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# 1 Acknowledgments

Seeds of Life (Fini ba Moris) is a program within the Timor-Leste (East Timor) Ministry of Agriculture and Fisheries (MAF). The Governments of Timor-Leste and Australia collaboratively fund the program. Australian funding is through the Australian Agency for International Development (AusAID) plus the Australian Centre for International Agricultural Research (ACIAR) and is managed by ACIAR. The Centre for Legumes in Mediterranean Agriculture (CLIMA) within The University of Western Australia (UWA) coordinates the Australian funded activities. The assistance of all partners is gratefully acknowledged.

The main driver of the program for the MAF at the beginning of SOL 2 was the then director for Research, Mr Lourenço Fontes Borges, who after two years of the project became the Director General of MAF. Mr Lourenço continued to lead the program along with the new Director for Research and Special Services, Mr Adalfredo do Rosario Ferreira and Director Gil Rangel da Cruz, from the Directorate of Agriculture and Horticulture.

From ACIAR, the interim program manager for Crop Improvement Management (CIM), Dr Tony Fischer was instrumental in commencing SOL 2 and assisted develop variations to allow an expanded social science program with the Australian National University (ANU). The SOSEK program appreciates the leadership of Dr Andrew McWilliam and the ANU nominated staff based in Dili especially Dr Diana Glazebrook and Dr Angie Bexley.

Dr Paul Fox, Research Program Manager for CIM in ACIAR has provided tireless leadership and management since January, 2007.

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A number of AusAID personnel have been involved with SoL over the five year period and provided valuable support, in particular, Ian Kershaw from Canberra and Jeff Prime currently assigned to the Australian Embassy in Dili.

SOL 2 also received significant guidance from the Technical Advisory Groups who visited the program biannually or annually throughout the period. Initially the two main "reviewers" were Mr Brian Gorddard and Mr Philip Young. Later Mr David Swete-Kelly joined Mr Gorddard.

Finally, it must be acknowledged that the success of the program is directly attributed to the dedication and hard work of the SoL Australian Team Leader, Mr Robert Williams, his team of advisors and the 40+ local research and seed production personnel. Some of the long term advisors who provided continuous support include, Mr Brian Monaghan, Mr Alex Dalley, Ms Rebecca Anderson, Dr Asep Setiawan, Mr Martin Browne, Ms Myrtille Lacoste and Mr Nick Molyneux. The 40+ MAF staff were based in Dili and in the Districts. They in turn received valuable guidance from the farming community.

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## 2 Executive summary

The Seeds of Life program within the East Timorese Ministry of Agriculture and Fisheries was originally designed (SOL 2 PDD) to operate in four of the country's thirteen districts. These were the Districts of Aileu, Baucau, Manufahi and Liquica. After two years of operation, the program expanded into an extra three districts making a total of seven Districts (now including Ainaro, Bobonaro and Viqueque) and seventeen Sub Districts. The addition of high altitude sites in Ainaro allowed research to be conducted in wheat, barley, climbing beans, potatoes and other temperate crops. All six of the country's agro-ecological zones are represented in these districts.

Towards the end of the fourth year a Technical Advisory Group prepared a Concept Note proposing an extension to the program (SOL 3). A design mission followed in April, 2010 and prepared a draft document which was finalized in September, 2010. As a result of the late design for SOL3, SOL 2 was extended to the end of January, 2011. SOL 3 commenced on 01 February, 2011

Progress in the Second Phase of Seeds of Life is summarized (by component) below. Extra detail is provided on the final year and four months of the program.

### **Component 1 Seed production, storage and distribution .**

The rehabilitation or establishment of three research stations was proposed as part of Component 1. At the end of March, 2011, all rehabilitation work on the buildings at Betano Research Station (Manufahi District) was complete and the facilities were fully operational. Five houses and two office buildings were also complete at Loes Research Station (Liquica District) along with a recently constructed seed and farm equipment storage warehouse. Suitable farm equipment for both stations was purchased and in operation as planned. At Loes, in the final year, the MAF funded the construction of a chainlink fence around the perimeter of the station and a brick and iron wall at the station entrance.

The research station site at Darasula, Baucau District has been fenced by MAF, a station manager assigned to oversee its development and an Environmental Site Assessment (ESA) drafted. In the 2010-2011 wet season (at the end of 2010) the research trials planned for Fatumaca (Baucau) were shifted to Darasula. Funds are also committed from SOL 2 for the construction of a building on the station.

Replicated trials on sweet potato, peanuts, climbing beans, cassava, rice and maize were conducted at four research stations each year (These were initially at Aileu (Alieu District), Loes (Liquica), Betano (Manufahi) and Fatumaca (Baucau) until 2010 when the Fatumaca trials were shifted to Darasula. The stations were generally well managed during the period. Replicated trials on rice, wheat, barley, potatoes and beans were also conducted on farmers' fields as representative ecosystems for these crops were not available on research stations. Field days were held at Aileu, Betano and Loes each year during which farmer observations of different varieties were recorded. These were supplemented with small field days held by each Research Assistant (RA) in his/her sub district.

Training on seed production and storage was provided by SoL personnel on an on-going basis by the Research/Extension Advisors (R/EAs) and the Seed Production Advisor (SPA). In total, 410 training person days were presented in 2010 following 459 days in 2009 and 53 days in 2008.

The Seed Law drafted with the assistance of SoL personnel was with the MAF at the end of SOL 2. The SPA will continue to work with the MAF during SOL 3 to develop regulations to complement the Law. This Law will not be submitted to Parliament for ratification until the MAF has sufficient personnel in place to administer the regulations.

Seven Seed Production Officers operating in six districts worked with an advisor to produce 60t Nakroma seed, 20t of maize, 100,000 sweet potato cuttings and 18t Utamua during the final year. The amount and quality of seed produced each year steadily increased over the final two years after the SPA was assigned to the program. Seed dryers, seed cleaning equipment and storage facilities were installed at two central sites (Baucau and Manufahi) and smaller depots were constructed at two other sites to process the seed and control seed quality.

## **Component 2 Evaluation of new germplasm and associated technologies**

SoL evaluated new varieties of food crops for cultivation in Timor Leste throughout the five year program. Most new material was sourced from Consultative Group on International Agricultural Research (CGIAR) centres although later in the program life, material from other sources was also included. During 2010 for example imported germplasm included 20 maize (mainly from CIMMYT), 15 peanut (mainly from ICRISAT), 16 varieties of sweet potato (mainly from CIP), 20 irrigated rice (from IRRI) and 25 cassava clones (mainly from CIAT). Some of this material was supplied by breeding programs in the Philippines, Indonesia and Zimbabwe. In addition, preliminary research was conducted on climbing beans, barley, wheat and potato. This breeding material came from Australia, indirectly from Rwanda and local sources. Within each trial were at least two local varieties. Introduced germplasm was cultivated and evaluated at Betano, Quintal Portugal (Aileu), Fatumaca and Loes plus on farmers fields. Forty two varietal evaluation trials were installed and analysed during 2010. This followed 34 trials in 2009, 18 in 2008, 19 in 2007 and 16 in 2006.

Agronomic trials to evaluate weeding, spacing, pesticide and tillage systems were also installed during the period. The number of these trials designed to capitalize on adopting higher yielding increased in importance to the program during the latter years. Approximately 20 of these trials were installed during 2010.

One researcher underwent germplasm conservation training in 2009 and a collection of cassava, sweet potatoes and peanuts was commenced in the same year. In 2010 the collection included 80 cassava entries, 40 sweet potato varieties and 30 peanut varieties. A collection of native legume species is also planned to add to the diversity of material under evaluation for East Timorese farming systems.

Capacity building was a large component of SOL 2. Over the five year period, formal training increased annually to be delivered at a rate of approximately 9 person days each working day of the year. In 2010, for example, 2306 formal training course days were delivered in seed production, English language, data management and agronomy. There were also workshops on SWOT analyses, development of research priorities and training by AQIS on pests and disease prevention. In addition, the R/EAs and visiting scientists provided constant on-the-job training in soils, the use of Excel, GPS, soil pH testing equipment etc. Each year, East Timorese were taken on a study tour of research facilities in Australia and/or programs in Indonesia. On these tours, participants were able to observe the precision and methodologies utilized by researchers and discuss methods for improving their own practices.

During the past year, two SoL/MAF staff members attended MSc training in Bogor, Indonesia, two other students studied English at UWA in preparation for studying MScs (with John Allwright scholarships), one student completed his Masters in GIS in Australia with SoL funding and the ATL co-supervised a PhD student studying at UWA. The level of longer term training support will expand under SOL 3.

## **Component 3 On-farm demonstrations and trials**

In Component 3, the most promising genetic material from the replicated research component are evaluated on farmers fields under farmer conditions. Twenty five square meter (5mx5m) plots are planted with the test entries and compared with the locally used variety. Each year 561-765 maize, peanut, cassava, sweet potato and rice on-farm

demonstrations and trials (OFDTs) were established in 17 sub districts during the 2005/2006-2010/2011 wet seasons (Nov-April). During the 2009/2010 wet season, 646 OFDTs were established. Included were 228 maize, 109 sweet potato, 157 peanut, 82 cassava and 70 rice trials. In earlier years, installed OFDTs numbered 561 in 2006, 713 in 2007, 705 in 2008 and 765 in 2009. 343 were underway during 2010/2011 as the report was being prepared. This number will increase as non-maize trials are installed.

The SOSEK team conducted a series of studies on the impact of SoL technologies on farm households, examined the farmer adoption patterns for different crops and continued a consumption study in SoL adopter households. Much of this research is reported in the SoL Annual Research Reports. A series of cropping calendars for each district was also completed and published.

Research Assistants installing OFDTs held field days each year in one or more crops in one or more of the 17 Sub Districts they worked in. During last wet season (Nov, 2009 – May, 2010), 34 field days were held fielding a total of 665 participants; 48% being women farmers. Fifteen of these field days were for maize, 8 for peanuts, 10 for sweet potato and 1 on rice. Similar field days were also held in earlier years. The crops were harvested during the field day, weighed and results discussed with the farmers and other members of the community. Feedback on the crops characteristics were then solicited from the visiting farmers.

OFDTs were conducted in all major Agro Ecological Zones to evaluate the new varieties under different conditions. The coordinates of all were logged and mapped.

Apart from varietal development, research was also conducted to improve the “packages of technology” available to farmers which would complement the high yielding varieties. Weed control is a major constraint in the upland areas and experiments on this were conducted on maize, peanuts and rice. Included was the use of Velvet bean (*Mucuna pruriens*) to control weeds in maize. Nitrogen and phosphorus application trials were also implemented on farmers rice fields. Other research included investigations into controlling storage insects, control of crop pests and diseases and general agronomy trials designed to improve farm productivity.

#### **Component 4            Program management and coordination and institutionalization of crop research and extension in MAF**

Initially SoL activities were administered from a small office in Fomento, Dili. In 2008 the office was transferred to the MAF compound in Comoro, Dili. This office is in the same building as the Directorate of Research and Special Services. SoL personnel, especially the Australian Team Leader interacted regularly with the Director for Research, Director for Agriculture and Horticulture and more recently with the Director for Agricultural Community Development.

Some SoL activities have been steadily institutionalized into the MAF. MAF manages the research stations and employs all but seven of local personnel assigned to the program. All internal correspondence is through the MAF and the program is represented at MAF “harmonization” meetings between donors and NGOs.

SOL 2 received to two Technical Advisory Group visits in the first year of operation and annually for the final four years. The final TAG visit in August, 2009 resulted in the preparation of a Concept Note for a third Phase (SOL 3). MAF, AusAID and ACIAR supported the Concept Note and design missions followed in April and June 2010. A final design was complete and accepted by all parties in September, 2010 at which time a five month extension was granted to SOL 2. The official commencement date for SOL 3 was set for 01 February, 2011.

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## 3 Background

The second phase of Seeds of Life (SOL 2) was implemented as ACIAR Project number CIM/2003/014. It consolidated the gains made by the Seeds of Life – East Timor (SOL1) (Project CIM/2000/160) which commenced in 2000.

SOL 1 was designed to improve farmers' access to a range of higher yielding crop varieties adapted to the varied environments in Timor Leste and to build capacity in the staff of MAF to evaluate, produce and distribute improved germplasm. Crop Centres belonging to the Consultative Group on International Agricultural Research (CGIAR) collaborated with ACIAR, providing their expertise and breeding material to assist with this process. By late 2000, contributions were being made by the International Rice Research Institute (IRRI) with assistance in evaluating rice varieties, the International Maize and Wheat Improvement Centre (CIMMYT) with maize, the International Centre for Tropical Agriculture (CIAT) with cassava and beans, the International Potato Centre (CIP) with sweet potato and the International Centre for Research in the Semi-Arid Tropics (ICRISAT) with groundnuts. Trials were conducted on five sites in east, west and central highlands of the country during the 2000-2001 wet season with the assistance of Non Governmental Organisations (NGOs). MAF personnel became increasingly involved with project activities after the elections of 2002 and benefited from the training and mentoring provided by CGIAR representatives.

In October of 2003, SOL1 was reviewed and a second phase recommended to be formulated by ACIAR in close cooperation with MAF. ACIAR held meetings with MAF and other potential partners in October 2003, March 2004 and August 2004 to discuss the composition and management options of a new project. The Australian Agency for International Development (AusAID) joined the last of these three meetings and agreed to consider providing support for a new phase. Drafts of Project Design Documents (PDD) were prepared, ensuring the suggested program fitted with MAF's priorities and plans proposed in the Sector Investment Program (SIP) of MAF released in 2004. AusAID reviewed the proposal in June, 2005 and a final PDD was developed in August, 2005. Funding approval from both ACIAR and AusAID was given on 28 September, 2005. In the meantime, the on-station research program was supported by ACIAR which provided extensions to SOL1.

Most of the research conducted in SOL1 was implemented on research stations or under controlled research station conditions. Phase 2 (SOL 2) concentrated on implementing research and demonstration trials on farms with a reduced emphasis on research station trials. The process involved a larger percentage of the farmer population, NGOs, private enterprise and international agencies in Timor Leste. Two Directorates in MAF were involved: The National Directorate for Research and Special Services and the National Directorate for Agriculture and Horticulture. The five CGIAR centres mentioned above remained as collaborators of SoL and continued providing germplasm, expertise and training courses.

The Seeds of Life program is referred to as SoL as an indication that Phase 2 (SOL 2) employs the results of SOL 1 and Phase 3 (SOL 3) will utilize the results of both programs.

SOL 2 had a comprehensive approach to improving the capacity of MAF to develop and release improved technologies. The program included on-station and on-farm research, on-station and on-farm seed production, research station infrastructure improvement, training and assistance with policy development. It was implemented under the bilateral assistance program for Timor-Leste with joint funding from the Governments of Australia and Timor Leste. AusAID provided considerable financial support to ACIAR for the program which was managed by ACIAR through the executing agency, the Centre



for Legumes in Mediterranean Agriculture (CLIMA) at The University of Western Australia (UWA). SOL 2 commenced on 01 September, 2005.

The draft (2010) research policy for MAF states “That inclusive and consultative processes be established for project initiation and development. Priority should be given to adaptive and applied research that will benefit the farmers of Timor Leste and improve livelihoods”. SOL 2 supported this approach considering that sufficient good genetic material was available from other parts of the world for use in Timor Leste. Germplasm continued to be sourced from CGIAR centres, much of it from regional centres. For example most sweet potato varieties were from programs in Indonesia and cassava was from Thailand and Indonesia. Potential varieties were also sourced from the University of Philippines breeding group (maize), programs in Australia (mungbeans, wheat and barley) and other parts of the world via local organizations. The NGO World Vision provided climbing bean material originally sourced from Rwanda.

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## 4 Objectives

The Goal of SOL 2 is *“improved food security in Timor Leste”*

The Purpose of SOL 2 is the *“use of improved crop varieties and associated technologies which result in increased food production”*.

The SoL program was designed with four components with specific objectives. These are a) Seed production, storage and distribution, b) Evaluation of germplasm and associated technologies, c) On-farm demonstrations and trials and 4) Program management and coordination. Capacity building is a priority of the program and is imbedded within the four components.

### **Component 1 Seed production, storage and distribution.**

Component objective: To enhance the capacity of MAF and other agricultural development agencies/groups to produce, store and distribute quality seed for Timor Leste’s main food crops:

Activities in this component include:

- Rehabilitation of Betano, Loes and Darasula research stations
- Utilization of the Aileu research site
- Seed production and storage at MAF stations and Districts
- Training in seed production and storage
- Testing and formulation of a seed certification, seed import and variety release policy

### **Component 2 Evaluation of new germplasm and associated technologies**

Component objective: to identify improved and acceptable food crop varieties and associated technologies for subsistence farmers, particularly in upland areas.

Activities in component 2 include:

- Introduction, evaluation and maintenance of new varieties
- Development of new technologies
- Development of an inventory of local varieties
- Staff training

### **Component 3 On-farm demonstrations and trials**

Component objective: to test and extend new crop varieties to farmers through extensive on-farm demonstration and trials and improved crop production “packages”.

Component 3 is comprised of:

- Implementation of OFDTs
- Social science and economics (SOSEK) research
- Research and Demonstration Unit (RDU) training
- Development of improved crop production packages

### **Component 4 Program management and coordination and institutionalization of crop research and extension in MAF**

Component objective: to effectively manage the program and to institutionalize crop research and extension in MAF

Component 4 includes:

- Office staffing
- Coordination of activities
- Development of a national extension strategy
- Progress reviews and planning
- Reporting
- M&E framework

## 5 Methodology

Implementation of SOL 2 was as presented in Figure 1. Overall direction was provided by a Program Steering Committee (PSC) with representatives from MAF, ACIAR, AusAID and UWA. The PSC also provided direction on resource re-allocation. It met twice the first year and annually afterwards to approve the Program Annual Plans. Day-to-day collaboration between the advisors and MAF was through the MAF program co-leaders (MPCLs), the Director for the National Directorate for Research and Special Services and the Director for the National Directorate for Agriculture and Horticulture often with assistance from the Director General of MAF.

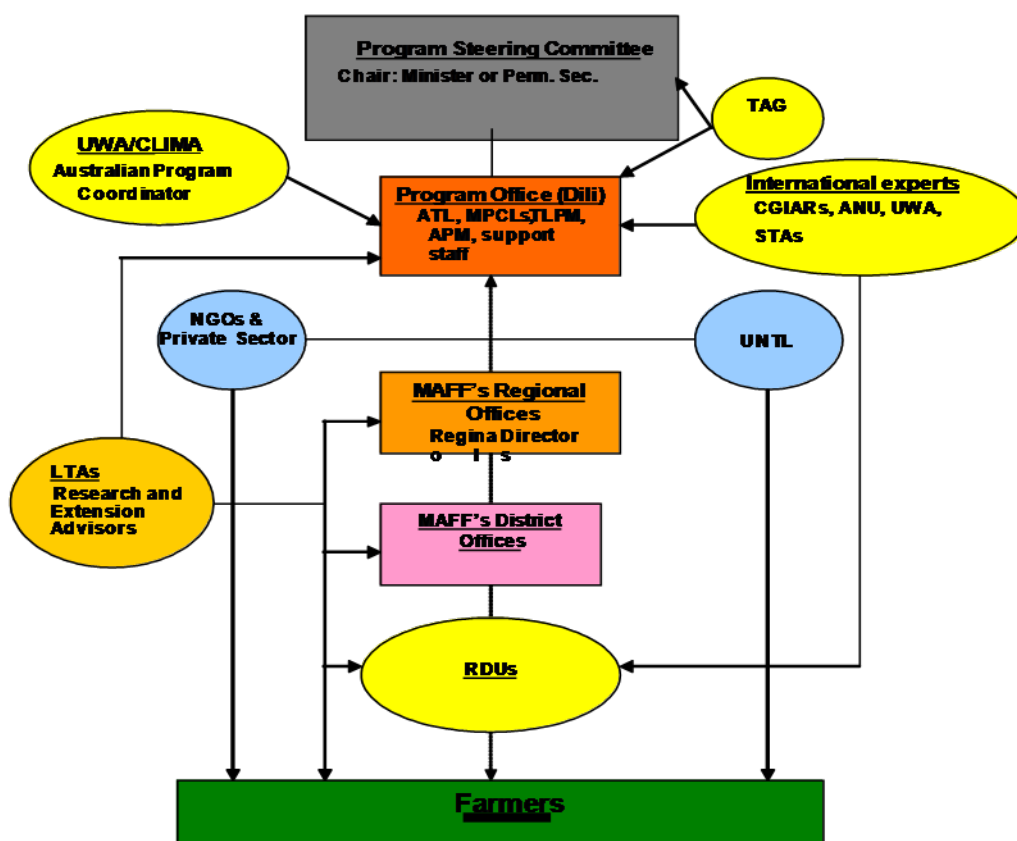


Figure 1. SOL 2 organizational arrangements as shown in design document

The program office was located in the MAF where Program and MAF personnel regularly interacted with each other. The two MPCLs worked directly with the Australian Team Leader (ATL) and the Australian Program Manager (APM) due to a MAF Program manager (TLPM) not being nominated. Most of the locally employed staff were MAF personnel living in the districts. This arrangement facilitated their work through the District Agricultural offices and Research and Development Units (RDUs).

The long term advisors (LTAs) assisted coordinate the program through the program office. The program interacted regularly with NGOs and the private sector, with the national university (UNTL) and with international experts and short term advisors (STAs).

An independent Technical Advisory Group (TAG) reviewed the program twice in the first year and annually for the following four years. They reviewed program progress from the previous year, the Annual Plans and resources required for the following year and technical aspects of research and extension activities in the program. Feedback from the TAG was provided to the PSC, program management and donors.

On a day-to-day basis, SOL 2 was implemented by component, each possessing an objective and a number of activities with expected outputs and milestones as described in Section 4 above. The methodology for the components' implementation are as follows:

### **Component 1. Seed production storage and distribution**

The approach for Component 1 "to enhance capacity to produce store and distribute seed" was one of research station rehabilitation and establishment, training, seed multiplication and assistance to policy development.

Research station rehabilitation relied heavily on the resources of the MAF to arrange. Advisors assisted the farm managers to develop farm layouts and to assess the number of facilities required for each site. Betano Research Station for example required five houses and an office/laboratory/meeting room to be restored. Engineering drawings for these buildings were initially drawn by an external consultant. In later years, an advisor to the MAF was engaged to complete the drawings. Construction was tendered through the MAF Department of Procurement the building activities were monitored by another company or SoL designate.

Two new research stations were established by the MAF over the 5 year period – the first at Loes and second at Darasula. Development at these sites followed a similar pattern to that at Betano with construction being contracted through the MAF.

Seed production training courses were presented directly by advisors, visiting consultants, previously trained MAF officers and by providing the opportunity for personnel to visit other seed production systems. Most knowledge gain though was through on-the-job training (OJT).

Seed was multiplied on both research stations and farmer fields. The primary stations were Betano and Loes where "foundation seed" of maize and peanuts was cultivated in addition to the multiplication of sweet potato and cassava cuttings. MAF possesses no irrigated stations and rice seed was multiplied on farmers fields. During the wet seasons of 2009/2010 and 2010/2011 30 farmers in six districts were also contracted to install small (0.05ha) sweet potato multiplication sites. Seed multiplication of the three cereals was done by farmers on contract to MAF/SoL. Included in the contract was an agreement to purchase the seed at a pre-determined price and pre-determined quality. Seed was then stored at seed centres prior to distribution. Distribution of all seed and planting material was through the farmers conducting OFDTs, via the FAO sponsored MAF distribution system and through NGOs. One NGO (CARE) used this high quality seed for their own informal seed production system.

Assistance to the MAF with the development with agricultural policy was provided officially twice over the five year period. On both occasions, short term advisors were

commissioned to spend time with personnel and articulate preferred options. Support was provided to assist with the development of policies for research and extension. SoL advisors also assisted with the formulation of the Seed Law.

## **Component 2 Evaluation of new germplasm and associated technologies.**

In this component, new food crop varieties were introduced and evaluated, germplasm maintained, research staff trained and agricultural information stored.

New food crop varieties were introduced through the importation of small amounts of seed from external institutes. This seed initially underwent observational trials in isolation from other crops. At the end of these trials, the number of entries was reduced and the successful short listed entries underwent replicated trials at four research station sites. These were generally at Betano, Loes, Aileu and Baucau. Replicated trials possessed approximately 20 entries. Rice trials were performed at irrigated sites off these stations. Some other upland crops unsuited to the four stations mentioned above may have been evaluated on farmers fields. For example, replicated trials on wheat, barley, climbing beans and potatoes are performed on farmers fields at higher altitudes. Sites for irrigated rice and high altitude research may be identified in Phase 3 of SoL.

The most promising entries in the replicated trials were further evaluated by farmers and other members of the community at field days on the research stations. Often this involved participants weighing the harvest and often tasting the produce both cooked and uncooked. Farmer field days assist the identification of one or two of the best performing varieties which were then evaluated on farmers fields under farmers conditions in unreplicated "on-farm demonstration trials" (OFDTs).

In addition to evaluation of improved varieties for release, the SoL program conducted farming systems research to address other constraints to production in Timor Leste. Considerable effort was invested in controlling weeds using velvet bean as a smother crop and in weeding, fertilizer and pesticide trials. The social science program examined the constraints under which farmers operate, conducted seed mapping exercises and studied marketing of SoL varieties in the districts. SoL continued an extensive training program.

Germplasm was maintained by cultivation at both Betano, Loes, Aileu and Maubisse research stations. The collection commenced after a germplasm curator was trained in Australia and permanently stationed at Betano. The collection includes introduced germplasm imported for evaluation in Timor Leste and local varieties collected by OFDT personnel.

As with Component 1, training was provided through OJT, short courses and study tours.

## **Component 3 On-Farm Demonstrations and Trials (OFDTs)**

Component 3 possessed activities on On-Farm Demonstrations and Trials (OFDTs), socio-economic research, training and the development of crop packages.

Promising entries emerging from the replicated research station trials were evaluated on farmers fields as OFDTs. These small (5m x 5m) plots were installed in approximately 700 sites each year spread across all the agro-ecosystems. This process allowed a large number of farmers to observe the growth and development of each variety. OFDTs were conducted in all seven districts allowing researchers to make comparisons of the test varieties over a range of environments and management practices. If any outstanding varieties were identified after this exhaustive process, they were recommended to the Minister of the Ministry of Agriculture and Fisheries for official release.

Socio-economic (known as SOSEK) research was conducted by the small SoL SOSEK team. Most of the data was collected by the team during in-field studies of farmers practices and through interviews at market places. Standard survey techniques

were used for each study. Extra information was gathered from protocols used by agronomists conducting OFDTs.

As with Component 1, training was provided through OJT, short courses and study tours.

Crop packages were developed through research conducted on research stations and on farmers fields. Most of the research trials were replicated.

#### **Component 4 Program coordination and research institutionalization within MAF**

The objective off this component was to effectively manage the program and to institutionalize crop research and extension in MAF. Included were the effectiveness of the programs staff, the way in which the program was coordinated, effective reporting and the use of a Monitoring and Evaluation framework.

SOL 2 was manned by a team of 7 advisors and 51 locally employed personnel. The MAF funded 32 of these directly. The SOL 2 office was located in the MAF compound, Comoro, Dili where personnel were able to interact with MAF personnel on a daily basis.

## 6 Achievements against activities and outputs/milestones

**Objective 1: To enhance the capacity of MAF and other agricultural development agencies/groups to produce, store and distribute quality seed for TL's main food crops**

| no. | activity  | outputs/<br>milestones   | completion<br>date  | comments  |
|-----|---|--|---|---|
| 1.1 | Betano research station rehabilitated and operational   | Buildings rehabilitated, equipment installed and operational. Staff living on site and working           | May, 2007 and handed over to MAF in June, 2007.   | Station inaugurated by MAF in November, 2007. Personnel living on site. Irrigation system for seed production working well, fencing and other infrastructure also complete. Equipment such as tractor and travelling irrigator supplied.      |
| 1.2 | Loes research station rehabilitated and operational   | Buildings rehabilitated, equipment installed and operational. Staff living on site and working           | Five houses and two offices completed during 2009. Property fenced by MAF and machinery shed constructed in 2010. Equipment in operation. | Research activities commenced on the station during the wet season of 2008/2009 and intensified in later years.   |
| 1.3 | Development of research station to serve Eastern TL   | Station at Darasula established  | Station was fenced and partially cleared in 2010.   | Agronomic research was conducted on the station during the 2010/2011 wet season. A building will be constructed on the site in 2011 by SOL 3.   |
| 1.4 | Alieu trial site used for upland research   | Trial site staffed and operational. Staff included in RDU  | Ongoing   | Trial site continues to be well managed.  |
| 1.5 | Selected MAF and NGO staff trained in seed production, storage and testing, in cooperation with other donor activities  | Number of MAF and other staff trained. Level of staff competency in seed production, storage and testing | Ongoing.  | Seed production training continued to be a major component of the overall training program. 14 formal seed production training courses held in 2010 totalling 410 training day opportunities, 12 in 2009 (459 days) and 5 in 2008 (157 days). |
| 1.6 | Limited assistance provided to MAF to develop policy/guidelines on seed certification, seed import and variety release. | Seed policy/guidelines prepared, approved and implemented.   | 2008  | SoL assisted MAF prepare seed law which includes SoL developed guidelines allowing release of SoL selected varieties. Law with MAF awaiting increased management support for program prior to legislation and implementation.                 |
| 1.7 | Seed produced and stored for trials and OFDTs   | Sufficient quality seed produced each year for trials, OFDTs and extension purposes.                     | Ongoing   | Seed surplus to OFDT needs produced for all crops. Rice, maize, peanuts and sweet potato cuttings distributed to farmers each year. Cassava cuttings ready for distribution in 2011.  |

**Objective 2: To identify improved and acceptable food crop varieties and associated technologies for subsistence farmers, particularly in upland areas.**

| no. | activity  | outputs/<br>milestones   | completion<br>date  | comments  |
|-----|---|--|---|---|
| 2.1 | New food crop varieties/technologies introduced and evaluated.  | No. of improved varieties tested. Results used to revise research programs. Results published to international standard.     | Annual evaluations and reporting of results.  | 2 maize varieties (Sele, Suwan5); 3 sweet potato (Hohrae 1,2,3); 1 rice (Nakroma); 1 peanut (Utamua), two cassava (Ai-Luka 2 and Ai-Luka 4) released.   |
| 2.2 | Germplasm of best new and local varieties maintained in East Timor  | Number of new varieties identified, described and maintained at each research station/site                                   | New varieties provided by CGIAR and other centres. On-station preservation at Betano. | Germplasm conservation extended to Betano, Corluli and Loes stations. Full time curator trained and working.  |
| 2.3 | Selected research and demonstration staff trained in research methods, and the agronomy of new crop varieties | No. of MAF staff trained in basic food agronomy and food crop variety evaluation methods. Level of competency in method use. | Ongoing.  | Total number of training days for 2010 was 2306, in 2009, 2378, in 2008 875days, in 2007 331 days and in 2006 280 days.<br>On average 9 SoL staff attend a technical training course each day, plus training of NGOs, MAF staff and farmers |
| 2.4 | Inventory of local varieties of main food crops, and samples collected and stored in CGIAR centres.           | No. of varieties collected and stored in CGIAR centres compared with MAF assessment of existing populations                  | 2015  | Current collection includes 241 entries composed of cereals, tubers and legumes. These will be further evaluated prior to sending duplicate entries to CGIAR centres.   |
| 2.5 | Agricultural information from SoL integrated into ALGIS system. MAF personnel trained.                        | Data and information collected and entered each year.  | Staff competent with program by end of 2007.  | Field based staff were trained in use of GPS. Equipment purchased and staff competent. Director of NDRSS received Masters in GIS with SoL support. SoL information not fully integrated with ALGIS at end of SOL 2.                         |



**Objective 3: To test and extend new food crop varieties to farmers-through extensive on-farm demonstration trials and development of improved crop production “packages”.**

| no. | activity  | outputs/<br>milestones  | completion<br>date   | comments   |
|-----|---|---|--|--|
| 3.1 | Socio-economic data collected from target villages to provide base-line data, and to focus OFDTs on farmers' food production constraints                | Targeted baseline data on agricultural systems, varieties, crop areas, yields, constraints and periods of food shortages  | In-depth baseline studies in 2007. Extra funding extends completion to August, 2010                        | Baseline data complete. Additional farmer surveys measure food production constraints and acceptability of newly released varieties.   |
| 3.2 | Selected staff from MAF and NGOs trained in Farmer Participatory Research (FPR)   | Staff trained in FPR<br>Assessment of staff's competency to assist with OFDTs   | Training in 2005-2006. Manual prepared 2006-2007.  | FPR training manual complete and distributed in 2007. Competency of OFDT implementation measured annually. See section 8.2, Capacity impacts.  |
| 3.3 | Appropriate OFDT training materials developed and disseminated to MAF staff, NGOs, and farmers  | Timely production of translated and well-presented materials<br>Farmers' comments on and responses to these materials   | OFDT protocols prepared annually as were GPS units, pH test kits and FPR manuals used.                     | Annual technical meetings facilitated discussion between technical personnel. Farmers provided feedback at technical meetings and farmer field days.   |
| 3.4 | OFDTs undertaken by farmers, with support from RDUs   | Annual OFDT programs in Annual Operating Plans<br>Number of districts, sub-districts and farmers' groups (female and male) involved with OFDTs each year<br>Farmer's views on, and acceptance of, new varieties | Annual operating plans complete by end of September each year. Goal of 15 OFDT's per RA per crop per year. | Annual technical meetings and farmer field days held each year. Five Annual Research Reports completed. Approximately 700 OFDTs in maize, peanut, cassava, sweet potato and rice were established in 17 sub districts of 7 districts each year. Farmers reviews on acceptance of new varieties recorded. |
| 3.5 | Agronomic, management, processing and storage technologies for improved crop varieties (improved crop production “packages”) developed and disseminated | Annual program to achieve objective designed, implemented and evaluated<br>Food crop production “packages” developed  | Completion of each “package” of technology included in Annual Research Reports.                            | Information brochures produced for each released variety. Weeds and insect pest manuals in draft.  |

**Objective 4: To effectively manage the Program and utilization of crop research and extension in MAF.**

| no. | activity   | outputs/<br>milestones   | completion<br>date  | comments  |
|-----|--|--|---|---|
| 4.1 | Program office staffed and equipped  | Suitable office space allocated and with adequate support staff and transport facilities   | 2005-2006   | Office re-established at MAF compound in Comoro. Office expanded in 2009.   |
| 4.2 | Activities effectively coordinated between the Program's stakeholders and partners   | Coordination strategy developed annually. Regular meetings at appropriate times. Outcomes from donor coordination meetings<br>Program's field experiences with cooperating stakeholders and partners – particularly NGOs | District RDU meetings held monthly, harmonization meetings monthly, discussions held regularly with international organizations and NGOs. | Regular meetings held between SoL management. NGOs utilize OFDTs for training purposes and collaboration. SoL considered to technical experts on crop agronomy in TL. |
| 4.3 | A Nation-wide extension strategy for MAFF  | Report produced, and accepted by MAFF and stakeholders in TL's rural sector  | Policy due for completion late 2008.  | Final extension strategy completed early in 2009 and submitted to MAF for discussion.   |
| 4.4 | Annual Progress Reviews and Annual Operating Plans (research, training and OFDT programs)  | Reports produced on time and to an acceptable standard   | Reports due annually.   | Annual reports in ACIAR format completed. ACIAR on PSC and review overview.   |
| 4.5 | Final M&E framework, and associated data-base  | Finalised M&E framework<br>Program data-base functional, and staff trained in operation  | Completed 2008.   | In place and operating. Staff trained on data base operation.   |
| 4.6 | Program reports: (i) six month progress {technical and financial}; (ii) exception reports {if required}; (iii) research results {published to international standards}; and (iv) end of Program report | Appropriate reports presented on time and to an acceptable standard  | Monthly reports completed monthly etc.  | Fifth Annual Research Report based on data presented at Annual Technical Meeting completed. Final Report completed.   |
| 4.7 | TAG visits and reports   | TAG reports and recommendations, providing independent technical advice to MAFF and the Program  | TAG visit annually.   | Final TAG incorporated formulation of Concept Note for SoL Phase 3. SOL 3 commenced on 01 February, 2011.   |

**Objective 4 continued: To effectively manage the Program and utilization of crop research and extension in MAF.**

| no. | activity   | outputs/<br>milestones   | completion<br>date | comments  |
|-----|--|--|--------------------|---|
|     |  |  |                    |   |
| 4.8 | Mid-Term Review and stop/go decision               | Review report and recommendation on stop/go  | May, 2007          | Review complete and go recommended.   |
| 4.9 | Progressive institutionalization of SoL within MAF | Ongoing main-stream activities progressively designed (and costed) into MAFF's Annual Action Plans | Progressive        | MAF staff managing research stations and supervise OFDTs at the end of 2009. Most salaries of professional staff paid by MAF and increasing contributions through labour and facilities.. |

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## 7 Key results and discussion

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### 7.1 Introduction

This section will discuss the results of SOL 2 activities over the life of the program. The impact these activities had on the program, MAF capacity to conduct research and produce seed and on Timor Leste agriculture in general are presented in Section 8 of this report.

The key results are presented by component.

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### 7.2 Component 1- seed production, storage and distribution

#### **Output 1.1 - Betano Research Station rehabilitated**

Building rehabilitation. Rehabilitation of the main buildings at Betano Research Station were completed and inaugurated by the Minister of Agriculture and Fisheries, HE Mariano *Assanami* Sabino on 29 November, 2007.

Irrigation, fencing and equipment Modifications to the station during 2007 and 2008 now make the station into a fully functional operation.

New MAF funded buildings. In addition to those rehabilitated under the SoL program, the MAF constructed a large warehouse, a meeting building, one residential house and tractor repair shed on the station during 2008-2009. The Government infrastructure development is clear signal to its commitment to agricultural development in Timor Leste.

#### **Output 1.2 - Loes Research Station rehabilitated and operational**

Development of Loes Research Station commenced in 2008 with the rehabilitation of one house/office from which the farm was managed for the year. In 2009 two housing blocks and two offices were constructed, the station partially cleared of overgrown weed vegetation and research trials implemented. A warehouse constructed in 2010 completed the building rehabilitation program at Loes. It is however, planned that an irrigation network will be established on the station during the first year of SOL 3. The MAF had assigned three researchers and support staff to work on the station by the end of 2010.

#### **Output 1.3 - Development of a research station to serve either eastern TL or high altitudes**

The need to establish a research station in the east of the country for upland research was identified during the design of SOL 2. The new station needed to be on a similar agro-ecosystem as at Fatumaca, a research site on loan from the church. A 12 ha site at Darasula, Baucau district was identified by local authorities and granted to the MAF. The site was fenced by the MAF in 2009, a station manager assigned and an Environmental Site Assessment (ESA) drafted. Research planned for Fatumaca was transferred to Darasula late in 2010. SOL 2 has committed funds to construct a building on this site.

#### **Output 1.4 - Aileu site used for upland research**

The research site at Aileu on Quintal Portugal (Portuguese garden) is a piece of Government land used mainly for coffee research and coffee tree propagation. The 0.8ha site is poorly serviced but possesses experienced labour who manage the site. Trials established on this station were well maintained throughout the program period. Field days were regularly held to invite farmers to evaluate potential varieties of either maize, sweet potato, peanuts or cassava.

#### **Output 1.5 - Staff trained in seed production, storage, and testing**

Seven District Seed Officers (DSO) were assigned by MAF to seed multiplication in six districts in mid 2008. In addition, one MAF Seed Officer was involved in foundation seed multiplication at Betano station. All Seed Officers attended a number of training courses each year and improved their capacity to design and implement a seed multiplication program. Training included an evaluation of the officer's ability to:

- a) Manage large areas of seed production
- b) Accurately record seed purchase, handling, transport, storage and distribution
- c) Conduct germination tests
- d) Test for seed purity
- e) Interact with farmers
- f) Amount of training successfully training undertaken
- g) Capacity to train others on seed production

A typical year of training included short courses, field days and trips to seed production programs in Indonesia. In 2009, for example there were formal courses on sweet potato characterization, maize and rice seed production, seed treatment and seed production and handling. One field trip was made to Indonesia that year. The seed program training courses held in 2010 are presented in Table 1.

**Table 1. Seed production training 2010**

| <i>Topic</i>   | <i>Venue</i>                                 | <i>Institution involved</i> | <i>No. of participants</i> | <i>Duration (days)</i> | <i>Training days</i> | <i>Date (2010)</i> |
|--|--|-----------------------------|----------------------------|------------------------|----------------------|--------------------|
| Introduction to seed processing and storage for seed growers and farmers | Triloka seed warehouse                       | MAF-SoL                     | 25                         | 1                      | 25                   | 14-Jul             |
| National Directors (NDRSS and NDAH) to Indonesian seed industries.       | Indonesia                                    | MAF personnel               | 2                          | 6                      | 12                   | 20 – 25 Jun        |
| Rogueing techniques for rice seed growers in Aileu                       | Seloikraik, Aileu                            | MAF-SoL                     | 8                          | 2                      | 16                   | 19-20 May          |
| Rogeing techniques for rice seed growers in Manufahi                     | Betano, Manufahi                             | MAF-SoL                     | 2                          | 3                      | 6                    | 20-22 May          |
| Rogeing techniques for rice seed growers                                 | Venilale, Baucau                             | MAF-SoL                     | 5                          | 3                      | 15                   | 25-27 April        |
| Rogeing techniques for rice seed growers                                 | Seisal, Baucau                               | MAF-SoL                     | 5                          | 3                      | 15                   | 11-14 Feb          |
| Maize seed germination testing   | Liquica                                      | Care                        | 20                         | 1                      | 20                   | 5-Feb              |
| Principles of seed storage for MAF staff                                 | Triloka seed warehouse                       | MAF                         | 30                         | 2                      | 60                   | 24-25 Feb          |
| Principles of maize seed production for MAF staff                        | Lautem                                       | MAF                         | 30                         | 1                      | 30                   | 26-Feb             |
| Principles of seed testing   | Betano Research Station                      | MAF                         | 30                         | 1                      | 30                   | 3-Mar              |
| Principles of rice seed production                                       | Maliana, Bobonaro                            | MAF                         | 30                         | 1                      | 30                   | 10-Mar             |
| Principles of seed quality control for seed staff                        | Betano Research Station                      | MAF-SOL                     | 8                          | 2                      | 16                   | 12 – 14 Jan        |
| Visiting farmers of a local NGO Cailalo.                                 | Triloka seed warehouse and Seisal rice field | MAF-SOL                     | 15                         | 1                      | 15                   | 17-Dec             |
| Sweetpotato field day  | Sweetpotato field (1 ha) at Guariwai, Baucau | MAF-SoL                     | 100                        | 1                      | 100                  | 26-Nov             |
| Maize germination test for CARE staff                                    | CARE Office Bairopitte-Dili                  | CARE                        | 20                         | 1                      | 20                   | 5-Nov              |

In 2010, SoL held formal training courses for NGOs, farmers and MAF personnel. The number of formal training days in the seed production program totalled 53 days in 2008 when the program started, 459 days in 2009 and 410 days in 2010. The effectiveness of these training programs are discussed in Section 8 of this report.

### **Output 1.6 – Development of policy/guidelines on seed certification, seed import and variety release**

SoL coordinated with ARPIII to assist the MAF formulate a draft Seed Law in January, 2008. The Seed Law draft contains the elements of a policy for the release, quality guidelines, labelling, certification and importation of seed. Some of these elements were already in place with the development of a Variety Release Committee to enable the release of SoL varieties in March, 2007. At the end of 2010, the draft Seed Law was with the MAF. Regulations supporting this law are still to be developed and personnel made available for its management need to be identified before the law will be submitted to parliament.

### **Output 1.7- Seed production and storage at Loes and Betano research stations and other districts**

This component was initially designed when all formal seed production was to be multiplied on-station to supply the OFDTs. This approach was later (in 2008) modified for seed production activities to be done on farmer fields through the district seed officers in an attempt to satisfy part of the national seed requirement. In the 2007/2008, 2008/2009 and 2009/2010 seasons, seed surplus to OFDT needs was produced for all SoL/MAF released crop varieties. Surplus seed was either sold to NGOs or distributed to farmers in small amounts, some through the MAF National Directorate for Agriculture and Horticulture, via extension personnel or directly by SoL/MAF to farmers, especially if the farmers were involved with installing OFDTs. The distribution of seed and planting material for each crops is presented in Tables 2-6. Distribution in year 2010/2011 was partially complete at the time of this report.

Seed cleaning machines and other equipment was purchased in May, 2009 to facilitate this process. Foundation seed for maize and peanuts was produced mainly on Betano station.

The amount of seed and cuttings distributed to farmers steadily increased over the three year period and will become a major focus of the program in SOL 3.

**Table 2. Distribution of Nakroma rice seed (t) by organization (% in brackets)**

|                        | 2008/2009 | 2009/2010 | 2010/2011 | Total      |
|------------------------|-----------|-----------|-----------|------------|
| By MAF                 | 9.8 (67)  | 46.4 (88) | 47.0 (93) | 103.2 (88) |
| By NGOs                | 1.0 (7)   | 4.6 (9)   | 0.8 (2)   | 6.4 (5)    |
| By MAF-SoL (OFDTs etc) | 3.8 (26)  | 1.8 (3)   | 2.5 (5)   | 8.1 (7)    |
| Grand total            | 14.6      | 52.7      | 50.3      | 117.6      |

**Table 3. Distribution of Sele maize seed (t) by organization (% in brackets)**

|                        | 2008/2009 | 2009/2010 | 2010/2011 | Total     |
|------------------------|-----------|-----------|-----------|-----------|
| By MAF                 | 2.2 (19)  | 6.5 (36)  | 25.1 (77) | 33.7 (45) |
| By NGOs                | 4.0 (35)  | 8.0 (44)  | 4.6 (14)  | 16.6 (27) |
| By MAF-SoL (OFDTs etc) | 5.2 (45)  | 3.7 (20)  | 2.9 (9)   | 11.7 (19) |
| Grand total            | 11.4      | 18.1      | 32.5      | 62.0      |

**Table 4. Distribution of Utamua peanut seed (t) by organization (% in brackets)**

|                        | 2008/2009 | 2009/2010 | 2010/2011 | Total     |
|------------------------|-----------|-----------|-----------|-----------|
| By MAF                 | 0 (0)     | 4.0 (25)  | 12.8 (76) | 16.7 (45) |
| By NGOs                | 1.2 (26)  | 5.2 (32)  | 2.1 (12)  | 8.5 (23)  |
| By MAF-SoL (OFDTs etc) | 3.4 (74)  | 6.8 (43)  | 2.0 (12)  | 12.1 (32) |
| Grand total            | 4.5       | 16.0      | 16.8      | 37.3      |

**Table 5. Distribution of sweet potato cuttings (no.) by organization (% in brackets)**

|                        | 2008/2009   | 2009/2010   | 2010/2011   | Total       |
|------------------------|-------------|-------------|-------------|-------------|
| By MAF                 | 64,010 (53) | 4,515 (10)  | 1,730 (7)   | 70,255 (37) |
| By NGOs                | 7,350 (6)   | 17,210 (40) | 0 (0)       | 24,560 (13) |
| By MAF-SoL (OFDTs etc) | 48,923 (41) | 21,710 (50) | 48,923 (93) | 21,710 (50) |
| Grand total            | 120,283     | 120,283     | 43,435      | 24,280      |

**Table 6. Distribution of cassava cuttings (no.) by organization (% in brackets)**

|                        | 2008/2009  | 2009/2010   | 2010/2011   | Total       |
|------------------------|------------|-------------|-------------|-------------|
| By MAF                 | 0 (0)      | 500 (2)     | 465 (2)     | 965 (2)     |
| By NGOs                | 1,000 (87) | 2,010 (7)   | 13,500 (68) | 16,510 (32) |
| By MAF-SoL (OFDTs etc) | 150 (13)   | 27,288 (91) | 6,030 (30)  | 33,468 (66) |
| Grand total            | 1,150      | 29,798      | 19,995      | 50,943      |

### 7.3 Component 2- evaluation of new germplasm and associated technologies

#### Output 2.1 - New crop varieties introduced and evaluated

New varieties of food crops commonly cultivated in Timor Leste were introduced for evaluation in replicated trials (Table 7). Most of the germplasm originated from CGIAR centres although most of it may have been sourced from regional centres. There were usually about 20 entries and at least two locals in each trial. In 2010 for example, replicated trials included 20 maize (mainly from CIMMYT), 15 peanut (mainly from ICRISAT), 16 varieties of sweet potato (mainly from CIP) and 25 cassava clones (mainly from CIAT). One irrigated rice (20 entries) evaluation trial was conducted at Aileu.

**Table 7. Number of replicated trials conducted each year 2005-2010**

| Trial type          | Cropping year |           |           |           |           |           |
|---------------------|---------------|-----------|-----------|-----------|-----------|-----------|
|                     | 2005/2006     | 2006/2007 | 2007/2008 | 2008/2009 | 2009/2010 | 2010/2011 |
| Tropical cereals    | 4             | 7         | 6         | 8         | 6         | 15        |
| Root crops          | 9             | 7         | 8         | 15        | 15        | 9         |
| Legumes             | 4             | 5         | 5         | 14        | 16        | 31        |
| Temperate crops     | 0             | 0         | 2         | 1         | 7         | 20        |
| Agronomy trials     | 6             | 10        | 6         | 22        | 12        | 9         |
| <b>Total number</b> | <b>23</b>     | <b>29</b> | <b>27</b> | <b>60</b> | <b>56</b> | <b>84</b> |

Note: a) Tropical cereals include rice and maize, b) Root crops include cassava and sweet potato, c) Legumes include peanuts, mungbeans climbing beans, wing beans etc, d) Temperate crops include wheat, barley and potato, e) Agronomy trials include intercropping maize and velvet bean, weevil tolerance etc

In the early years of the program, introduced germplasm was cultivated at five MAF research stations. These were Corluli (Bobonaro), Betano (Manufahi), Quintal

Portugal (Aileu), Fatumaca (Baucau) and Loes (Baucau). Three of these upland sites (excluding Aileu) are located at lower altitudes although on different soils and climatic conditions. In later years, trials were installed on farmer fields in ecosystems at higher (and cooler) altitudes and in irrigated paddy fields more suited to rice cultivation. In 2005/2006 the main crops evaluated were maize, rice, sweet potato, cassava and peanuts. As high yielding improved varieties from these crops were identified, an increasing amount of attention was given to other legumes (mungbeans climbing beans, wing beans etc), temperate crops (wheat, barley and potato) and agronomic trials (intercropping maize and velvet bean, weevil tolerance etc) to improve overall productivity improvements. To accommodate this program, the number of installed replicated trials increased from 23 during the wet season of 2005/2006 to over 80 in the 2010/2011 season.

Varieties showing any potential for release to the farming community were further evaluated through taste and acceptability tests. Samples of the produce were cooked and examined by consumer prior to tasting. These were then rated to be included in overall evaluations. Data of all of these evaluations were collected and recorded.

In addition to the physical science research, the SOSEK team evaluated acceptance of the varieties by farmers and surveyed markets for the sale of SoL products.

### **Output 2.2 - Germplasm of new varieties maintained**

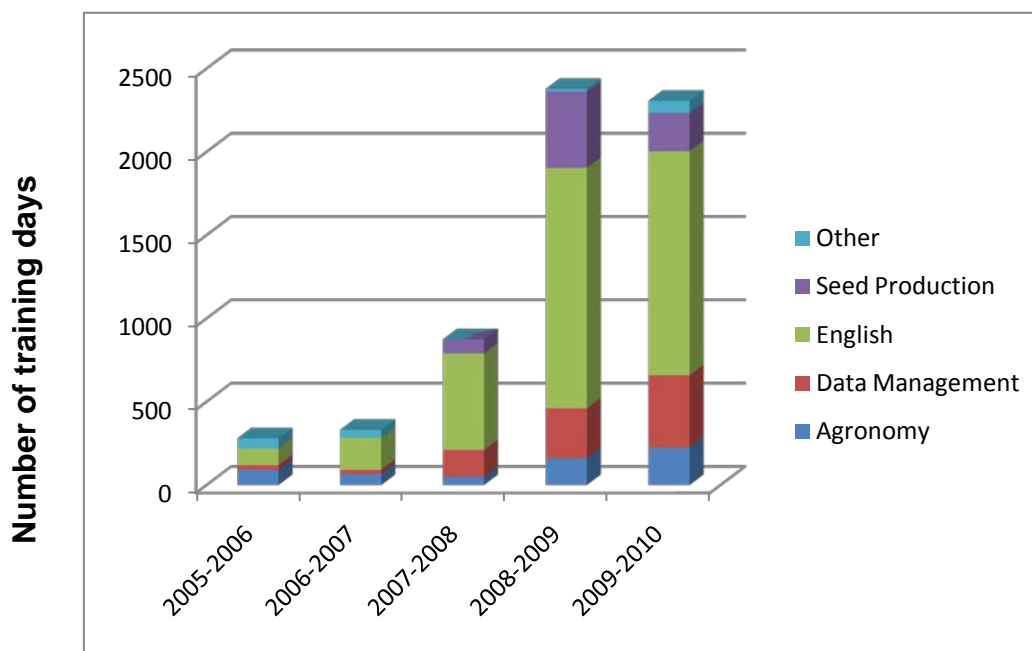
Introduced germplasm utilized by SoL is currently conserved and regenerated on-station. Germplasm was grown at Corluli, Betano, Aileu, Loes and Baucau. Other storage facilities exist at Comoro and Baucau. Extra storage facilities as the seed production program expands include the installation of refrigerated long term storage at Betano and Comoro. The SPA has developed a conservation plan for germplasm of each species and has included training on seed selection in the training program. A Seed Collection Curator was assigned during 2008 to collect and conserve germplasm and underwent training on conservation techniques in Australia during February, 2009. In the current collection are 80 cassava entries, 40 sweet potato varieties and 30 peanut varieties (See SoL, 2010).

### **Output 2.3 - Research and demonstration staff trained**

Training of members of Research and Development Units (RDUs) involved with the program was a priority throughout SoL 2. Training was composed of on-the-job training, formal short term courses, study tours, field days and long term training (masters degrees). The number of short term courses each year are presented in Figure 1. Poor English language comprehension was determined to limit the capacity of some research staff to properly design, manage and analyse their trials. For this reason, a high proportion of the formal training courses were in English language training. As a consequence to this the amount of effort spent on data management and statistics increased over time.

The R/EAs and visiting scientists provided constant on the job training in soils, the use of Excel, GPS, soil pH testing equipment etc. In addition, an increased number of team members pursued short and long term training courses abroad. At the beginning of 2011, five ex-SoL team members were undergoing MSc training – three in Australia and two in Indonesia. MAF staff also attended short courses in Australia on germplasm conservation techniques, on-farm trial analysis and English training. MAF personnel also joined study tours to Australia and Indonesia.





**Figure 2. Number of short term training days presented each year 2005-2010.**

The Seed Curator received a scholarship from the ATSE Crawford Fund to attend Germplasm collection training at UWA.

**Output 2.4 – Inventory of local varieties of main food crops**

As mentioned in Output 2.2, an inventory of local varieties commenced after the Seed Collection Curator underwent training in Australia in 2008. At the end of 2010 the germplasm collection had a total of 241 entries, 86 of which were collected locally.

**Output 2.5 - Agricultural information integrated with the ALGIS system**

The former head of Agricultural Land Geographical Information System (ALGIS) is now the Director of Research of MAF and the ALGIS unit lacks both resources and incentive to incorporate SoL data into their GIS system. SoL, however developed an excellent data management system suited to incorporation into ALGIS.

**7.4 Component 3- On-farm demonstrations and trials**

**Output 3.1 - Participatory social research completed**

Household data was collected throughout the five year program period by the SOSEK team. Two Timor Leste social scientists worked for much of the time collecting data and preparing reports on the economic benefits of farmers involved in SoL in Aileu, Baucau, Liquica and Manufahi, some of which are included in the Annual Research Reports. Cropping calendars for the seven SoL Districts were completed and published in both English and Tetun. Excerpts of these are included in the SoL ARR, 2010.

A baseline survey of 612 famers was undertaken in 2008 covering aspect of livelihoods undertaken in the seven project areas. The survey was designed to provide a snapshot or situation report and illustrates disaggregated data, particularly in gender terms, aspects of food security and economic standing, and as a basis for assessing adoption rates and constraints to improved food production.

Data on the status of OFDT households was collected each year, providing information ranging from household size and assets to farmers perceptions of factors reducing harvest yields in the districts. This data collected over a period of time will add depth to the baseline survey.

Each RA held mini field days in each sub district during the cropping seasons. It was planned that one field day would be held for each species. The crops were harvested during the field day, weighed and results discussed with the farmers and other members of the RDU. Feedback on the crops characteristics were then solicited from the visiting farmers giving them the control over the varieties to be selected for investigation and release.

### **Output 3.2 – RDU staff trained in participatory research and extension**

SoL involved MAF staff, farmers, NGOs and other organizations in training courses, a summary of which is presented in Figure 1. All sectors of the agricultural society are considered to be part of the RDU and included in relevant training courses. As part of the training, a Farmers Participatory Research (FPR) manual was developed and used for training on participatory research and extension.

### **Output 3.3 - OFDT training materials developed and disseminated**

Protocols for collecting data from each OFDT were developed at the beginning of the program and used as material to train RAs on FPR. RAs generally developed a good relationship with farmers through this familiarization process. The protocols were regularly updated. Special protocols were prepared and distributed to NGOs, where a lower level of monitoring and evaluation was planned. These protocols played a key part in the SoL learning cycle. The RAs made summaries of their information for inclusion in monthly reports. The collated data was incorporated into a database for analysis, monitoring of progress and reporting. These Protocols were shared with NGO partners and District MAF staff working in Districts SoL have yet to work in.

OFDT training material included agronomy books, (maize, rainfall etc), GPS and associated manuals, statistics books, English language books and listening CDs plus 7 information brochures on the major food crops were prepared. Copies of the FPR manual were also distributed.

SoL material appeared in each of the MAF Agri Boletins. SoL reports were also provided to the MAF “Harmonization meeting” (between MAF and externally funded programs) and the monthly Sustainable Livelihoods Network meetings. Proceedings from the regional technical reporting and planning meetings were also circulated.

The SoL Annual Research Reports compiled the results of most SoL research conducted by the program over the year from 01 September to 31 August the following year. Five of these reports were completed during SOL 2 and were circulated to research and extension personnel. Details of SoL seed production was also included in the final two reports. Included in the results section is a summary of the results leading to the release of the new varieties.

### **Output 3.4 – OFDTs undertaken by farmers, with support from RDUs**

The most promising genetic material from the replicated research component were evaluated on farmers’ fields under farmer conditions. Twenty five square meter (5mx5m) plots are planted with the test entries and compared with the locally used variety. Each year 561-765 maize, peanut, cassava, sweet potato and rice on-farm demonstrations and trials (OFDTs) were established in 17 sub districts. In the 2009/2010 wet season, 646 OFDTs were established. Included were 228 maize, 109 sweet potato, 157 peanut, 82 cassava and 70 rice trials. In earlier years, installed OFDTs numbered 561 in 2006, 713 in 2007, 705 in 2008 and 765 in 2009. 343 were underway during 2010/2011 as this report was being prepared. The number of trials will increase in 2011 as non-maize trials

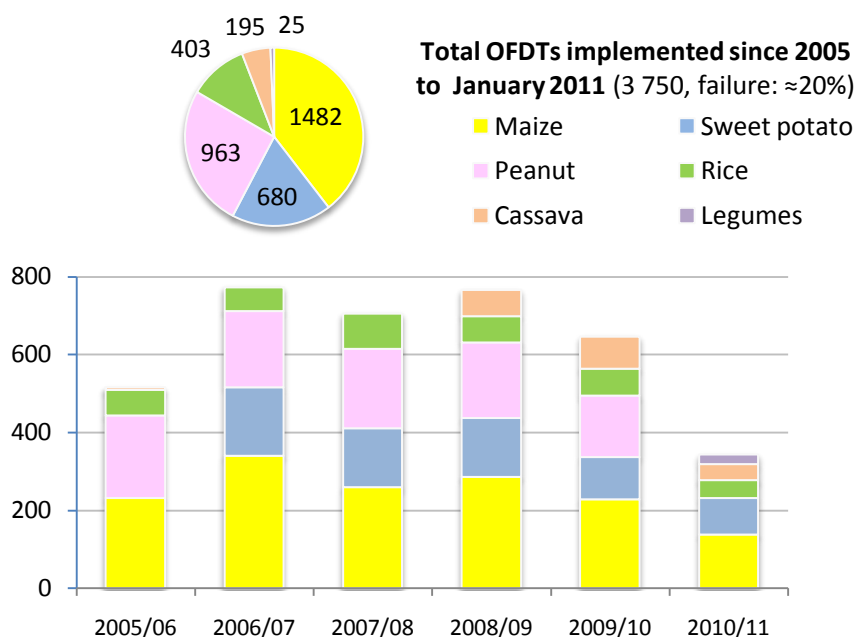
are installed. The number of non-core crops under evaluation in OFDTs will also increase as the results of replicated trials reveal potentially useful germplasm.

Gender disaggregated views on the new varieties were collected. The results indicate there are few differences in preferences for varieties between men and women in most years. However, women did place emphasis on pounding quality in addition to taste.

**Table 8. Number and type of OFDTs conducted during SOL 2**

|              | Maize       | Sweet potato | Peanut     | Rice       | Cassava    | Other legumes | TOTAL       |
|--------------|-------------|--------------|------------|------------|------------|---------------|-------------|
| 2005/06      | 231         | 0            | 213        | 65         | 7          | 0             | 516         |
| 2006/07      | 340         | 176          | 195        | 62         | 0          | 0             | 773         |
| 2007/08      | 259         | 151          | 204        | 91         | 0          | 0             | 705         |
| 2008/09      | 286         | 151          | 194        | 68         | 66         | 0             | 765         |
| 2009/10      | 228         | 109          | 157        | 70         | 82         | 0             | 646         |
| 2010/11*     | 138         | 93           | 0          | 47         | 40         | 25            | 343         |
| <b>TOTAL</b> | <b>1482</b> | <b>680</b>   | <b>963</b> | <b>403</b> | <b>195</b> | <b>25</b>     | <b>3748</b> |

\* Partial year only.



**Figure 3. Number and type of OFDTs implemented 2005-2011**

**Output 3.5 – Improved crop production “packages” developed and disseminated**

Research to develop “packages of technology” included experiments on the use of Velvet beans (*Mucuna pruriens*) to control weeds in maize, weeding trials in maize, the position of cuttings of sweet potatoes, phosphorus application on peanuts and weevil tolerance in maize. These were utilized as recommendations for farmers in specific areas. Fertilizer trials were particularly useful to identify constraints to production but no recommendations were made to farmers under the current Government policy.

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## 7.5 Component 4- Program management and coordination and institutionalization of crop research and extension in MAF

### **Output 4.1 - Program office staffed and equipped**

Initially, SoL activities were administered from a small office in Fomento, Dili. In 2008 the program transferred to a new office in the same building as the Directorate of Research and Special Services in the MAF compound in Comoro, Dili. This allowed SoL personnel, especially the Australian Team Leader (ATL) to interact regularly with the Director for Research, the Director for Agriculture and Horticulture and more recently with the Director for Agricultural Community Development. At the beginning of SoL 2, the team consisted of the ATL, two Research/Extension Advisors (R/EA), an office manager and a part time SOSEK advisor plus 15 local staff. In 2008, a Seed Production Advisor (SPA) joined the team as did a Climate Change Advisor in 2009. At the end of 2010, the size of the local team had expanded to 42, 29 of whom were Government employees. Seven of these were Seed Production Officers.

Volunteers assisted with the implementation of SOL 2. One Australian Youth Ambassador supervised program communications including the launching of a web page. Volunteers also mentored research station managers at Betano and Loes.

### **Output 4.2 - Activities effectively coordinated**

SoL personnel kept in close contact with National and District personnel, AusAID, ACIAR, and CGIAR centres. Good relationships were maintained with other agricultural based programs through the RDUs and attendance at regular meetings (for example the MAF/Donor "Harmonization meetings" and the Sustainable livelihoods meetings). . Activities were effectively coordinated between the major stakeholders. Large quantities of maize, peanuts and rice seed was sold to FAO, USC Canada, CARE, World Vision and provided free of charge to five other NGOs needing small amounts. CARE's village based seed production system was monitored by SoL for future expansion of its own seed production.

Weekly meetings were held on Monday mornings to coordinate activities. Minutes were taken and circulated amongst the staff. Other forms of activities that SoL used to inform/co-ordinate with MAF include:

- 1) Verbal and written reports to MAF harmonisation meetings
- 2) Compilation of monthly reports from the Districts.
- 3) MAF co-leaders were copied all correspondence in and out of the program.
- 4) The MAF procurement office selected and approved tenders for all SoL sponsored construction. These were signed by the Director General.
- 5) All field staff recruitment of the SoL program was by MAF directors
- 6) All outgoing correspondence of the program was sent by the Director General.
- 7) Direct daily supervision of the district based Research Assistants was provided by food crops staff in that district.
- 8) Payment, reimbursement etc. including per diems to MAF permanent staff from SoL program only occurred with a directors' signature.
- 9) MAF staff of both the food crops and research division attended all trainings provided by the SoL program excepting for office management related issues.
- 10) Field days at research locations conducted by the SoL program were all conducted by MAF staff

- 11) SoL Research and Extension Advisors interacted regularly with Dili and district based food crop staff, and visited research and on farm sites together.
- 12) SoL Research and Extension Advisors met regularly with SoL co-leaders.
- 13) MAF researchers/ assistants responsible for research station management generally met weekly with SoL advisors to review and plan new activities.
- 14) SoL contributed to every edition of the MAF produced "AgriBoletin".

A personnel evaluation system was established to help guide staff improvement. This system was adapted to be a self evaluation system in 2009 which helped SoL personnel identify their limitations and the design of training programs.

#### **Output 4.3 - A nation-wide extension and research strategy**

SoL partly funded a consultant to assist develop an extension policy for the MAF. The policy was drafted at the beginning of 2009 and was under review by the MAF at the end of SOL 2. SoL also commissioned a Research Policy specialist to assist the Directorate of Research and Special Services develop its policy. The draft policy was under review by the Director at the end of 2010.

#### **Output 4.4 - Annual progress reviews and annual operating plans**

Annual Reports (January – December) were prepared annually, the summary of which appeared on the ACIAR website. In addition an Annual Research Report was prepared detailing the research conducted during the previous year (Sept-August). A summary of the progress made in other programs during that time period was also included. The Annual Plan prepared mid-year also included a summary of events over the previous year.

Comprehensive program progress reports were produced each month to collate relevant information. These reports included information from monthly reports completed by RAs. There were also descriptions of program activities, staffing and management issues, training, coordination with stakeholders, a description of the on-farm and on-station trials, rainfall, visitors, program sustainability issues and personnel activity reports. Also, there was a summary of progress against project outputs.

#### **Output 4.5 - Final M&E framework, and associated data-base**

The M&E framework was updated in November, 2008 during the visit of a short term M&E specialist. The updated format was used to formulate the progress to date is attached shown in Section 6 above. The M&E specialist returned in 2009 to make further recommendations regarding data collection in the program.

#### **Output 4.6 - Program reports**

A list of program reports is presented in Section 11

#### **Output 4.7 - TAG visits and reports**

The TAG visited the program twice in the first year and annual thereafter. Most recommendations resulting from the visit were implemented over the following year. The TAG visits often resulted in extra activities being adopted by the program. For example, extra funding was provided to the program and 2009 to expand the activities of the SOSEK program and a Climate Change Specialist was assigned to the program.

#### **Output 4.8 - Progressive institutionalization within MAF**

MAF has funded the salaries of 39 SoL staff (including 4 drivers) since 01 January, 2008. This move indicates the commitment of MAF to the SoL program. MAF also supported the construction of buildings at Betano research station, fencing at Darasula and Loes plus has assigned personnel to manage these stations.

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## 8 Impacts

SoL activities are having an increasingly large impact on agriculture in East Timor in terms of MAF recommendations and management, the capacity of personnel working in the rural sector and on the economics of farming enterprises. These impacts are summarised under the headings of Scientific, Capacity, and Community impacts.

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### 8.1 Scientific impacts

The SoL program has impacted significantly on the way the MAF plans, implements and analyses its research. The National Directorate of Research and Special Services now has policies and procedures in place to ensure agronomic technologies are thoroughly evaluated before official release to the farming community. The draft research policy with the NDRSS also provides guidelines for other sectors of agricultural research.

Training on research management during SOL 2 has provided many of the MAF staff with the skills to reduce variability in their trials by employing consistent management methods. Increasingly complex techniques were introduced as the skills level rose. For example, in 2010, researchers from the stations were tutored on the elimination of row and column effects using REML (Restricted/Residual Maximum Likelihood) analysis. It was also possible to assess the consistency of varietal performance across years using BiPlot analyses. This has been made possible through the implementation of a number of replicated trials each year over the five year period. As mentioned above (Table 7), the number of replicated trials increased from 23 in 2005/2006 to 84 in 2010/2011. Knowledge gained from these experiments contributed to the development of technologies for utilization in East Timor resulting in the release of highly acceptable varieties and improvement recommendations to farming systems.

Little history exists of past agronomic research in East Timor. This poor knowledge base is being addressed through the publication of all research results in Annual Research Report format and preparation of other reports. These are presented in the publications list.

SoL studies have raised the level of understanding on the effects climate change will have on agriculture in Timor Leste. The Climate Change Specialist was regularly requested to make presentations on this topic on behalf of the MAF at forums in Dili. A report describing the study was officially released by the Minister for Agriculture on 27 October, 2010 and a brochure was subsequently prepared for distribution to the general public titled "Climate change and its effects on agriculture in Timor Leste". The report and brochure are the first of its kind prepared for Timor Leste and are being used by the Ministry as its position on climate change in agriculture. A larger, comprehensive report, is under preparation as is a paper for release in a refereed journal.

SoL training on seed production is leading to an improvement in the practices of the MAF to multiply, store and distribute seed.

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### 8.2 Capacity impacts

SoL's capacity building investment over the life of the program was in the form of improved infrastructure, system development and human resources development.

The rehabilitation of research stations has significantly improved the capacity of MAF to conduct replicated agronomic trials in Timor Leste. MAF research stations at Betano and Loes are now fully developed and operating after a five year investment in infrastructure and personnel development. Both stations possess housing, an office and laboratory space, at least one warehouse and fencing. Betano possess good irrigation facilities for seed production. Similar irrigation facilities will be installed in Loes during

2011. A third station at Darasula has also been cleared and fenced allowing research trials to be initiated. This station will be improved further during SOL 3.

SoL has invested a considerable level of time and energy in training personnel working in agriculture. Over the years, training has ranged from motorbike handling through to computer operation. The impact on the local research community has been remarkable. Improvements have been measured on their capacity to plan, design, conduct, analyse and report research. In addition, NGOs, MAF personnel and farmers now have an improved capacity to participate in farmer participatory research.

Activities to build capacity in East Timorese agriculture were a high priority for SOL 2. Each year, MAF staff members from Dili and the districts plus representatives from NGOs and international organizations were included in training programs on agronomy, seed production, statistics and English language.

In the latter two years, the SoL training program progressed at a rate of 9 persons being trained in the classroom each working day of the year. The total number of training days increased over time from 280 days per year to over 2300 in 2009 and 2010 (Table 9) including seed production. Courses were directed at members of the research and development units (RDUs) involved with the program. In addition, farmer field days were held in each of the sub districts and on-the-job training was on-going.

**Table 9. Total number of training days over years 2005-2010**

|                 | 2005-<br>2006 | 2006-<br>2007 | 2007-<br>2008 | 2008-<br>2009 | 2009-<br>2010 |
|-----------------|---------------|---------------|---------------|---------------|---------------|
| Agronomy        | 90            | 66            | 48.5          | 160           | 224           |
| Data Management | 30            | 26            | 162           | 301           | 435           |
| English         | 100           | 192           | 579           | 1443          | 1345          |
| Seed Production | 0             | 0             | 85            | 459           | 230*          |
| Other           | 60            | 47            | 0             | 15            | 72            |
| <b>TOTAL</b>    | <b>280</b>    | <b>331</b>    | <b>874.5</b>  | <b>2378</b>   | <b>2308*</b>  |

\* Some seed production training included seed producers

Formal classes were regularly provided for English as were courses on mathematics, agronomy or statistics. There were also workshops on SWOT analyses, development of research priorities and training by AQIS on pests and disease prevention. In addition, the R/EAs and visiting scientists provided constant on-the-job training in soils, the use of Excel, GPS, soil pH testing equipment etc. MAF personnel were also invited to join study tours each year.

Long term training was funded by or arranged by SoL for five MSc students. In 2010, two SoL/MAF staff members attended MSc training in Bogor, Indonesia, three were at UWA (with John Allwright scholarships). One student completed his Masters in GIS in Australia with SoL funding and the ATL co-supervised a PhD student studying at UWA.

English language fluency has restricted the number of applicants for post graduate scholarships. Apart from the three MSc candidates at UWA, only five SoL researchers achieved an IELTS level of 4.5 in 2010, and three more were approaching this proficiency. A level of at least 5.0 is needed to gain scholarships to complete a degree at an Australian university.

The training program made steady progress in improving MAF competency over the five year period. Assessments were made annually from 2008 using a wide set of evaluation criteria. Evaluations catered for four distinct positions in the professional team. These were a) personnel installing OFDTs, b) research station researchers, c) seed production officers and d) socio-economic researchers (SOSEK). For each position, a

questionnaire was designed with series of competencies. A few of these are presented in Table 10. Some competencies are common to all positions, others are specific.

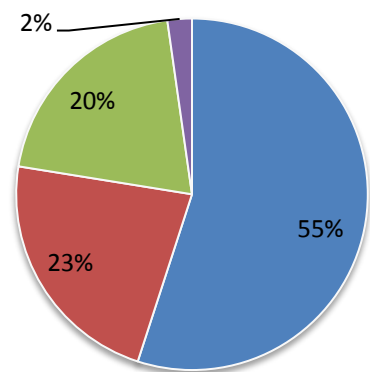
**Table 10. Competency categories and examples**

| <i>Category</i>      | <i>Staff position</i> | <i>Number of competencies per position and example</i> |   |
|----------------------|-----------------------|--|---|
| Agronomy             | OFDTs                 | 13   | Identify major maize and rice diseases                  |
|                      | Research stations     | 13   | Understanding of soil pH                                |
|                      | Seed production       | 12   | Understanding of the different seed production systems  |
| Research methodology | OFDTs                 | 26   | Use Excel to compare results and draw correlations      |
|                      | Research stations     | 28   | Complete basic ANOVAs                                   |
|                      | Seed production       | 11   | Interpret data and give recommendation                  |
|                      | SOSEK                 | 18   | Develop survey objectives                               |
| Field work           | OFDTs                 | 15   | Use GPS (degrees and decimal units)                     |
|                      | Research stations     | 17   | Collect rainfall data                                   |
|                      | Seed production       | 14   | Prepare contracts between SoL and farmers               |
| Farmers' field days  | OFDTs                 | 12   | Explain SoL objectives to participating farmers         |
|                      | Research stations     | 11   | Provide feedback from farmers                           |
|                      | Seed production       | 11   | Invite farmers and MAF extensionists to participate     |
| Mathematics          | OFDTs                 | 13   | Calculate yield advantages compared to local varieties  |
|                      | Research stations     | 14   | Calculate yield components                              |
|                      | Seed production       | 14   | Count silo volumes and storage capacities               |
|                      | SOSEK                 | 7  | Prepare data for proper analysis                        |
| Computer skills      | OFDTs                 | 17   | Uses powerpoint for presentations                       |
|                      | Research stations     | 17   | Export data from Excel and GenStat to Word              |
|                      | Seed production       | 17   | Backup data regularly                                   |
|                      | SOSEK                 | 9  | Edit and use photos                                     |
| Monthly reporting    | OFDTs                 | 8  | Make general observation about the district situation   |
|                      | Research stations     | 7  | Use clear report layout with format, graph, photos etc. |
|                      | Seed production       | 4  | Always update seed production areas table               |
|                      | SOSEK                 | 2  | Finalise and lodge reports in time to supervisors       |
| Work attitude        | OFDTs                 | 16   | Organize trainings and communicate to colleagues        |
|                      | Research stations     | 16   | Make lists and plans                                    |
|                      | Seed production       | 15   | Show professional attitude by arriving on time          |
|                      | SOSEK                 | 13   | Ask for help whenever need some                         |

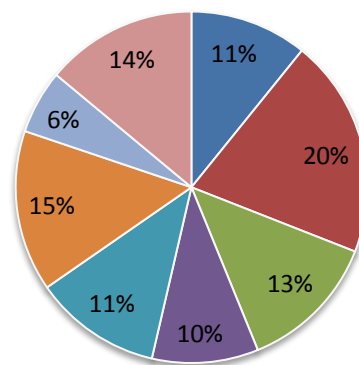
Total number of competencies per position: OFDTs: 120; research stations: 123; Seed prod.:98; SOSEK: 49.

For each competency, SoL Staff were asked to score their skills or knowledge on a scale of 1 to 4 corresponding to 0-100% in terms of capacity building objectives (had not yet the opportunity to learn, progressing, can do the activity alone, able to teach others). The individual self-evaluations were then reviewed by SoL advisors and entered into the database. The percentage of persons in each category is presented in Figure 4. The dominance of the OFDTs reflects the programme current emphasis on on-farm testing (half the staff). Eight competencies were measured in 2010 as shown in Figure 5.





- OFDTs (120 competencies, 20 pers.)
- Research stations (123 comp., 8 pers.)
- Seed production (98 comp., 9 pers.)
- SOSEK (49 competencies, 2 pers.)



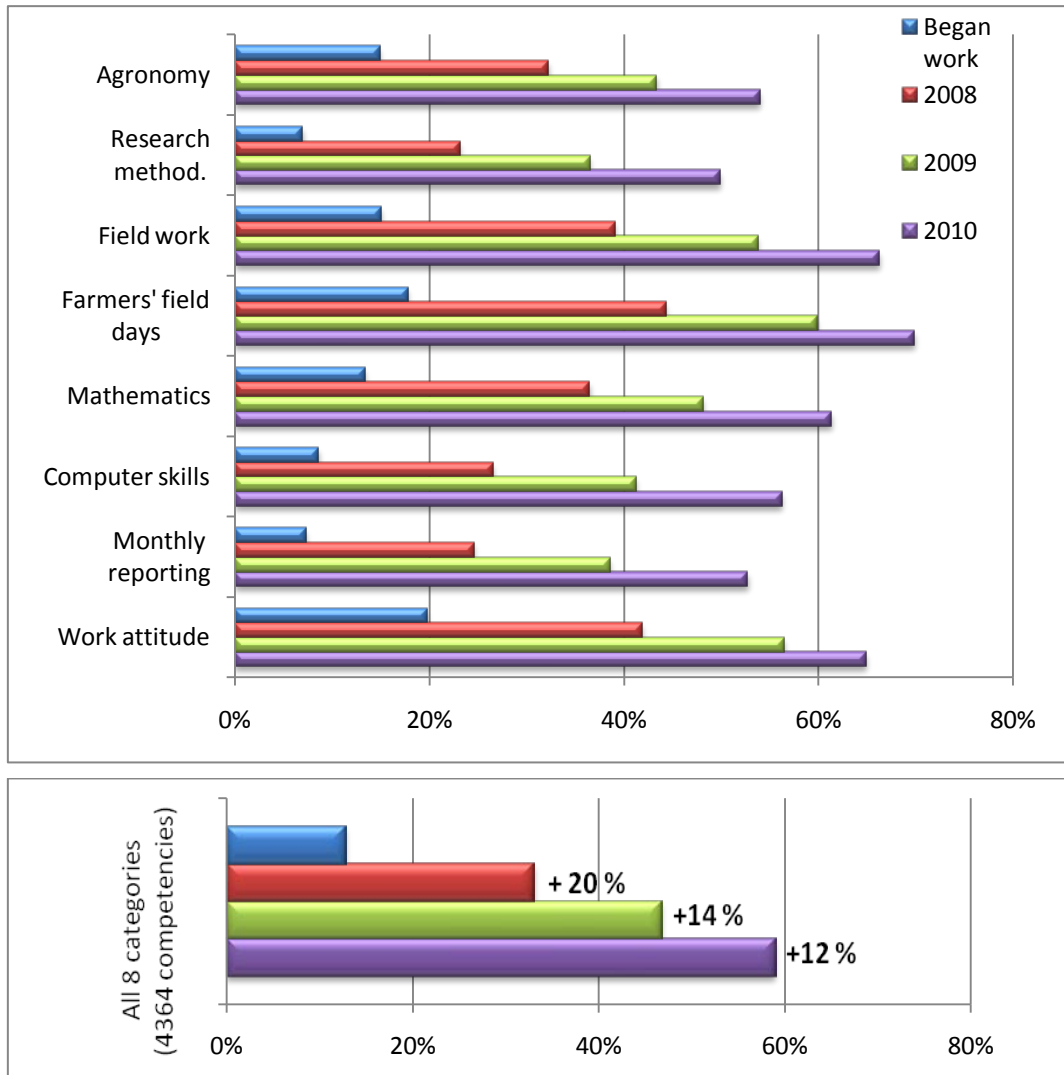
- Agronomy
- Research methodology
- Field work
- Farmers' field days
- Mathematics
- Computer skills
- Monthly reporting
- Work attitude

**Figure 4. % of persons in each category      Figure 5. % of 8 competencies evaluated**

Overall improvements made in the competencies of MAF personnel working on SoL are presented in Figure 6. 100% represents a level of skill which allows staff to perform well and to teach others.

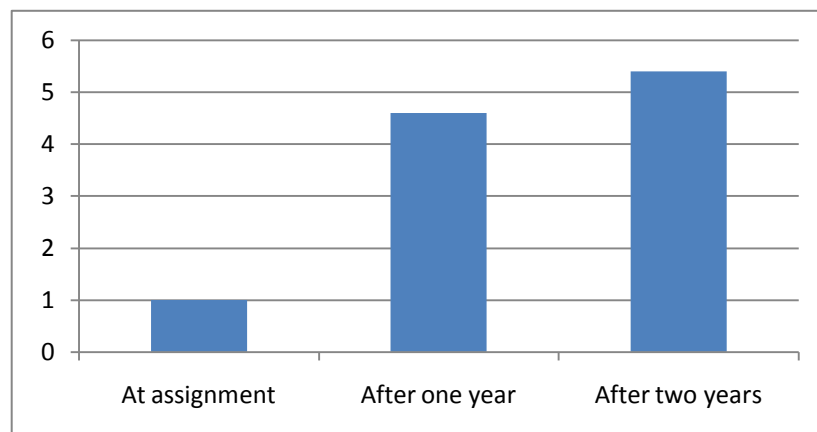
Most staff never had the opportunity to learn the skills involved in SoL activities before joining the programme. Therefore, they started with a 13% level overall in terms of the ability to master the relevant skills. Since then, there has been a steady average improvement of 15% every year. In 2010, the team reached almost 60% in terms of the capacity building objectives. This means that after three years, often less, most SoL staff were able to conduct a majority of tasks by themselves while some were already able to teach others.

The competencies which SoL staff learnt the fastest about are related to field work (trial implementation and data collection) and farmers' field days (farmers' preferences and feedback, result presentations), with a 50% improvement in three years. General agronomic knowledge, which requires long-term training, recorded a 40% improvement. The other competency categories averaged around 45%. The 'Research methodology' category (research objective, data analysis, results interpretation) was the most varied one. Positive results were registered for many skills which had never been practised before, such as trial design or statistic analysis. However, some of these advanced skills were particularly difficult to fully master.



**Figure 6 SoL staff competency assessment and progression (39 pers.)**

A specific evaluation of skills improvement was with the SOL/MAF Seed Production Officers. SPOs had little concept of seed production when they joined the seed production group. On a scale of 0-10 the average skill level was less than 1. At the beginning of May, 2009 (nearly one year later for some team members), the average level of competency had risen to 4.6. At the end of 2010 the level was assessed as being 5.4.



**Figure 7. SoL seed staff skills on seed multiplication (scale of 1-10)**

Specialist inputs from SoL helped the MAF develop a Farmer Participatory Research Manual, a policy for Agricultural Extension and a draft policy for national agricultural research. SoL also facilitated research planning meetings during which the MAF prioritized its research.

### 8.3 Community impacts

Distribution of seed multiplied under supervision of MAF/SoL personnel (formal seed) reached an increasing percentage of the East Timorese population during the year. Details of the amount distributed by crop and by sector are presented in Tables 2-6 of this report. Seed was distributed a) directly by MAF/SoL to farmers conducting OFDTs, b) through the MAF (and FAO sponsored) seed distribution system and c) by NGOs. An estimate of the number of farmers it reached is presented in Table 11.

**Table 11. Estimated number of farmers receiving SoL/MAF seed**

| <i>Est. number of HH received seed and cuttings*</i> | <b>2008/2009</b> | <b>2009/2010</b> | <b>2010/2011</b> | <b>Total</b>  |
|--|------------------|------------------|------------------|---------------|
| <b>Rice (Nakroma)</b>                                |                  |                  |                  |               |
| via MAF  | 979              | 4,635            | 4,700            | 10,314        |
| via NGO  | 293              | 457              | 79               | 829           |
| via MAF-SoL  | 382              | 176              | 248              | 806           |
| Total households                                     | 1,654            | 5,268            | 5,027            | 11,949        |
| <b>Maize (Sele)</b>                                  |                  |                  |                  |               |
| via MAF  | 220              | 645              | 2,407            | 3,272         |
| via NGO  | 8,077            | 13,263           | 2,129            | 23,469        |
| via MAF-SoL  | 516              | 366              | 290              | 1,172         |
| Total households                                     | 8,813            | 14,274           | 4,826            | 27,913        |
| <b>Peanuts (Utamua)</b>                              |                  |                  |                  |               |
| via MAF  | 0                | 0                | 637              | 637           |
| via NGO  | 321              | 710              | 135              | 1,166         |
| via MAF-SoL  | 168              | 341              | 99               | 608           |
| Total households                                     | 489              | 1,051            | 871              | 2,411         |
| <b>Sweet potato (Hohrae 1, 2 and 3)</b>              |                  |                  |                  |               |
| via MAF  | 1,280            | 90               | 35               | 1,405         |
| via NGO  | 147              | 344              | 0                | 491           |
| via MAF-SoL  | 978              | 434              | 451              | 1,864         |
| Total households                                     | 2,406            | 869              | 486              | 3,760         |
| <b>Cassava (Ai-Luka 2 and Ai-Luka 4)</b>             |                  |                  |                  |               |
| via MAF  | 0                | 10               | 9                | 19            |
| via NGO  | 20               | 41               | 270              | 331           |
| via MAF-SoL  | 3                | 546              | 121              | 670           |
| Total households                                     | 23               | 597              | 400              | 1,020         |
| <b>Total no. HH receiving seed +cuttings</b>         | <b>10,979</b>    | <b>21,190</b>    | <b>11,124</b>    | <b>43,293</b> |

\* Estimates based on distributing 10kg of seed to rice and maize farmers, 20kg to peanut farmers and 50 cuttings per household for cassava and sweet potatoes.

The data presented in Table 11 estimates the number of households receiving seed and planting material originating from the SoL/MAF program. However, it is difficult to estimate the number of *different* recipient households. The large number of households receiving maize in 2009/2010 was due to the NGO, World Vision distributing 200 g of Sele to individual farmers. Some of these farmers may have joined a similar distribution program the following year. It is also difficult to determine where the seed was distributed as the MAF program is widespread and not closely monitored. It is however, believed that SoL material may have reached all 13 districts of Timor Leste. Most of the recipient farmers would have been concentrated in the core seven districts. As mentioned in Table 8, more than 3,700 OFDTs were installed over the period from 2005 to 2011. By the end of 2009, OFDTs had been installed in 65% of the sucos (village) in the District of Aileu, 71% of the sucos in Baucau, 91% in Liquica and 69% in Manufahi. After another two years the penetration would be greater. It is not too optimistic to say that at the program had benefitted many more than 150,000 individuals over the life of the program.

### 8.3.1 Economic impacts

On-farm trial data indicate that the potential yield improvement of the MAF released varieties over traditional land races range from 24% to 159% based on two and four years of data and over 2900 harvested trials (Table 12).

**Table 12: Yield advantage of MAF Seeds of Life varieties over traditional varieties**

| Crop   | Released variety name | Yield advantage over local variety | Number of on-farm trials    |
|--------|-----------------------|------------------------------------|-----------------------------|
| Maize: | Sele                  | 47%                                | 1100 trials over five years |
| Peanut | Utamua                | 47%                                | 779 trials over five years  |
| Rice   | Nakroma               | 24%                                | 297 trials over five years  |
| Sweet  | Hohrae 1              | 66%                                | 198 trials over two years   |
| Potato | Hohrae 2              | 80%                                | 198 trials over two years   |
|        | Hohrae 3              | 159%                               | 383 trials over four years  |

SoL released varieties are highly acceptable to many farmers for reasons ranging from eating quality to cob size. An example of why farmers like Hohrae sweet potatoes is presented in Table 13.

**Table 13. Farmers opinions of new sweet potato varieties**

| Reason for liking this variety              | Hohrae 1 | Hohrae 2 | Hohrae 3 | Local |
|---|----------|----------|----------|-------|
| Big tubers                                  | 26.5     | 31.6     | 29.2     | 0     |
| Good to eat                                 | 21.1     | 18.4     | 17.7     | 22.4  |
| Fast growing                                | 12.2     | 10.9     | 12.2     | 0     |
| Total % respondents giving positive comment | 66       | 65.3     | 70.7     | 29.3  |

Preference for the newly release varieties is illustrated through the high adoption of the varieties by farmers performing OFDTs. Farmers often cultivated the test varieties after conducting an OFDT (Table 14) with approximately 70% of farmers continuing to grow Sele maize four years later. Farmers cultivating the new varieties tended to grow larger areas than the “test” plots of the OFDTs and often sold surplus at the market or on the roadside (Table 15).

**Table 14. Proportion of households replanting at least one test variety from one year to another after the initial 2005/06 on-farm trials**

| Crop<br>(number of households) | % households which kept replanting from:     |   |   |  | Means | St.dev. |
|--------------------------------|--|---|---|--|-------|---------|
|                                | Initial trial to 1 <sup>st</sup> year after* | 1 <sup>st</sup> to 2 <sup>nd</sup> year after | 2 <sup>nd</sup> to 3 <sup>rd</sup> year after | 3 <sup>rd</sup> to 4 <sup>th</sup> years after (anticipated) |       |         |
| Maize (42)                     | 83   | 66  | 70  | 69   | 72    | 8       |
| Sweet potato (37)              | 61   | 64  | 67  | 68   | 65    | 3       |
| Peanuts (40)                   | 60   | 50  | 40  | 77   | 57    | 16      |
| Rice (12)                      | 77   | 73  | 88  | 90   | 82    | 8       |
| Means                          | 70   | 63  | 66  | 76   | 69    | 6       |
| St.dev.                        | 12   | 10  | 20  | 10   | 6     |         |

**Table 15. Expanded cultivation of modern varieties after completing OFDTs**

| <i>Crop</i>  | Maize                                     | Sweet potato | Peanut | Rice  |
|--|---|--------------|--------|-------|
| <i>Number of households still re-planting in 2009/10</i> | 19  | 12           | 6      | 7     |
| <i>Areas (m<sup>2</sup>) planted per household</i>       | <i>in 2006/07 (on-farm trials*)</i><br>50 | 75           | 50     | 25    |
| <i>in 2009/10 at time of survey</i>                      | 4,200                                     | 230          | 315    | 7,215 |

\* Each variety was planted in 5x5m plots.

Some farmers now produce surplus product providing valuable cash income which previously did not exist. Farmers report selling their surplus and that it is of high value when sold in local markets. One farmer is quoted as saying . *“My experience with Hohrae sweet potato is a story that can be remembered by our children when I pass away”* indicating that having money in the household was a life changing experience. That particular farmer used the surplus to buy household goods. Others buy food with the proceeds, educate their children, use funds for clothes etc (Table 16).

**Table 16. Use of cash earned from selling Nakroma rice**

| <i>Farmer's name</i>     | <i>Village (Baucau)</i> | <i>Cash received (US\$)</i> | <i>Purchases for the household</i>  |
|--------------------------|-------------------------|-----------------------------|---|
| Fernando Kolimau         | Sarin                   | 35.0                        | One pig and one chicken   |
| Antonio Hornai           | Betano                  | 25.0                        | Paid children school fees and paid labour for planting, harvest and threshing |
| Ernesto da Costa Freitas | Buruma                  | -                           | Shared the yields with group member   |
| Regina Amaral            | Uma nai iku             | 305.2                       | Coconut grater machine  |
| Antonio Hornai           | Betano                  | 21.0                        | Children's school fees  |
| Domingos                 | Sarin                   | 17.5                        | Cheaper rice  |
| Augusto Da Silva         | Sarin                   | 23.8                        | Children's clothes  |
| Maria da Costa           | Sarin                   | 18.0                        | Other types of food   |

### 8.3.2 Social impacts

There is some indication that food security is improving in the farming community installing OFDTs. Farmers appear to have improving food sufficiency over the three years from 2007 to 2010 (Table 17) and ownership of mobile phones in these households is increasing rapidly (Table 18). These impacts will be measured further in 2011, although a very poor maize crop is expected because of high rainfall during the dry season. Initial studies of non-maize crops (sweet potatoes and rice) indicate that farmers use their increased yields to supplement household food sources directly and by selling the higher value product to purchase other (cheaper) food (Table 19). Funds generated from produce sales is also improving access to medical facilities.

**Table 17. Maize sufficiency in OFDT households over years.**

| <i>Year</i> | <i>Insufficient (%)</i> | <i>Sufficient (%)</i> | <i>Surplus (%)</i> | <i>No. respondents</i> |
|-------------|-------------------------|-----------------------|--------------------|------------------------|
| 2006/2007   | 37                      | 58                    | 5                  | 340                    |
| 2007/2008   | 38                      | 47                    | 15                 | 502                    |
| 2008/2009   | 29                      | 54                    | 17                 | 362                    |
| 2009/2010   | 16                      | 73                    | 11                 | 354                    |

**Table 18. OFDT household wealth indicators over years**

| Description                 | 2006/7 | 2007/8 | 2008/9 | 2009/10 |
|-----------------------------|--------|--------|--------|---------|
|                             | %      | %      | %      | %       |
| Car                         | 2      | 3      | 1      | 2       |
| Motorbike                   | 5      | 5      | 3      | 11      |
| Mobile Phone                | 3      | 10     | 6      | 43      |
| Diesel Generator            | 3      | 3      | 2      | 3       |
| Tin/board roof              | na     | 76     | 69     | 79      |
| Half block wall             | na     | 22     | 20     | 13      |
| Full block wall             | na     | 19     | 17     | 24      |
| Cement/floor tiles          | na     | 34     | 22     | 35      |
| Total number of respondents | 340    | 502    | 362    | 354     |

SOSEK researchers report on the significant role rituals play in crop production. Rituals are performed in response to the plant reaching the threshold of another stage. Some new crop varieties will impact on the timing of these rituals.

### 8.3.3 Environmental impacts

SoL activities do not impact significantly on the East Timorese environment. Potential negative impacts that require consideration include genetic diversification degeneration as introduced crop varieties become popular and the effects research station development has on land degradation. In order to address the first issue, germplasm is being collected of traditional crop varieties and they will be “banked” at CGIAR centres for access in the future. Farmers also plant a number of varieties of each crop. The new varieties are viewed as adding extra diversity to farmers fields, not diminishing it.

An Environmental Assessment Study of Darasula research station is drafted which provides guidelines limiting degeneration of the environs.

SOSEK work emphasises the importance of wild foods in farmer’s diets during the lean season. It is envisaged that higher productivity of introduced varieties will reduce the need to clear farm land, leading to diminished wild food reserves and opening the land up to erosion.

### 8.3.4 Gender

SOSEK research and reports indicate the individual roles that women and men have in agricultural production. Approximately 26% of the subsistence farms in Timor Leste are managed by female farmers. In all households, women play a significant role in most farm tasks, particularly planting, harvesting (especially for rice), and in seed selection. Hence, SoL has been proactive in targeting women in the testing of new varieties, as well as in the evaluation of their storage, processing and acceptability characteristics. Women are encouraged to attend field days and training courses, particularly on seed selection. It has been a goal of SoL RAs to increase the number of female farmers attending their farmer field days to access information about SoL/MAF varieties, their seed properties and qualities for food. Data collected from 74 OFDT Farmer Field Days held for maize, peanuts, sweet potato and rice during the 2009/10 wet season, indicates that 62% of attending farmers were women (from a total of 2387 farmers). Female trainees make up 24% of the total number across all courses. Women are also encouraged to work with SoL. In excess of 25% (10 of 39) of SoL professional staff are women.

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## 8.4 Communication and dissemination activities

### ***Publications***

- Manual for Farmer Participatory Research in Timor Leste, R Parkin, 2006 30p
- Lopes M, Ximenes M, M Bexley & A Soekartawy. Understanding Food Sovereignty towards Food Security in Timor-Lest, 16p, Conference presentation, Jakarta, 2008.
- SoL, 2006 Annual Research Report, 2006, Seeds of Life, January, 2007, 58p
- SoL, 2007 Annual Research Report, 2007, Seeds of Life, August, 2008, 136p
- SoL, 2008 Annual Research Report, 2008, Seeds of Life, August, 2009, 146p
- SoL, 2009 Annual Research Report, 2009, Seeds of Life, June, 2010, 200p
- SoL, 2010 Annual Research Report, 2010, Seeds of Life, April, 2011, 238p
- Lourenco Fontes Borges, Adalfredo do Rosario Ferreira, Deolindo Da Silva, Robert Williams, Rebecca Andersen, Alex Dalley, Brian Monaghan, Harry Nesbitt and William Erskine (2009). Improving food security through agricultural research and development in Timor-Leste: a country emerging from conflict. Springer. Published on-line October, 2009. <http://www.springerlink.com/content/050t8r7584553435/>
- Erskine, W., and Nesbitt H., (2009), How can agriculture research make a difference in countries emerging from conflict? *Expl Agric.* (2009), volume 45, pp. 313–321
- Variety Fact Sheets, Sweet Potato (Tetun), printed four times
- Variety Fact Sheet, Peanuts (Tetun), printed four times
- Variety Fact Sheet, Rice (Tetun), printed four times
- Variety Fact Sheet, Maize (Tetun), printed four times
- Variety Fact Sheet, Cassava (Tetun), printed four times
- Fact sheet, Supergrainbag storage system. printed three times
- 2009 Calendar (2000 copies)
- Seeds of Life Brief, 2009 (2000 copies)
- Reaping the Benefits, 2009 (2000 copies)
- SOL Newsletter, November – December 2009
- SoL, Variety Fact Sheet: Ai-luka 2 cassava (Tetun), September 2009
- SoL, Variety Fact Sheet: Ai-luka 4 cassava (Tetun), September 2009
- Report on Climate Change for Ministry of Agriculture, April 2010
- Seeds of Life. 2010. Predicted changes to rainfall and temperature in Timor Leste due to climate change and its impact on agriculture. Dili, East Timor: Ministry of Agriculture and Fisheries, Comoro Nicolao, 8pp.
- Seeds of Life. 2010a. *Climate Change and its effects on Agriculture In Timor Leste*. Dili, East Timor: Ministry of Agriculture and Fisheries, Comoro Nicolao, 4pp.
- Seeds of Life. 2010b. Predicted changes to rainfall and temperature in Timor Leste due to climate change and its impact on agriculture. Dili, East Timor: Ministry of Agriculture and Fisheries, Comoro Nicolao, 8pp.
- Nicholas Molyneux, Gil Rangel da Cruz, Robert L. Williams, Rebecca Andersen and Neil C. Turner, 2011. Climate change and population growth in Timor Leste: Implications for food security. 30pp Submitted to *Ambio* in November, 2010 for publication

Seeds of Life, 2011a Agricultural Interventions for Increasing Food Security in Timor Leste; Specific Reference to Contemporary Predictions of Climate Change and Population Pressure. A policy and planning paper for the Ministry of Agriculture. 40pp (in progress)

Lacoste, M, Borges F., L., and Erskine, W. Varietal diffusion patterns following on-farm trials of maize, sweet potato, peanut and rice in East Timor, 16pp. In progress

Shepherd C.J, McWilliam A. (2011) Ethnography, Agency, and Materiality: Anthropological perspectives on rice development in East Timor. (in press)

Williams, R., Borges F., L., Andersen, R., Lacoste M., Johansen C. and Nesbitt., H. (2011) On-farm evaluation of introduced maize varieties and their yield determining factors in East Timor 22pp. In progress

## ***Major reports***

Seeds of Life Annual Plan, 2005-2006

Situation Report. Conditions and characteristics for food crop production in Timor Leste, 2005-2006. William, Andrew, Australian National University, (2006). 33p

Shires D and Balasubramanian V, (2006). Training Needs Analysis and Strategy Report, September 2006. Seeds of Life Report, 23 p

Seeds of Life Phase One Analysis of Trial Data. de Meyer, Julien EDG, Canberra, (2006) 21p

Training needs analysis and strategy. Balasubramanian, V. and David Shires, IRRI, Philippines, 2006. 23p

Guidelines for the conduct of Farmer Participatory Research in Timor Leste. R Parkin, March, 2006, 10p

Consultancy and training for SOL. David Bergvinson, CIMMYT, 2006 10 p

Seeds of Life Six Monthly Report, 01 September, 2005-28 February, 2006

Seeds of Life Annual Plan, 2006-2007

Seeds of Life Mid Term Review, David Swete Kelly, Bryan Gorddard, Philip Young, Helder da Costa. June, 2007. 53p

Using seed priming to improve the germination of peanut variety PT5, Nysha Munro, February, 2007. 21p

Buka Data Lo'os 2007, Baseline survey of SOL participating farmer households: 2006-2007

Glazebrook Diana, Lopes Modesto and Anita Ximenes 2007. Cultivation practices for staple foods (maize, rice, sweet potato, cassava, peanuts, pigeon pea): a study of Seeds of Life farmers in Aileu, Baucau, Liquica and Manufahi districts. 102p

Glazebrook Diana, Lopes Modesto, De Jesus Marcelino and Anita Ximenes 2007, Stocks and flows of household food supplies during the wet and dry seasons and food shortage period: a longitudinal case study among subsistence farmers in Aileu, Baucau, Liquica and Manufahi districts, Timor Leste.

MAFF SoL (2007a) Monitoring and Evaluation Design Ministry of Agriculture Forestry and Fisheries, Dili Timor-Leste

MAFF SoL (2007b) Cultivation Practices for Staple Foods: A study of Seeds of Life Farmers in Four Districts Ministry of Agriculture Forestry and Fisheries, Dili Timor-Leste

Manual for in-field soil assessment. Luis Sena Esteves, January 2007. 22p

Manual for Farmer Participatory Research in Timor Leste 30p



McWilliam, Andrew and Marcelino de Jesus, 2007. Buka Data Los: Baseline survey of participating farmer households in the Seeds of Life Program, 2006-2007.

Monitoring and Evaluation Review Geoff Moyle, January, 2007. 41p

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Seeds of Life Annual Plan, 2008-2009 with Progress report to 31 May, 2008

Six monthly progress report (to end of February, 2008)

Technical Advisory Group, Annual Review, August, 2008, 35p

SOSEK Constraints for Utamua: A Study of Participating Seeds of Life Farmers in Aileu, Baucau, Liquisa and Manufahi, June – September 2009, September 2009

Seeds of Life Annual Plan, 2009-2010

B Gorddard. MAF extension policy framework, January, 2009

Seeds of Life Phase III, Program Design Document, 30 April 2010

ODE Strategic Review on Rural Development, Feedback on visit to the Seeds of Life Program, East Timor, March 15th – 18th 2010

SOSEK Seed Mapping (Planting Survey) Report, A Survey of Participating Seeds of Life Farmers in the Districts of Aileu, Ainaro, Maubisse, Baucau, Liquisa and Manufahi, January 2010

Richard Brettell. Draft Policy Framework for Agricultural Research in Timor Leste, May, 2010 15p

### ***East Timor media coverage***

Agriboletin Number 5 Volume III. Ministry of Agriculture, Forestry and Fisheries, 2007.10p

TVTL 18 September, 07. SoL/MAF international research results meeting.

TVTL 16-21 October, 07. SoL Activities in MAF

Timor Sun newspaper. 01 March, 2008. Article highlighting the contribution Seeds of Life is making to the increase of food production in East Timor.

East Timor attempts to answer the Food Crisis. TV station Al Jazeera 27 April, 2008.

TVTL program showing Minister of Agriculture harvesting SoL maize. 22 April, 2008.

Newspapers Suara Timor Lorosae (STL) and Diario Tempo story and photographs on activities and impacts of SoL released varieties. 11 July, 2008.

SOL Press Release Introducing Ai-Luka 2 & 4, September 2009

Jornal Agrikultura, Introducing Ai-Luka 2 and Ai-Luka 4 (September, 2009)

RDTL "Seed of Life" halo mudanca bo toos nain sira" in Sura Timor-Leste (2/08/2010).

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RDTL Discovering Wheat and Barley in Maubisse, September 2009

Jornal Agrikultura, February, 2010. Description of the ABC crew to Timor-Leste to film SoL activities.

Jornal Agrikultura, May, 2010. Article on the Seeds of Life Phase 3 program plan outline,

Jornal Agrikultura, August, 2010. Seeds of Life/ACIAR in Timor-Leste – improving agricultural production through release of good quality varieties

Jornal Agrikultura, September, 2010 . Reporting SoL research results meeting in the District of Baucau

### ***Australian media coverage***

Beanstalk. Seeds of Life program in East Timor Successfully reviewed". SoL feature on the front of CLIMAs Beanstalk newsletter Volume 8 no.2. November, 2007

Beanstalk. Centre for Legumes in Mediterranean Agriculture Newsletter, Vol 10 no 2. December, 2009

East Timor farmers learn methods the Aussie way. Warwick Daily News, April, 2009

ABC Landline. Seeds of Life was featured on the Australian Broadcasting Commission program, Landline two times in 2010 – the first on 14 March, 2010 and two weeks later on 28 March, 2010.

Website <http://www.seedsoflifetimor.org/>

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## 9 Conclusions and recommendations

The Technical Advisory Group recommended a number of changes to the design and implementation of SOL 2. Many of these were accepted by the donors and management of the program. During the final years, the TAG suggested that SOL 2 should be extended. The final visit of this two man team was held in August, 2009 and the occasion doubled as an opportunity to prepare a Concept Note for a possible third Phase (SOL 3). It was recommended that a third phase be designed but the program have more emphasis placed on seed production and extension of the new material. A SoL Program Steering Committee meeting followed in September, 2009 endorsing the concept note and the desire of all involved parties for a new Phase. AusAID and ACIAR supported the concept note in separate meetings. In November, 2009 a preliminary design for SOL 3 was completed and a design team visited East Timor in April to finalize the design. This design was modified and finalized in September, 2010. SOL 3 is scheduled to commence on 01 February, 2011.