ministry of Agriculture, Forestry and Fisheries. It is the national program for variety testing and release of major food crops. The range of crops currently includes maize, rice, cassava, sweet potato, peanuts and pigeon pea.

Seeds of Life is testing new introductions of the food crops on research stations as well as on-farm with subsistence farmers. Additional research is conducted with farmers to answer particular questions, such as weevil tolerance of new maize genotypes.

Farmers are involved in evaluating a large range of new genotypes at field days. Elite germplasm is further tested with farmers. Small areas ($25m^2$) of the crop genotypes are established with farmers in their fields, and managed by the farming family. During the last wet season, Seeds of Life established over 800 on-farm trials, with more than 600 participating farmers.

Key Words

Maize, cassava, subsistence farmers, East Timor

Introduction

East Timor has primarily an agricultural economy with 80% of the population residing in the countryside and relying primarily on subsistence agriculture for their livelihood. Maize, cassava, rice and sweet potato are the staple food crops. Maize is grown intercropped with cassava, sweet potato, and pigeon pea. Rice is grown in both irrigated and dryland areas.

Farming uses primarily traditional slash-and-burn techniques, and yields of staple food crops are low. Thus there is commonly a “hungry period” for the 2-4 months preceding the maize or rice harvest. The hungry season is associated with a cereal deficit for many families, where stored maize and rice does not last from one harvest to the next.

The cereal feed gap and associated hungry season, has been cited as the potential cause of the high prevalence of stunted, wasted and underweight children. Child nutritional surveys show that approximately 55% of the children are stunted (low height for age) and 51% are underweight (low weight for age), indicating a generally poor long-term and short-term nutrition situation (CARE 2004, GTZ 2003).

Seeds of Life aims to reduce the length and intensity of the hungry season for Timorese farmers, through the use of improved crop varieties. The program has been active in East Timor since the 2000-2001 cropping season. It was set up not only as a response to the loss of seed and planting material, but also

the loss of Ministry of Agriculture, Forestry, and Fisheries infrastructure following the post-election violence in 1999 (Piggin and Palmer, 2003).

Seeds of Life is based within the Ministry of Agriculture itself, and managed by three leaders: the director of the Department of Research, the director of the Department of Food Crops and the Australian Team Leader. By basing the program within the ministry's management structure, Seeds of Life will strengthen crop research and extension within the ministry.

Methods

Seeds of Life has been testing and introducing new genotypes of the staple field crops: maize, rice, cassava, sweet potato, peanuts and pigeon pea. These have been supplied by Consultative Group for International Agriculture Research (CGIAR) crop centres, namely CIMMYT, IRRI, CIAT, CIP and ICRISAT.

Testing now consists of two phases, namely replicated research station trials and unreplicated on-farm trials. Farmers are included in the process at research station field days, in on-farm trials, and in problem-specific on-farm research.

Research Station Trials

Approximately 10-20 test genotypes of the major food crops (maize, rice, cassava, sweet potato, peanuts and pigeon pea) have been grown at four locations in East Timor each year since the 2000 wet season. Many introduced genotypes of irrigated rice, maize, peanut, sweet potato and cassava produced much higher yields than local checks, and some appeared quite acceptable to local consumers. For each crop, several genotypes were broadly adapted with good yields across sites. In the case of maize, for example, the late-maturing varieties LYDMR and Suwan5 yielded 3-6 t/ha during the 2000-2003 growing seasons, whilst local maize produced 1-2.5 t/ha. For peanuts, a large-seeded introduction PT5 from ICRISAT often yielded greater than 2-3 t/ha of pods, while the local checks yielded 1-2 t/ha (Piggin *et al.,* 2004).

Using Farmer Participatory Research Approaches to Identify Elites

In order to select 'elite' genotypes for further trialling on farms, a Farmer Participatory Research approach has been used. Farmers are invited to field days on Research Stations at the time of harvest. Here they evaluate all the genotypes trialled on-station using their own criteria, which can include yield, visual appearance, taste and other qualities. This process has resulted in some very interesting new insights into the ways that farmers perceive value in a variety. Some of these are discussed under *Results* below.

On-Farm Testing

A small number of the elite genotypes of each food crop are trialled on farms. Farmers in collaboration with the Seeds of Life research assistants, establish $25m^2$ plots of the elite genotypes amongst their usual plantings. Management of the plots is completely up to the farmer, with the only request being that the farmers manage each plot in exactly the same way as the rest of their usual planting. In the first year of the on-farm testing component of the program (2005-2006), over 800 on-farm trials were established. The on-farm testing does not end at the harvest of the crop, but continues until the next planting season. In this way, farmers' preferences on qualities such as taste, storability, and market acceptance can be evaluated within their own household.

Problem-specific Research

Farmer Participatory Research is also used to target specific problems. This consists of small research projects such as the Maize Storage Project carried out in collaboration with the National University of East Timor.

Results

Farmer involvement in the Seeds of Life program has resulted in better selection of appropriate new genotypes for on-farm testing. Farmer field days, conducted at the harvest of each crop, have not only exposed farmers to potential new genotypes, but have given farmers a voice in the choice of genotypes to be selected for on-farm trials. Two cases are reported here, where farmers have informed the program on essential criteria for selecting new genotypes.

Cassava Field Days

Four farmer field days have been conducted at the time of cassava variety trial harvests, with usually about 30 farmers from the surrounding villages and a few district officials. As the cassava tubers are dug, and weighed for yield, each plot of one replicate were displayed in the centre of the plots with one border row left intact. Each farmer was asked to evaluate each of the 20-30 genotypes based on his or her own criteria. They described each of the genotypes as 1 = “very bad”, 2 = “OK” and 3 = “very good”. Farmers could see the number, shape, size and overall volume of roots in each pile, as well as the plant type of the plants remaining in the border rows. As part of the evaluation, many farmers spontaneously cut off a piece of peeled root and chewed on it to determine the sweetness or bitterness of the variety.

In the first such field day in Aileu in 2004, 46% of the variation in variety preference was due to taste Figure 1), whereas just 4% of the variation in preference was due to yield (Figure 2). The two most popular genotypes (each rated by over 80% of respondents as “very good”) were both judged to have a very sweet taste, but neither had exceptional yields.

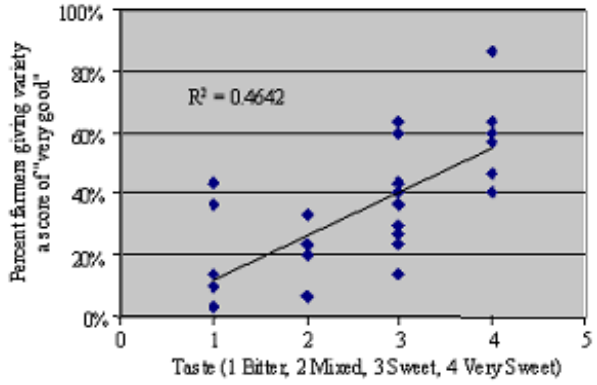

Figure 1. Percentage of farmers who gave a score of “very good” compared to the perceived taste of 33 cassava genotypes in Aileu, October 2004

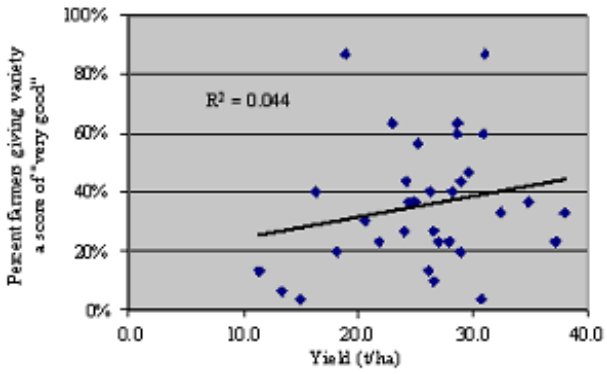

Figure 2. Percentage of farmers who gave a score of “very good” compared to the yield of 33 cassava genotypes in Aileu, October 2004.

The importance of the taste of the raw tuber as a predictor for farmer preference was confirmed by three subsequent field days, as was the fact that yield is a poor predictor of preference (Table 1).

Table 1. The extent to which farmer preference for a range of cassava genotypes correlates with taste and yield, based on four field days conducted by Seeds of Life in East Timor.

Location	Date	Correlation between farmers’ preference and yield (r)	Correlation between farmers’ preference and taste (r)

Aileu	October 2004	0.16	0.41
Betano	January 2005	-.161	0.45
Aileu	October 2005	-0.04	0.89
Maliana	October 2005	0.45	0.57

In response to this information, only genotypes judged as sweet or very sweet, which also have above average yield, have been selected for on-farm trials.

Farmer field days have also shown other traits that are prized by farmers. One such trait is long thin "stems" on the edible roots, which facilitate the selective harvesting of roots without damaging or harming other roots. Other preferences include low stem branching and a purple inner skin colour.

Maize Field Days

During maize field days, farmers were asked to record their preference for the 20 maize populations tested. Although the highest yielding maize populations received the most votes, many votes were also given to a local maize population with half the yield of the new introductions. In later focus groups, farmers expressed the view that they chose the local population because of its reputation as weevil-resistant and able to be stored for more than 12 months. Farmers were therefore choosing to forgo a doubling of their maize yield, if the maize could be stored for a 12 month period. As a result, measuring weevil tolerance is now standard practice for variety evaluation. In response to farmers showing a preference for white maize, all recently sourced maize genotypes were white.

Targeted On-Farm Research

In response to farmers' perception that new genotypes are weevil-susceptible, and therefore do not keep well, some targeted research with farmers was conducted concerning maize storage. With 18 farmer groups, new and traditional maize genotypes were stored using traditional methods as well as in sealed plastic containers. This on-farm research confirmed that modern genotypes available to Timorese farmers are more weevil-susceptible, but also demonstrated that if sealed storage is used for maize grain, new genotypes can be stored as well as the traditional genotypes (Oxfam 2004).

On-Farm Maize and Peanut Trials

In the 2005-2006 season, 169 of the 199 on-farm maize trials were harvested. Average yield of the local maize checks was 1.9 t/ha, compared to 2.9 and 2.6 t/ha for the test varieties Suwan 5 and LYDMR. After harvest, 166 of the 169 participating farming families indicated that they would plant the new varieties in the next season. The harvested grain is being stored by each farming family, and will be evaluated for storability, taste and other characteristics.

Of the 181 on-farm peanut trials, the test peanut variety PT5 yielded 2.7 t/ha compared to the 1.9t/ha for the local peanut genotypes. All of the responding farm families have stated they will plant the new variety next season. On-going monitoring will determine the actual level of replanting, using seed from the current trials.

Conclusion

Children in East Timor experience chronic malnutrition. The Seeds of Life Program seeks to address this problem by increasing the yields of staple food crops. As farming families are the final beneficiary of new

improved food crop genotypes in East Timor their inclusion in each stage of the evaluation of germplasm is essential. During both planned and unplanned time with farmers, Seeds of Life staff have learned new selection criteria from farmers, and have incorporated these criteria into variety evaluation and selection.

References

CARE International (2004) Assessment of Nutritional Status and Vaccine Coverage in Timor-Leste: Liquica, Covalima and Bobonaro Districts, Dili Timor-Leste

German Technical Co-operation (GTZ) 2003. *Nutrition baseline survey, Baucau and Viqueque, Timor-Leste*. Final report, December 2003.

Oxfam (2004). Maize Production and Storage in Timor-Leste. A report on research conducted by the department of agronomy National University of East Timor.

Piggin C, Palmer B, Howeler R, Nigam S, Javier E, Setiawan A, Srinivasan G, Monaghan B, Gonzalez F, Jayasinghe U, da Silva D, San Valentin G, De Oliveira A and Nabais C (2004). Seeds of Life - increasing production of staple crops in East Timor. Proceedings for the 4th International Crop Science Congress, Brisbane, Australia, 26 September – 1 October 2004.

Piggin C and Palmer B (2003). An introduction to the ACIAR project “Seeds of Life-East Timor.” ACIAR Proceedings 113, 65-71