TIMOR-LESTE SEEDS OF LIFE (PHASE 3)

Technical Advisory Group Report

Prepared for

AusAID and ACIAR

Australian Embassy
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Executive summary

Seeds of Life Phase 3 (SOL3) is a program within the Timor-Leste Ministry of Agriculture and Fisheries (MAF), funded jointly by the Governments of Timor-Leste and Australia. Australian funding is through the Australian Agency for International Development (AusAID) and the Australian Centre for International Agricultural Research (ACIAR). SOL3 is managed by a Program Implementation Team formed from senior MAF staff and SOL staff engaged through ACIAR's commissioned organisation, the University of Western Australia. MAF, AusAID and ACIAR engaged a 2-person Technical Advisory Group (TAG) to provide an independent assessment of the progress of SOL3. Its brief was to review the contributions of stakeholders, and determine the extent to which planned outcomes are being achieved, and to suggest modifications to the implementation strategy, program design, management and monitoring. Between October 3 and 12, 2011 the TAG visited program activities and farmers' fields in six districts of Timor Leste, and consulted with MAF and AusAID in Dili.

***Foundation provided by SOL1 and SOL2**:* The TAG found that SOL3 is based on solid and well-reported achievements of SOL1 and 2. In SOL2 innovative data analysis techniques were effectively employed to identify and release nine varieties of the key staples maize (2), rice (1), sweet potato (3), cassava (2) and peanuts (1). Experiment stations at Betano and Loes were rehabilitated and development began on the station at Darasula. Formal seed production procedures were established and seed was distributed through MAF and NGOs. On-farm demonstration trials (OFDTs) were conducted at around 700 locations per year providing farmers with a choice of variety grown under their own management. Underpinning these accomplishments were significant improvements in competence of MAF staff obtained through extensive training efforts, and a modest level of research on improved crop management practices. Institutional developments such as a draft Seed Law and a Variety Release Committee provided a formal framework for dissemination of improved varieties. The outputs from SOL2 enabled a stronger emphasis on institutional sustainability, informal seed systems, and transition to MAF during SOL3.

Transition from SOL2: This has been accomplished effectively and with few glitches, given the expansion in program size. The rehabilitation of Darasula research stations continues, and two new locations (irrigated rice at Bobonaro; temperate site at Maubisse) are tentatively identified for development. The research pipeline of new varieties is relatively full. Formal seed production through contract growers and processing at four well-equipped seed centres is proceeding as planned. The program is on target in 2011 to plant 50 ha of Sele maize, 25 ha of Utamua peanuts, 40 ha of Nakroma rice, 3,800m^2 of Hohrae sweet potato and 2.9 ha of Ai Luka cassava for seed or cutting production. A new initiative in SOL3, the establishment of informal seed multiplication and distribution of SOL varieties, is well underway with 40 Community Seed Production Groups (CSPGs) established in each of the seven focus districts. These complement 446 existing seed groups managed by NGOs. Seed planning and management systems have been established, encompassing inventory management, M&E systems, a coherent gender strategy, managing effects of rainfall variability, and capacity development of MAF staff. MAF have increased their assigned staff to 67 of the 95 staff engaged in SOL3, and the new SOL3 Program Implementation Team meets regularly. Decentralisation of SOL3 advisors has occurred with three living in the Bobinaro, Baucau and Same regions.

The emphasis in SOL3 components should now shift from "what to do" to "how it gets done" by MAF during this transition phase, especially in established components 1 (varietal screening and OFDTs) and 2 (Formal seed production). This change should start after this current cropping season if MAF is to effectively assume full responsibility by 2016. The TAG

notes that there will be competing demands on the time of MAF staff and leadership to provide performance indicators, and meet demands from other complementary donor projects such as the EC-funded RDP IV. Work load will need to be carefully managed within SOL, MAF and among donors. Accordingly the TAG recommends that SOL3 management work with MAF to address the following areas:

- ***Simplify and focus performance management:*** **R1:** the TAG **recommends** that the SOL3 performance management system is simplified and focused by using a results framework for quantitative measurement of end-of-program outcomes and simple variance from plan measures for activities and outputs. This should be complemented by use of developmental evaluation which includes Social Sciences (SOSEK) case studies to answer evaluation questions that test the theory of change hypothesis for SOL3.
- ***Transition from "what" to "how" C1, C2 and C4 activities are planned and implemented to prepare for handover to MAF in 2016:*** **R2**: The TAG **recommends** that after the 2011/12 cropping season the teams implementing components 1, 2 and 4 work with MAF to change the way activities are planned and implemented via a formal transition plan implemented from mid-2012.
- ***Lead harmonisation of major donor initiatives in MAF:*** **R3**: The TAG **recommends** that AusAID establish and lead a like-minded donor group or rural development thematic group to harmonise donor approaches in Timor-Leste, reduce transaction costs for MAF and ensure consistency in strategic direction, extension messages and institutional development. This should help ensure: coordinated engagement with extension staff at national and district levels; consistent approaches to per diems and staff compensation; harmonised supervision and evaluation missions; and complementary activities between SOL3, RDP IV and the IFAD post-harvest handling project. This group would ensure a consistent approach to participation in quarterly donor harmonisation meetings led by MAF.

There are a number of ways in which implementation of the research program may be refined. These include the provision of evidence needed by MAF to attract a badly-needed increase in recurrent budget, and the systematic use of end-of-program outcomes as annual plans are developed. Institutionalising the Program Implementation Team will help manage the transition to MAF. The passage of the Seed Law and the development of regulations will require monitoring and possible intervention so that regulations do not constrain informal seed production but still provide mechanisms that ensure seed quality. Capacity enhancement, a keystone of SOL2, must continue, but should develop hands-on skills needed by research and seed production teams when MAF fully assumes the functions of SOL3.

The following research areas merit special attention:

- ***Research reporting:*** This is currently through a well-prepared but voluminous Program Annual Research Report. This should be reviewed for fitness of purpose with a view to increasing its suitability for specific target audiences. **R4:** The TAG **recommends** that the format of the Annual Research Report be reduced in length and published in sections that target distinct audiences; and that the Program publishes and widely distributes an attractively illustrated annual summary of all its activities as "Research Highlights".
- ***Understand soil fertility:*** Crop yields in Timor-Leste are among the lowest in Asia, and reflect the very limited use of inputs. Fertiliser use is rare, and weed growth limits the area a farmer can plant. Average national yields of maize (1.4 tons/ha) are about 30% of the potential of the released varieties Sele and Suwan 5. About half this "gap" (or about 1.5 t/ha) is due to inadequate soil fertility, resulting in low returns to labour and land on farm and in seed production. SOL research has shown that velvet beans substantially increase subsequent maize yield through nitrogen fixation. However, anecdotal evidence suggests that micronutrients may limit response to applications of NPK in several areas. There is an urgent need to understand soil fertility in Timor-Leste. Hence **R5:** the TAG

recommends that SOL3 a) engage a soil fertility consultant to develop an appropriate research strategy to identify soil constraints; b) conduct soil analyses on all experiment stations to determine the status of major and minor nutrients; c) nutrient response curves be established for maize and rice, with a view to increasing the efficiency of seed production; and d) maize-velvet bean technology be evaluated in farmers' fields.

- ***Improve agronomic practices:*** Farmers' management of newly released SOL3 varieties remains unchanged, so many advantages of these varieties are not being exploited. **R6:** The TAG **recommends that OFDTs be used as a vehicle for improving farmers' agronomic practices** by adding an extra plot to the standard OFDT in which MAF/SOL3's "best bet" production package (suitably adapted for yield potential and risk), is demonstrated. Well-watered lowland OFDTs could include purchased inputs, while in the higher risk hill environments the technology could demonstrate benefits of maize/velvet bean combinations.
- ***Prioritise among research choices:*** The means of priority setting in crop research is unclear. Technological interventions and farming systems should be ranked by impact on food security, poverty and risk, and used to inform the variety improvement program. **R7:** The TAG **recommends that priority setting in crop research** be linked to potential impact through agro-ecological zones defined in terms of crop adaptation, cropping system, farmer risk and potential impact on food security; that the focus be retained on SOL3's five target crops, with a reduced effort on minor crops; and that genetic options that improve the nutritional value of these five crops be more fully explored.
- ***Raise farmers' awareness of new varieties:*** **R8:** the TAG **recommends** that a strategy be developed and implemented in conjunction with MAF's extension services for raising farmer awareness of the benefits of SOL3 varieties via regular rural radio programs and targeted SMS texting.

In summary the TAG finds SOL3 ready to deliver on its objectives in a timely and effective manner, and compliments its entire staff for their dedication and enthusiasm. Transition of program research and seed production functions to MAF is challenging, but manageable if it gets underway in 2012. If limitations of crop nutrition can be effectively addressed, SOL3 is poised to have a remarkable impact on food security and human nutrition in Timor-Leste.

Acronyms

ACIAR	Australian Centre for International Agricultural Research
AEZ	Agro-ecological zone
ALGIS	Agricultural Land Geographic Information System
APAARI	Asia-Pacific Association of Agricultural Research Institutes
AusAID	Australian Agency of International Development
CGIAR	Consultative Group on International Agriculture
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CIP	Centro Internacional de Papa
CSPG	Community Seed Production Group
DNDCA	National Directorate for Agricultural Community Development (MAF)
DNR&SS	National Directorate for Research and Special Services (MAF)
DNE	Direcção Nacional de Estatistica
FAOSTAT	Food and Agriculture Organisation Statistics (on line)
FSMG	Farmer Seed Marketing Group
GoTL	Government of Timor-Leste
GMO	Genetically modified organism
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture
IRRI	International Rice Research Institute
M&E	Monitoring and Evaluation
MAF	Ministry of Agriculture and Fisheries
MEF	Monitoring and Evaluation Framework
NGOs	Non-Governmental Organisations
NPK	Nitrogen, phosphorous and potassium
OECD-DAC	Organisation for Economic Cooperation and Development – Development Assistance Committee
OFDT	On-Farm Demonstration Trial
OXFAM	Oxford Committee for Famine Relief
PDD	Project Design Document
PDO	Program Development Objectives
PGRFA	Plant Genetic Resources for Food and Agriculture, Treaty on
QPM	Quality protein maize
RDP IV	Rural Development Program Four
RDTL	Radio Timor-Leste
REML	Restricted Maximum Likelihood
SEO	*Suco* Extension Officer
SMS	Short message service
SMTA	Standard Materials Transfer Agreement
SOL1, 2, 3	Seeds of Life (Phases 1, 2, 3)
SOSEK	Social Sciences and Economics
SPC	Seed Production Centre
SWOT	Strengths Weaknesses Opportunities Threats
TAG	Technical Advisory Group
UWA	University of Western Australia
VRC	Varietal Release Committee

1 Background

Seeds of Life Phase 3 (SOL3) is a program within the Timor-Leste 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) and the Australian Centre for International Agricultural Research (ACIAR). The program is managed by a Program Implementation Team formed from senior MAF staff and SOL staff engaged through ACIAR and its commissioned organisation is the University of Western Australia (UWA).

SOL3 evolved from early ACIAR work on variety selection that started in 2000 (SOL1) and was extended in a second phase with seed production and distribution that commenced in late 2005 and ended up working in seven of the thirteen districts in Timor-Leste (SOL2). SOL3 builds on the scientific results and technical capacity built in MAF during SOL1 and SOL2. The goal of SOL3 is "Improved food security through increased productivity of major food crops". The purpose of SOL3 is that "46,000 lowland rice farmers and 61,000 upland farmers have access to and are routinely using improved food crop varieties".

MAF, AusAID and ACIAR engaged a 2-person Technical Advisory Group (TAG) to review relevant documentation and consult with stakeholders to report on program activities undertaken since SOL 3 commenced in February 2011, with a particular focus on:

- the transition from SOL 2, including the expansion of those elements common to SOL 2 and the implementation of new activities, particularly under Component 3 (Informal seed production and distribution);
- the extent to which MAF has supported the program (including necessary staff and other resources) and how MAF ownership and policy dialogue can be strengthened;
- progress in developing a transition strategy for decreasing operational and staffing costs funded by Australia and a corresponding increase in funding by MAF;
- the appropriateness of the overall monitoring and evaluation (M&E) system, including the Revised M&E Framework and other recommendations of the M&E Review (April 2011).

The TAG worked with Timor-Leste farmers, MAF staff and representatives from AusAID, ACIAR and UWA in Timor-Leste between October 3 and 12. During that time the TAG visited farmers and activities in the districts of Aileu, Ainaro, Baucau, Bobonaro, Liquiça and Manufahi, as well as consulting MAF and AusAID in Dili.

The TAG congratulates all involved with the early progress of SOL3 and thanks all participants in the organisation and implementation of the TAG mission.

2 Achievements of SOL 2

The SOL2 final report[1] is an accurate reflection of the activities implemented and outputs delivered by SOL2. It provides a clear description of the foundation available for implementation of SOL3. The evidence is particularly strong for scientific activities and changes in individual competencies resulting from SOL2 capacity development activities. Quantitative monitoring data collected at activity and output level is comprehensive and well presented. There is less evidence about institutional changes (*e.g*. changes in MAF organisational capacity) and higher-level outcomes (*e.g*. changes in Timor-Leste food security status and the extent to which SOL2 contributed to those). Given the scale and focus of SOL2, this is not a surprise – the design was strongly focused on evaluation of new germplasm, on farm demonstrations and trials, seed production and distribution as well as capacity development throughout the formal seed system. The outputs from SOL2 provide a sound foundation for SOL3 and enable a stronger emphasis on developmental outcomes such as institutional sustainability; informal seed systems; and a transition to independent implementation of scientific and formal production and distribution elements of the seed system by MAF.

The 2009 and 2010 Annual Research Reports[2] were selected for review by the TAG. In summary the Annual Research Reports provide an excellent institutional memory, though the current format may not be suitable for the expanded activities underway in SOL3. They are a good practice record of scientific activities and outputs, which provide an important foundation for SOL3. The project is to be congratulated on the quality of reporting, but especially on the across-year analyses of crop performance data using modern analysis methodologies (*e.g*. REML; biplot analysis) to identify stable varieties. Reports include all SOL2 activities in the seven districts in which the program operates. The expanded sections describing socioeconomic activities, and surveys of farmer' circumstances and adoption behaviour are welcome additions. There are duplications from year to year (*e.g*. 2009; 2010) that make these reports large. There are also some gaps – for example, while the description of the above ground environment of trials is comprehensive, the reports are noticeably silent on the soils environment other than soil pH. Low experimental yield levels resulted in a number of trials on and off research stations that have high coefficients of variation. This is partly due to variation in rainfall, but it also reflects the low level of fertility under which crops are grown in Timor-Leste. Another general limitation is the large variation in plant stand that leads to inflated error variances in non-tillering crops like maize, suggesting that further research on successful crop establishment would improve the quality of yield data.

The Annual Research Reports reviewed do not attempt to account for the very low on-station yields reported for crops such as maize and rice. The low yields likely result from two major causes: poor and variable plant stand; and low soil fertility (low N especially, but perhaps P and K) with possible deficiencies of micronutrients, especially boron, copper and zinc). Yields of maize on station average around 2 t/ha, when at least 4-5 t/ha should be possible in this climate with varieties such as Sele. The reasons for the yield "gap" of 2-3 t/ha on station require explanation. It is extremely unusual to find experiment stations like those in Timor-Leste on which no fertiliser is applied. Put simply, the amount of maize seed produced on station could be double what is currently being produced if crop nutrition was adequate. As a minimum this requires: either an analysis of the soil environment annually on station; or reference to a thorough soil analysis carried out every 2-3 years by specific blocks on the station; or documented yield responses to applied nutrients. Soil pH is well described by the project, but soil fertility status appears to be ignored.

[1] ACIAR (2011) Final report for Seeds of Life 2. Australian Centre for International Agricultural Research, Canberra, Australia.
[2] SOL2 (2011) Annual Research Report 2010. Seeds of Life Project Phase 2, Dili, Timor-Leste.

3 Progress of SOL3

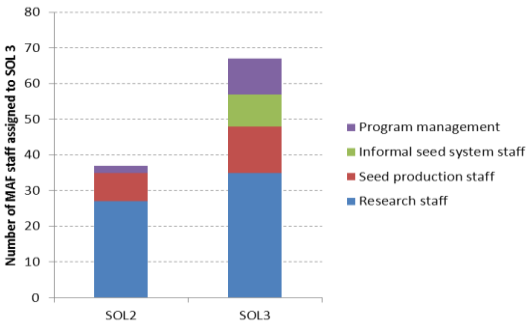
3.1 Contribution of Ministry of Agriculture and Fisheries

MAF have provided staff for SOL3 as designed

Evidence from meetings with MAF leaders in Dili and MAF staff in 6 districts and 5 research sites consistently demonstrated strong ownership of, and commitment to, SOL3. This is most importantly demonstrated by the early commitment of additional MAF staff to SOL3 as set out in the program design document (see Chart 1). Anecdotal evidence from the field suggests that MAF took care to allocate quality staff to SOL3 at national and district levels.

[Source: Project Design Document Appendix 1, p24 and MAF confirmation]

Chart 1 – MAF has increased its commitment of staff to SOL



Management relationships are established

MAF leaders in Dili worked with their Australian partners to initiate new relationships, maintain existing relationships and develop new management arrangements to support effective implementation of SOL3. The Director General, National Directors and District Directors are actively engaged in the recently formed Program Implementation Team – an innovation of the new Team Leader and MAF Director General that is a practical addition to institutional arrangements set out in the design.

There are opportunities for more SOSEK activities to inform SOL3

There is an opportunity for the Social Science and Economics unit (SOSEK) to more actively contribute to research activities and report outputs in a form that is useable for planning and reflection by MAF and SOL3. There are also opportunities for the SOL3 Team Leader to work with the MAF Director General to understand how SOL3 activities can contribute to MAF delivery of results identified in the agriculture sector elements of the Timor-Leste Strategic Development Plan.

The national research station network is consolidating

There is steady progress in rehabilitating and equipping MAF experiment stations, and in establishing new stations on land that MAF owns or controls. The Betano Experiment Station in Manufahi District is fully rehabilitated and operational. Experiment stations at Loes (Liquiça) and Darasula (Baucau) are under development, with Loes much further advanced than Darasula. Loes and Betano have access to irrigation. The smaller MAF site in Quinto Portugal (Aileu) has no irrigation but can be used for replicated yield trials. A proposed upland site for temperate crops is identified at Urulefa (Ainaro) at 1,320m elevation, and an irrigated rice location at Maliana (Bobonaro) is under negotiation. When the rehabilitation of these six stations is complete there will be a total of 10 permanent professional researchers and managers involved in their day-to-day operation. There is a question of how many such stations are needed because of the high cost of their establishment, operation and maintenance. However, the decision on the size and sophistication of each station should be linked to the size and potential of the agro-ecological zone it represents and the potential for impact, as well as the usual considerations of uniformity of the soil, availability of irrigation, and ownership by MAF.

Evaluation of improved food crop varieties

There is on-going progress in Component 1. Germplasm has been supplied to SOL in earlier phases from CGIAR centres (maize: CIMMYT or IITA; rice: IRRI; peanut: ICRISAT; cassava: CIAT or IITA; sweet potato: CIP; beans: CIAT). The delivery of germplasm best suited to the needs of Timor-Leste from such sources depends on how well the needs of the program can be described, since there is little previous history of international trials of varieties conducted in Timor-Leste. The supply also depends on the responsiveness of the CGIAR centres. Initial evaluation is on-station, though farmers will normally attend a field day at harvest and indicate their own preferences. A total of 311 varieties or lines from 12 distinct crops were screened on station in observation trials (single replicate) and replicated yield trials in 2010/11, though 212 of these lines were targeting a temperate upland environment (> 1300m elevation). Trials of leading performers are repeated over several years on station and from these subsets of 2-3 are chosen to be demonstrated in unreplicated on-farm demonstration trials (OFDTs) where new varieties are managed by the farmer and gown alongside a plot of his/her own variety. In 2010/11 more than 300 OFDTs of the five target crops were established by SOL and extension staff in the seven target districts, and in 2011/12 this number will increase to its previous level of around 700. Information on varietal performance and farmer circumstances and practices is collected from each site. Where possible a field day is conducted at harvest and farmer preference is recorded. Seed or cuttings are often saved from OFDTs and used by the farmer the subsequent year, or given to neighbours. For all crops except maize the varieties will yield similar results in the following season, but for maize which cross pollinates, there could be a significant loss of performance the following season caused by crossing with pollen from the farmer's variety. Where a few ears are taken from the centre of the 5m x 5m plot, outcrossing is minimised and quality maintained to some degree. Instruction on saving seed from OFDTs should be given to the farmer during the crop season. Adoption of a variety from an OFDT is important evidence of the suitability and the appeal of that variety, and has been used well by SOL staff to assess adoption and dis-adoption rates (dis-adoption usually occurs because seed is lost in around 25% of cases). In summary, station and OFDT performance data show around a 40% superiority in yield for improved varieties over farmer varieties at very low yield levels. This yield advantage of improved over local seed will only increase as crop nutrition improves and yields rise. At present there are 16 SOL3 staff (24% of total) involved in the OFDTs.

Data from the on-station trials and from the OFDTs are used as the basis for formal release of varieties. It is not clear to the TAG if there is a written protocol indicating the relative value of the evidence of varietal performance from station versus OFDTs, but it is important in the development of Seed Law regulations that both sources of evidence be considered in the decision to release varieties. However, a Variety Release Committee has been established and a system of classifying seed into nucleus (breeder) seed, foundation seed and certified seed has been established. Inspections of contract grower seed fields are conducted by MAF officials, as an important step in seed certification. Certified seed is simply an assurance to farmers of quality – of varietal purity and of per cent germination, but it is an essential component of a viable seed industry that farmers can trust and are willing to pay for.

The formal seed production network is scaling up in 2011/2012

Seed production is being undertaken at the Betano and Loes stations, and at Triloca, 10km north of Darasula in the Baucau district on irrigated land where winter seed production can be undertaken. Seed production is also taking place in Viqueque, Aileu and Bobonaro districts. Quality of breeder and foundation maize, rice and groundnut seed is generally better when seed is generated in the dry season under irrigation. Certified seed production is undertaken by a network of 78 seed growers who are contracted to deliver given seed quantities of the three grain crops at specified quality during the wet season. Seed so generated is processed at Triloca, Betano and Corluli (Bobonaro), Loes, Aileu and Ratano (Viqueue) seed warehouses,

and one season of seed production has been processed from the 2010/11 season with support from SOL3. Seed handling capacity at each of those locations has been improved since the inception of SOL3. Thrashing, drying and cleaning capacity had already been installed at several sites under SOL2, along with a series of 1.5 ton capacity sealed corrugated iron silos for longer term storage. The upgrading of capacity and equipment has continued under SOL3, and the installed seed handling capacity is now approaching the SOL3 target of 175 tons of seed annually. In addition around 15 locations for generating sweet potato or cassava cuttings throughout the year under irrigation have been identified. In the 2010/11 season 32 tons of seed of the maize variety Sele, 17 tons of peanut variety Utamua, 50 tons of rice variety Nakroma, 20,000 cassava cuttings and 64,000 sweet potato cuttings were distributed. During that same season seed production totalled 69 tons with reduced maize seed production because of higher than normal rainfall. Plans for 2011/12 are to distribute 1.4 tons of maize, rice and peanut and 82,000 cuttings of sweet potato and groundnut to Community Seed Producer Groups (CSPGs), with similar quantities going to support community seed group sponsored by six NGOs. A total of 15 tons of maize and rice seed and 95,000 sweet potato cutting are planned for distribution through MAF in the 12 districts. To ensure that this complex process succeeds while maintaining quality standards, five additional staff were engaged under SOL3 to bring the total staff under Component 2 to 13.

Seed produced from the formal sector is high quality and valuable seed. As the informal seed sector expands, there will be an increasing need to see this MAF-generated seed play more of a role as foundation seed rather than filling a need for commercial certified seed. This will allow MAF/SOL3 to focus on its role of identifying new superior varieties validated on station and through on-farm demonstrations (also an outlet for seed to farmers as well) and on supplies of high quality seed to community seed groups and emerging private sector entrepreneurs.

Underlying the success of Components 1 and 2 is a great deal of staff training in field skills, data taking and data management. The TAG congratulates the project on the significant investment in training (over 2,300 person days in 2010) that often involves a sizable commitment of advisor time. Trained staff will continue to be the most important asset of both MAF and SOL3.

Informal seed production is getting started

This component is new to SOL3, is ambitious, and forms an important part of an effective national seed program. Using reasonable assumptions on the rate of resowing of farmer seed (three years in four), MAF seed production in 2010/11 for maize met only 6% of the national demand, 22% for rice, 19% for peanuts and less than 1% for sweet potato and cassava. The seed demand also reflects the frequency with which planting materials are lost under typical farmer conditions where hunger, weather, weevils and animals can result in loss of seed. The strategy adopted of establishing CSPGs within communities provides seed more cheaply than via MAF, it empowers local communities, and greatly increases access to improved seeds. Seed quality is self-declared by the group, who follow quality control steps of their own to minimise outcrossing (*e.g.* saving seed only from the middle of ears, and ears saved from middle of the seed field) and to test germination prior to planting. The activity is supported initially by either a SOL3-trained *Suco* Extension Officer (SEO) from MAF or by NGO staff who visit several times, but later the groups will manage their own quality assurance. SOL3 is working closely with the National Directorate of Agricultural Community Development (DNDCA), MAF, through one advisor and two Coordinators, who then link with one Informal Seed Coordinator who has been appointed in each of the seven SOL3 districts.

Forty CPSGs have been established in each of the seven districts for the 2011 planting season. Groups are present in 31 of subdistricts and in 70 of the sucos. These 280 CSPGs have 3,815 members. Many are mixed gender, and a few are women only, for an overall membership

that is 27% female. Groups normally focus on a single crop – 97 are for maize, 69 for rice, 53 for peanuts, 40 for sweet potato and 21 for cassava. At this stage SOL3 is 28% of the way towards its goal of 1000 CSPGs, and is well on track to achieve this. There is an additional set of 440 CSPGs linked to NGOs (in descending order of numbers: CARE, Mercy Corps, World Neighbours, World Vision, Hivos and Oxfam) which also work with SOL released varieties. Of the total 726 groups, 50% work on maize seed, 24% on peanuts, and 14% each on rice, cassava and sweet potato – with some groups working on two or more crops. Estimates of seed production from these informal sources are 64 tons of maize, 8 tons of peanuts, 62 tons rice, 100,000 cuttings of cassava and 1.2 million sweet potato cuttings – or, respectively, 11%, 6%, 26% , <1% and <1% of national demand for these five crops. Together the current formal and informal seed supplies are projected to meet 17% of the annual seed demand for maize, 48% for rice, 12% for peanuts but still less than 1% of the demand for the vegetatively propagated crops.

What contributes to the success of these groups? Experience from other countries such as Nepal, and from the NGO CARE in Timor-Leste, suggests these factors:

- good leadership and cohesive group membership with regular meetings;
- single goal and collective purpose, and a record of group decision making;
- activity must generate some economic benefit to members, and financial records must be transparent;
- maintenance of purity and seed quality;
- initial mentoring by extension officers; and
- for long term sustainability, access to new and improved varieties.

The next step in 2012 will be to form Farmer Seed Marketing Groups (FSMGs) of 10-20 CSPGs to collectively market seed that is surplus to group needs. CARE has considerable experience in this area that SOL3 staff will draw upon. From the FSMGs focal seed merchants will hopefully be established that could provide the nucleus of a private seed industry in Timor-Leste. In 2012 seed fairs are also planned for at-risk areas where there has been little adoption to date.

The development of the informal seed sector is an exciting and mission-critical activity. Progress to date, lessons learned by leading NGOs, and the leadership shown by experienced SOL3 staff all suggest that this will be a success. It is important however to see this as a formal-informal seed partnership rather than a competition. The informal seed sector needs carefully evaluated and validated varieties and quality-assured foundation seed to provide the base input to the CSPGs. The CSPGs in turn depend on the formal sector for a flow of new varieties, and SOL3 should already be addressing the question of successor varieties to its most popular releases. The informal sector also needs the formal sector to add authority to its self-declared quality standard, and in the future will need to have a class of seed that carries MAF sign-off of quality through a label such as "truthfully labelled" seed. This will help to safeguard against CSPGs creating mixtures of seed, or of merely bagging and selling commercial grain from the market as seed. "Fake" seed is a major issue in emerging seed markets, and as the true value of good seed is recognised through a price premium, the economic incentive to cheat on quality will correspondingly rise. Finally, the formal seed sector needs the informal sector to ensure adoption and impact – in short a win-win relationship for both. Again, the success of this component will hinge on effective training of staff and farmers, and consistent attention to detail and to quality assurance.

Network of Suco Extension Officers and District staff

Within the seven districts that SOL is operating, regional advisors from SOL3 have been placed at Baucau (Martin Browne, Baucau district), Maliana (Joe Freach, Bobonaro district) and in Same (Luis Aguilar, Manufahi district). Each of these has as his effective counterpart the District Director for MAF. The TAG was impressed by the quality of these advisors, their

obvious ease in Tetun and with their counterparts, and their overall enthusiasm. They manage SOL3 staff in their regions and advise on experiment station operations and management and on regional formal and informal seed production. Training of MAF extension staff at the *suco* level and in research is also a major component of their work, and a critically important component of their success in preparing MAF staff for leadership of tasks undertaken by SOL3 in 2015. The TAG endorses the move towards decentralisation of SOL3 activities, provided good communications (internet; mobile phone) can be assured, and living conditions (health, security and education) remain at acceptable levels.

3.2 Contribution of Australian partners

AusAID, ACIAR and UWA have worked together to ensure retention of key SOL2 staff and recruitment of new staff for SOL3 at district and national levels. The quality of the SOL3 staff and their MAF colleagues provides a sound foundation for effective implementation of the program and builds on the strengths and experiences of SOL2. MAF expressed satisfaction with the recruited team members and appreciates the quality of relationships being established. The recently mobilised Team Leader has already established working relationships with MAF leadership cadres in Dili and Districts as well as with the SOL3 team. The Program Coordinator made a significant contribution, as acting Team Leader, to ensuring continuity and maintaining momentum between SOL2 and SOL3 while a team leader was recruited. The current Team Leader has the skills, experience and development understanding to effectively work with MAF to build on the SOL2 foundation to deliver the end-of-program outcomes set out in the program design document (PDD). AusAID has provided practical support for the transition of SOL from a program delivering quality scientific outcomes to one providing sustainable developmental and institutional outcomes.

3.3 Transition from SOL2

Despite delays in appointing the Team Leader, the transition from SOL2 has been effective. Plans for scaled up research and formal seed production under components 1 and 2 were prepared effectively and are now being implemented as the 2011/12 cropping season commences. Field evidence demonstrated that design and implementation of field trials and formal seed distribution are working well and have the capacity to be brought to scale as outlined in the PDD. There are some risks and opportunities relating to this, but overall these components appear to be well on track, with experienced staff retained and new MAF colleagues already welcomed and operating effectively in the team for 2011/12 cropping season activities that were getting underway during the TAG mission.

SOL3 activities planned for the 2011/12 cropping season in components 1 and 2 are a scale-up of SOL2 activities. For example, in the 2010/11 season there were 84 replicated trials conducted and more than 3400 on-farm demonstrations and trials. In the 2011/12 season the SOL3 team plans to implement 79 replicated trials and more than 600 on-farm demonstrations and trials. In summary, what the team is doing in components 1 and 2 builds on the SOL2 foundation and is likely to deliver expected outputs at scale.

The challenge for the team implementing these components is not so much “what” they do but “how” they do it. This is where these two components need to be different in SOL3 – with much more emphasis on enabling MAF to gradually take over the leadership, execution and delivery of results from evaluation of improved food crop varieties (Component 1) and formal seed production (Component 2). For example, the relationships SOL3 staff have with sources of germplasm such as CGIAR centres and regional universities and the way those relationships are used to identify, acquire and use new germplasm need to be transferred to MAF as soon as possible. Similarly, the leadership of these components, and responsibility for delivery of end-of-program-outcomes set out in the program design document, needs to be

gradually transferred to MAF leaders. This requires capacity development and management "downwards" (*e.g.* SOL3 Advisers supporting MAF National Directors to take control and lead) as well as strategic engagement "upwards" (*e.g.* SOL3 Team Leader working with the MAF Director General to provide evidence that supports improved budget outcomes for MAF in the Government of Timor-Leste budget process). This change is at the heart of sustainability and needs to start after this current cropping pattern (*i.e.* in Q2 2012) if MAF is to effectively deliver targets of 50% responsibility by end 2014 and 100% responsibility during the last year of SOL3 in 2015.

Addressing lessons from SOL2

As identified in Section 2, lessons learned from SOL2 identified opportunities to collect more evidence about institutional changes (*e.g.* changes in MAF organisational capacity) and higher-level outcomes (*e.g.* changes in Timor-Leste food security status and the extent to which SOL2 contributed to those). The SOL3 performance management system is being designed now and intends to monitor institutional changes. More needs to be done to monitor changes in food security status and some of the underlying reasons for food insecurity. For example, the TAG suggests that soil fertility status of each major block on each experiment station be assessed every 2-3 years and reported in the Annual Research Report; and that the opportunity cost of not using fertiliser is quantified by conducting fertiliser response trials in selected stations and community sites.

Strategic response to food security

There is an opportunity for components 1 and 2 to address food security in a more strategic way. With growing urban populations forecast to 2030, the areas with greatest potential, such as those with irrigation and the southern coastal plain offer the opportunity for more intensive agriculture that combines improvements in genetics and agronomic practices to achieve rice and maize yields close to the full potential (see Chart 3). The Strategic Development Plan (2011-2030) identifies a number of opportunities to achieve food security by 2030 that SOL3 outputs should be able to directly contribute to, including[3]:

- increasing the area cultivated for maize from 76,500 ha to 80,500 ha by 2015 and to 87,000 ha by 2030;
- more than doubling the area cultivated for roots and tubers from 48,000ha to 105,500 ha by 2030;
- continuing to invest in research and development and extension services in relation to Timor-Leste adapted maize and other basic crop varieties;
- continuing to offer subsidies on seed and other inputs for maize and basic food crops to the farmer;
- introducing agriculture zones to identify areas most suitable for maize and other basic food crop cultivation and commercialisation;
- developing and extending special maize/roots-tubers support programs for poor rural communities; and
- developing and promoting livestock feeding systems based on maize/roots-tubers surpluses.

The scope of the investigation into the use of fertilisers under SOL3 should be limited to establishing the response on station of seed fields of recommended varieties to specific soil nutrients, in parallel with a careful soil analysis to a 60 cm depth. When major deficiencies have been identified and responses quantified on station, modest levels of fertiliser could be tested in an additional plot demonstrating recommended practices in the OFDTs planted on seed producer fields. The goal of the fertility response research is to understand the nature of

[3] GoTL (2010) Strategic Development Plan 2011-2030 Part 4 Economic Development (p125). Government of Timor-Leste, Dili, Timor-Leste.

the limits of crop nutrition, and to increase the yields of seed from improved varieties – since one of their benefits compared with landraces will be a greater response to soil nutrients.

Evidence from the early implementation of informal seed production and distribution (Component 3) leverages and scales-up effective NGO experience. Early indications are promising and the team recruited to lead and implement this component gives confidence that effective results and useful lessons will result from this cropping season if climatic conditions are not extreme.

A total of 280 community seed production groups have been identified in 70 *sucos* in 7 districts (comprising 2,797 men and 1,018 women). Baseline data have been collected for these groups. Collaborative relationships have been established with 6 NGOs and estimates of informal seed production suggest a good start towards Component 3 end-of-program-outcomes. The seed credit system introduced for Component 3 provides incentives for group members to actively participate. There is an opportunity for SOSEK to conduct case studies of groups to identify what works, what doesn't work and lessons for refinement of the strategy in the 2011/12 cropping system.

SOL3 commenced at a time when MAF is also engaging with other donors for complementary initiatives. For example the European Commission is financing Rural Development Program Phase IV (RDP IV - ~US$8.5m over 4 years) from late 2011/early 2012, with a focus on strengthening the national extension services operated by MAF. There is an opportunity for the national campaigns supported by RDP IV to be informed by lessons learned from SOL3 and designed to complement SOL3 activities. There is also a risk of conflicting advice and increased transaction costs that exceed MAF capacity to effectively work with both SOL3 and RDP IV in some districts. IFAD is funding a post-harvest handling program that complements the SOL3 goal and purpose. These opportunities and risks highlight the importance of donor harmonisation and SOL3 leadership in supporting MAF to coordinate and ensure complementarity between major initiatives implemented with MAF. AusAID needs to use its donor relationships to support the SOL3 Team Leader in efforts to lead donor harmonisation in MAF, especially in the research and extension directorates. There is an important leadership role for AusAID in supporting this effort amongst the donor community in Timor-Leste. This will be strengthened by open and frequent communication between MAF leaders, the SOL3 Team Leader and AusAID staff in Dili.

Research priorities for SOL3 in 2011/12 have largely remained as described in the PDD. The primary focus is on variety development; with a minor component addressing improved crop management practices (see Section 4). There is an increase in Climate Change research. The increased activity of the SOSEK group in assessing impact and impact pathways, and in establishing baseline conditions for SOL3 is overdue and appreciated.

Draft Seed Law

This is currently with MAF and the Timor-Leste legislature. If it is passed into law, the development of its regulations will have significant impact on how the seed sector does its business. It will be important that SOL3 staff stay engaged in this process at the highest level. If the regulations are too prescriptive, MAF may be locked into a testing protocol that is inflexible and not responsive to the needs of farmers, of CSPGs or of any emerging private seed enterprise. If it is not sufficiently rigorous, the maintenance of quality standards, especially in the informal seed sector, could prove impossible. Of particular interest will be regulations regarding variety release protocols (trial data versus farmer preference), self-identified or truthfully labelled seed developed by CSPGs, and the structure and function of a seed inspectorate.

Phased/targeted strategy for food security at the household level

Such a strategy must address needs of rural and urban households, and will not be uniformly suited to all agro-ecological zones in the country. In fact, the appropriate package of practices will be conditioned by the level of risk a farmer is prepared to tolerate and the availability of inputs. There are areas that will rapidly take up improved seed and the use of increased levels of inputs during seed production. One example is the Maliana irrigated area where yield potential is high (Section 4), risks are relatively low and inputs are seeping in across a porous border with Indonesia. It is likely that seed crops such as maize and rice can be grown here with fertiliser and herbicides as in other high yield areas in SE Asia. On other flat, arable areas, especially where irrigation is available, seed yield will also be responsive to use of additional inputs. Although beyond the direct scope of SOL3, the same principles apply to grain production in farmer's fields. The MAF/SOL released varieties have all been developed under conditions of moderate to high soil fertility, so the advantage of them over existing farmer varieties will probably increase with input use, especially for maize. It is likely that these areas will provide food security to cities such as Dili and other urban centres because rice and maize are efficiently transported and easily stored. However, in the hill zones risks are higher, farmers are more risk averse and external inputs such as fertiliser are not available. Here increases in production will be smaller and the options for developing robust but improved growing practices are fewer. Intercropping and crop diversity will remain important, and adoption rates are likely to be slower, even for improved varieties. However, as farmers in the more favoured environments gain confidence in using inputs and accessing credit, this will also spill over to the higher yield potential areas in the hills, and result in a demand for additional crop inputs. In summary the TAG suggests that SOL3 consider an extension and adaptive research strategy that differs between areas based on their yield potential and risk.

Mission drift and focus – climate change

The TAG is concerned that there may be some mission drift around two areas. The first is climate change research. The TAG regards the predicted long-term changes in climate change as a one-off piece of work that has virtually been completed, and now serves to condition all research activities. The central message of climate change studies to date is to emphasise the need for new varieties that tolerate drought and heat, and have variation for maturity dates so farmers can pursue stress escape as well as stress tolerance.

The Climate Change Advisor has contributed strongly to the understanding of the possible changes to temperatures and rainfall amount and distribution under different climate model scenarios. Rates of change in mean temperature have been estimated, though are subject to error. In our view much of the basic predicted weather outcomes from climate change have already been documented by SOL3, effectively down-scaling results from primary research by others such as CSIRO and the Hadley Centre for Climate Prediction and Research. As such, further SOL3 investment in these areas seem unjustified. However, there are at least two things that can be addressed by SOL3 as the climate change mandate evolves: the importance of crop maturity in stabilising farm output (*e.g*. early maturing varieties that can escape the consequences of early cessation of rainfall), and the development of seed production techniques that reduce the impact of varying weather on seed set and filling. The latter requires stress tolerant varieties. Selection for earliness and stress tolerance is therefore relevant for Component 1 activities, and its EOPO of "10-15 new varieties of food crops evaluated….". Also needed are appropriate crop management methods (*e.g*. lower crop densities; greater or less use of intercrops; varying date of planting) that mitigate the effects of climate variability on seed and grain. These variety x management technologies could be developed under existing SOL3 EOPOs. To focus this area of work, the TAG suggests that the EOPO for Component 1 (p 22 PDD) be reworded to read: "10-15 new heat and drought stress tolerant varieties of food crops evaluated and officially released". Similarly, the last

EOPO of Component 4 (p 29 PDD) could be reworded to read "Improved heat and drought stress-tolerant varieties and risk-reducing management practices being identified taking into consideration possible impacts of climate variability in Timor-Leste".

So, what remains to be done? The measurement of climatic variability, the identification and characterisation of agro-ecological zones for target crops, and the assessment of appropriate adaptation strategies by farmers should be the main research agenda of the climate change team. Explicit agronomic technologies for mitigation of climate change are needed but the emphasis should be on variety-based strategies (different maturities, levels of stress tolerance) and less on direct agronomic interventions such as water harvesting and terracing. These latter interventions should be done with partner projects and institutions, and lie outside the SOL3 mandate.

Mission drift and focus – variety trials with minor crops

The second area of concern is the testing of a wide array of relatively minor crops, without a clear idea of their potential to impact food security. The TAG agrees that a viable legume option is needed in addition to peanuts, but sees little value in testing temperate crops until their potential impact is more firmly established through a more rigorous approach to cropping system-based agro-ecological zonation.

3.4 Performance management system

The SOL3 program design document presents a description of management processes, including monitoring and evaluation (Design pp 46-48) and a draft M&E Framework (Appendix 6 pp 124 – 133). A Monitoring and Evaluation Review conducted in April 2011 sets out additional recommendations and a revised monitoring and evaluation framework as well as proposing next steps to increase clarity about what, how and when monitoring and evaluation will be implemented as well as who will do it. The Monitoring and Evaluation/SOSEK Adviser is currently preparing a Monitoring and Evaluation Manual. There should also be consistency between the end of program outcomes and outputs used in the MEF (Appendix 6 pp124-131), the component descriptions (Design pp21-29) and the strategic framework diagram (Design, p20), and the recommended revisions to the MEF (Review Annex 1-1 to Annex 1-8).

The baseline survey that is being implemented at the time of this TAG mission seems thorough. Working with the Timor-Leste Statistics Office (DNE) to administer the survey is sensible and a good example of how SOL3 activities should be planned and implemented to build capacity and sustainability. Similarly, alignment of the baseline survey with the GoTL food security survey represents good development practice.

The objective-level targets are expressed in the PDD (p21) as a percentage of farmers: 70% of lowland rice farmers and 45% of upland farmers using one or more SOL variety, with some additional species-specific targets (40% of maize growers, 70% of peanut growers, 50% of sweet potato growers, and 20% of cassava growers using SOL variety). The design deliberately uses a proportion of the farmers because of their changing number, as revealed recently by the recent census. The TAG confirms the approach taken in the design – to use as a target a proportion of farmers using one or more SOL variety.

SOL3 does not yet have a clearly defined performance system. Many of the required elements are in the design document and its appendices, and further elaborated in the April 2011 Review and draft Manual, but they need to be compiled in an easily understandable and separate document with additional information to be consistent with good practice. There is not yet a stand-alone and explicit plan describing the SOL3 monitoring and evaluation system, although many of the required elements are available in separate documents. A useful SOL3 Monitoring and Evaluation Framework (MEF) needs to describe the approach,

methods, roles and responsibilities for collection, analysis, interpretation, reporting and use of monitoring data and evaluation lessons to support management and continuous improvement.

A performance management plan describing the SOL3 monitoring and evaluation system would normally detail approaches, methods and principles for monitoring and evaluation as well as monitoring indicators. It would also frame evaluation questions, and detail resource allocation (people and money) as well as methods and institutional arrangements for data collection, analysis, interpretation, reporting and the use of this information to support management and continuous improvement. The performance management system would be strengthened if it was based on a Theory of Change, developed with MAF and other stakeholder groups. This would help stakeholders understand end-of-program outcomes and outputs.

The monitoring indicators presented in the draft MEF (Appendix 6 pp124 – 131) and the proposed improvements in the Monitoring and Evaluation Review of April 2011 are adequate to allow for measurement of the quality and reach of key program deliverables. There is an appropriate balance between quantitative and qualitative indicators. However, most are at an activity level and there is an opportunity to strengthen the framework by including some indicators at outcome level for each component as well as at whole-of-program level. The SOL3 performance framework would be strengthened if there were less indicators overall, and more emphasis on relative costs and benefits of new varieties compared with the next best alternative. Accordingly, as described in Section 4, these could be simplified and focused to increase efficiency. The Monitoring and Evaluation Review of April 2011[4] addresses this issue with changes to high level indicators (Review p8). These recommended indicators and related changes to the MEF are appropriate but could be further simplified.

3.5 Opportunities for varieties with improved nutritional characteristics

With the selection, release and rapid adoption of an orange-fleshed sweet potato variety (with higher beta-carotene content improving Vitamin A nutrition in those who eat it) SOL2 demonstrated that Timor-Leste farmers are willing to adopt varieties with improved nutritional characteristics. This is a sensible focus for SOL3. Sources of germplasm of all target crops possessing superior nutritional characteristics may offer a bonus to resource-poor consumers, provided yield and other grain, tuber or root quality characteristics meet farmer requirements. Options are available through the CGIAR's HarvestPlus initiative (http://www.harvestplus.org/content/crops), though the suitability of these bio-fortified varieties would depend on nutritional limitations of resource-poor families in Timor-Leste and the adaptation of bio-fortified varieties to Timor-Leste growing conditions. If protein and calorie deficiencies dominate then bio-fortified varieties may be unsuitable unless they are also high yielding and attractive to consumers. Previous experience suggests that a variety needs to be superior for yield or some visually obvious trait in order to be adopted, and improvements in nutritional characteristics are a bonus that is not highly valued because they cannot be seen. Varieties of maize and peanuts with low aflatoxin production are available from IITA and ICRISAT, though pre- and post-harvest management of these crops (proper drying and aeration) is also effective in reducing aflatoxin formation.

Specific issues with maize: Is there are role for quality protein maize (QPM)? QPM varieties carry the *opaque-2* mutant that boosts the levels of tryptophane and lysine, both amino acids that are deficient in normal maize protein. As a consequence QPM maize provides a reasonably balanced diet for newly weaned children and is significantly better than normal maize in that regard. The *opaque-2* character is controlled by a recessive allele, whose soft

[4] Seeds of Life 3 (2011) Monitoring and Evaluation Review. Consultant report to Seeds of Life 3 by Geoff Moyle, April 2011.

chalky phenotype is corrected by genetic modifiers. When the QPM variety outcrosses with normal maize the nutritional benefits can be lost over time, and the kernels may segregate for a soft *opaque-2* phenotype. Provided isolation requirements are strictly followed a QPM variety will be stable and could deliver real nutritional benefits for Timor-Leste. However, the loss of quality from seed saved out of OFDTs and even from CSPGs may occur rapidly. The weevil resistance of QPM varieties would need to be assessed carefully, since weevils also respond favourably to balanced nutrition. Maize varieties suited to Timor-Leste must be resistant to downy mildew, be flinty in texture, and intermediate in maturity. These requirements further narrow the options among "off the shelf" varieties. With these caveats in mind, the TAG encourages the introduction and testing of yellow and white QPM varieties from CIMMYT and nutritionally enhanced rice, cassava and sweet potato varieties.

Farmer practice appears to include at least two types of maize – full season flint and early pop-corn maize, the latter presumably for consumption during the "hungry" period (2010 Annual Research Report, p. 183). There may be a demand for earlier maturing versions of other crops also (though Hohrae-3 is known to be much earlier than most local sweet potato varieties). Use of early varieties may minimise risks to stable household food supply, though the yield of early duration varieties is generally less than those of late maturing varieties.

The TAG has some concerns about adequacy of isolation of maize crops for seed increase. Normal isolation requirements for maize seed production are 200m distance or three weeks separation of flowering time. The need for adequate isolation will become more acute when white seed is being produced in an area where yellow maize is grown, or when a recessive nutritional quality trait such as *opaque-2* is present in the variety under increase.

3.6 Record keeping for germplasm imports

Record keeping with respect to Intellectual Property Rights and GMO status of SOL germplasm imports appears to be adequate and provides evidence required to verify the source, phytosanitary compliance and nature of germplasm imported into Timor-Leste. A total of four inspections of seed fields of the contract growers have taken place on schedule.

Most new varieties can be sourced from CGIAR centres. Some may also be available from Universities in the Southeast Asian region. In general the CGIAR centres back their recommended varieties with performance data in environments similar to Timor-Leste, and provide them with a Standard Materials Transfer Agreement (SMTA) in accord with the Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA), and a valid phytosanitary certificate. The SMTA serves as a legal framework for the management of intellectual property and plant variety protection issues that may be associated with any imported variety. In the case of maize and rice there should also be included a certificate of freedom from adventitious presence of genetically modified seed (genetically modified organisms, GMOs). The relative strength of the Plant Quarantine Services in East Timor could not be assessed by the TAG, so it is important that SOL3 continue to maintain a high standard for the entry of outside germplasm into the country. Several CGIAR centres maintain regional breeding programs, and these may have direct responsibility for supplying improved germplasm to Timor-Leste. For example, CIMMYT-Hyderabad or CIMMYT-Zimbabwe (rather than CIMMYT-Mexico) are likely to have synthetic varieties that meet the requirements of white or yellow grain, superior husk cover, resistance to downy mildew and drought tolerance in backgrounds that may be well adapted to Timor-Leste.

4 Opportunities to refine implementation strategy

At this early stage the TAG does not see a need to modify the implementation strategy, program design or management arrangements. A general summary of TAG findings and perceptions are presented for the record in a SWOT analysis presented in Annex 1. The TAG has some recommendations to simplify and focus monitoring. It encourages the SOL3 team to focus on implementing activities through the 2011/12 cropping season to deliver results, build confidence and learn lessons for next year.

The TAG has identified a number of opportunities to refine the implementation strategy during 2012 and these are presented here for discussion by the Program Implementation Team and more detailed review during the next TAG mission.

4.1 Refinements in SOL3 program management

Provide evidence to attract increased recurrent budget allocations for MAF research and extension

There is an opportunity for SOL3 to support MAF with evidence to attract increased recurrent budget allocations for agricultural research and extension. Developing country benchmarks for agricultural research and development in Asia Pacific are around 0.45% of total agricultural output[5]. Timor-Leste agricultural output is around US$150 million per year – suggesting that MAF should have a research and development budget of around US$1 million per year[6]. In the 2012 Financial Year the National Directorate of Research and Special Services in MAF had a recurrent budget allocation of US$302,000 – or 45% of the regional benchmark6. SOL3 is unlikely to achieve sustainability and end-of-program outcomes in Component 1 and Component 2 unless MAF successfully attracts increased recurrent budget allocations for research. Stronger SOL3 support to MAF to enable it to better engage with the Ministry of Finance will support the transition to MAF funding for Components 1 and 2 in year 4 (50%) and year 5 (100%) as set out in the PDD.

Acknowledge and use end-of-program outcomes in program design

Consistent with AusAID good design practice, the SOL3 program design document sets out end-of-program outcomes for each component. These need to be explicitly acknowledged in all planning and consistently reflected in performance management arrangements. For example, monitoring indicators and evaluation questions should be consistent with the designed end-of-program outcomes. At this time there is no evidence to suggest a need to revise these component outcomes, although this should be tested again at the next TAG using lessons from the 2011/12 cropping season.

Institutionalise Program Implementation Team

The recently formed Program Implementation Team – an innovation of the new Team Leader and the MAF Director General – is a practical addition to institutional arrangements set out in the PDD. There is an opportunity to write down in the next Annual Plan the functions of the team and the roles and responsibilities of the Director General, National Directors, District Directors and team members to ensure that the team becomes an effective mechanism for execution of SOL3.

[5] Bientema, N.M. and Stads G-J. (2008) *Measuring Agricultural Research Investments*. Agricultural Science and Technology Indicators, CGIAR Washington DC USA [see http://www.asti.cgiar.org/pdf/Global_revision.pdf]

[6] Government of Timor-Leste 2012 Budget Papers

Strengthen institutional arrangements for seed development and distribution

Similarly, there is an opportunity for SOL3 to continue supporting MAF to strengthen institutional arrangements for agricultural seed development and distribution. This includes finalisation of the draft Seed Law and ensuring that the draft law and related regulations enable both formal and informal seed production as well as focus on public goods such as quality assurance, protection of genetic diversity and governance of seed providers. There is an opportunity for SOSEK to work with community seed production groups to learn lessons during the 2011/12 growing season to inform the draft Seed Law and related regulations.

Actively engage in donor harmonisation of major aid initiatives in MAF

There is a risk that the absorptive capacity of MAF will be exceeded, especially at district and *suco* level, once new donor programs commence in 2012. There is an opportunity for Australia to take a more active role in the quarterly donor harmonisation meetings led by MAF and to establish and lead a like-minded donor group or rural development thematic group for aid effectiveness. Such a group would harmonise donor approaches to budget and policies issues in Timor-Leste, reduce transaction costs associated with donor program management and implementation for MAF and ensure consistency in strategic direction, extension messages and institutional development. This should ensure coordinated engagement with extension staff at national and district levels; consistent approaches to per diems and staff compensation; harmonised supervision and evaluation missions wherever possible; and complementary activities between SOL3, RDP IV and the IFAD post-harvest handling project.

Diversify capacity development approaches to strengthen professional development of research teams

SOL2 emphasised capacity development and effectively codified and monitored development of individual competencies. Much of this was done with formal training complemented by mentoring and on-the-job practice. The SOL3 design also emphasises capacity development but this is expanded to include institutional capacity, group capability and individual competencies. There is an opportunity for SOL3 to use explicitly a wider range of capacity development approaches – with a focus on practice and on-the-job learning. Some of this already happens but it needs better communication and sharing of lessons learned. As researchers become better trained and better connected to regional peers, there is an opportunity for relevant literature and networks to be shared with SOL3 researchers. Similarly, there is an opportunity for MAF to join the Asia-Pacific Association of Agricultural Research Institutions (see http://www.apaari.org/) as it gains confidence and builds relationships needed for identifying, attracting and observing international germplasm resources for Timor-Leste.

Simplify and focus monitoring system

The monitoring and evaluation framework in the program design document, the April 2011 M&E review, and the draft M&E manual set out indicators, targets, means of verification and data types in a logical framework. This framework is thorough but complex – including more than 60 indicators. There is an opportunity to simplify the monitoring system to include a small number of quantitative performance indicators presented in a results framework (*e.g.* up to 4 quantitative performance indicators linked to end-of-program outcomes for each component making 16 in total – see example in Annex 2) along with a number of process indicators to monitor variance from planned activities and outputs (*e.g.* up to 4 quantitative process indicators for each component, making an additional 16 in total). This monitoring framework would be complemented by evaluation questions that could be used for regular, qualitative case studies and analysis by SOSEK to support management. In this way the transaction costs of performance management would be reduced; a more realistic system would be implemented with MAF to increase the likelihood of sustainability; and management would have a useful mix of quantitative and qualitative information to support

management decisions. This approach also draws on the strengths of both AusAID (*e.g.* results framework) and ACIAR systems (*e.g.* evaluative questions).

The program design document states that methods will be developed during the Inception Period (PDD, p46). There are no methods for monitoring or evaluation set out in the PDD, the draft MEF, the April 2011 Monitoring and Evaluation Review or the draft Manual. Monitoring and evaluation methods need to be described and tools to support their use included in the final plan for SOL3 performance management.

There are many relevant monitoring methods, and for SOL3 these are likely to include:

- sampling methods (such as poverty ranking or geographic location);
- core monitoring methods (such as stakeholder analysis and questionnaires);
- discussion methods for groups (such as brainstorming and role plays);
- methods for biophysical measurement (such as crop yield and adoption);
- methods for spatially-distributed information (such as maps and transects);
- methods for time-based patterns of change (such as diaries and photographs);
- methods for analysing relationships and linkages (such as logical frameworks, impact flow diagrams and problem trees); and
- methods for ranking and prioritising (such as matrices and lists).

Research reporting is an important part of the research process. The current Research Annual Report is a large document. The size is currently justified by the training in documentation that its preparation offers MAF staff. Given the scale-up of activities under SOL3 (research activities will more than double) a new and practical format should be considered for reporting research findings from this phase. For example, there is an opportunity to publish "Research Highlights" – a summary of the main points that can be more readily disseminated and translated, and more easily understood. The rigour of the established analyses must be maintained, but the output requires better targeting towards specific readers and interest groups around specific commodities and/or agro-ecological zones. Publishing in the form of factsheets and smaller printed and web-based reports available in Tetun (as is done now for some variety releases) would increase reporting flexibility. Sharing among staff could also take place in a program-wide reporting meeting that precedes the annual planning process, and where MAF staff are encouraged to do the presentations.

Review SOL3 output targets

As shown in the performance tracking charts in Annex 2, the targets set in the PDD for formal and informal seed production do not always scale-up what was achieved in SOL2. For example SOL2 produced 50.3 tons of formal rice seed in 2010 and yet the PDD target for formal rice seed production in SOL3 is 50 tons/year. There is an opportunity for the SOL3 Program Implementation Team to review these targets and adjust them where appropriate to maximise the return from the SOL3 investment.

Include evaluation as part of performance management

The SOL3 performance framework needs to include evaluation questions that focus on efficiency, effectiveness and sustainability criteria. This was developed further during the TAG mission in partnership with the SOL3 team, AusAID and ACIAR. Evaluation questions should especially focus on perceptions of seed users (farmers and traders); relative performance of formal and informal seed sectors; as well as the expected public goods to result from SOL3 and potential private goods that may result from substitution of public and private roles in the farming systems of Timor-Leste. The SOL3 performance framework would be strengthened if evaluation questions included exploration of human development – such as changes in confidence, productivity and capability of individual MAF staff, contracted seed growers and farmers.

There are many relevant evaluation methods that should be considered for inclusion in the SOL3 Monitoring and Evaluation Manual:

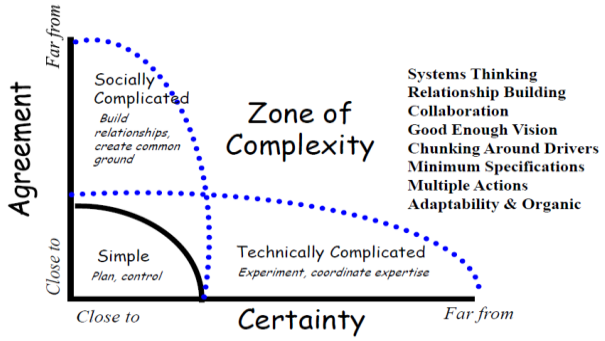
- Documentation review
- Biophysical measurement
- Questionnaires and surveys including Goal Attainment Scaling
- Case studies
- Direct observation
- Semi-structured interviews
- Focus groups

The program design document, draft monitoring and evaluation manual and other program performance documents omit evaluation questions and other evaluation arrangements. Given the complexity of SOL3 change processes (Chart 2), there are broadly four options available for the evaluation of SOL3:

- use the formal AusAID quality reporting system including a mid-term Independent Progress Review and terminal Independent Completion Review;
- use the formal ACIAR impact evaluation process;
- use a formal joint evaluation approach with MAF, AusAID and ACIAR that builds on a combination of strengths from the AusAID and ACIAR evaluation processes; or
- use a developmental evaluation approach linked to the TAG process.

Developmental Evaluation[7] processes include asking evaluative questions and applying evaluation logic in regular inputs from a technical advisory group throughout implementation. The processes support program, output, staff and/or organisational development and adaptive management as part of a continuous process. In this way the independent evaluator becomes better engaged with the program stakeholders and the Program Implementation Team, whose members collaborate to conceptualise, design and test new approaches in a long-term, on-going process of continuous improvement, adaptation and intentional change. The evaluator's primary function with the team is to support stakeholder discussions with evaluative questions, data and logic, and facilitate evidence-based decision-making[8].

Chart 2 : Evaluation for complex change processes



Source: Quinn-Patton, M. (2009) Developmental evaluation. Presentation to Canadian Evaluation Society, June 1, 2009.

With a developmental evaluation, the evaluator collaborates with those engaged in the change effort to design an on-going evaluation process that complements regular monitoring and matches the philosophy and organisation of the program. Evaluation activities are designed to capture system dynamics, identify principles for adaptive management as well as interdependencies, and emergent relationships rather than being based on linear cause-effect logic models.

This results in context-specific understandings that inform implementation and provide reality-testing to inform results-focused, learning-oriented leadership. This seems to be consistent with the intention of the TAG and could provide a useful learning environment for MAF.

[7] Steps typically include: (a) determining scope; (b) framing the evaluation so data collected is used to inform action [as has already been started by the M&E Advisor]; (c) data collection and analysis; (d) reporting to inform iterative planning and action.

[8] Quinn-Patton, M. (2010) Developmental evaluation – applying complexity concepts to enhance innovation and use. Guilford Press, Canada.

4.2 Refinements in the research strategy in SOL3

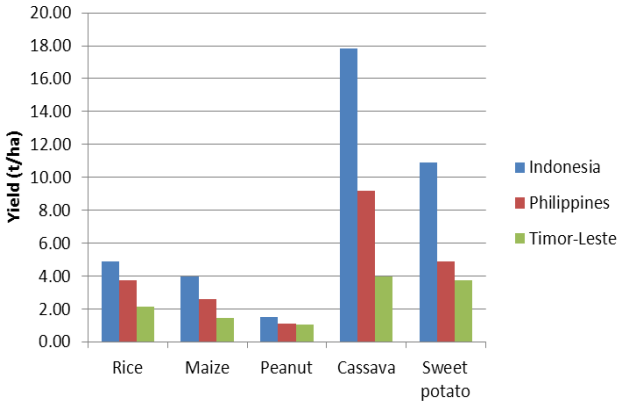
Raising farmers' awareness of SOL3 products

The participation of SOL in the weekly RDTL radio show increases exposure of the Project to the public in Timor-Leste, but it is unclear whether this is appropriately targeted towards farmers. Pilot surveys indicate that 24% of Timorese possess a radio and confirmation of this will be provided in the planned Baseline Survey conducted in October, 2011. In addition 43% of rural households have cell phones, and this offers the possibility of bulk SMS texting messages to specific areas at key times during the cropping season, and of collaboration in rural extension with the telecommunications sector in Timor-Leste. Other media may also be appropriate if it provides coverage of target farmers – for example if the baseline survey shows that television is useful then SOL3 should engage with existing television programs for farmers.

There is significant yield potential and yield gaps still to be addressed

It appears that farmers have become used to the relatively low yields reported for Timor-Leste (see Annual Research Reports 2009; 2010). Why is the yield gap so large between Timor-Leste and two other countries that share similar environments? (See Chart 3, which shows FAOSTAT data for 2007-2009). There are undoubtedly errors associated with crop data collection in remote and rugged areas. Crops are usually intercropped, and that reduces yields significantly. However, Timor-Leste has very low input farming systems where little fertiliser is used.

Chart 3 - Target crop yields in Timor-Leste vs. Indonesia and Philippines



In Indonesia and the Philippines FAO statistics (FAOSTAT (2011), mean of 2007-2009 data) suggest the average rate of nutrient application is between 61 and 86 kg NPK/ ha/year of land under cultivation and permanent crops. No data are available for herbicide use in the three countries, but it is likely similar, so it is not surprising that weed control is a major constraint to yield in Timor-Leste. Higher levels of soil fertility support a greater plant density with larger leaf area, and this allows a crop such as rice or maize to suppress weeds more effectively.

Chart 4 - Yield gap in maize suggests opportunity for further work

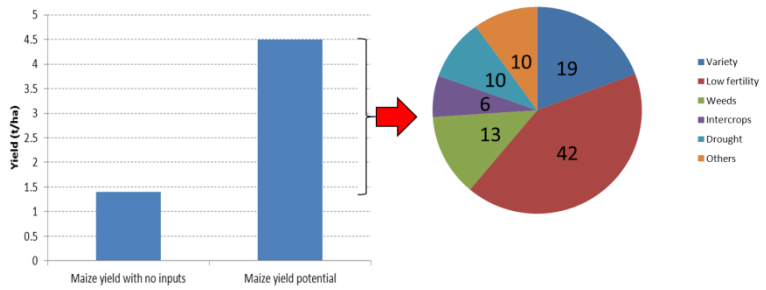


Chart 4 (left panel) shows average maize yield for Timor-Leste 2007-2009 vs. estimated potential yield for Sele

Chart 4 (right panel) shows factors responsible for the yield "gap" between average and potential of 3.1 tons/ha (%).

Source: FAOSTAT, 2011

What does the yield gap look like? Previous experience with maize varieties like Sele suggest that under ideal conditions it will yield at least 6t/ha on flat land, and perhaps 4t/ha on steep

hillsides for an average of around 4.5t/ha. Mean maize yields in Timor-Leste are 1.4t/ha, so there is a gap of around 3 t/ha that can be broken into its component parts. Previous experience with low input maize systems suggests that this gap is primarily due to use of unimproved varieties (19%) and low fertility (42%) (Chart 4).

If the fertility component of the gap (1.3t/ha) was simply due to N deficiency, an application of around 50kg N/ha would meet crop needs at current levels of management. However, it seems likely there are significant additional issues related to soil fertility (*e.g*. deficiencies of B, Cu, Zn *etc*.) that may reduce the N response.

The TAG suggests that (1) a consultant on soil fertility be engaged to develop an appropriate research strategy to identify soil constraints; (2) soil analyses be conducted on all experiment stations with a view to identifying status of major and minor nutrients in the 0-30 cm and 30-60 cm depths; (3) nutrient response curves be established for maize and rice, with a view to increasing the efficiency of seed production; (4) maize-velvet bean technology be taken off-station and trialled in farmer's fields on a wider scale as part of the OFDT activities.

Chart 5 – Velvet bean can increase maize yield in Timor-Leste

The TAG saw clear evidence of the importance of nutrients in maize-velvet bean relay cropping experiments on Betano and Loes stations (Chart 5 - this photo taken at Betano shows a plot to the right with maize and no velvet bean, while in the plot to the left velvet bean preceded the maize crop and left perhaps 40-60 kg N/ha for the maize crop to use. Yield differences are estimated to be 1.5-2 tons/ha).

Safeguarding the database for crop performance

SOL1 and SOL2 generated a large amount of data, and these data have growing value as methods for unbalanced data set analyses continue to improve. It will be important for SOL3 to ensure that Program databases are well-organised and annotated, and secure within MAF, with appropriate external backup provided.

The website as a tool for communicating and training

SOL's website (http://www.seedsoflifetimor.org) has not yet made the transition to SOL3, and appears to be at least one year out of date. This website will become increasingly important as a means of communicating project information. It should be updated with 2010-11 information, and be the 'go to' location for all technical reports, important presentations from SOL3 and extension information. SOL3 has invested significantly in internet connectivity during the establishment of three regional offices for SOL3 advisors to the District MAF Director. It will be imperative that up-to-date project information be available on the website for these Directors. MAF's professional staff located in the expanding network of rehabilitated experiment stations will also benefit directly be being able to access up to date factual information on varieties and crop management practices. Further development of the SOL3 website should be carefully coordinated with any further development of MAF's own website (http://gov.east-timor.org/MAFF/English/plant_production.htm).

Conservation of local varieties of target crops

There is a significant effort directed towards conserving local collections of legumes and imported germplasm of target crops. This is an expensive activity, especially for vegetatively

propagated crops since it requires annual grow outs. For crops such as maize, wheat and peanuts and other grain legumes it is suggested that only collections under active evaluation be maintained, and that any collections of local varieties be passed to the appropriate CGIAR centre for long-term storage. Seeds stored at stations should be consolidated and moved to the coolest location in the country so the need for regeneration is minimised. The maintenance of a viable germplasm collection by MAF in the future will be especially challenging given electricity supplies, costs of recurrent regeneration activities and the absence of active breeding programs.

Targeting and research priority setting

From previous Annual Research Reports it is unclear how research in different agro-ecological zones is prioritised. The six current agro-ecological zones (AEZs) are defined by slope (north vs. south) and elevation (0-100 m, 100-500 m and > 500 m elevation). They are not defined by genotype x environment interactions or by distributions of important cropping systems, or soil type. Furthermore, they are not accompanied by areas of target crops or by numbers of households. This makes it difficult to assess whether returns on investments in temperate crops are likely to be as large as returns on investment in staples adapted to lower elevations. SOL3 could establish a system of research prioritisation that includes potential impact as well as consideration of poverty, food security and risk. The SOL3 climate change group should be involved, and MAF staff in the ALGIS group could assist with geographic information system approaches as needed.

Use of OFDTs to demonstrate improved technology

The 2010 Annual Research Report includes a section called Farming Systems Recommendations, essentially outlining a package of practices for maize production. There are a number of years of experimental results of the effect of maize-velvet bean technologies on weed control and soil fertility. The TAG suggests that it is time to demonstrate a package of improved practices in farmer's fields so farmers are given a better choice of technologies. We suggest that an extra plot be added to the standard OFDT in which a MAF/SOL3 "best bet" package is demonstrated. In OFDTs conducted on irrigated lowland sites where risk of crop loss is less we suggest that fertiliser be included in the package while in the riskier hill zones the technology could demonstrate benefits of maize/velvet bean that require no cash inputs. When the site questionnaire is designed questions should be asked of the farmer regarding his/her attitude towards the use of fertiliser, willingness to assume risk, and the basis of those attitudes.

Data supporting the domestic production of seed

There are high direct and opportunity costs to importing seed of unknown quality from outside Timor-Leste when seed supplies run short. The varieties themselves may be untested and unadapted, and in the past some imported seed has no or very poor germination. It is suggested that SOSEK staff study these costs, find documented examples, and assemble a policy brief for MAF supporting greater investments in domestic seed production.

5 Recommendations

Based on document review, interviews with SOL3 stakeholders in Dili, and field interviews in 6 Districts, the TAG recommends SOL3 and MAF management

1. **Simplify and focus performance management** – the TAG recommends that the SOL3 performance management system is simplified and focused to include three elements: (a) performance monitoring using a results framework for quantitative measurement of end-of-program outcomes; (b) developmental evaluation, including SOSEK case studies,

focused on measurement of qualitative changes, and answering evaluation questions that test the theory of change hypothesis for SOL3; and (c) management monitoring using simple variance from plan measures for activities and outputs. Reporting can then be simplified to be more appropriate to the increased scale of SOL3.

2. **Transition from "what" to "how" C1, C2 and C4 activities are planned and implemented to prepare for handover to MAF in 2016** – the TAG recommends that after the 2011/12 cropping season the teams implementing components 1, 2 and 4 work with MAF to change the way activities are planned and implemented so that MAF takes increased responsibility for initiating, leading and delivering activities under these components. In this way, from mid-2012 all activities should be designed to enable MAF to take over full responsibility by 2016. This should include a phased approach included in the formal transition plan, as set out in the program design document, to be developed during the first half of 2012 and implemented from mid-2012 at the latest.
3. **Lead harmonisation of major donor initiatives with MAF** – the TAG recommends that AusAID establish and lead a like-minded donor group or rural development thematic group for aid effectiveness to harmonise donor approaches in Timor-Leste, reduce transaction costs for MAF and ensure consistency in strategic direction, extension messages and institutional development. This should especially ensure coordinated engagement with extension staff at national and district levels; consistent approaches to per diems and staff compensation; harmonised supervision and evaluation missions wherever possible; and complementary activities between SOL3, RDP IV and the IFAD post-harvest handling project. This group would ensure a consistent approach to participation in the quarterly donor harmonisation meetings led by MAF.
4. **Improve flexibility of Project scientific reporting** – the TAG recommends that the format of the Annual Research Report be reduced in length and published in sections that target distinct audiences; and that the Project issues an illustrated summary of all project activities as "Research Highlights" that can be distributed widely in print and on line.
5. **Understand soil fertility** – the TAG recommends that a) a soil fertility consultant be engaged to develop an appropriate research strategy to identify soil constraints; b) soil analyses be conducted on all experiment stations with a view to identifying status of major and minor nutrients in the 0-30 cm and 30-60 cm depths; c) that nutrient response curves be established for maize and rice, with a view to increasing the efficiency of seed production; and d) that maize-velvet bean technology be evaluated in farmers' fields on a wider scale.
6. **Use OFDTs as a vehicle for improving farmers' agronomic practices** – the TAG recommends that an extra plot be added to the standard OFDT in which MAF/SOL3's "best bet" production package, suitably adapted for yield potential and risk, is demonstrated. Well-watered lowland OFDTs could include purchased inputs, while in the hills the technology could demonstrate benefits of maize/velvet bean combinations.
7. **Improve priority setting in crop research** – the TAG recommends that the agro-ecological zones be more clearly defined in terms of crop adaptation, farmer risk and potential impact on food security; that the focus be retained on the five target crops, with a reduced effort on minor crops; and that more nutritional options of these five crops be more fully explored.
8. **Raise farmers' awareness of new varieties** – the TAG recommends that a strategy for raising farmer awareness of the benefits of SOL3 varieties via regular radio, television and/or short message service programs be developed in conjunction with MAF's Extension services.

Annex 1

TAG Rapid Appraisal SWOT Analysis

Annex 1: TAG Rapid Appraisal SWOT Analysis

Strengths	Weaknesses
• Credibility of SOL name • MAF has strong ownership of SOL • Strong relationships built on the SOL2 foundation • Good staff engaged and retained for SOL3 • MAF assignment of staff to SOL3 as designed • Good will, commitment and professionalism of entire SOL3 team – both MAF staff and SOL3 staff • SOL3 effectively leverages experience, infrastructure and relationships from SOL2 • SOL3 starting with good suite of new varieties • Baseline survey conducted with DNE enumerators • Baseline survey aligned with MAF household food security surveys • Demand for quality seed exceeds current supply • Good quality assurance for formal seed • Effectively leveraging NGO experiences to bring effective practices to scale • Network of experiment stations established • Activities are focused on key food security crops	• Poor understanding of end-of-program outcomes • MAF currently has insufficient recurrent budget to sustain component 1 and 2 activities by year 4 • Components 1 and 2 currently focused more on what is planned and done than how those processes are designed to transition to MAF implementation • MAF lacks seed scientist with international relationships and stature to attract germplasm • Training is dominant capacity development method • Confused communication lines between SOL3 team, AusAID and ACIAR • Variable quality assurance for informal seed • Occupational health and safety need emphasis, especially in field work and seed handling • Uncertainty about institutional arrangements for formal seed sector – especially Seed Law • Human resource management processes not yet scaled up to meet needs of larger team • Limited understanding of soils, agronomic responses and agro-ecological zonation • Focus of climate change activities? • Lack of branding and brand recognition
Opportunities	**Threats**
• Include agronomic management treatments in trials where risks are lower and potential is higher (*e.g.* coastal plain) • Meta-analysis of SOL2 socio-economic research and targeted SOSEK case studies to inform research program and target component 3 activities • Increase focus on strategic, developmental issues including MAF recurrent budget, harmonisation with RDP IV, poverty targeting and food security strategy for urban communities and rural poor • Soil analysis and pot trials to better understand responses of key crops to nutrients • Strengthen marketing of yield potential to farmers • SOSEK research to document existing farmer responses to climate variation • Develop rules of thumb and variety choices under different climate conditions • Review branding strategy to optimise leverage for policy dialogue and sustainability • Australia lead harmonisation activities with donors supporting MAF to manage absorptive capacity • Explicitly plan and use a wider range of capacity development methods including mentoring, on-the-job learning and learning-by-doing • Develop transition plan for C1 and C2 before end 2012 • Simplify and focus approach to performance management to take advantage of the best practices from AusAID, ACIAR and internationally • Coordinate with IFAD on post-harvest handling project • Coordinate with EC and GIZ on RDP IV • Technology transfer via OFDTs • Bio-fortified crops to enhance nutritional outcomes • Understanding risk-averse behaviour of farmers	• Absorptive capacity of MAF with several new, large donor programs starting in 2012 • Drifting away from activities and outputs that clearly deliver end-of-program outcomes as designed • Reputational risks resulting from poor quality seed being presented as SOL product • New Seed Law and related regulations stifle informal seed sector • Farmer and NGO perception of new varieties and use of purchased inputs especially fertiliser • ”Fake” seed • Mission drift

Annex 2

Example of a results framework for SOL3

Annex 2 – Example of a results framework for SOL3

Program Development Objective (PDO): **Improved food security in Timor-Leste**												
PDO Level Results Indicators	**Unit of Measure**	**Baseline**	**Cumulative Target Values**						**Frequency**	**Data Source/ Methodology**	**Responsibility for Data Collection**	**Description (indicator definition etc.)**
			2011	**2012**	**2013**	**2014**	**2015**	**2016**				
Proportion of lowland rice farmers growing one or more SOL varieties	%	xx					70%		Annual	SOSEK & NDE surveys	SOSEK	The number of lowland rice farmers growing one or more SOL varieties
Proportion of upland farmers growing one or more SOL varieties	%	xx					45%		Annual	SOSEK & NDE surveys	SOSEK	The number of upland farmers growing one or more SOL varieties
Proportion of upland maize growers growing one or more SOL varieties	%	xx					40%					The number of upland farmers growing SOL maize/Total number upland maize growers
Proportion of upland peanut growers growing one or more SOL varieties	%	xx					70%					The number of upland farmers growing SOL peanuts/Total number upland peanut growers
Proportion of upland sweet potato growers growing one or more SOL varieties	%	xx					50%					The number of upland farmers growing SOL sweet potato/Total number upland sweet potato growers
Proportion of upland cassava growers growing one or more SOL varieties	%	xx					20%					The number of upland farmers growing SOL cassava/Total number upland cassava farmers

Intermediate Result – Component 1: **Evaluation of new germplasm and associated technologies using research stations to develop technologies for on-farm testing**											
End of program outcome indicators	**Unit of Measure**	**Baseline**	**Cumulative Target Values**						**Frequency**	**Data Source/ Methodology**	**Responsibility for Data Collection**	**Description (indicator definition etc.)**
			2011	**2012**	**2013**	**2014**	**2015**	**2016**				
Number of new, improved varieties evaluated and released	No.	8					15	15	Annual	SOL3 C1 monitoring records	MAF team working on C1	Number of new varieties evaluated and released as improved varieties
Quantity of foundation maize seed produced	kg	xx										Weight of foundation maize seed produced this year
Quantity of foundation rice seed produced	kg	xx										Weight of foundation rice seed produced this year
Quantity of foundation peanut seed produced	kg	xx										Weight of foundation peanut seed produced this year

Intermediate Result – Component 2: **Seed production, storage and distribution**											
End of program outcome indicators	**Unit of Measure**	**Baseline**	**Cumulative Target Values**						**Frequency**	**Data Source/ Methodology**	**Responsibility for Data Collection**	**Description (indicator definition etc.)**
			2011	**2012**	**2013**	**2014**	**2015**	**2016**				
Total capacity of formal seed production centres (SPC)	Mt/year	99.6					175		Annual	SOL3 C2 monitoring records	MAF team working on C2	Total number of metric tons of formal seed SPCs capable of producing
SPC capacity to produce formal maize seed	Mt/year	32.5					100					Total number of metric tons of formal seed (by species) SPCs capable of producing
SPC capacity to produce formal rice seed	Mt/year	50.3					50					
SPC capacity to produce formal peanut seed	Mt/year	16.8					25					
SPC capacity to produce formal sweet potato cuttings seed	Cuttings/ year	43,435					600,000					
SPC capacity to produce formal cassava cuttings seed	Cuttings/ year	19,995					600,000					

Intermediate Result – Component 3: Informal seed production and distribution											
End of program outcome indicators	**Unit of Measure**	**Baseline**	**Cumulative Target Values**						**Frequency**	**Data Source/ Methodology**	**Responsibility for Data Collection**	**Description (indicator definition etc.)**
			2011	**2012**	**2013**	**2014**	**2015**	**2016**				
Number of community seed production groups producing surplus of quality seed for sale (includes CSPGs under MAF, SOL3 & NGOs)	No.	0	280	650	900	1,000	1,000	1,000	Annual	SOL3 C2 monitoring records	SOL team working on C3 and SEO and CSPG partners	Number of community seed production groups producing surplus of quality seed for sale
Total capacity of informal seed production groups (includes CSPGs under MAF, SOL3 & NGOs)	Mt/year	0										Capacity (in tons of seed per year) of community seed production groups to produce surplus of quality seed for sale
Total capacity of informal sweet potato and cassava production groups (includes CSPGs under MAF, SOL3 & NGOs)	Cuttings/ year	0										Capacity (in numbers of cuttings per year) of community seed production groups to produce quality sweet potato and cassava cuttings for sale

Intermediate Result – Component 4: Seed system management											
End of program outcome indicators	**Unit of Measure**	**Baseline**	**Cumulative Target Values**						**Frequency**	**Data Source/ Methodology**	**Responsibility for Data Collection**	**Description (indicator definition etc.)**
			2011	**2012**	**2013**	**2014**	**2015**	**2016**				
Budget allocation to MAF research and extension divisions	US$('000)	302,000		302,000					Annual	SOSEK and MAF	MAF and MOF	Annual budget allocation to MAF research and extension divisions
Agricultural research budget allocation as proportion of gross value of agricultural production	%	0.2%					0.5%		Annual	SOSEK and MAF	MAF and MOF	Annual budget allocation to MAF research and extension divisions / Agricultural GDP

Examples of charts to present results in output-to-purpose reporting