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## Review of Performance

The following report presents progress the Seeds of Life (SoL) program has made against its Goal and Objectives to the end of January, 2009.

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### Progress towards Seeds of Life (SoL) Goal

The goal to which SoL contributes is:

*Improved food security in Timor Leste*

The program aims to achieve this through the:

*Use of improved crop varieties and associated technologies which result in increased food production*

Food insecurity during the “lean” months arises from seasonal production cycles, low yields of staple crops, unfavourable seasons, natural disasters, lack of cash income to purchase food, post harvest losses (for example by weevils, mould and rodents) and lack of access due to the poor rural infrastructure.

World Food Program data indicates that food insecurity in Timor Leste affects more than half of the population - meaning well over 100,000 families have insufficient carbohydrate at key times of the year. The majority of these families are subsistence farmers. These ‘macro’ statistics provide a contextual backdrop that justifies ongoing food security interventions as a central element of the Timor Leste/Australia bilateral partnership.

Analysis by SoL (2007) of subsistence farmers participating in the program confirms that general food security is poor. This assessment is based on a range of measures. No family surveyed had sufficient rice or maize to last a full twelve months, and seven out of ten families went without maize for four or more months. All were forced to practice food rationing from one to six months of the year, many were forced to gather wild food regularly, and every year the worst affected families were inevitably forced to consume the planting seed they had set aside for the next season. Hence SoL’s aim is to address this problem of food security by introducing higher yielding varieties of staple subsistence crops. With increasing experience as the program progresses, more and more care is being taken to ensure that the varieties introduced are of high quality, that they taste good, and that they fit well with low input subsistence farming practices.

Since the second phase of SoL began in September 2005, it has been directly responsible for food productivity improvements in 26% (114) of Timor Leste’s 442 sucos (villages) spread across seven districts. This represents 47% of the sucos in the seven districts SoL installed trials in since September, 2005. For the first two years, SoL worked in the four districts of Aileu, Manufahi, Baucau and Liquica. In these four districts, OFDTs have been installed in 73% of the sucos. The coverage is 91% in the district of Liquica (Table 1).

**Table 1. Presence of SoL in Sucos 2005-2008 (does not include 2008-2009 season)**

District	Suco number <sup>1</sup>	No. Sucos with SoL OFDTs	% sucos with OFDTs
Aileu	31	20	65
Ainaro	21	6	29
Baucau	59	42	71
Bobonaro	50	2	4
Covalima	30	na	na
Dili	31	na	na
Ermera	52	na	na
Lautem	34	na	na

Liquica	23	21	91
Manatutu	29	3	10
Manufahi	29	20	69
Oecusse	18	na	na
Viqueque	35	na	na
TOTAL	442	114	26
<sup>1</sup> Suco numbers from Journal de Republica 14 July, 2004			

These seven districts represent all agro-climatic zones within the country, and thus form a strategic base from which to test, multiply and distribute new varieties. Approximately 20 on farm trials per RA for each crop were commenced each year between 2005 and 2007. This was found to be too large a number to supervise effectively and was reduced to 15 per RA per specie in 2008/2009. An estimated 700 trials have been installed during the current wet season (2008-2009) totalling over 3000 trials over the initial four year period of SoL2. Some households implemented two or more trials. The number of individual households implementing OFDT are presented in Table 2 and the number of farmers receiving seed and sweet potato cuttings during 2008-2009 are presented in Table 3.

**Table 2. Interventions of SoL (January, 2009)**

Intervention	Number implemented by SoL	Households partnering through SoL	Households partnering through NGOs (estimates)	Households partnering through MAF Extension
Research Trials	132	na	na	na
2005/06	23			
2006/07	29			
2007/08	30			
2008/09	Est 50			
On-farm Demonstration Trials	3083	2510	8000	1171
2005/06	684	513	na	na
2006/07	824	676	na	na
2007/08	875	721	300	na
2008/09	Est 700	Est 600	Est >7,700	Est 1171

*na Not applicable. Est Estimated number for 2008/2009*

In addition to the OFDT sites, NGOs distributed seed to farmers in a number of districts. The number of farmers distributed with planting material in the 2008-2009 wet season are presented in Table 3. World Vision was particularly active in the distribution of Sele maize issuing approximately 200g of seed to 7500 farmers. Other NGOs requesting seed and sweet potato cuttings during 2008-2009 included USC Canada, Care, Oxfam, GTZ, CCF and USAID. SoL and MAF distributed seed directly to ex and current OFDT farmers, seed producers and MAF collaborators.

**Table 3. Number of farmers receiving seed, 2008-2009 season (to end of Jan, 09)**

Farmer numbers receiving SoL seed through:				
	MAF	NGOs	SoL	TOTAL
Rice	651		240	891 <sup>1</sup>
Maize	520	7740	726	8986 <sup>2</sup>
Sweet potato	26	47	128	201 <sup>3</sup>
Peanuts	0	47	699	746 <sup>1</sup>
TOTAL	1171	7740	966	9877

<sup>1</sup> Based on 5kg per farmer and 20 kg per seed producer

<sup>2</sup> Based on 5kg per farmer except for World Vision who distributed 200g of Sele to 7500 farmers

<sup>3</sup> Based on 100 cuttings being distributed to each farmer

Selections for the OFDTs are made from a number of entries evaluated in replicated trials conducted on research stations and on farmers' fields. Approximately 20 entries that have proven to perform well under similar environments in other countries are compared with locally grown varieties. Comparisons include crop type, yield, performance consistency across sites and acceptability by consumers.

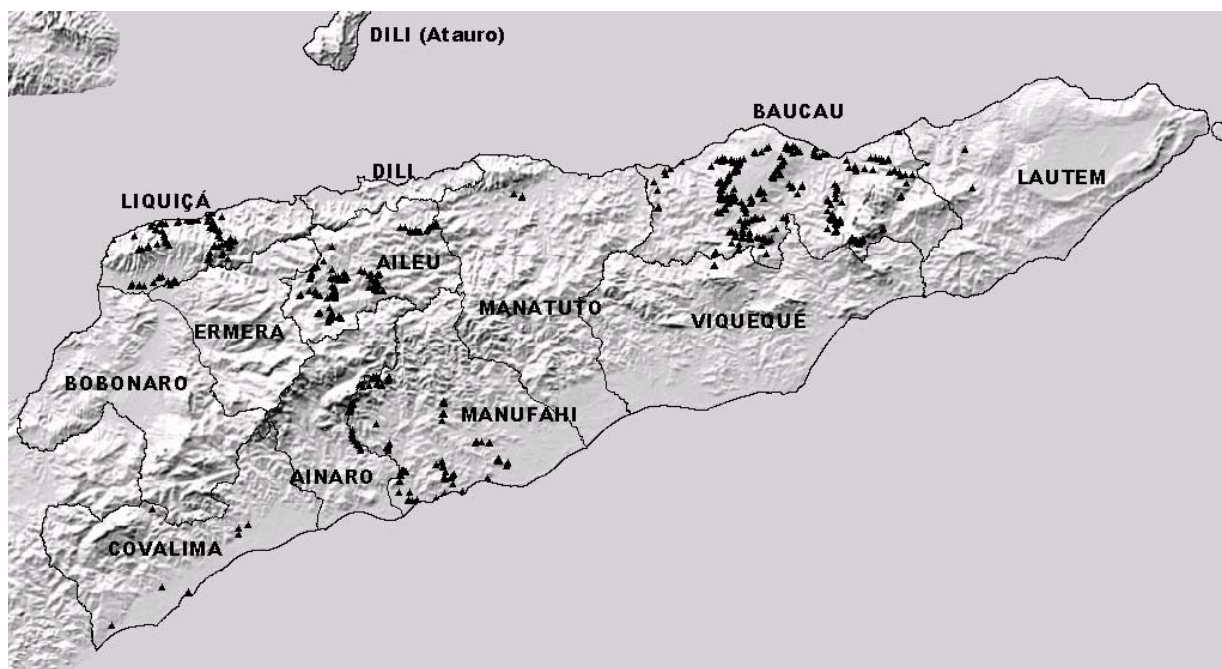
Agronomic trials conducted to increase productivity by improving weed control, soil improvement (generally through the cultivation of legumes), and yield also compose an increasing number of replicated trials being conducted by SoL. At least 50 varietal and agronomic trials will be conducted by the program during the 2008/2009 wet season. Those either planted or in the planning stage at the end of January, 2009 are presented in Table 4. These are concentrated in the core districts of Baucau, Alieu, Manufahi, Liquica, Bobonaro, Viqueque and Ainairo (See Figure 1).

**Table 4. List of trials being implemented or planned for 2008/09 (January, 2009)**

Trial	Quintal Portugal station. Alieu	Fatumaka research site. Baucau	Loes Research Station. Liquica	Corluli Research Station Bobonaro	Betano Research Station Manufahi	On-Farm sites
Maize variety trial	1	1	1	1	1	
Cassava variety trial	1	1	1	1	1	
Sweet potato variety trial	1	1	1	1	1	
Sweet potato observ. trial	1	1	1	1	1	
Peanut variety trial	1	1	1	1	1	
Mungbean variety trial					1	
Rice variety trials					1 +1 dist.	
Climbing bean	1					4
European potatoes						
Weevil tolerance	1	1	1	1	1	
Germplasm collection				1	3	1
Agronomy trials on stations	1	1		1	1	
Agronomy trials in districts						9

Figure 1 presents the geographic distribution of MAF Seeds of Life research and on-farm demonstration sites for the 2007-2008 cropping year.

**Figure 1: Geographic distribution of SoL OFDT sites (as of August 2008)**



MAF through Seeds of Life has released seven new food crop varieties:

- Maize – Suwan 5 and Sele
- Rice – Nakroma
- Peanut – Utamua
- Sweet Potato – Hohrae 1, Hohrae 2 and Hohrae 3

These varieties underwent stringent research, including farmer testing, prior to their release by the government's Varietal Release Committee (originally established by SoL and the Division of Research, MAF). This active process continues, with SoL having imported and tested 210 prospective varieties since the program began.

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### **Significant Achievement:**

***Seeds of Life within MAF has released seven new varieties of four staple food crops. Since September 2005, it has directly conducted 3083 demonstration trials with over 2,500 individual families benefiting an estimated 15,000 individuals.***

After reviewing the results of trials conducted during 2007-2008 and a summary of results over the entire program period, SoL will recommend two cassava varieties for release by the MAF in 2009. All relevant data for the release of these two varieties (Ca15 and Ca26) was being collated by a SoL R/EA, the SoL Seed Production Advisor plus Division of Research, MAF personnel at the end of January, 2009. It may also be possible to release another rice variety at the end of 2009 and new sweet potato varieties in 2010.

To date, SoL has directly partnered with more than 2,500 farming families to conduct on-farm demonstration trials. During the 2008-2009 wet season the program distributed 6.8 ton of rice, 14.7 ton of maize, 3.9 t of peanuts and approximately 27,000 sweet potato cuttings to nearly 10,000 farmers (Table 3). Since its inception SoL(2) released seed and planting material has reached all thirteen districts of Timor Leste (including Dili and Oecussi). Approximately 7 ha of commercial Nakroma rice, 4ha of commercial Sele maize

and 6ha of commercial Utamua peanut seed was in production at the end of January, 2009 plus smaller areas of foundation seed and sweet potato cuttings.

MAF has scaled up its seed production activities by appointing six district seed officers (one per district). The aim is to produce sufficient elite seed to ensure that 5% of the national subsistence seed requirement is annually upgraded with appropriate seed.

At this point in the life of the program there is growing evidence of both the potential and actual impacts that these varieties are having on individual families and communities. Findings indicate encouraging preliminary results in terms of acceptability, production, economic return and adaptive practices. Each of these themes will now be discussed in turn.

Acceptability: Adoption rates are high - more than seven out of every ten farmers participating in SoL (n=1340 out of 1,910) actively replanted significant areas (averaging 500m<sup>2</sup>) of most SoL varieties given the first opportunity<sup>1</sup>. After just three years this level of primary adoption already matches what was expected in year five. Furthermore this outcome has been consistent for at least one variety of every target crop (Sele maize, Utamua peanut, Nakroma rice and Hohrae 3 sweet potato). This in itself is an excellent result, but it also probably underestimates farmers' intentions as many of the remaining 20% would have replanted if the material had been available<sup>2</sup>. Farmers also appreciate the taste of most of the new varieties. In particular Hohrae sweet potato and Nakroma rice are very highly regarded (Table 5).

**Table 5. Farmers opinions of new varieties (from SoL 2008)**

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

Sele maize is also very popular with farmers used to eating yellow maize. In addition Utamua (peanut) is prized for its seed size (Table 6).

**Table 6. Frequency of variety characteristics described by farmers when asked why they would plant that variety again (From SoL 2008).**

Reason for planting	Local	Utamua
Adapted to the climate	5	0
Can make money	1	0
Only three month duration	2	0
New variety	0	4
New variety not yet common	4	0
The variety belongs to the land	44	0
Good price	0	1
Three nuts per pod	5	0
Easy to harvest / pull	1	5
Tastes good	12	5

<sup>1</sup> There is also some limited data available for farmers who replanted for a second season. This shows that five in ten maize farmers replanted an average of 1,000m<sup>2</sup> (15% of their available land). However, the interpretation of farmers' intent is very difficult as the sample sizes are small, the material available for replanting are limited, and farmers tend not to remember the names of released varieties making tracking difficult. Ongoing monitoring will attempt to clarify any confusion.

<sup>2</sup> In many of these cases grain seed was either eaten or lost in storage. In the case of sweet potato, vegetative material failed to survive through the dry season to allow replanting.

Many pods	5	2
Large pods	1	0
Fast yielding	13	0
Good germination rate	1	0
Shell easy to open	0	1
Shell soft to open	1	0
Many nuts	10	3
Large nuts	0	91
All branches yield pods	0	1
Wide leaves	0	1
Total Respondents	105	114

Productivity and return: In terms of increased farm productivity every new variety consistently out-yielded traditional varieties (in fact all three sweet potato varieties more than doubled the yield). Table 7 spells out these advantages.

**Table 7: Yield advantage of MAF Seeds of Life varieties over traditional varieties**

Crop	Variety	Yield advantage over local variety
Maize (Sourced from CIMMYT* and Thailand)	SELE , tested as LYDMR (late maturing downy mildew resistant)	40%
	Suwan 5 (SW5)	55%
Peanuts (Sourced from ICRISAT*)	Utamua (tested as PT5)	23%
Rice (Sourced from IRRI*)	Nakroma (tested as PSBRC54)	17%
Sweet Potato (Sourced from CIP*)	Hohrae 1 (Tested as CIP 1)	128%
	Hohrae 2 (Tested as CIP 6)	138%
	Hohrae 3 (tested as CIP 7)	138%

At this very early stage of adoption hundreds of families who - for example - replanted Sele maize (average area about 1000m<sup>2</sup>) have about 60kg more maize than they had previously. Rough estimates currently indicate that an average Timorese family should ideally store approximately 1,000kg of grain each year to ensure they do not experience shortages<sup>3</sup>. Yet although in the light of the total need, the initial increases seem small (6%), when this is compared to the marginal increase in stored food needed to ensure constant supply, it equates to three to four week's grain supply for an average family. Thus the impact of SoL is already important. Furthermore, it is this, at least in part, that is driving the high demand and adoption of new varieties. Preliminary impact data also shows that eleven out of the twenty farmers surveyed sold on average one third of their SoL crop production. This extra income not only meets non-food essential household expenses, but can also be used to buy rice, protein and other produce that can vary and thereby enrich the family diet (SoL, 2007).

Adaptive Practices: An increase in yield however is not the only reason farmers adopt new varieties, and SoL is working with farmers to help them understand and advantageously integrate the new varieties into their production systems. A good example is sweet potato. In Timor Leste sweet potatoes are normally planted in December/January, and harvested in August, seven to eight months later. The new Hohrae varieties on the other hand, although planted at the same time as the local varieties, can be harvested after only four to five months. This allows farmers to plant a second grain crop, significantly increasing total annual yields. Another good example is the two new yellow maize varieties, these having low (Suwan 5) or average (Sele) weevil resistance. As such these varieties are not ideal for long-term storage. However farmers creatively integrate these better-yielding

<sup>3</sup> Although poor on-farm storage facilities (both in terms of volume as well as capacity to keep grain dry and weevil free) generally result in farmer's storing only a fraction of this amount.

varieties with the more weevil-resistant traditional maize varieties. As such the total yield is increased and farmers either eat the new varieties first, keeping the more resistant types in storage until later in the season, or sell the new varieties to buy rice (for example). In addition grain storage trials have suggested simple mechanisms for proper drying and air sealed storage, which completely eliminates the often heavy post-harvest losses. Air-tight storage can be achieved by using plastic bags for smaller volumes (e.g. seed for planting), and 200L drums for larger volumes (e.g. food for consumption). SoL is now working with NGOs to increase the adoption of such improved grain storage mechanisms.

Despite its notable successes, adaptation problems have inevitably occurred, and SoL is currently working closely with both farmers and its social research team to understand the concerns that underlie these difficulties. For instance SoL is working actively to improve between-season survival of sweet potato cuttings, to reduce weevil damage to grains, and to understand dormancy in Utamua. Lessons are also being fed back into the selection process for new varieties – this is driving the search for powdery mildew resistant varieties of white maize, for example.

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## Significant Achievement:

***Over 2,500 participating households have grown at least one of the seven new varieties of the four crops (maize, rice, peanut or sweet potato), experiencing yield increases ranging from 17 to 138%. In addition seven out of ten farmers actively replanted at the first opportunity. Many of the others simply did not have planting material.***

## Progress towards Institutional Ownership

SoL is strongly owned by MAF, and the Ministry is demonstrating this commitment by taking on more and more of the financial responsibility for the program. Prior to the beginning of the 2008-2009 wet season the number of local staff members was increased to cater for seed production and an expansion into extra districts. Currently 28 of the 39 professional staff are fully funded by the Government. MAF has also committed to supporting the management, some infrastructure and operational costs of the Betano Research Station in Manufahi, Corluli and Loes Research stations (in Bobonaro and Liquica districts respectively) plus Darsula in Baucau. MAF is expected to absorb all of MAF Seeds of Life's local staff before the end of the program – which can only be to its advantage.

Furthermore, SoL has contributed strongly to building the skills of MAF staff. In addition to on-the-job mentoring from expatriate staff, these local staff have also attended a wide range of formal training courses - a total of 1,234 “people training days” were conducted by MAF Seeds of Life between September 2007 and August 2008. This equates to 4.5 people attending training for every working day during this period. At the commencement of the program staff were assessed to have 16% of the skill set required to conduct all the activities needed to evaluate new varieties. This skill set included: planning research activities, working with farmers, presenting results, seed testing, and computer and statistical skills. Currently, after working in the program for some time, the same staff have 50% competency in the skills required for the complete process of variety evaluation. As might be expected, the rate of progress is uneven, but several of the Timorese staff are already operating satisfactorily as young professional researchers, are developing pleasing levels of rigour in their approach to research, and are undergoing language

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<sup>4</sup> Most of this was English language training (757 days) to assist team members with computer work, reading scientific papers and attending training courses abroad. Of the other 477 days, 23% was on agronomy, 18% seed production and 59% on statistics.

training that will open opportunities for short term and postgraduate study (subject to MAF approvals).

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## Significant Achievement:

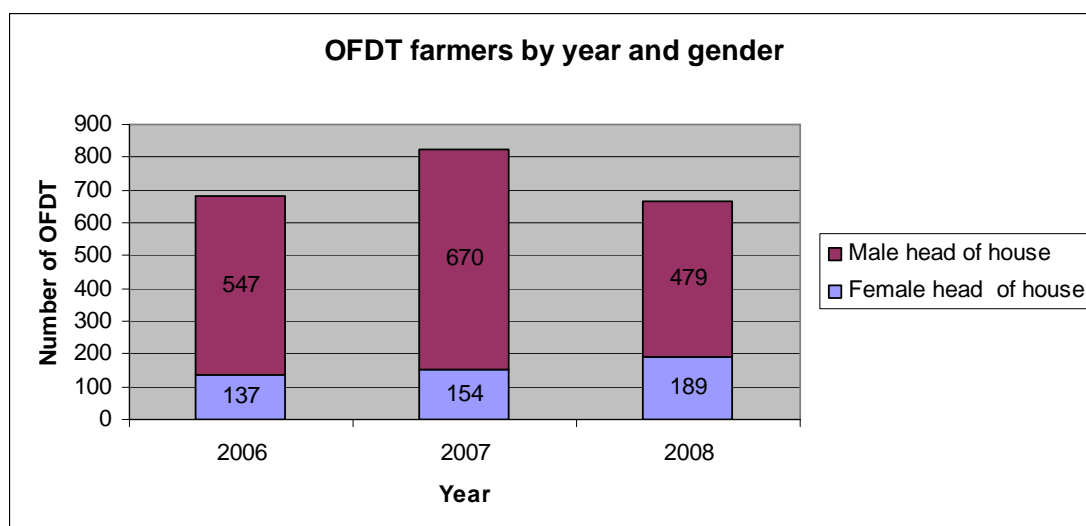
***MAF has assumed financial responsibility for the majority of local staff as well as the operational costs for key infrastructure. In addition MAF staff have shown significant capacity improvements over the life of the program.***

## Effectiveness of SoL Gender Initiatives

Approximately 20% of the subsistence farms in Timor Leste are managed by female farmers. Paddy rice is the only exception to this where only 4% of farms are managed by females. In all households, women play a significant role in most farm tasks, including food storage, processing and preparation.

Hence from its outset, 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. In excess of 25% (10 of 39) of SoL professional staff are women and OFDTs are run with both male and female farmers – female farmers making up 22% (Figure 2).

**Figure 2. OFDT farmers by year and gender**



In addition, the Program has refined its Social Science and Economics (SOSEK) instruments for 2007-08 in an effort to better capture the gender impacts of the new varieties. The SOSEK Consumption Panel study specifically targets female household members as respondents in 14 households, with 199 interviews to date.

The key points regarding the adoption of new technologies on gender equity are being addressed by the SoL team, especially through the SOSEK surveys and feedback. Studies on this aspect will be expanded when the SoL social scientist advisor commences work through ANU. This is expected to occur during March, 2009. Included in the studies will be to get a more quantitative assessment of household labour demands in terms of gender and age, across all areas of food production, including foraging, preparation and storage. The implications this data has for crop production and income generation are also being investigated.

SOSEK commodity research has shown that, except for a few gender-restricted activities in certain locations, both women and men are involved in nearly all activities associated with cultivating the main food crops. Any division of labour along gender lines has usually been due to the amount of physical input needed and has rarely been driven by local

customs. In addition, women-only groups have traditionally been active in certain areas, particularly in seed preparation, and post-harvest processing and storage. As SoL concludes this indicates that not only should women be targeted equally with men in all extension activities, but that they should be the predominant target audience for issues related to seed preparation, post-harvest processing and crop storage.

SOSEK commodity research has also given a good indication of just how hard women have to work during the annual 'hungry' season. Not only do women take on the responsibility for foraging and preparing wild foods at this time, but usually the 'hungry season' also coincides with the peak labour demand for weeding subsistence crops. One of the beneficial impacts of increased food production from the new varieties may well be a reduced reliance on wild food collection, and thus a significant reduction in women's labour at this very busy time.

Cropping Calendars prepared by the SOSEK team are a significant source of information regarding indigenous farming practices. The SOSEK team is currently formulating a calendar stipulating the farm tasks and disaggregating them according to gender. This will allow the identification of important issues such as the timing, gender and labour constraints on critical production activities.

### **Effectiveness of SoL Environment Initiatives**

The environmental impact of the activities of SoL was discussed briefly in the MTR. This noted that the program was well aware of two issues of particular concern. The first was the need to make a written assessment of any adverse environmental impacts arising from clearing and development of the Darasula Research Station. At the end of January, 2009 a draft of an Environmental Site Assessment (ESA) had been completed. It is recognized that the main risks will be the removal of fuel wood, contamination of the groundwater and a reduction of the number of sandalwood trees on the property. Measurement of the existing seasonal groundwater flows etc is still incomplete but an ongoing management and monitoring plan should be sufficient to address the water system risk. Governmental personnel are working on completing an inventory of sandalwood in Timor and small trees on the station.

The second issue relates to the need to maintain traditional crop biodiversity, ensuring it is sustained in cases where traditional varieties are replaced by higher-yielding alternatives. SoL does not anticipate a major problem with this because Timorese farmers are known to maintain a number of varieties of each main food crop and are not dependent on a single variety. The Program expects that this practice will continue so that the new SoL varieties will be added to, rather than replace, the traditional varietal mix. However, the situation does need close monitoring and a Germplasm collection officer has been identified and is undergoing training to fulfil germplasm conservation responsibilities. SoL assists maintain a small collection of 70 cassava accessions now grown at UNTL, Hera and in Maliana. More recent collections include peanut and local cassava varieties which are being grown out at Betano research station for identification and elimination of duplicates. The germplasm collection officer will commence training at the University of Western Australia, the Western Australian Department of Agriculture and Food, Murdoch University and Kings Park Board in Western Australia during February, 2009. Appropriate CGIAR centres will be approached for the storage of one duplicate of the collection with the working populations being maintained in a bank to be centralized in Dili and/or Betano.

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### **References**

SoL (2007). Seeds of Life Annual Research Report (2007)

SoL (2008). Seeds of Life Annual Research Report (2008)