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Seeds of Life

Photographer: Brad Collis
An introduction to the ACIAR project
‘Seeds of Life–East Timor’

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Abstract

This paper provides an introduction to the ACIAR Seeds of Life project in East Timor, which has the goals of 1) improving food security for East Timor through the introduction, testing and distribution to farmers of improved germplasm of the major food crops and, 2) enhancing the capacity of Timorese scientists and technicians to independently develop and manage crop improvement programs for the benefit of village farmers and the nation.

The major staple crops being tested are irrigated rice, rainfed lowland rice, upland rice, maize, cassava, beans (red beans, soybean, mungbean, cowpea), sweet potato, potato, and peanut (groundnut). The main project activity has been the testing of 10–20 potentially adapted lines of these crops across four or five differing environments of East Timor. Trials in the first two years were conducted at Aileu, Baucau, Los Palos, Maliana and Maubisse in 2000–2001 and Aileu, Fatumaca, Betano and Lotes in 2001–2002. Sites and experimental methods are described in the paper. Observations and measurements were made assessing growth, yield, stress tolerance and acceptability (taste).

It was very encouraging that some introduced varieties/lines of irrigated rice, maize, cassava, beans and sweet potato produced yields which were much higher than local check varieties. This indicates the appropriateness of the project approach to test widely for better adapted germplasm for East Timor. The increased yields possible with better-adapted material should bring strong benefits when extended and taken up by East Timorese village farmers.

Detailed reports on the trials, the performance of the crops and some suggestions on the best adapted lines are provided in the five papers that follow on maize, rice, sweet potato, peanut, and cassava and beans.

Introduction

East Timor, which comprises the eastern half of the island of Timor, is about 300 km long and 100 km wide. The climate is semi-arid. Along the north coast there is a short 3–4 month wet season of 800–1000 mm from December to March and a long, hot dry season. It is wetter along the south coast, with a 1000–1500 mm wet season, sometimes bimodal, from December to June. The wet season is wetter (1500–2000 mm) and longer (6–8 months) along the central mountain range, which rises to almost 3000 m. However, rainfalls are typically unreliable and unpredictable and short- and long-term droughts are common. Soils are sedimentary, with high clay contents and pH is generally alkaline, although some older formations are slightly acidic. There are five major land/soil formations (Aldrick, 1984a; Aldrick, 1984b; Aldrick and Anda, 1987) and six major agroclimatic zones (ARPAPET, 1996; Keefer, 2000).

East Timor has 850,000 inhabitants and, with a GDP/capita of US$400, is one of the poorest countries in the Asia-Pacific region and one of the poorest 10 countries in the world. Some 85% of the population live in rural areas, where people rely on subsistence agriculture for their livelihoods and have little capacity to participate in the cash economy.

Farming families generally grow corn as the major staple crop with other crops such as sweet potato, cassava, peanut, beans, pumpkins, rice, taro
and yams also prominent. In some areas wild forest foods such as yams, tubers and beans may be harvested. Food insecurity remains a major problem. There are food shortages each year during the three to six month period prior to crop harvest in March–April and there can be widespread famines in occasional years when there is a major drought and the wet season fails. The extent and duration of hungry periods depend mainly on the amount of maize and other crops harvested and stored from the previous year. Increasing crop yields in a sustainable manner can help alleviate food shortages and is a key priority for agriculture in East Timor.

The country, formerly a Portuguese colony and Indonesian province, voted for independence in August 1999. In the few weeks following the independence vote, there was widespread and extensive damage of infrastructure and institutions, displacement of people, and disruption to farming activities as Indonesian troops and militia withdrew and the United Nations became established. In many towns, most schools, offices, shops and houses were destroyed. Damage was less in rural areas, but farming and markets were severely disrupted with massive losses of livestock and planting materials. Since this time, there has been a shortage of well-adapted planting material of staple crops. Emergency seed brought in during 1999–2000 was not necessarily well adapted to local conditions and locally-used material often lacks vigor and purity. There is a recognised need to reinvigorate the planting material of the major crops.

ACIAR developed the Seeds of Life project in August–October 2000 in response to these cropping issues with the goals of 1) improving food security for East Timor through the introduction, testing and distribution to farmers of improved germplasm of the major food crops; and 2) enhancing the capacity of Timorese scientists and technicians to independently develop and manage crop improvement programs for the benefit of the nation and for village farmers.

The project is consistent with the major aims of the agricultural sector in East Timor, which are to support a rural population of healthy, well-fed adults and children with access to a balanced intake of carbohydrate and protein and the capacity to produce and market surpluses which contribute to national food security and a cash economy. The overall strategy promotes not only the production of rice and maize, but also of protein-rich legumes in cropping systems which are sustainable and relevant to upland, non-irrigated areas where the majority of the farmers depend on dryland crops.

The proposal was developed quickly in September–October 2000 with excellent cooperation from all potential collaborators, to try and ensure testing could begin in the 2000–2001 wet season. This was achieved with the workplan being agreed and seed for testing introduced at the first project meeting in Dili in November 2000. A highlight of the first meeting was the launch of the project on 16 November 2000 by Xanana Gusmao.

It was agreed that the project would run from 2000 to 2003 to cover the 2000–2001, 2001–2002 and 2002–2003 wet seasons. The Memorandum of Understanding (MOU) for the project was signed in December 2000 by CGIAR institutes and between April and June 2001 by the East Timor Transitional Administration/United Nations Transitional Administration for East Timor (ETTA/UNTAET), ACIAR and ET partners.

Collaborators

The project is a collaborative effort between the Division of Agricultural Affairs of ETTA/UNTAET, which since independence on 20 May 2002 has become the Ministry of Agriculture, Forestry and Fisheries (MAFF), and ACIAR, with participation from several Non Government Organisations [World Vision International (WVI), Catholic Relief Services (CRS), Australian Volunteers International (AVI)] and Centers of the Consultative Group of International Agricultural Research (CGIAR) including the International Rice Research Institute (IRRI), the International Maize and Wheat Centre (CIMMYT), the International Centre for Tropical Agriculture (CIAT), the International Potato Centre (CIP) and the International Centre for Research in the Semi-Arid Tropics (ICRISAT).

Personnel involved in implementing the project are:

MAFF: G. San Valentín, F. Benevides, D. Da Silva, A. Da Costa, J. Soares
AVI/ACIAR: B. Palmer, B. Monaghan
ACIAR: C. Piggine
WVI: P. Kapukha, D. Tupa
CRS: A. de Oliveira
IRRI: E.L. Javier, M.C. Toledo, V. Lopez, R. Reano
CIMMYT: F. Gonzalez
ICRISAT: S. Nigam, A.G.S. Reddy, D. Yadagiri
CIAT: R. Howeler, K. Hartojo
CIP: U. Jayasinghe, A. Setiawan

Objectives

The specific objectives of the project are:

• To evaluate under a range of soils, land forms and climatic conditions in East Timor the adaptation of a range of lines of rice, maize, cassava, beans (including red beans, soybean, mungbean,
cowpea), potato, sweet potato and peanut supplied by IRRI, CIMMYT, CIAT, CIP, and ICRISAT

• To identify and multiply lines with improved environmental adaptation and tolerance to biotic (pests, diseases) and abiotic (drought, low fertility) stresses

• To improve farmers’ access to high-quality seeds of the best-adapted cultivars

• To gather crop performance base data over a range of environments for future developmental programs on increasing farm productivity

• To build capacity of East Timorese Government institutions and staff in evaluation, production and distribution of improved germplasm.

**Expected outputs**

Expected outputs from the project over three years are:

• information on best-adapted lines

• knowledge of farmer preferences from on-farm testing and tasting

• seed increase and distribution to farmers of ‘released’ varieties

• increased capacity of MAFF and NGO staff to identify, investigate and solve problems.

**Crops**

The project is addressing the major staple crops of East Timor, with new and potentially better-adapted germplasm supplied by the CGIAR institutes as follows:

IRRI — Irrigated rice, rainfed lowland rice, upland rice

CIMMYT — Maize

CIAT — Cassava, beans (red beans, soybean, mung-bean, cowpea)

CIP — Sweet potato, potato

ICRISAT — Peanut (groundnut)

**Methodology**

The main project activity has been the testing of 10–20 potentially adapted lines of each of the main crops across 4–5 differing environments of East Timor. Trials were conducted in Aileu, Fatumaca, Los Palos, Maliana and Maubisse in 2000–2001 and Aileu and Maubisse in the central highlands (under the guidance of WVI). The experimental program started late for two reasons; firstly, the wet season was unexpectedly early and, secondly, some of the material was unavoidably late arriving in East Timor. Nevertheless, the 2000–2001 trials allowed valuable experience and information to be obtained on crop performance and difficulties conducting trials in the East Timorese environment. Many trials yielded useful technical data and have supported information for more rigorous trials in 2001–2002.

The locations used for the second and third seasons were Fatumaca in the district of Baucau in the east, Aileu in the central highlands, Betano in the district of Manufahi in the south and Loes in the district of Liquica in the west (Fig. 1). The Fatumaca site is on the Agricultural Training Centre run by the Silesian Order and is conducted with the guidance of Father Eligio Locetelli, with assistance from CRS under the management of Dr Brian Palmer. The Aileu site, conducted on property rented by the Portuguese Mission, is managed by Dr Brian Palmer using locally appointed farm staff. The Betano site, located on MAFF property, is managed by Mr Brian Monaghan in conjunction with MAFF staff and locally employed laborers. The Loes site, located on land under MAFF control, is managed by Dr Gene San Valentin in conjunction with MAFF staff and locally appointed laborers.
Aileu site

This site is located near the town of Aileu and is at an elevation of about 950 m on an alluvial terrace. The area is renowned for high intensity rain showers and so the plots were positioned on raised beds to encourage adequate drainage (Fig. 2). All operations were carried out by hand.

The major upland food crops grown by farmers in the area are maize and vegetables with minor amounts of cassava and sweet potato grown in home gardens. Soil fertility is extremely low (Fig. 3) and major responses to low levels of fertiliser inputs are observed. The Aileu site is representative of the central highlands.

Fatumaca site

This site at Fatumaca is a raised coral derived from coraline limestone, well structured with no evidence of waterlogging, and representative of the eastern region. It is located on a plateau about 500 m above sea level. The soil appears deficient in major nutrients, particularly phosphorus owing to its relatively high iron content (probably a ferrusol). The location has had a history of cropping with fertiliser application. The site was cultivated using a reversible disc plow and rotovation. The major crops grown by farmers in the area are maize and groundnuts with minor amounts of cassava and sweet potato grown in home gardens.

Loes site

The soil at this site is a coarse-textured, old alluvial terrace located near Liquica close to the Bobonaro and Ermera districts; it is well drained and at an elevation of about 100 m. The soil fertility is low and the most common fertiliser used is urea, although...
Figure 2. Aileu location prior to planting.

Figure 3. Maize at Aileu. Photographer: Brian Palmer
deficiencies of phosphorus and potassium are suspected. The major upland food crops grown by farmers in the area are maize and cassava with minor amounts of groundnut, mungbean, upland rice and sweet potato. Large areas of irrigated rice grow next to the river Loes.

Betano site

This site is located south of the town of Same on the south-central coast and is at an elevation of just above sea level on recent alluvial deposits. The area has a longer wet season, with rains continuing into May–July (Fig. 4). All operations were carried out by hand.

The major upland food crops grown by farmers in the area are rice and maize with minor amounts of cassava and sweet potato grown in home gardens. Soil fertility is low and major responses to low levels of fertiliser inputs are observed. There are suggestions that the site is alkaline with induced iron deficiency. The Betano site is representative of the south coastal area.

Rainfall

On average, the wet season occurs between late November/December and April in lowland northern areas, with extended rains from May to July in the south (Betano) and in October in the central highlands (Aileu). There is very little rain between July and October. However, rainfall is extremely variable, and short dry periods are common in the wet season. There are also some years when the wet season fails. Long-term rainfall at the 2001–2002 sites is presented in Figure 4.

Crop performance 2000–2002

Overview of crop trial results

Some introduced varieties/lines of all crops except potato and red beans gave outstanding yields, which were much higher than local check varieties. These are highlighted below, and confirm the appropriateness of the project approach to test widely for better adapted germplasm for East Timor. The increased yields possible with better adapted material should bring strong benefits when extended and taken up by East Timorese village farmers. Potato and red beans proved difficult to grow well in the trials, probably because of the need for different planting times and/ or management from the other crops.

In 2000–2001, after a rushed start, good, analysable data was obtained from 12 of the 35 trials,
which were conducted at Los Palos, Baucau, Aileu, Maubisse, and Maliana. Yields of some introduced material were much higher than local controls for maize (3 vs 1.8 t/ha), sweet potato (24 vs 4 t/ha), peanut (4 vs 2 t/ha), and cassava (35 vs 6 t/ha). These are quite remarkable increases from better adapted material.

In 2001–2002, in trials at Baucau, Aileu, Betano, and Loes, local maize varieties had an average yield of 1.3–1.5 t/ha over the four sites, whilst CIMMYT lines SWS001Y-3 and SW5 had average yields of 3.8 and 3.5 t/ha. At Baucau, local sweet potato yielded 1.1 t/ha whilst the eight introduced CIP lines all yielded above 8 t/ha. At Baucau, local peanut yielded 2.8 t/ha whilst ICRISAT lines 93269, 95322, 95278 and 93261 yielded over 3.5 t/ha. At Loes, local peanut yielded 2 t/ha whilst 94063 yielded 3.4 t/ha. At Betano, ten test entries of irrigated rice had significantly higher yields than the local variety (3.49 t/ha), with PSB RC 74 having the highest yield (8.1 t/ha), followed by IR 72 (7.34 t/ha), and PSB RC 4 (6.90 t/ha).

**Detailed reports**

Detailed reports on the first two years of testing have been produced for rice by IRRI, maize by CIMMYT, peanut by ICRISAT, cassava and beans by CIAT, and sweet potato by CIP. These are reproduced in the five papers that follow in this proceedings and describe the experimental crop trials conducted in the 2000–2001 and 2001–2002 wet seasons in terms of: trials and activities; data collected and findings; interim conclusions on crop performance and ‘best-bet’ lines.

**References**


