

SEED SYSTEM SECURITY ASSESSMENT

ESTUDU SISTEMA SEGURANSA FINI (ESSF)

TIMOR-LESTE

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Seeds of Life
Fini ba Moris



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This SSSA was strongly informed by an unusual amount of background documentation and verbal sharing of implementation experience. The MAF/Seeds of Life Project has completed (and is still effecting) an impressive amount of pioneering work in the areas of plant breeding, seed production, and livelihood analysis. The UN-FAO for its part, offered key insights on seed relief analysis and possible response. In terms market value chains, the generous sharing of data and reflections from the new Market Development Facility was greatly appreciated. Further, Mercy Corps and CRS have a strong track record with seed storage work and novel kiosk variety delivery/sale experiments.

In field itself, the insights of diverse and many people shaped this seed system security assessment. Men and women farmers, government ministry personnel, crop and livelihood specialists, local seed producers, agro-dealers, traders, agro-enterprise entrepreneurs, humanitarian relief personnel, (and others) provided information, offered critique of practice and, often, pointed a clear way forward. Thanks to all for providing extensive reflections and helping to sharpen the results.

Finally, we do aim for this assessment to lead to practical action in the short and medium-term. There have been important, positive, seed system developments in Timor Leste within the last decade. This assessment aims to catalyze further positive developments and to broaden and strengthen seed availability, seed access and seed quality for all Timor-Leste farmers.

Acronymns

ACIAR	Australian Centre for International Agricultural Research
AusAID	Australian Agency for International Development
CIAT	International Center for Tropical Agriculture
CSPG	Community seed producer group
CRS	Catholic Relief Services
DiNER	Diversity in Nutrition for Environmental Resilience (i.e. type of aid fair)
DSD	Direct Seed Distribution
ESS	Effective Seed Storage
ESSF	Estudio Sistema Seguransa Fini (Timorese for SSSA)
HH	Household
ICM	Integrated Crop Management
MAF	Ministry of Agriculture and Fisheries
NGO	Non-governmental organization
FAO	Food and Agriculture Organization (also UN-FAO)
G	grams
GoTL	Government of Democratic Republic of Timor-Leste
Kg	Kilos
MT	Metric Tons
OPV	Open Pollinated Varieties
SISCA	Servisu Integradu da Saúde Communitária (Integrated Community Health Services)
SoL	Seeds of Life (Fini ba Moris)
SPO	Seed production officer
SSSA	Seed System Security Assessment
SVF	Seed Vouchers and Fairs

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EXECUTIVE SUMMARY

A Seed System Security Assessment (SSSA) was carried out in Timor-Leste in October 2013 just before planting time for the main agricultural season. It reviewed the functioning of the seed systems farmers' use, both formal and informal, and assessed whether farmers could access seed of adequate quantity and quality in the short and medium term. The work covered three Districts, Alieu, Baucau and Ainaro, chosen as they represent contrasting ecologies and are key areas where partners have ongoing implementation programs.

The rationale for conducting the SSSA in Timor-Leste was four-fold:

- Substantial progress has been made in seed system development over the last decade, spurred especially by the Ministry of Agricultural and Fisheries (MAF) and the Seeds of Life Project (funded by AusAID and ACIAR). Other newer investments, by OFDA/USAID and others, mean that significant work has been unfolding in the general areas of planting breeding, seed production, and seed storage (etc.). The SSSA aimed to catalyse this seed security work even further, focusing on gap knowledge and identifying novel areas for action.
- There have been repeated seed aid programs particularly in Timor-Leste fairly regularly since post-independence. These emergency practices, and the assumptions guiding them, were deemed in need of review.
- Ongoing climatic disturbances as well as high malnutrition rates suggested seed security strategy vision and action could have a more central place in combatting chronic stresses. System resilience, nutritional additions and crop-related developmental opportunities were among the themes to be explored.
- Finally, the work took place to build assessment capacity. Seed security assessment tools are linked to food security assessments, but are also quite distinct. The *Seed System Security Assessment (SSSA) Timor-Leste* was designed to give honed technical insight and to train professionals in fast-evolving seed security assessment and intervention design methods.

For a better understanding of the dynamics of seed security in Timor-Leste, Catholic Relief Services, Mercy Crops, MAF/Seeds of Life, CARE, the UN-FAO, The International Center for Tropical Agriculture, and the University of East Anglia/Dev all joined together to conduct this assessment.

Key findings are summarized below, grouped into short-term findings (***Acute seed security findings, 2012-14***) and longer term ones (***Chronic seed security findings and emerging opportunities.***) A set of 20 ***Recommendations for action*** follows.

FINDINGS

Summary: Acute Seed Security Findings: 2012-14

1. This assessment revealed no significant acute seed security stresses. Sowing rates were stable for the 2012-13 season (varying across sites from -1.4 to + 0.3%) with projections of sowing increases for the 2013-14 season (+3.74%). Yields, across crops, were also assessed as generally 'good' or 'average' (90% cases).
2. Among the minority of households indicating a reduction in sowing amounts for the 2012-13 and 2013-14 seasons, labor constraints were cited as the driving factor (over 1/3 of reasons for both seasons). Lack of money and poor weather also figured important in about 10% of cases. A positive development was the fourth major factor cited: use of less seed due to better integrated crop management (ICM on rice,). Lack of cash particularly affects sowing rates for purchased seed such as common bean. Note that 'lack of seed' (i.e. non-availability) was not highlighted — except in a small number of cases associated with cassava cuttings.
3. For those 'sowing more than usual', 'having access to more land' and 'getting new varieties' were important positive factors.
4. Overall, over 90% of the seed farmers sowed came from local channels, including from farmers' own stocks, the local market, or through social networks of neighbours, friends and relatives. This suggests the importance of informal seed systems as the core seed sources. Farmers' own stocks were, by far, the main source of seed, supplying 71.8% of total seed sown.
5. The local seed/grain markets were the second major source for seed. Across crops, these markets provided 12% of the seed. Local seed/grain markets proved particularly important for the legumes (supplying 15-50% of the seed of peanut, common bean, long beans, mung beans and black beans). Support of this seed channel might be key for those interested in supporting nutrition.

Can the markets deliver seed for 2013-14?

6. Agro-dealer outlets and networks are just starting to function in Timor-Leste and, during the assessment periods supplied <1% of the seed sown (and only of maize and vegetable seed). Likewise, kiosks- that is, general goods stores also selling agro-input supplies, were just being catalyzed 2012-14.
7. Local seed/grain markets, important for legume seed, were functioning at normal levels of quantity and quality, as assessed by a large group of traders (N=62). Mapping of actual supplies and potential seed flows indicated there would be no availability problem.
8. Linked to #6, seed flows from one region to another are so extensive that lacks in any one area, are likely to be compensated by incoming supplies from another (for instance, moving bean seed from Baucau to Alieu). Any seed security district-level

plans might practically project for inter-district flows rather than (falsely) assume 'self-sufficiency' within any one District entity.

9. The wide availability of vegetable seed, sold in packets, was an unexpected finding. Packaged vegetable seed is being sold in open markets, general stores, and even in hardware and motorcycle supply stores. Demand is rising and sellers are responding by putting on offer variability (e.g. in a single store, 16 different types of seed, a greater range than in the formal agro-dealer enterprises).
10. The vegetable seed phenomenon flags some concerns. Packet information was often printed in 'foreign languages', that is not Tetum or English. Farmers could not interpret the expiry date or make informed choices around management requirements. Also, it is not clear if the crops/varieties would actually be adapted to specific Timor-Leste regional agro-ecological conditions, or if they had even been tested in country. Third, an unknown supplier cannot be held accountable for the quality of planting material.

Can farmers afford to buy supplies available?

11. Expenses slated for seed purchase seem relatively modest and affordable for most farmers. The sums needed per farmer roughly fell between \$US 9 and \$18 for 2012-13 and \$11-\$19 for 2013-14. The cash needs were markedly higher for Baucau due to the emphasis on common beans (where seed is routinely purchased on local markets). Of more general note is that farmers *do* buy seed.

Communities' assessment of seed security

12. The communities themselves deemed their members as 100% seed secure for the 2013-14 season. Seed security was defined as having the seed in hand or being able to access seed for the major crops

Hence, the 2012-13 season was a stable if not promising one. There are some seed system stresses, but are chronic ones, rather short-term constraints.

Summary: Chronic Seed Security Findings + Emerging Opportunities

The review of longer-term trends in seed security in Timor-Leste showed both positive moves forward as well as ongoing bottlenecks.

1. There has been modest dynamism in seed channels. The catalyzing of agro-dealers networks and kiosks to sell certified seed are notable steps. The blossoming of the informal vegetable seed sector shows strong demand and quick informal seed sector response.

2. There is important crop diversification with communities, although few crops are transformed beyond local domestic use. Also of concern is the degree to which legumes and vegetables are targeted for sale, rather than home consumption. This may have important negative ramifications for household nutrition.
3. Overall, 43% of farmers in the SSSA sample indicate they had accessed a new variety within the last five years, which seems a relatively promising figure. However, upon closer look, access to new varieties is quite constrained: About 85% of the new entries were either of maize or rice with few farmers accessing a new variety of key legumes.
4. The lion's share of accessions (> 95%) has been obtained free (through government or NGO/FAOs). Few sustainable channels can supply farmers with an array of new varieties on a continuing basis.
5. Decentralized seed multiplication initiatives are growing: In 2012/13, 681 Community seed producer groups (CSPGs) covered 135 of 442 sucos in the country. In 2013/14, MAF/SoL has plans to expand CSPGs from 681 to 1200, covering 370 sucos, excluding urban ones. The scale of operation is impressive. This model of production might now be reviewed for its sustainability and for its ability to move new varieties quickly and widely.
6. Increased attention to cassava and sweet potato will be required to move the planting material of these vegetatively-propagated crops. Efforts are being catalyzed for sweet potato vine production. Cassava planting material presents a next major challenge.
7. Manure/compost are used by about ½ the population and pesticide/foliar sprays by ¼ of households. Other inputs are used at only modest levels (e.g. mineral fertilizer, storage chemicals).
8. Storage loss raises among the more marked constraints. The large majority of farmers, 86.3%, reported average losses of over a third of their stocks, across a range of crops. In response, very few farmers (4%) applied protective chemicals to halt especially bruchid damage.
9. To help combat such storage losses, the rise in use of storage drums has been a positive development. By February 2013, 3378 rural farmers had accessed seed storage units, with 1,041 paying full price (an average cost of \$US 27.60). Attention to a market based approach, with local blacksmiths producing the drums, holds promise for this innovation to be both profitable and sustainable.
10. In terms of male-headed versus female-headed households, three statistically-significant trends were noted revolving around seed security: Female-headed HH tend to have smaller family sizes and small field sizes. They also used compost and manure less frequently than male-headed HH. Important is that there seemed no major differences in terms of access to new varieties and seed aid.

Having summarized the findings, we now move to Recommendations for Action. Each constraint (and opportunity) will require a focused set of initiatives.

RECOMMENDATIONS

The opportunity to conduct assessments in distinct sites provided the field teams a useful perspective on seed security in select regions of Timor-Leste.

Below, we put forward a set of recommendations that is applicable across sites. All can be moved forward in the short to medium term: 1-5 seasons. Of special note is that the SSSA teams identified no problems in the assessed zones that might be labeled as ‘emergency ones’. All constraints require actions linked to chronic stress and developmental opportunities.

The recommendations below are clustered into distinct sections. These include: a) seed system actions linked to addressing chronic stress and developmental possibilities; b) emergency response and seed system security assessment; and c) broader seed security goals and vision for Timor-Leste.

Overall, substantial progress has been made in Timor-Leste over the last decade in developing systems that strengthen seed security for smallholder farmers. Recommendations below are put forward to stimulate further these positive processes.

I. **Seed-linked responses linked to chronic stress + development concerns.**

Practical recommendations are made here in the following domains: decentralized seed production, variety delivery systems, seed storage improvements and information systems for helping farmers make informed choices

Decentralized seed production

Decentralized seed production needs to become a strategic and effective force in serving smallholder farmers: the formal seed sector alone will never be able to handle a) the range of crops needed for diverse agro-ecological zones; nor b) the range of varieties. At this point, the seed multiplication initiatives in Timor-Leste are new and seem to be having modest impacts among farmers. They are being propped up by institutional buyers rather than from demand of smallholder farmer clients. At this point, they are also operating at small scale and focus on a handful of crops and varieties. Sustainable decentralized seed production models need to be confirmed that can operate at scale.

1. **Cost-effectiveness seed production models.** The cost-effectiveness of existing seed production models need to be carefully assessed, examining separately the organization of certified production, registered commercial seed producers and community seed producer groups (CSPGs). (What are the costs of maintaining these groups? At what scale can they feasibly operate? What is the cost of seed being produced?)
2. **Developing ongoing links among diverse segments of seed chain.** Ongoing links should be further catalyzed between a) the registered commercial growers and the CSPGs and b) between the registered growers and the *Loja Agrikultura* (Agriculture input shops). For

moving new varieties (rather than certified seed), links between the CSPGs and local seed/grain traders might also be promoted.

3. **Maintenance of seed producer/institutional inventory.** The countrywide seed producer inventories initially amassed for the SSSA might be usefully maintained to ensure that producers can be more efficiently linked with buyers, at varied scales. In this vein, information available with MAF in Dili needs to be shared systematically out to the Districts. Feedback mechanisms also have to allow District local authorities to routinely add information to Ministry level databases.
4. **Merging /paring down CSPGs.** The community seed producer group model, in particular, might be honed to focus on the few more effective producers who can serve many (rather than a widespread diluted network). Linked to this concentration, the CSPG's might logically move to marketing seed, so as to become self-sustaining.
5. **Training CSPGs in enterprise skills.** In addition to seed production training, CSPG's will require capacity building in agro-enterprise and marketing skills. These groups need to develop realistic business plans. They might be better geared to serving a large smallholder client base (rather than focus on a set of institutional aid buyers). Possible links to select agro-enterprises might also be analyzed.
6. **Modeling of options for moving varieties fast and widely.** Ultimately, the goal of much of the seed production work is to move the new varieties being evaluated by MAF/Sol. Different options should be modeled to do this quickly and efficiently—recognizing that a good number of crops and varieties need soon to be in diffusion. For instance, would the sale of 50,000 small packs of certified seed (in 25g sizes) be a quicker way to get new germplasm out than assuming diffusion through CSPGs (and relying on farmer-to-farmer gift or exchange)?

Variety Delivery systems

Currently. Over 95% of new varieties are obtained by Timorese farmers through government and NGO aid, and free. This type of system creates a ethic of farmers dependency and undermines the development of more ongoing systems, based either formal or informal seed channels. Simply, giving away free seed, repeatedly (across crops and varieties) is bad practice. Further, as the Uma Ita Nia and vegetable packet experience show, Timorese farmers are willing to buy seed if it is available, accessible and of a quality that meets there needs.

Variety delivery systems need to move from a 'donor aid optic'—to market-oriented ones that can serve all farmers on an ongoing basis.

Across Crops

7. **Outlet channels expanded.** While the formal agro-dealer network (Loja Agrikultura) is slowly growing, it will never be able to reach deep into rural areas. Certified and truthfully labelled commercial seeds can be sold in additional ways: for example by

building on general good shops (the Mercy Corps, kiosk model), commissioning vendors at open markets, and selling seed through faith-based groups. These are but a few options to be tested for stimulating multiple variety delivery channels.

8. **Kiosk sale model- evaluation.** The Kiosk sale model heralds to be a particularly promising one as no new institutional infrastructure is required. Key here is to reinforce shopkeepers' capacity to a) keep seed viable; and b) pass on refined technical information along with the physical seed sale.
9. **Linking CSPGs to grain traders.** For non-certified seed of new varieties, to be sold as grain, CSPGs might best be specifically linked to seed/grain traders. Such traders need to be brought into the 'variety information circles (though field days? Organized visits in Districts?).
10. **Testing small seed size packaging.** The small pack model of sale, 50g, 100g, etc. has proven useful for making seed more accessible to farmers in many regions of the world. This packaging option might be tested in both the Loja Agrikultura and the kiosks.

Vegetable seed

The abundance of vegetable seed packets found in multiple venues outside of formal agro-dealers (Loja Agrikultura) proves to be a positive sign of demand. This phenomenon also flagged some concerns. Most of the packets had information printed in 'foreign languages'. Also, there was not always evidence that the crops/varieties on offer would be adapted to specific Timor-Leste regional agro-ecological conditions, or if they had even been tested in country.

As a way forward in promoting more transparent vegetable packet seed sale and use, several actions are proposed

11. **Organized vegetable seed screening.** The wealth of vegetable seed packet material (found in open markets, general goods shops) might be collected and systematically screened by researchers in on-station trials at diverse agro-ecologies and elevations.
12. **Translation of seed packet information into Tetum.** Seed Sector services should be leveraged to encourage that seed packet information is intelligible to smallholder farmers. Mechanisms for doing this need to be tested. Posters at suco offices? Via Radio? Labels added to seed packs?

Seed storage improvements

The seed storage work and particularly the development of storage bin enterprise, represent impressive achievements with a short three-year period. The scale of the task, however, is formidable given that farmers lose 1/3 of stored crops countrywide. Two additional areas are signaled for action.

13. **Seed/grain traders and storage- diagnostic.** To-date, the seed storage options have been focused at the farm household level. Traders, however, also report high storage losses, especially for maize and the legumes. Trader storage management concerns might require a novel diagnostic, especially as traders save in bulk quantities and may move potential seed cross considerable distances.

- 14. Farmers' management information needs on storage.** To-date, storage work has focused on the vessels for storage. Complementary emphasis needs to be put on management options and farmer knowledge: e.g. how to do better selection the field; varied types of drying strategies.

Information systems to help farmers make informed choices

As a final thrust in the area of addressing chronic stress and developmental actions, we make a general recommendation on developing farmer-oriented information systems. Simply, Timorese are eager for new knowledge in a large range of areas. As one example, focusing on new varieties, they seek information on: a) what range of varieties might be available; b) what their suitability is for different types of stresses; c) how farmers can access these; d) how farmers can quickly share information with others.

- 15. Farmer-oriented information systems on technical options.** Substantial and explicit efforts need to be devoted to developing farmer-oriented novel information systems. Primary conduits signaled during the assessment included: rural radio, schools, Lafaek Magazine, SISCA, and 'social events in the evenings'. Certainly, there may be others.

II. Emergency Seed aid + Seed Security Assessments

The SSSA teams also reviewed actions related to acute or emergency responses. While no 'emergency' was ongoing, past practice and programs gave cause for reflection.

Seed aid frequency and targeting

- 16. Repetitive seed aid and programmed review.** Emergency seed aid is becoming repetitive (and farmer dependency was particularly noted in Ainaro). In zones where emergency seed aid has been implemented three seasons in a row, decision-makers (donors, GoTL, NGOs and other humanitarian partners) should program a formal review so as to determine the necessity of the aid. Also, repeated distribution over multiply years to the same groups should be closely scrutinized.

- 17. Better coordination seed security actors- District Committee?** Those involved in the SSSA lamented 'poor coordination between the government and NGOs on a range of seed-linked issues'. Seed security groups might be catalyzed by MAF, especially giving focus to District-level complementary field activities.

Seed aid responses

- 18. Testing range of seed aid responses.** Seed assistance in Timor-Leste in crisis periods unfolds around a single response: 'Direct seed distribution'. This response gives farmers no choice in deciding which crops and varieties might be needed; it assumes seed is not available in a region; it also is currently being affected only with maize and rice (as these

are crops for which certified seed is available in bulk). Depending on the problem encountered, alternative aid responses might be tested which address other seed security problems (e.g. farmers having problems with seed access).

- Voucher models might be tested in Timor-Leste, with and without accompanying fairs. This needs to be done in ways which do not encourage further dependency and which promote farmer choice
- Vouchers might be better used to link those in need (i.e. vulnerable households) to those who provide seed commercially (at Loja Agrikukturas; CSPGs).
- Voucher models might be tested to address problems of 'labor shortage'. Note that this would be high exploratory work and would have to be monitored closely.

Seed system security assessment

Need assessments in Timor-Leste inevitably conclude that 'seed is needed' and advise that the response should be a direct seed distribution- and with maize and rice. While perhaps innovative at their inception (as they distinguished seed aid need from food aid need), such assessments now need to be sharpened. Worldwide, understanding of what happens to seed systems during disaster has become markedly more refined in the ten years: experience shows that *distinguishing among seed security constraints is key for recovery*. In Timor-Leste seed security assessment methods might usefully be revamped.

19. **Seed security methods and processes.** National and regional formats for assessing seed security status should shift from those which calculate simplistic 'seed needs' to frameworks which recognize different types of seed security problems, and which tailor responses accordingly. These problems might include diverse constraints of seed availability, seed access and seed quality, which are distinguished by their presence in the short and in the long term.

- Linked to this general shift, seed security assessment capacity needs to be built at regional and local levels. Technical tools already exist to help NGO and government agricultural officials move forward on seed security assessments.
- More generally, a political environment for 'real seed security assessment' has to be established. This is no easy task. *Technical advances in methods alone will not lead to more accurate assessments. Political leaders need to spearhead the change).*

III. Seed security goals and vision

We end this section on needs for implementation with a 'higher level' recommendation. There is a need for review and basic reflection on the overall seed security strategy that shapes actions on the ground.

20. **Sharpening goals of seed security vision.** Seed security vision in Timor Leste has been shaped largely around visions of moving towards food security, particularly in the staple

foods. Realities on the ground suggest that this 'brute seed security for food security' vision could be usefully broadened.

Seed Security for Nutrition

High stunting and malnutrition rates in Timor-Leste suggest that '**Seed Security for Nutritional Security**' is one avenue that needs to be promoted much more aggressively. In practice, this might mean such actions as (*inter alia*):

- Testing and promoting a large range of legumes;
- Linking voucher use to 'nutritional' agricultural options (as is done in the 'DiNERS'-fair for Diversity, Nutrition, and Environmental Resilience');
- Promoting production of nutrient-dense foods.

Much has been written on nutrition and agriculture in Timor Leste (e.g. Fanzo, 2013) We need not repeat the multiple suggestions for quite detailed programming. Simply, seed security actions might be pragmatically tied to enhancing better nutritional outcomes. This will not happen 'naturally': it needs to be programmed in deliberate, smart ways.

Seed Security for Resilience

The abundant and repeated nature of climatic stresses, (drought, flood, typhoons) suggests that seed systems have to be designed to built greater resilience. '**Seed security for Resilience**' will take many forms. Attributes/actions , *inter alia*.

- *Widen **portfolio of crops** on offer (speed process up?)*
- *Screen **local as well as improved varieties** for 'best bets'*
- *Develop/identify **varieties tolerant to stress** (flood, drought, wind, pests)*
- ***Identify ongoing and diverse delivery channels***
- ***(Focused) Information:** suitability, sourcing, options to address constraint*
- ***Choice:** farmers need room to strategize in stress periods*

Again, there is a growing literature on seed security and resilience and detailed information can be found elsewhere (e.g. McGuire and Sperling 2013) . Here we emphasize that a resilience-perspective will demand a re-thinking of a range of seed security actions.

Overall, there has been great progress in strengthening seed systems in the last decade. These 20 recommendations aim to catalyze even further positive changes geared to meet the needs of Timorese farmers.

I. INTRODUCTION

Rationale for Report

A Seed System Security Assessment (SSSA) was carried out in Timor-Leste in October 2013 just before planting time for the main agricultural season. It reviewed the functioning of the seed systems farmers' use, both formal and informal, and assessed whether farmers could access seed of adequate quantity and quality in the short and medium term. The work covered three Districts, Alieu, Baucau and Ainaro, chosen as they represent contrasting ecologies and are key areas where partners have ongoing implementation programs.

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- There have been repeated seed aid programs particularly in Timor-Leste fairly regularly since post-independence. These emergency practices, and the assumptions guiding them, were deemed in need of review.
- Ongoing climatic disturbances as well as high malnutrition rates suggested seed security strategy vision and action could have a more central place in combatting chronic stresses. System resilience, nutritional additions and crop-related developmental opportunities were among the themes to be explored.
- Finally, the work took place to build assessment capacity. Seed security assessment tools are linked to food security assessments, but are also quite distinct. The *Seed System Security Assessment (SSSA) Timor-Leste* was designed to give honed technical insight and to train professionals in fast-evolving seed security assessment and intervention design methods.

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Aims and Structure of Report

The report presents the results of the SSSA in Timor Leste October 2013. It presents the findings on seed security across the three districts, Alieu, Baucau and Ainaro.

In terms of report structure, Chapter II briefly describes the context with Chapter III introducing the SSSA methodology used in the October assessment, including the rationale for the choice of sites. Of special interest is that all fieldwork tools were translated in the local Tetum language. Chapter IV provides a brief background to the Timor-Leste breeding program as well as the formal and informal seed sector.

Chapter V presents the main field findings, divided by seed security issues in the acute phase (2012-14) and then homing in on medium and longer-term , chronic stresses and emerging opportunities.

Chapter VI presents the Recommendations for action across sites, followed by references (Chapter VII).

Annexes post site-by site action plans and give a glimpse into the type of tailored strategies needed to have impact in diverse farming areas (Annex I). The household site- specific data tables are presented in Annex II.

This is not an academic report: the fieldwork has been completed in a relatively short time to allow for planning of a forthcoming agricultural season, starting with sowing in November 2013. Having said this, the assessment has aimed for considerable rigor: including use of multiple methods, triangulation of results (with quantitative and qualitative data), and fieldwork encompassing important sample sizes.

II. THE CONTEXT (A SNAPSHOT)

Political overview

Timor-Leste's population is approximately 1.2 million is one of the youngest in the world, with over 70% of the population below 30 years of age. The country is largely agricultural, with 80% employed in agriculture, though the majority of foreign earnings come presently from oil. The country is a democratic republic, whose administration is divided among 13 Districts (World Bank, 2014; CIA, 2012).

Timor-Leste is the world's second-newest state, re-gaining its independence in 2002. Indonesia had annexed the territory in 1975, but relinquished control following the United Nations-sponsored act of self-determination in 1999. In that year more than two-thirds of its infrastructure was destroyed and much of its administrative capacity returned to Indonesia. Like many post-conflict states, Timor-Leste has experienced bouts of conflict or instability - on average every two years since the independence vote in 1999.

Since 2008, Timor-Leste has experienced a period of stability. The Government has made efforts to resolve some of the issues arising from unrest which occurred in 2006, through cash transfers to internally displaced people and veterans and through international assistance with security. The Government has now explicitly shifted its focus from stabilization to what it terms 'growth and development for all' (AusAID, 2009).

Economic trends

Timor-Leste is one of the poorest countries in the world, ranking 162nd out of 182 countries in the United Nations Human Development Index. Poverty has increased since 2001: around half the population now lives below the poverty line of USD 0.88 per day (World Bank, 2008). The MDGs are unlikely to be met by 2015 although progress is being made in primary education and gender equality in education (UNDP, 2009)

Timor-Leste is almost entirely dependent on oil and gas revenue with 90 per cent of its income coming from this sector. Far-sighted policy makers established a Petroleum Fund which has protected much of this revenue through a conservative offshore investment strategy. The country retains sufficient capital to generate an income from which the Government can derive the majority of its operating resources.

A key policy challenge for the Government concerns management of oil funds and translating this into services and longer-term investment. The non-oil private sector still needs development, and Dutch-disease effects of oil have contributed to high wages (e.g. \$5 a day, compared to roughly \$2 a day in West Timor; World Bank, 2014). A challenge for Timor-Leste is to diversify its economy away from oil, and to nurture a dynamic private sector, away from dependence on public spending. Additionally, the regulatory environment in Timor-Leste make it one of the most challenging countries in which to conduct business, according to the Ease of Doing Business report (World Bank, 2014a).

Agricultural trends

The agriculture sector employs 80% of the active population. Oxfam Australia found that food insecurity in some districts affected 80 percent of households. Over two thirds of the poor's spending went on food, making them susceptible to food price rises and shortages (World Bank, 2010). Most farming families suffer from food insecurity producing insufficient cereal staples of maize and/or rice to last a full 12 months. In most farming households, the maize deficit period can range from 1 to 9 months and households are required to purchase maize or rice or rely on foraging from the natural vegetation (SOSEK, 2007). To address this deficit rice imports of around 100,000 t yr⁻¹ are required. Timor-Leste faces 'extremely alarming' levels of hunger, with high percentages of underweight children (IFPRI, 2013) and high levels of micro-nutrient deficiency (Fanzo, 2013)

A typical farming household in Timor-Leste is unable to derive a wide diversity of food crops and animals. Agriculturally this mountainous country lies midway between the Javanese rice culture and the Melanesian root-based culture. With features from both directions, its staple foods are the grains maize and rice and the root crops – sweet potato and cassava, peanut, and various vegetables, fruits, spices and tree crops.

Maize and other rainfed crops are usually grown in mixtures in homestead plots or in "slash and burn" fields, often on sloping land, this is usually using farmer recycled seed and no inputs of chemical fertilizer or pesticide. Crops are usually grown without even organic manure, with crop nutrition being reliant on recycling of crop residues or natural vegetation and weeds. Yields are low with national averages of 2.2 t ha⁻¹, while world averages are around 5 t ha⁻¹. Last year maize is estimated to have been cultivated on about 37,000 ha and produced 80,000 t yr⁻¹. Further to the problem of low maize yields and production, there are considerable storage losses of maize, mainly attributable to maize weevil (*Sitophilus zeamais*) (Seeds of Life, 2014).

Considering the sustained and increasing yield gap with neighboring countries, there appears to be considerable scope for increasing maize and other crop yields in East Timor (da Costa, *et al.*, 2013).

Seed Aid

Scale of seed aid

Seed aid has been a routine feature in Timor-Leste agricultural support. Governmental support has most routinely given maize and rice (Box 1)

Box 1. Scale of Seed Aid in Timor Leste - per year

<i>Govt</i>	<i>200 MT maize</i> <i>100 MT rice</i>
<i>NGOS</i>	<i>10-15 MT Maize</i> <i>7-10 MT rice</i>

* source: government contract reviews

There were multiple critiques about such routine seed aid heard during the SSSA: Simply, the consensus is that repeated aid is creating farmer dependency and is damaging the emergence of commercial seed enterprise.

Among the concrete actions recommended were the following (see Chapter VI: Recommendations):

1. Seed aid/distribution has to be based on assessed seed security needs;
2. Seed actors should move to more targeted seed distribution (vulnerable HH's, emergency cases, etc.);
3. Repeated seed aid distribution over multiple years to same HH's/groups should be avoided
4. Implementers should increasingly use a voucher systems to match those who need seed (i.e. vulnerable households) to those who provide seed commercially (i.e. seed producer groups)
5. The feasibility of using a range of voucher models to be linked to seed assistance might be more thoroughly explored in the Timor-Leste context. Vouchers can be used along or can be explicitly linked with seed fairs. Overall, the aid process needs to be done in a way that does not further create dependency and that increases choices for farmer beneficiaries.

Assessing seed security needs

The process for assessing seed security needs among Timorese populations might further refinement. The explicit SSSA in October 2013 was a positive step forward.

In the past few years, multiple ministries have their own formats for assessing needs, many of which are linked to seed-related response. Hence the Ministry of Health and Ministry of Agriculture and Fisheries (through District Directors, MAF), all have distinct formats that are not necessary cross-checked or coordinated. At the time of the SSSA, there were moves underway for more coordinated actions (UN-FAO advisor, *per. communication* October 2013).

As a general trend, seeds are being given every year with such seed coming from abroad, especially from Indonesia. While amounts calculated as needed are relatively constant (see Box 1), several assumptions guide them: the overall figures of the land areas farmers cultivate and , then, estimates particularly of areas affected by stress (landslides or flooding). As a prerequisite for refining seed assistance calculation, two issues were highlighted as fundamental. First, the actual areas under cultivation need to be reviewed. The current land area estimates draw from a 1992 agricultural census, which needs to be updated. A new manual for better measuring crop cuttings, under preparation in October 2013, could contribute to refining this agricultural land assessment. Second, the new seed policy stipulates that only certified seed can be used in aid delivery. The advantages of delivering some of the best local varieties might merit further consideration. (Note that many countries elsewhere have flexibility in this clause of certified seed when they are considering emergency programs).

Adopting some better practice principles: seed relief

In the broader humanitarian world, there have been substantial advances in the last 5-10 years, which might be used as tools to partly inform Timor-Leste practice.

In 2004, the UN Food and Agricultural Organization and its member states adopted a set of nine broader ‘principles for guiding seed relief’ (Box 2) . Key is that a seed system security assessment is always needed and that the response has to match the problem encountered. For instance, the problem might be that little seed is not available in a region--- so seed has to be brought in. However, the problem might be different: Perhaps farmers do not have the funds or means to get seed that is found in the local area. Here, a response would help farmers get access- by giving them vouchers or cash or helping with barter arrangements. Also, the UN-FAO guidelines clearly indicated that response should build on an understanding of all the seed systems farmers use: informal as well as formal. Seed interventions should facilitate farmers’ choices of crops and varieties, so as to allow them to strategize, even during stress periods.

Box 2. UN- FAO: Guiding principles for seed relief

1. A needs assessment should underpin any decisions to undertake seed relief and guide the choice among possible interventions. This needs assessment should be holistic, putting seed security in the context of livelihood security.
2. Seed relief interventions have to be clearly matched to the context (for example, a crisis caused by drought may require very different actions from a crisis caused by war). By supporting food production, seed relief should decrease dependence on repeated food aid.
3. Seed relief activities should aim both (i) to be effective with the immediate objective of facilitating access to appropriate planting material; and (ii) to contribute to the restoration, rehabilitation or improvement of agricultural systems in the longer term.
4. Ideally, considerations of seed system sustainability should be built into seed interventions from the beginning. As a minimum, seed aid should do no harm to farming systems. Thus, emergency relief activities should support local seed system development, ideally by integrating long-term needs into the design of the project.
5. Seed relief activities should be built upon a solid understanding of all the seed systems farmers use and the role they have in supporting livelihoods. The local system is usually more important to farmers’ seed security and has been shown to be quite resilient. Depending on the context, the focus in an emergency should normally be on keeping the local seed system operational. One practical problem is that seed systems are often not sufficiently understood, especially in emergency situations. Hence, there is a need for more emphasis on understanding seed systems, their role in supporting livelihoods, and needs assessment.
6. Seed relief interventions should facilitate farmers' choices of crops and varieties. Seed relief interventions should aim to improve, or at least maintain, seed quality and to facilitate access to crops and varieties that are adapted to environmental conditions and farmers’ needs, including nutritional needs.
7. Monitoring and evaluation should be built into all seed relief interventions, to facilitate learning by doing and thereby to improve interventions.
8. An information system should be put in place to improve institutional learning and to function as a repository of information gained from cumulative experience. Such information systems should be institutionalized at national levels, to the greatest extent possible.
9. A strategy to move from the acute emergency response to a capacity building or development phase should be included in the design of the intervention.

These guiding principles were endorsed by the FAO Emergency Coordination Group (Rome, 20 June 2003), based on the recommendations of a stakeholders’ workshop “Improving the Effectiveness and Sustainability of Seed Relief” (Rome, 26–28 May 2003). The initial draft was prepared by the FAO seed relief discussion group.

A range of concrete practical guidance for seed-related interventions has also become more widely available in the last 10 years (and exists, in English, Portuguese and French versions) (<http://seedssystem.org/aid-response-advice/>).

Advice to guide implementation is available on topics such as: a) should one introduce new varieties in stress periods (Box 3); or how can markets be bolstered during emergency responses and c) what kind of evaluations might be used to understand better aid effectiveness.

Box 3. Introducing new varieties in crisis periods? Advice on reducing risks and maximizing gains

Regardless of the potential for improving smallholder productivity through the introduction of new varieties, it is important to start by questioning the legitimacy of such introductions during crises. In periods of emergency and prolonged stress, small farmers are already at levels of increased risk. They are generally poorer, having lost household assets, livestock or crops in the field, and they cannot afford to waste any land or labor, which may already be scarce. Further, they need to have some confidence that the next planting season will yield better than the present, stressed one.

Outside aid, minimally, should put on offer products or processes at least as good as those already in farmers' hands. While formal sector varieties are referred to as 'improved' and the quality of the seed is certified, these varieties sometimes yield poorly in smallholder cropping systems. They may not be adapted to the local agro-ecological conditions or farmers may not possess the management inputs (for example, fertilizers and pesticides) crucial for their growth. So an 'improved' variety does not mean that performance is guaranteed.

If new variety introduction is being considered during a period of stress, a number of well-defined steps might best be followed:

1. Work with farm communities and other informed personnel to choose possible new varieties.
Is there sufficient prior evidence that varieties:
 - Are adapted to the specific agro-ecological zones?
 - Meet farmers' acceptability criteria (harvest + postharvest for subsistence + market use)?
 - Can be successfully used under farmers' own management conditions (e.g. without fertilizer)?
2. Design introductions so as to minimize risk and maximize farmers' informed choice.
 - Offer 'test size' packets: introductions should be small-scale.
 - Give farmers choices: to use the variety or not. And if possible, put several varieties on offer.
 - Provide sufficient accompanying information to allow farmers to make variety choices and management decisions (planting time, levels of input use, crop associations).
3. Build in explicit monitoring and evaluation of new varieties: are they performing? For whom? Where?
4. Count on a multi-year process.
 - Can the new introductions be successfully integrated into stressed farming systems?
 - If yes, is further fine-tuning needed?

(Source: Sperling *et al.*, 2006)

Finally, in terms aid, it is useful to remember that free aid might not always results in positive advances. Bringing discussion ‘close to Timor-Leste home’, Box 4 shares initial field observations on tractor aid in the region of Ainaro, 2013. Simply, the aid seems not to be addressing some of the basic constraints farmers seem to be facing.

Sharpening emergency aid and sharpening seed security more generally were the driving reasons for conducting this Seed System Security Assessment (SSSA) in Timor-Leste, October 2013.

Box 4. Free inputs do not guarantee productivity – take TRACTORS!

Timor-Leste sought to boost national production by making tractors more available, and accessible, to small farmers. Starting around 2010, Timor-Leste invested heavily in tractors, with MAF purchasing over 300 large tractors and over 2000 small hand tractors for District MAF offices, which in turn provided them to farmers (da Costa *et al.* 2013). Large tractors were initially provided free to individuals or groups upon request, but later with a small user fees (e.g. \$5 + fuel and food for the driver). Though some farmer groups have benefited from better access to tractors, there is no evidence that national production has increased as a result. Timor-Leste’s experience of tractors is hardly unique (Binswanger and Pingali, 1988): there are key problems with using free tractors to drive production increases. This suggests important lessons as well for free seed.

Problem one: sustainability. Maintenance costs were not adequately budgeted, and as (nearly) free gifts there was less attention to developing incentives or institutions for supporting this locally. Thus, of the 12 large tractors supplied to Aileu District, only 2 were working at the time of SSSA ; for Ainaro District, only 3 of 15 were working.

Problem two: the input does not address a key constraint. As farmers in Cassa noted, there is not point expanding areas planted to rice if they don’t have the labor to weed it later. Farmers may also not wish to expand areas to rice without better prices in the markets.

Problem three: narrow scope of application. Tractors are useful for field crops in flat areas, such as wet rice, but less effective on steep slopes, or for crops important to nutrition, such as legumes.



This story shows some clear parallels with seed. Free seed weakens sustainability by slowing the development of real farmer-oriented supply systems. It may not address a key constraint (often labor, land or cash – **not** seed availability in Timor-Leste). And the focus is often narrow – usually just maize and rice – meaning other farming systems and crops are neglected. The large-scale free distribution of inputs – whether tractors or seed – is rarely a shortcut to greater productivity.

III. BACKGROUND TO SEED SYSTEM SECURITY ASSESSMENT

This chapter presents the necessary background to interpret this SSSA. It introduces the concept of seed security and the different types of seed aid approaches that might be matched to diverse seed security problems (and opportunities) encountered on the ground.¹ Methods used in the October 2013 assessment are then presented.

The Concept of Seed Security

Farm families are seed secure when they have access to seed (and other planting material) of adequate quantity, acceptable quality, and in time for planting. Seed security is best framed within the broader context of food and livelihood security. Helping farmers to obtain the planting materials they need enables them to produce for their own consumption and sale.

Achieving seed security is quite different from attaining food security, despite their obvious links. One can have enough seed to sow a plot but lack sufficient food to eat, for example during the 'hungry season' prior to harvest. Conversely, a household can have adequate food but lack access to appropriate seed for planting. Despite these important differences between food and seed security, determinations of seed security are normally based, implicitly or explicitly, on food security assessments. This results from a lack of understanding of seed security issues.

The Dimensions of Seed Security: a Framework

The concept of seed security embodies several fundamental aspects. Differentiating among these is crucial for promoting those features that foster seed security as well as for anticipating the ways in which such security might be threatened. Table 2.1 outlines the fundamental elements of seed security: seed has to be available, farmers need to have the means to access it, and the seed quality must be sufficient to promote good production.

Table 2.1: Seed security framework, basic elements

Parameter	Seed Security
<i>Availability</i>	Sufficient quantity of seed of adapted crops is within reasonable proximity and in time for critical sowing periods.
<i>Access</i>	People have adequate income or other resources to purchase or barter for appropriate seeds.
<i>Quality</i>	Seed is of acceptable quality: <ul style="list-style-type: none">• 'healthy' (physical, physiological and sanitary quality)• adapted and farmer-acceptable varieties

Source: Remington *et al.* 2002.

Availability is defined narrowly as whether a sufficient quantity of seed of target crops is present within reasonable proximity (spatial availability) and in time for critical sowing

¹ This section draws on Sperling *et al.*, 2008.

periods (temporal availability). It is essentially a geographically based parameter, and so is independent of the socioeconomic status of farmers.

Seed **access** is a parameter specific to farmers or communities. It largely depends upon the assets of the farmer or household in question: whether they have the cash (financial capital) or social networks (social capital) to purchase or barter for seed.

Seed **quality** includes two broad aspects: seed quality *per se*, and variety quality. Seed quality consists of physical, physiological and sanitary attributes (such as germination rate and the absence or presence of disease, stones, sand, broken seed or weeds). *Variety quality* consists of genetic attributes, such as plant type, duration of growth cycle, seed color and shape, and palatability.

In situations of stress, it is rare to have constraints in all three seed security features at the same time. The challenge is to identify the real problem and then target actions to alleviate that problem.

Acute and Chronic Seed Insecurity

Analysis of seed security requires consideration of the duration of the stress: whether it is 'acute' or 'chronic' (recognizing that the divisions are not absolute).

Acute seed insecurity is brought on by distinct, short-lived events that often affect a broad range of the population. It may be spurred by failure to plant, loss of a harvest, or high pest infestation of seed in storage. While in normal times households may have various degrees of seed security, all may be affected by an acute event, such as a flood.

Chronic seed insecurity is independent of an acute stress or disaster, although it may be exacerbated by it. It may be found among groups who have been marginalized in different ways: economically (for example, due to poor, inadequate land or insufficient labor); ecologically (for example, in areas of repeated drought and degraded land); or politically (in insecure areas, or on land with uncertain tenure arrangements). Chronically seed insecure populations may have ongoing difficulties in acquiring off-farm seed due to lack of funds; or they may routinely use low-quality seed and unwanted varieties. The result is households with built-in vulnerabilities.

Acute and chronic seed insecurity often exist together in emergency contexts. Indeed, in cases where emergencies recur – in drought-prone areas, for example – acute problems are nearly always superimposed on chronic problems rooted in poverty.

More Refined Analyses Leading to More Targeted Responses

Table 2.2 gives examples of how identification of a specific seed security constraint should lead to a targeted response, as we are aiming for in this Southern Sudan assessment. So, for example, if 'seed availability' is assessed as the problem in the short term, seed-based interventions, such as seed importation (for acute shocks) may be appropriate. (Seed availability problems rarely persist over the long term.) In contrast, a diagnosis of a problem of 'seed access' might wisely trigger a holistic analysis of livelihood strategies. In the acute phase, providing farmers with cash or vouchers to get their desired seed might be effective. However, an identification of access problems on a chronic basis should lead practitioners to look well beyond seed and seed security constraints. The inability to access certain necessary goods on a repeated basis is usually equated with problems of basic poverty. Initiatives to help farmers generate income and strengthen their livelihoods would be essential. Seed quality problems, whether they relate to concerns with the varieties or with seed health *per*

se, are rarely short-term. Responses usually require significant development programs, linked to plant breeding or seed quality initiatives, depending on the specific constraint identified.

Table 2.2: Types of seed security problems and broadly appropriate responses

Parameter	Acute	Chronic
Unavailability of seed	Direct distribution of seed	(Happens rarely or never)
Farmers lack access to available seed	Vouchers and cash (sometimes with seed fairs)	Income generation activity Agro-enterprise development
Poor seed quality <ul style="list-style-type: none"> ○ poor varieties ○ unhealthy seed 	<u>Limited</u> introductions of new varieties	Introduce new varieties and give technical support Variety selection / breeding Development of seed enterprises linked to new varieties and other quality enhancements

Seed System Security Assessment

A SSSA reviews the functioning of the seed systems farmers use both formal and informal. It asks whether seed of adequate quality is available and whether farmers can access it. The SSSA also promotes strategic thinking about the relief, recovery or development vision needed. For instance, during a period of stress, should efforts aim to restore the seed system to its former state, or should they aim to strengthen it? Should efforts focus on crops for food, income or both? Should interventions be linked to crops tied with the most vulnerable (e.g., women)? (see <http://seedsystem.org/assessment-tools/> for a description of the SSSA approach and tools).

Methods Used

The themes and methods used in the Timor-Leste SSSA are sketched out in Table 2.3. They include a range of qualitative and quantitative methods and draw on multiple stakeholder insights. Mapping tools were used to assess seed availability and seed flows within and among regions. Of special note is that the sample sizes were relatively big for a quick assessment: 191 individual farmer interviews, 6 focus group discussions often with 40 people or more, and about 60 seed/grain trader interviews and visits to all agro-dealers in zones of assessment. Note that all tools were translated into the local language of Tetum so as to ensure a more rigorous assessment.

Table 2.3: Investigative thrusts and methods used in the Timor-Leste SSSA

Type of Investigation	Commentary
Background information analysis	Commissioning of specific documents (MAF/SoL): 2. formal sector breeding + sector seed supply trends 3. Decentralized seed production inventories
Key informant interviews	MAF /project personnel Seed Producer Groups
Focus group discussions --- Community-based --- Women's groups	Separate community + women- only focus groups <ul style="list-style-type: none"> • agricultural and variety use and trends • seed source strategies, by crop • community seed security assessment • women's crop/seed constraints/opportunities
Farmer interviews (N=191)	1. Agricultural trends – acute/chronic 2. seed source patterns/input use
Seed/grain market analysis (N=62 traders+ veg sellers)	1. crops and varieties supplies on market 2. pricing patterns/ sourcing areas 3. seed quality management procedures
Agro-dealer shops /kiosks (N=4)	4. Dili, Baucau , Ainaro, Cassa

Household sample

Part of the methodology used in the SSSA did involve conducting quantitative interviews at the household level. Households were chosen without bias by fanning out in diverse directions from a central location point. Every 3rd or 4th household was chosen, (depending on population density).

Of note is that slightly less than 10% of the households designated themselves as 'female-headed'. The SSSA team later found this category not very useful as many households legally headed by men were practice run by women ---as men were working off-farm, or not engaged in daily decisions. Also, in terms of household cultivated areas, the SSSA sample gives a good reflection of what is known from national statistics. 70% of the sample reported having 1 ha or less. This compares with reports that give a national average of 0.8 ha.

Table 2.4: Timor-Leste household (HH) sample characteristics

Feature	Description	N	% Sample
Sex of HH head	Male	172	90.1
	Female	19	9.9
Area cultivated	<0.5 ha	40	21.1
	0.5-1.0 ha	92	48.4
	>1.0-2.0 ha	45	23.7
	>2.0 ha	13	6.8
Household size			
Mean size: 6.9	Std dev: 2.7	Minimum: 1	Maximum: 15

Site Choice

Sites were chosen so as to link mainly to link the assessment to action, and hence closely followed partner priorities. Figure 2.1 indicates the general location of sites, with Table 2.5 presenting more detailed parameters.

Figure 2.1. Geographic location of Timor- Leste SSSA zones, October 2013



Table 2.5: Select descriptive parameters of sites chosen for assessment.

Site	Site: Seeds of Life Aileu	Site: CRS Baucau Subdistrict Baguia	Site: Mercy Corps Ainaro Vila Sub-district
Agro-ecology	800-1000 m good irrigated rice plain	1200m- hilly/mountainous Southern High Land, close to Viqueque specially Watukarbau and Lospalos-Iliomar.	Southern slope (Northern hills between 100 and 500 m asl, mean annual rainfall of 1000–1500 mm

Irrigated/ rainfed	Rainfed. One main season. small amount of vegetables grown off season	Mostly rainfed for main season Some small gardens are irrigated Two seasons	Two season Rainfed and irrigated
Principal Crops	Major season: maize, peanuts, sweet potato, cassava, beans/legumes, colocasia (taro) and paddy are grown.	Maize, Rice, Red Bean, Potatoes, Cassava. Production not maximized for various reasons	1. Maize then fallow 2. Red beans + white beans (sometimes with maize) then fallow 3. Maize followed by red beans + white beans 4. Maize or beans followed by upland rice followed by mungbean 5. Maize + cassava or maize + sweet potato 6. Upland rice + cassava or sweet potato
Emerging crops	Horticulture	Yam, taro, kontas. Used to solve hungry season or as a snack or supplement food.	Horticulture (green leaves, tomatoes, chilies, string beans, potatoes, kangkung), Peanuts, soybean Banana
Key Wild Crops		Maek and Bitter bean are used only in urgent and emergency situations.	Different kind of taros (talas, talas bo'ot, kumbili/gembili)
Infrastructure Roads Markets Phone Coverage	47 km from Dili. (2 hours) 'suburb') excellent road full cell coverage Markets well developed (central market and surrounding shops)	Road: Sub District Baugia is Border with Viquque (Watukarbau) and Lospalos (Iliomar and Luru) with one main road. Condition of main road is not very good with many obstacles during rainy season; sub-roads to villages are very challenging: especially in the rainy season- sometimes becomes inaccessible. Markets: District Markets, Village Market, Weekly Market Phone Coverage: Telephone network is spotty because Baugia blocked by Matebian.	Good road network Markets: district markets, village weekly markets Phone coverage: almost all areas are covered
Security Risks	none	continuous slight security risks across TL . No current known security risks.	
Environmental risks		Landslide, Flood and Wind. In the rainy season landslides, flooding and damaging winds are the main crop factor	Strong wind , Drought/Fire Flood prone, Landslide
Other Key characteristics	SoL key site. Good support with new varieties and seed producer groups. Strong presence NGOs No agro-dealer shops- some seed packets sold in markets	Strong cultural conditions 'Little/less seed aid'	Has Loja Agricultural Many tractor handouts!

Finally, at all sites, farmers were at the center of the seed system security assessment, and the sharing of key wisdom. In many aspects, it is farmer-driven recommendations that have influenced the shape of the SSSA report and findings. Box 5 gives one specific example of how “farmers may have productive recommendations for agriculture”.

Box 5. Farmers may have productive recommendations for agriculture

In Fahiria Suco of Aileu District, a few farmers are planting improved variety ‘Sele’ maize with 1 m spacing between rows. This contrasts with the spacing recommendation from the Ministry of Agriculture and Fisheries (MAF) Extension Services of 75 cm between the rows. The farmers also plant 4-5 seeds per hole instead of the MAF recommended 1-2 seeds per hole. The farmers say that these farming techniques, practiced by them for last 4 years, are working well in their locations and they have better crop performance than the MAF recommended practices.

According to the farmers, the following are the benefits of their new practices:

- One meter spacing between rows provide good air circulation during crop growth;
- Plants get good sunshine;
- It is easy for weeding and harvesting;
- Having 4-5 plants in one place protect from lodging caused by strong wind;
- If some seeds are eaten by insects or chickens in one hole, it is likely that there are still some seeds left over to germinate. In comparison, replanting would be required for the MAF recommended practices of 1-2 seeds/hole.

IV. SEED SYSTEMS IN TIMOR-LESTE: BRIEF OVERVIEW

Smallholder farmers use multiple channels for procuring their seed. These channels fall within formal and informal seed systems (with the latter also sometimes labeled as the local, traditional or farmer seed system). This chapter gives a brief introduction of how these systems are generally organized in Timor-Leste. The material draws from detailed presentations prepared for this SSSA by MAF and SoL. A wealth of complementary information and research advances have also been published by MAF/SoL in the last five years (for example, see SoL, 2012, 2013a,b,c; Williams et al. 2012a,b, Lacoste et al., 2012, among others).²

Introduction to seed systems

Formal and informal seed systems have quite distinct characteristics.

The formal seed system involves a chain of activities leading to certified seed of named varieties. The chain usually starts with plant breeding, and promotes materials towards formal variety release. Formal regulations aim to maintain varietal identity and purity, as well as to guarantee physical, physiological and sanitary quality. Seed marketing takes place through officially recognized seed outlets, either commercially or by way of national agricultural research systems (Louwaars, 1994). Formal sector seed is also frequently distributed by seed relief agencies.

The informal system embraces most of the ways farmers themselves produce, disseminate and procure seed: directly from their own harvest; through gifts and barter among friends, neighbors and relatives; and through local grain markets or traders. Farmers' seed is generally selected from the harvests or grain stocks, rather than produced separately and local technical knowledge, standards, and social structures guide informal seed system performance (McGuire, 2001). In developing countries, somewhere between 80% and 90% of the seed sown comes from the informal seed system (DANAGRO, 1988; FAO, 1998), although this varies by crop and region. **Results of this Timor-Leste SSSA show that over 90% of seed farmers sow comes from the informal seed systems** (see Chapter V, Table 4.1).

Important to highlight is that farmers themselves obtain their seed through both formal and informal channels, and both merit serious attention. In Timor-Leste, for example, the formal seed sector is growing and potentially could even become important for moving especially the horticultural crops. Legumes, in contrast, have typically been sourced from informal channels, as especially local seed markets.

² Several powerpoint presentations particularly serve as a base for this chapter and were presented to the SSSA and interested partners October 7, 2013 in Dli Timor Leste. 1) 'Breeding structures and varieties released'- delivered by Adalfredo do Rosario Ferreira: Director, National Directorate for Research and Special Services. 2) Formal Seed Sector Supply- delivered by Gil Rangel da Cruz- National Directorate for Agriculture and Horticulture. 3) Decentralized Seed Multiplication- delivered by Buddhi Kunwar, Community and Commercial Seed Advisor, Seeds of Life.

Note that the development of a 'relief seed system', has become of distinct importance on the supply side in many parts of Africa (Bramel and Remington, 2004), including in Timor-Leste. Typically, in any one year, the Government of Timor-Leste moves about 200MT of maize and 100 MT of rice (see Box 1, Chapter II).

Figure 3.1 shows schematically the formal and informal seed systems, their component channels, and how they may interact. The figure also highlights the importance of the local seed market and seed relief channels. As a complement, Table 3.1 suggests how farmers in one community assess the advantages of accessing seed from the diverse channels.

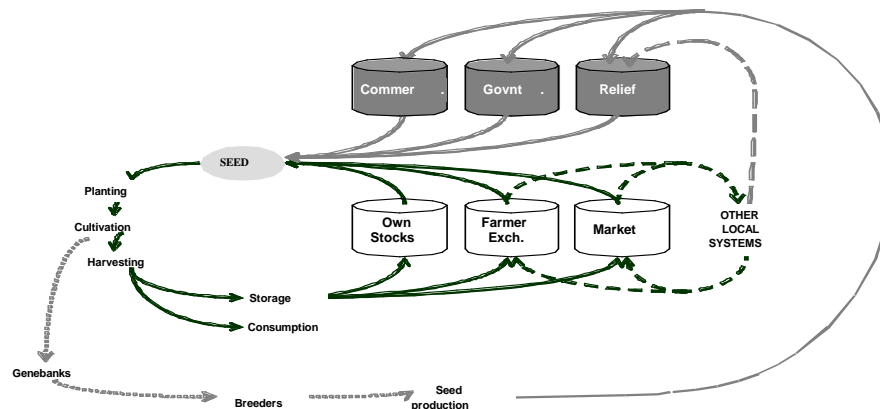


Figure 3.1.: Channels through which Farmers Procure Seed. These are depicted by the cylinders: Own seed stocks, exchange with other farmers, and purchase through local grain markets constitute 'informal' channels, while commercial seed stockists, government or research outlets, relief supplies constitute formal channels. The arrows indicate the flow of seed in the 'informal' and 'formal' sectors respectively. Adapted from Almekinders and Louwaars (1999).

Table 3.1: Advantages and disadvantages of using diverse seed channels : perspective from a community in Aileu, Fahiria October 9, 2013.

Advantages	Disadvantages
<u>Own stocks</u> <ul style="list-style-type: none"> • Early planting/ on time • Know the seed well: they select it • Quality is good • Free 	<ul style="list-style-type: none"> • ----
<u>Local Market</u> <ul style="list-style-type: none"> • available 	<ul style="list-style-type: none"> ▪ the quality might be low- ▪ farmer has to further select (so extra labor ▪ costs money
<u>Neighbors</u> <ul style="list-style-type: none"> • free • on time 	<ul style="list-style-type: none"> • small amount • the quality is not as good as 'own stocks
<u>Government (MAF)/NGO</u> <ul style="list-style-type: none"> • quality seed • free 	<ul style="list-style-type: none"> • Always late • Small amount
<u>Agro-input store</u> <ul style="list-style-type: none"> • High quality • (mainly for institutional/ big buyers and have to order in advance 	<ul style="list-style-type: none"> • High price • Have to travel far

The next sections emphasize a few key points on varieties and seed system structures serving Timorese farmers . The formal breeding and seed sector are first reviewed and then the focus shifts to the informal seed systems and particularly the local seed/grain markets.

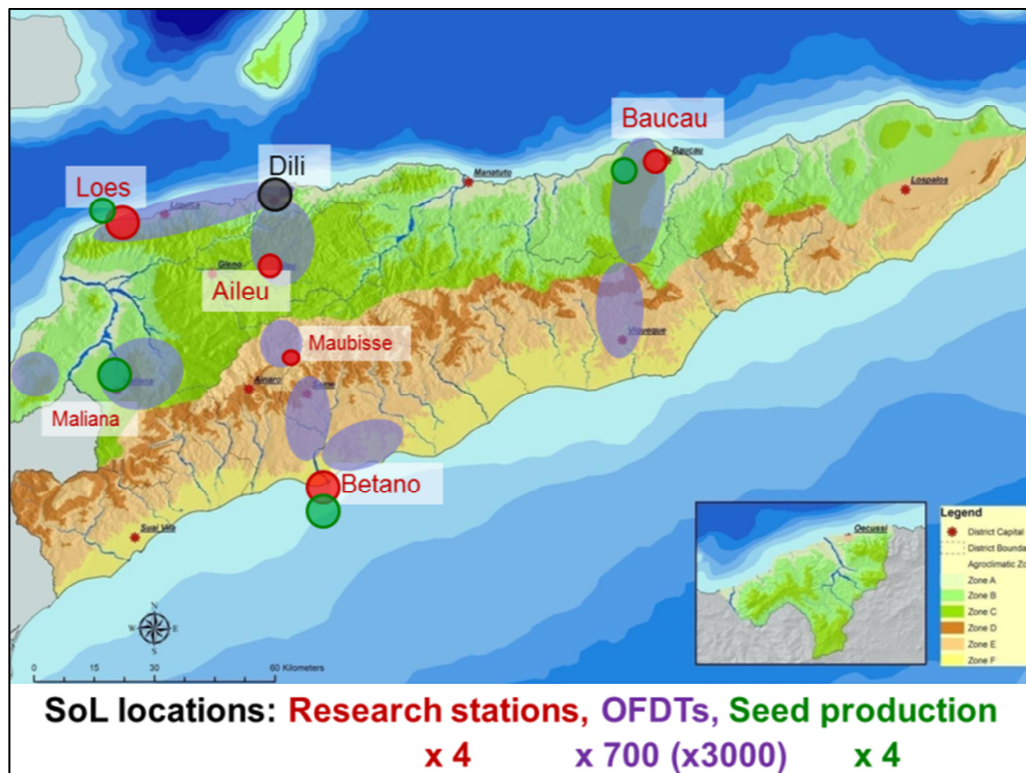
Formal Breeding Systems, Timor-Leste

Variety development systems

From 1975 to 1999, crop breeding work for Timor-Leste was conducted by the Indonesia national breeding centers. Unfortunately, very little is known about the results of this work in Timor-Leste, and at independence in 1999, only two older maize varieties, developed in Indonesia, were widely grown, along with local varieties for most other crops.

Since then, within the last 15 years, minimal plant breeding activities have taken place within Timor-Leste, with the exception of some important maize hybrid breeding work. Rather, the focus has been on variety evaluation, both on station and on-farm through the Seeds of Life program (SoL) of MAF. Evaluations are unfolding in a good range of regions (Figure 3.2).

Figure 3.2: MAF research centers and stations, 2013



For this first period of post-independence, variety evaluation research has focused mainly on the many staples found across country (maize, rice, sweet potato, peanut, and cassava). Through relationships with international breeding programs, MAF/SoL obtained lines for testing, established/rehabilitated research stations and other testing sites to conduct

replicated trials, and trained a cadre of national staff to conduct them. Promising lines go to On-Farm Demonstration Trials (OFDTs), which are under farmer management, across hundreds of sites a year. Varieties that are acceptable to farmers have good yield potential, and which perform well across a range of environments are considered for release. Table 3.2 lists the varieties released as of October 2013. In the immediate pipeline are releases for mung beans and cassava varieties that can be used for industrial purposes. Potential new varieties, at earlier stages of screening on-station and on farm embrace a wide range of crops: maize, upland rice, lowland rice, sweet potato, peanut, cassava, mung bean, bed beans, wheat, wing bean, peanuts (local red) and sweet potato (Baucau purple).

Table 3.2: Crops and varieties released by MAF as of October 2013

Species	Variety	Source	Original name	Adaptation
Maize	Suwan 5	Thailand	Suwan 5	Broad adaptation. Sensitive to weevils. Recommended where there is good storage
	Sele	CIMMYT India	LYDMR	Broad adaptation over all altitudes.
	Nai	Timor leste	Arjuna*Suwan 5	As for Suwan 5 above.
	Noi Mutin	Philippines	CMU Var12	White maize with broad adaptation
Rice	Nakroma	IRRI	PSB RC 54	Semi fragrant, with broad adaptation. Shorter season varieties useful along north coast
Sweet Potato	Hohrae1	CIP Bogor	B0053-9	White fleshed high yielding only above 500m elevation
	Hohrae 2	CIP Bogor	AB96001.2	Cream, high yielding
	Hohrae 3	CIP Bogor	B89702.1	Yellow fleshed High yielding on all elevations
Peanut	Utamua	ICRISAT	ICGV 88438	Large seeded peanut with tolerance to late leaf blight and some seed dormancy
Cassava	Ai-luka 2	RILET Indonesia	OMM 90-03-100	Broad adaptation, all locations
	Ai luka-4	RILET Indonesia	MLG 10169	Broad adaptation, all locations

Prior to release, MAF/SoL conduct on-farm trials and include an unusually broad range of stakeholders into the variety release process. (Box 6). The variety release committee for Timor-Leste was established in 2007.

Box 6: Multi-stakeholder input into varietal release in Timor-Leste

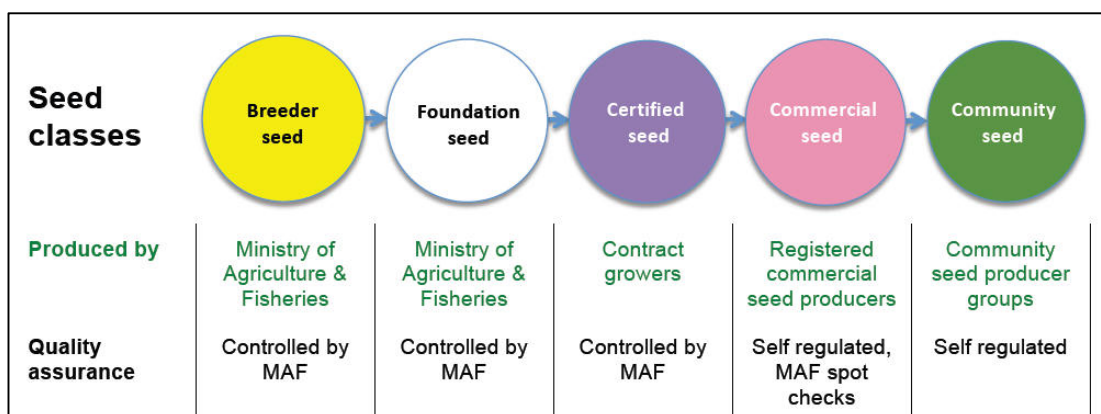
Representatives and primary responsibilities of variety release committee

No	Representative	Primary responsibility
1.	MAF	Acceptance, rejection of application. Release of variety by MAF
2.	Director, DNRSS	Provide evidence of varietal superiority over currently used germplasm
3.	Director, DNAH	Provide assurance seed production programs are capable of maintaining pure seed for release
4.	Breeding org. representative	Ensure breeders approval is given for release of material in East Timor. Provide intellectual property right clearance.
5	Farmer rep (Male)	Examine production figures and review on-farm evidence of productivity
6	Farmer rep (Female)	Examine acceptability of new variety for release in terms of consumer preference
7	NGO representative	Examine environmental impact of introducing new variety
8	Seed industry representative	Provide assurance that sufficient seed can be produced for release

Seed production – MAF/SoL

Organized seed production started in 2008, supervised by MAF/SoL’s dedicated seed production team, with a National Seed Production Advisor from SoL/MAF and District Seed Officers appointed to work for MAF in specific districts (currently, 11). Research stations are the main source of Breeder and Foundation Seed (though such classes were not legally recognized until 2013). In 2013, Timor-Leste adopted a National Seed System for Released Varieties (NSSRV). This defines (and labels) distinct classes of seed, with decentralized multiplication producing ‘Community Seed’ or ‘Commercial Seed’ (Figure 3.3).

Figure 3.3. Seed classes in Timor-Leste, from 2013.



Between 2008 and 2011, the great majority of seed production was directly managed by MAF/SoL. Seed Production Officers (SPOs) organize contract growers (there are now 134 Certified seed producers), who are generally 'progressive' individuals or groups with favorable access to assets and infrastructure. SPOs support this with regular visits and inspections. Once processed and sorted, SPOs purchase all of their harvest (less a small amount for personal use) at guaranteed prices. Producers for sweet potatoes were paid a monthly fee (e.g. in 2010, this was \$50), rather than on a per cutting basis. Seed crops are processed and stored at SoL/MAF's Seed Centers for further processing and storage, while vegetative crops tended to be distributed closer to their production areas.

Select tables give an idea of the scale achieved in such a schema (Tables 3.3 – 3.5). Such production is enough for roughly 5 – 15% of national area for these crops (SoL estimated, cited in AusAID, 2010).

Table 3.3 Maize seed production 2008-2013

Year	2008		2009		2010		2011		2012		2013	
	Sele	Suwan 5	Sele	Suwan 5	Sele	Noi Mutin	Sele	Noi Mutin	Sele	Noi Mutin	Sele	Noi Mutin
Breeder Seed	0	0	0	0	0	0	100	360	0	0	481	400
Foundation Seed	0	0	0	0	0	0	0	0	1,550	3,502	0	1,480
Certified Seed	13,025	1,725	18,880	1,020	33,909	820	24,495	0	30,482	2,231	33,079	8,693
TOTAL (KG)	13,025	1,725	18,880	1,020	33,909	820	24,595	360	32,032	5,733	33,560	10,573

Table 3.4 Rice seed production 2008-2013

Year	2008		2009		2010		2011		2012		2013	
	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma	Nakroma
Breeder Seed	0	0	0	0	0	0	0	0	0	0	0	0
Foundation Seed	300	0	0	0	0	0	0	0	200	200	200	200
Certified Seed	8,900	61,333	61,333	47,063	47,063	44,444	44,444	22,500	22,500	25,515	25,515	25,515
TOTAL (KG)	9,200	61,333	61,333	47,063	47,063	44,444	44,444	22,700	22,700	25,715	25,715	25,715

Table 3.5 Peanut seed production 2008-2013

Year	2008		2009		2010		2011		2012		2013	
	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua	Utamua
Breeder Seed	0	0	0	0	0	0	0	0	0	0	0	0
Foundation Seed	1,483	0	0	0	0	0	0	0	0	0	0	0
Certified Seed	4,780	17,860	17,860	19,948	19,948	2,624	2,624	3,985	3,985	8,531	8,531	8,531
TOTAL (KG)	6,263	17,860	17,860	19,948	19,948	2,624	2,624	3,985	3,985	8,531	8,531	8,531

The main clients for Certified seed produced through the MAF-managed system are institutional buyers. For example, Table 3.6 shows some of the NGO and UN seed purchases from SoL/MAF between 2009 and 2011. In 2009, 85% of all rice seed distributed went to FAO and district MAF offices, while 45% of maize, and 35% of peanuts, went to NGOs (AusAID, 2010).

Table 3.6 Seed purchase from NGOs, 2009-11 (Source: Gil Rangel da Cruz, MAF presentation to SSSA Oct 2013)

Qty (kg)	Variety	Institution	Date
1 000	SELE (maize)	Care	10-Jul-09
1 000	UTAMUA (peanut)	Care	10-Jul-09
2 000	SELE (maize)	Child fund	10-Jul-09
500	SUWAN 5 (maize)	Child fund	10-Jul-09
1 000	UTAMUA (peanut)	Child fund	10-Jul-09
2 700	SELE (maize)	WVI	10-Jul-09
1 000	UTAMUA (peanut)	WVI	10-Jul-09
4 100	NAKROMA (rice)	WVI	10-Jul-09
1 000	SELE (maize)	WVI	27-Sep-10
1 218	SELE (maize)	WVI Baucau	27-Sep-10
350	SELE (maize)	World Neighbor	29-Sep-10
350	UTAMUA (peanut)	World Neighbor	29-Sep-10
750	SELE (maize)	Care	29-Sep-10
600	UTAMUA (peanut)	Care	29-Sep-10
500	SELE (maize)	Susubeen	10-Oct-10
500	UTAMUA (peanut)	Susubeen	10-Oct-10
500	NAKROMA (rice)	Susubeen	10-Oct-10
10 000	UTAMUA (peanut)	FAO	20-Apr-11
20 000	SELE (maize)	FAO	20-Apr-11
45 000	NAKROMA (rice)	FAO	20-Apr-11
230	SELE (maize)	Hivos	23-Nov-10
150	NAKROMA (rice)	Mercy Corp	27-Jan-11
4 000	SELE (maize)	RDP3	10-Oct-11
555	SELE (maize)	Care Han project	10-Oct-11
70	UTAMUA (peanut)	Care Han project	10-Oct-11
1 000	SELE (maize)	FAO	10-Oct-11
500	SELE (maize)	CRS	20-Apr-12
2 500	SELE (maize)	WVI Aileu	10-Oct-11
400	NAKROMA (rice)	WVI Aileu	10-Oct-11
400	NAKROMA (rice)	WVI Aileu	23-Nov-11

SoL/MAF's seed production is well-organized, but on its own is not at the scale to reach all farmers in Timor-Leste. While some NGOs and donor-supported projects organized farmer

multiplication of SoL/MAF varieties, the quality and quantity of such seed was usually modest. Consequently, SoL developed a new component in 2011 that coordinates seed multiplication by farmer groups, alongside the Certified seed already occurring within the formal system.

Seed production – Decentralized farmers groups

SoL/MAF started supporting Community Seed Producer Groups (CSPGs) in 2012. By 2013 there were 681 CSPGs under SoL/MAF guidance, with plans to increase to around 1200 CSPGs, or roughly 3 per Suco. These were found in 135 Sucos, in 11 of the 13 Districts national. Another 300 groups are supported by collaborating NGOs. Each CSPG has around 12 members, and a third of all members are women. A CSPG focuses on a single crop; about half of the groups multiply maize, and a third multiply rice. CSPGs receive a storage drum and a small amount of seed (usually 5 kg) from SoL/MAF, which they then multiply. Multiplication could occur on communal plots, if the CSPG received land from the Suco or Aldeia (village) Chief. However, seed is more commonly produced on individual plots of one or more group members.

Generally, multiplied seed does not go far beyond the group itself, and most CSPGs do not organize multiplication for sale, but rather to meet their own members' needs. For instance, 45 CSPGs sold maize or rice seed to NGOs in 2012, totaling 8 T. A survey of CSPG members found that only 20-30% of individuals reported selling seed (though over 50% of those growing sweet potatoes sold vines; Seeds of Life 2013a). In general, CSPGs are not oriented towards seed marketing as a systematic activity, and the assumption is that any onward spread is through sharing between farmers. If other farmers were aware of a CSPG in their community, they commonly stated they could not get access to seed from them, simply as there was no surplus, or because available seed was not promoted.

For organized marketing, rather, MAF/SoL's plan is to support the development of Farmer Associations – generally building upon the more entrepreneurial Contract Farmers. As of July 2013, three Associations (two in Baucau, one in Liquiça) have been registered for producing Commercial Seed, all for maize. As of December 2013, there were 31 Associations registered (<http://seedsoflifetimor.org/12-more-commercial-seed-producers-registered-brings-total-to-31/>). These Associations get spot checks from MAF four times a season.

MAF/SoL is not involved in marketing seeds produced, either by Associations or CSPGs, but does facilitate linkage with potential seed buyers. The production of these Associations has so far been sold back to SoL/MAF, or to international NGOs (e.g. 8 t was sold in 2012; Table 3.7). This seed has not been marketed directly to farmers. The immediate goal of such production appears to be import-substitution, as a replacement for the 200 – 300 t of seed annually imported by MAF from Indonesia (e.g. SoL, 2013b). These imports face problems of adaptation, phyto-sanitary quality, and lateness of supply from the ports. Once seed quality, supply inefficiencies, and opportunity costs are factored in, the estimated full cost of imported maize seed is over US\$ 20 a kg (compared to US\$ 1.50 for Sele seed in-country; Seeds of Life 2013c). MAF/SoL's interest in registered commercial seed producers is therefore to reduce these costs, as well as reduce dependency on seeds from abroad, while promoting domestic production of adapted seeds.

Table 3.7 Farmer Associations' production and sales of commercial seed, Aug 2011 – July 2012.

<i>Seed Produced</i>					<i>Seed sold</i>			
Crop	Variety	Seed Quality	Amount		Crop	Variety	Amount	
			kgs	MT			kgs	MT
Maize	Sele	Commercial Seed	45,840	45.8	Maize	Sele	6,578	6.6
Rice	Nakroma	Commercial Seed	27,164	27.1	Rice	Nakroma	2,300	2.3
Peanuts	Utamua	Commercial Seed	4,047	4.0	Peanut	Utamua	30	0.03

MAF/SoL has developed an inventory of seed production from CSPGs and Farmers Associations. These data are useful in that they did not exist before, but would be particularly valuable if made widely available to District-level officials. This information is already presented at national level, for instance to encourage Ministers to buy seed from within Timor-Leste. Secondly, the data are mostly about seed production: there is rather less about local demand, or about how marketing would take place, at scale. Thirdly, there is a focus on disaggregating 'seed needs' and 'seed production' at the District level, contributing to a view that seed security = seed self-sufficiency at the District level. However, there is ample evidence that seed moves between Districts in response to need (seed Fig. 3.4 below). Because seed flows, it is more useful to focus on how farmers can access the seed they want (which may come from another area) than on whether each District produces everything it needs locally.

Variety delivery systems

The results of the Timor-Leste SSSA showed that 43% of farmers accessed some new varieties within the last 5 years (Chapter V, figure 5.6). These new varieties were nearly all maize and rice, and were provided mainly through free distribution from government or NGOs (Table 5.10, and *Seeds of Life*, 2012). Varieties are promoted by On-Farm Demonstration Trials, and promotions through recently-established Suco Extension Officers. Nationally, adoption rates vary between 3% (cassava) and 16% (peanuts). However, adoption varies considerably by District, and is highest where MAF/SoL have worked the longest (*Seeds of Life*, 2012). Increasing demands are being placed on Suco Extension Officers from a range of development programs, so other channels should also be explored for improving farmers' awareness of, and access to, new varieties – including links to markets and to decentralized seed producers.

Agro-dealer outlets

Agro-dealers, commonly called Loja Agrikultura, are specialized in selling agro-inputs. There are 3 or 4 agro-dealers nationwide in 2013, all established relatively recently. These are Loja Agrikultura Dili and Jupiter Agri, both in Dili, while Loja Agrikultura in Baucau District and Fini Diak in Liquica District are both donor-supported (DAC, 2013). These shops mainly sell imported horticultural seed packets, along with chemical inputs, tools, and other products (such as for aquaculture). Such agro-dealers presently serve very few farmers nationally, although the Liquica shop does travel via motorbike to rural areas to sell, and

select farmers in both Alieu and Baucau indicated they occasionally travel to Dili (1- 3 hours) to purchase seed packets.

Kiosks

In addition to this, one NGO, Mercy Corps has been working to train general goods supplies to also sell horticultural seed. Four existing shops in Ainaro and Manufahi Districts were supported in 2013 through a small gift of seed (5 packets each of 10 horticultural varieties), a display case, and watering cans. Additional support included a DVD to provide to farmers, which included short animated clips on Good agricultural practices, as a series of short animated clips in Tetum. These are also available for watching on mobile devices for free. These kiosks received no further support, but several have continued to purchase horticultural seed for continued sale, generally from Loja Agrikultura Dili. The placement of these shops is shown on Figure 3.4.

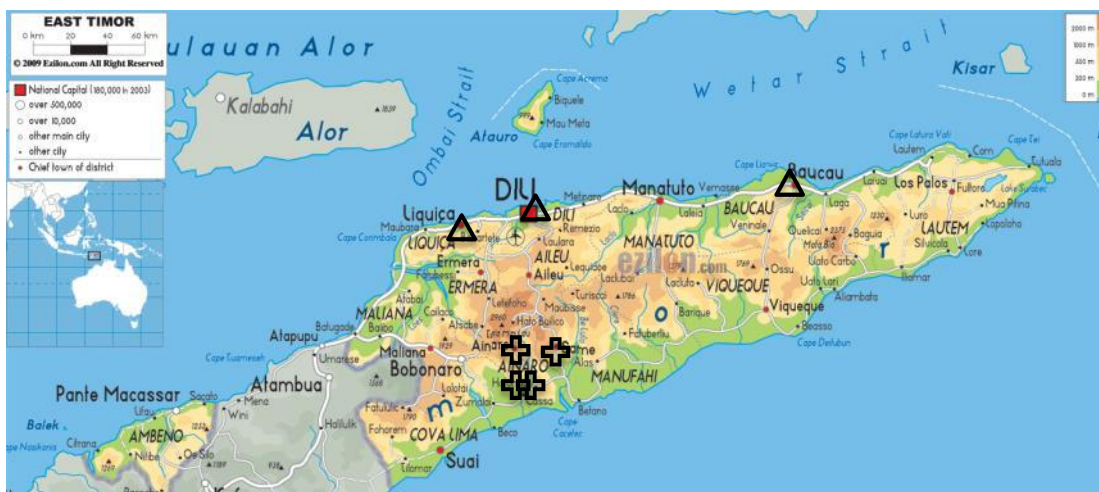


Figure 3.4 Location of agro-input shops (Δ) and kiosks (+).

Informal Seed Systems in Timor-Leste

The informal system is the major seed procurement system across crops in Timor-Leste, providing over 90% of the seed sown. The informal sector includes all the ways farmers themselves produce and disseminate seed: through own stocks, via barter/gifts and through local markets. Overall, farmers’ own stocks are, by far, the main source of seed, supplying about 72% of the seed sown in 2012-13 (Chapter V, Table 5.1). The local seed/grain markets were the second major source. Across crops, these markets provided about 12% of the seed (Ibid.) The section below focuses particularly on these seed/grain markets as they have received relatively little attention to date in the Timor-Leste seed system analysis.

Seed/grain markets

‘Seed/grain markets’ refer to a diverse set of actors and institutions, from open-market traders to permanent village shops to long-distance truckers, who buy and sell crops for consumption and, potentially, for seed (Sperling and McGuire, 2010). To be clear, much

that is sold in local markets is used for grain (for consumption, for livestock feed, for brewing). However, there is a special subset of this grain which can potentially also be used for seed and which is actually sown.

Local markets, in particular, often serve as the backbone of seed provision during and after seasons of stress. Simply, due to poor harvests, farmers are forced to access a larger portion of their seed off farm and in local markets. In Timor-Leste, these markets are especially important for legume seed provision (Fig. 5.2). The average farmer in Aileu or Baucau spends between \$7 and \$12 in markets (Table 5.7). Supporting and strategically strengthening such markets would be key for promoting seed security across a range of smallholder farmer sites. Much of this next section on Informal Seed Systems focuses on how local seed/grain markets work.

Distinguishing seed from grain

Both farmers (buyers) and traders (sellers) use a range of strategies to access 'good' seed from the markets. For the buyer, he/she wants to maximize the possibility that the product bought will actually grow on his/her own farm. For the seller, he/she wants to tap into a lucrative seed market, whose prices prove higher than those obtained from routine food grain alone. Box 7 gives broad overview of how farmers and traders strategically manage their stocks of 'potential seed', that is, grain which can usefully be planted. There are at least seven different practices which over half of the traders interviewed use to encourage a better product.

Box 7: Managing ‘potential’ seed

Open markets serve as a source for farmers’ seed, especially legumes in Timor-Leste. While these are commonly referred to as ‘grain’ markets, farmers and traders exercise considerable agency in managing and selecting among grain supplies to ensure that some can be used as ‘potential seed’.

Traders don’t sell just anything

Traders aim to sell a quality product and clearly recognize that some of their stocks will be used as seed: prices do rise around planting time for ‘potential seed’.

Here are practices observed among traders in Alieu—for managing potential seed:

1. Traders get grain from specific regions believed to have potential for sowing—to be adapted
2. Specific varieties are sometimes sought—highly productive
3. Specific growers are contacted- those with high quality seed
4. Varieties are kept pure and separate (and maize seed is kept on the cobs)
5. Freshly harvested stocks are kept apart
6. Twigs, stones, broken seed (‘waste’) are removed
7. Bad grains, immature or broken, are removed

Farmers don’t plant just anything

In scouting out potential seed from markets, farmers seek out varieties, they know. They further screen for visible quality traits: are the grains mature?; are they not damaged by pests?. Farmers may also buy potential seed within a larger grain batch and make the refinements for ‘seed’ at home, sorting out the non-seed trash (the twigs, pebbles, sand, broken grains.)

As important as the product is the provider. Farmers try to buy planting material from people they trust—sellers who will tell them the origin, so as to know if the material is adapted--- and sellers who will be held responsible—if the planting material proves sub-standard.

Understanding seed flows to assess supply and adaptation (quality)

To assess supply (is seed available!), one needs to have insight not only in to the level of traders but also into the zones which can supply potential seed (that is, grain which is adapted and will grow in a specific local region). As figure 3.5 implies, seed/grain markets are not only ‘local’, but are also part of a much wider market system with links to other regions. Tracing of seed/grain flows proves to be important for understanding not only availability of supplies, but also price. It is key to understand flows for several concrete reasons:

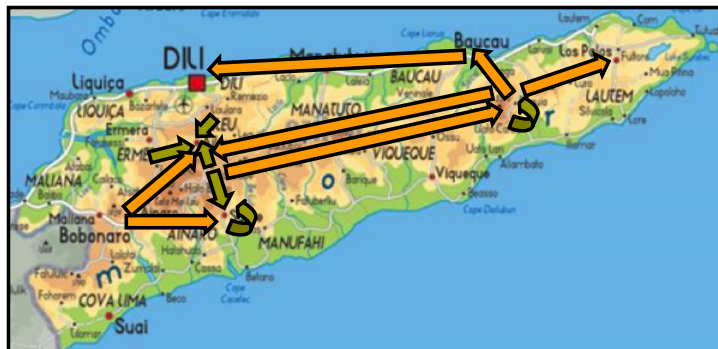
- Seed flows mean that seed availability is rarely just a **local** phenomenon. Potential seed supplies of from other areas may alleviate local shortfalls; conversely, it may sometimes occur that market stocks mostly flow outwards, due to high prices in other markets, or to speculation.

- Prices are affected by national factors (e.g. due to urban demand, national supply restrictions) as well as local ones

The SSSA explored flows of potential seed in three different markets: Aileu, Baucau/Baguia, and Same. Flows vary by crop, with Figure 3.5 showing flows for maize and beans. Across a wide range of crops, the analysis of flows of potential seed shows that:

- seed flows into markets from defined locations for each crop (i.e. not randomly, but from known areas of good production for that crop) (green arrows)
- while some seed sources are from the same District, there are also longer-distance flows between Districts. For instance, for beans, between highland areas of Baucau and Maubisse. These generally followed established trading routes between the regions, and could be long-distance flows. In such cases, the provenance was maintained (origins of potential seed were still known), and the potential adaptation was generally good. (Yellow arrows)
- In times of stress, there may also be 'special flows' to fill a need. For instance, in 2010 when there was a shortage of maize seed in Aileu market, maize came in from Suai market to meet demand.
- There is evidence that particular regions, like some individual merchants, gain a reputational 'rent' for being associated with good quality seed, and so gain price premiums. Some traders sourced potential seed from particular regions due to quality.

Figure 3.5. Key seed flows to select markets in Timor-Leste for beans and maize



Beans



Maize (corn)

One important conclusion from looking at the flows of potential seed is that markets are NOT local. Thus, it does not follow that seed security needs to be focused on self-sufficiency at the District level, as seed flows between regions in response to demand, and following established trade patterns.

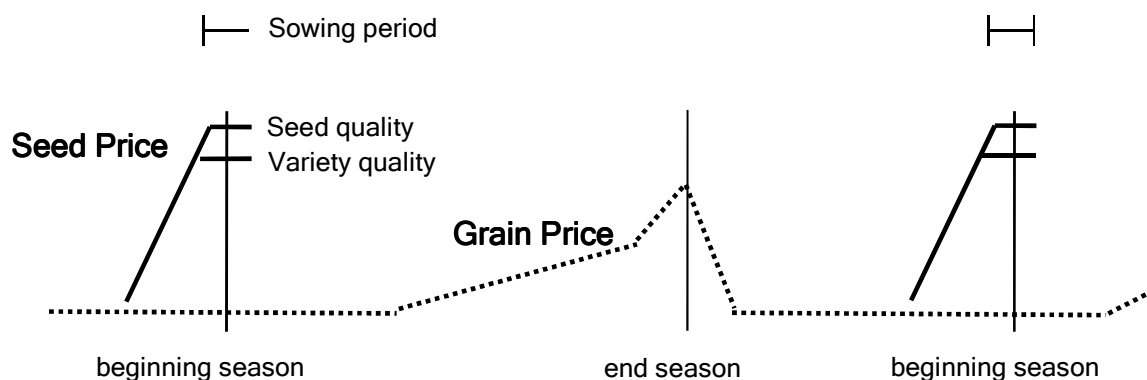
Potential seed and price

As a final facet of analyzing local seed/ grain markets, we look at the issue of price of seed and grain, and how prices might fluctuate according to seasonal patterns.

During non-sowing periods, grain and potential seed remain relatively undistinguished in terms of price. However, during sowing periods, extending some four to eight weeks prior to planting, two trends can be observed. First, prices spike for the most sought-after varieties for sowing, that is, for the varieties that are most adapted, productive or which give the highest income return (i.e. those which could be used as potential seed). In areas of high stress, where few varieties may perform at all, prices between desired and non-desired varieties can differ by as much as 25-50%. Second, around planting time, traders may distinguish among batches of the same variety which are 'well sorted and stocked' from batches 'less well sorted and stocked', adding a price premium ($\approx 5\%$) for the cleaner materials which presumably demand less labor to prepare for sowing. So sometimes prices reflect the differences between seed and grain in terms of 'varietal quality', and sometimes reflect the differences in terms of 'seed quality'. Farmers who pay these price premiums are undoubtedly buying seed *per se*.

Seed-related prices, unlike grain prices, do not rise during the hunger gap periods (and immediately pre-harvest) so the patterns of price rise and fall are quite distinct for seed and grain. Figure 3.6 conceptually suggests these price trends. The pattern below is sketched mainly for didactic reasons: grain price trends, in particular, may be highly variable by environment and time period.³

Figure 3.6 Trends in crop and seed prices in local seed/grain markets through the season, showing seed price peaks at sowing time and grain price peaks before harvest. Seed price differential takes into account variety quality (for the most sought-after varieties), plus sometimes additional seed quality features (i.e. a price premium for well-sorted stocks).



³ This section on price draws from Sperling and McGuire, 2010

Points for possible action

At this point, the seed multiplication initiatives in Timor-Leste are new and seem to be having modest impacts among farmers. They are being propped up by institutional buyers (who are giving seed onward as free distribution) rather than from demand of smallholder farmer clients. At this point, they are also operating at small scale and focus on a handful of crops and varieties. Sustainable decentralized seed production models need to be confirmed which can operate at scale. This will involve action in a number of areas. These are listed below, but discussed in more detail in Chapter V.

- **Cost-effective seed production models.** The cost-effectiveness of existing seed production models need to be carefully assessed, examining separately the costs of organizing and maintaining certified production, registered commercial seed producers and community seed producer groups (CSPGs).
- **Developing ongoing links among diverse segments of seed chain.** Links exist, but can be further developed between registered commercial growers, CSPGs, Loja Agrikultura shops, and local seed/grain traders, for promotion of seed and of new varieties.
- **Maintenance of seed producer/institutional inventory.** The countrywide seed producer inventories initially amassed for the SSSA might be usefully maintained to ensure that producers can be more efficiently linked with buyers, at varied scales.
- **Merging /paring down CSPGs.** The number of CSPGs might be honed to focus on the few more effective producers who can serve many.
- **Training CSPGs in enterprise skills.** If CSPGs sell surplus seed, it is often below market price (Le Broque, 2013). CSPGs require capacity building in agro-enterprise and marketing skills to help address this challenge. They might be better geared to serving a large smallholder client base (rather than focus on a set of institutional aid buyers). Possible links to select agro-enterprises might also be analyzed.
- **Modeling of options for moving varieties fast and widely.** Ultimately, the goal of much of the seed production work is to move the new varieties being developed by MAF/SoL. Different options should be modeled to do this quickly and efficiently—recognizing that a good number of crops and varieties need soon to be in diffusion. For instance, would the sale of 50,000 small packs of certified seed (in 250g sizes) be a quicker way to get new germplasm out than assuming diffusion through CSPGs (and relying on farmer-to-farmer gift or exchange)?

Decentralized seed production needs to become a strategic and effective force in serving smallholder farmers: the formal seed sector alone will never be able to handle a) the range of crops needed for diverse agro-ecological zones; nor b) the range of varieties.

We now turn to actual field findings in the next Chapter V.

V. FIELD FINDINGS: ACROSS SITES

The fieldwork for the SSSA took place in October 2013, just before planting time for the main agricultural season.

The assessment considered two major themes. It analyzed the short-term, **acute seed security situation**, focusing on the *season recently ended* July 2013 (extending variously from: November 2012- June 2013 in Alieu; January-July 2013 in Baucau; and February to July in Ainaro) and *that which was imminent*, starting in November 2013 (and again extending for varied periods: to June 14 in Aileu, and to March 2014 in Baucau and Ainaro).⁴ Seed procurement strategies, quantities sown, crop profiles were all analyzed. As the second thrust, the SSSA considered **medium-term trends**, including possible chronic seed security problems and emerging opportunities. Issues considered included crop diversification, agricultural product transformation, access to modern varieties, seed production, use of other inputs, and seed aid received.

This section presents field findings on seed security across the three assessment sites.⁵ For site-by site information, see the tailored action plans in Annex 1 and the site-specific data tables in Annex II.

Acute Seed Security Findings, 2012-2014 sowing periods

Issues of seed security were first scrutinized for the short term: how and where did farmers obtain seed for the season ending July 2013? Did they plant a 'normal' quantity of planting material? What were their seed security prospects for the November 2013 sowing season? Note that seed system stability and resilience are best assessed by looking at multiple seasons in a row.

All farmers: seed sources and quantities planted: late 2012/early 2013 sowings ('season recently ended')

Table 5.1 and Figure 5.1 show the sources and quantities of seed actually planted by farmers for the main 2013 season (ending July 2013). Information is given in both table and graph form so as to make visible the relative use of sources and the scale of seed use from each. Several features are of note.

Overall, over 90% of the seed farmers sowed came from local channels, including from farmers' own stocks, the local market, or through social networks of neighbours, friends and relatives. This suggests the importance of informal seed systems as the core seed sources.

A closer look reveals that farmers' own stocks were, by far, the main source of seed, supplying 71.8% of total seed sown and being an important source across crops. Farmers in

⁴ The SSSA monitored the same season over two cycles in Alieu, and two distinct seasons for Ainaro and Baucau.

⁵ The seed security focus is on the three crops farmers each consider 'most important' so there may be some under-reporting of secondary crops, which are also key for nutrition and income.

Timor-Leste heavily rely on seed saving to much greater degree than farmers in many other regions of the world (see Sperling and McGuire , 2013).

The local seed/grain markets were the second major source. Across crops, these markets provided about 12% of the seed, but this source proved particularly important for the legumes. As Figure 5.2 shows, about 15-50% of the legume seed sown (peanut, common bean, long beans, mung beans, black beans) was sourced from local markets. Support of this seed channel might be key for those interested in supporting nutrition.

Neighbours, friends and relatives, that is social networks, were of relatively minor importance as a source of seed sown (7.2% of seed. The networks provided portions of seed especially for the vegetatively-propagated crops of cassava, sweet potato, and Irish potato, and, to some extent, for common beans and rice.

Seed from government channels was central for maize and rice (especially when one regards the large quantities sown) and for about a third of the Irish potato planted.

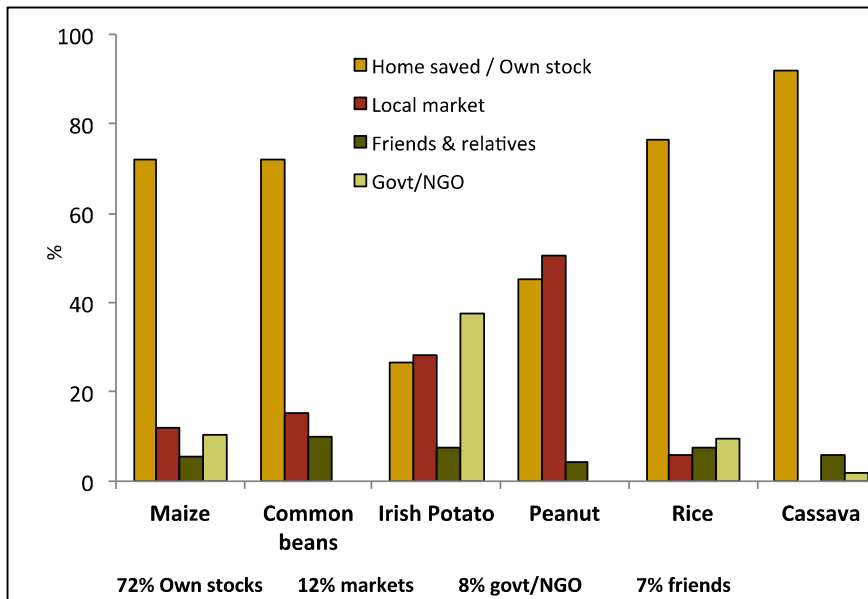
All other seed sources provided negligible amounts of seed. The relative lack of impact from the community seed producer groups might be linked to their being recent developments. This SSSA could usefully serve as a baseline to measure the possible growing importance of these seed producer groups in the future.

Table 5.1: Seed (kg) planted and sources farmers used, Timor-Leste late 2012/early 2013

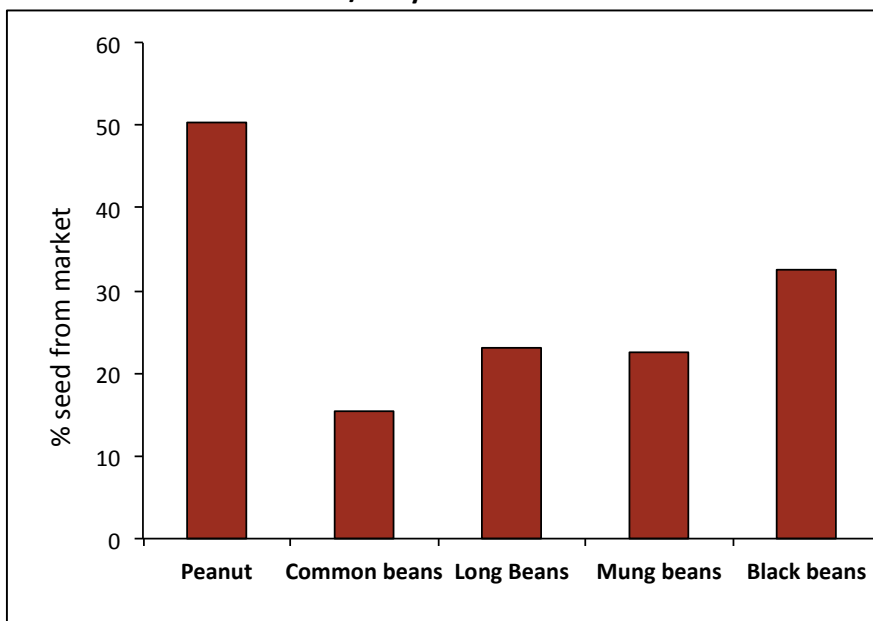
Crop	Total kg sowed	% of total						
		Own stocks	friends, relatives	local market	agro-dealer	-CSPG	Gov't	NGO / FAO
Maize	2395.6	69.5	5.2	15.2	0.0	0.1	6.1	3.9
Common beans	1800.5	71.9	10.0	15.4	0.0	0.0	0.0	0.0
Cassava	165.8	92.0	6.0	0.0	0.3	0.0	1.3	0.4
Sweet potato	37.2	86.1	10.1	0.4	0.0	0.0	3.2	0.2
Taro	30.5	99.8	0.0	0.2	0.0	0.0	0.0	0.0
Irish Potato	266.0	26.7	7.5	28.2	0.0	0.0	37.6	0.0
Peanut	57.6	45.3	4.3	50.3	0.0	0.0	0.0	0.0
Rice	2506.0	76.3	7.5	6.1	0.0	0.6	8.1	1.4
Pigeonpea	10.7	84.5	7.0	8.5	0.0	0.0	0.0	0.0
Cabbage	0.1	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Arrowroot	81.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Long Beans	6.5	69.2	7.7	23.1	0.0	0.0	0.0	0.0
Mung beans	11.1	77.5	0.0	22.5	0.0	0.0	0.0	0.0
Mustard	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Veg	0.1	0.0	34.2	54.8	11.0	0.0	0.0	0.0
Black beans	12.3	67.5	0.0	32.5	0.0	0.0	0.0	0.0
Pumpkin	1.4	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Eggplant	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL-all crops	7387.2	71.8	7.2	12.3	0.0	0.2	6.1	1.8

- CSPG= community seed producer groups

**Figure 5.1. Seed sources (% seed sown) farmers used, Timor-Leste late 2012/early 2013 .
N=191 farmers**



**Figure 5.2. Local seed/grain market (% seed sown) as farmers' source for legume seed.
Timor-Leste late 2012/early 2013 . N=191 farmers**



Are farmers seed-stressed for the main 2012-13 planting season

(Were the amounts of seed sown more or the same as usual? what about the yields?)

To understand better any possible vulnerability, the SSSA team asked farmers to compare the 2012-13 quantities of seed they sowed, by crop, with what they would normally sow at the same period each year. Basically, the question was this: Were the 2012-13 patterns 'normal' or 'different' from what farmers usually do, as gauged by the farmers themselves?

Farmers reported they that, overall, quantities sown were fairly close to the normal (varying from - 1.4 to + 0.3 % by site). There were, however, some important trends by crop. In Alieu, rice seed use decreased, but for positive reasons: farmers were using less seed due to the adoption of Integrated Crop Management (ICM) practices. On the negative side, potato seed use in Baucau declined due to heavy rains and increased problems with disease and rot.

Table 5.2: Farmers' sowing amount for 2012-13: more less or the same?

Crop	N	% of HHs			Change in sowing amounts (%)	Alieu : + 0.3 %
		MORE	SAME	LESS		
Maize	65	24.6	64.6	10.8	8.32	
Cassava	56	10.7	76.8	12.5	0.76	
Rice	48	4.2	70.8	25.0	-12.23	
Sweet potato	13	7.7	69.2	23.1	1.90	

Crop	N	% of HHs			Change in sowing amounts (%)	Baucau: - 1.4 %
		MORE	SAME	LESS		
Maize	54	13.0	59.3	27.8	-5.07	
Common beans	50	16.0	52.0	32.0	8.87	
Cassava	33	6.1	63.6	30.3	-4.05	
Sweet potato	14	0.0	78.6	21.4	-9.52	
Taro	14	7.1	85.7	7.1	4.46	
Irish Potato	5	20.0	40.0	40.0	-28.33	

Ainaro: + 0.2 % (table not shown)

Sowing rates portray only of the picture. The crop yield and general harvests obtained by farmers were reported as quite good overall, again the exception being in Baucau. There, heavy rains affected yields especially of Irish potatoes and, for select farmers, also for common beans (Table 5.3).

Table 5.3: All farmers: assessment of yield, by crop, Timor-Leste 2012-2013

Crop	N	How was yield?					
		N			%		
		Good	Average	Poor	Good	Average	Poor
Maize	260	164	61	35	63.1%	23.5%	13.5%
Common beans	62	27	11	24	43.5%	17.7%	38.7%
Cassava	146	116	20	10	79.5%	13.7%	6.8%
Sweet potato	42	37	4	1	88.1%	9.5%	2.4%
Taro	19	14	4	1	73.7%	21.1%	5.3%
Irish Potato	6	0	2	4	0.0%	33.3%	66.7%
Peanut	15	12	3	0	80.0%	20.0%	0.0%
Rice	112	96	11	5	85.7%	9.8%	4.5%
Pigeonpea	6	5	1	0	83.3%	16.7%	0.0%
Cabbage	2	2	0	0	100.0%	0.0%	0.0%
Arrowroot	5	5	0	0	100.0%	0.0%	0.0%
Long Beans	7	5	1	1	71.4%	14.3%	14.3%
Mung beans	7	4	3	0	57.1%	42.9%	0.0%
Mustard	1	1	0	0	100.0%	0.0%	0.0%
Yam	1	1	0	0	100.0%	0.0%	0.0%
Green Veg	3	2	1	0	66.7%	33.3%	0.0%
Black beans	5	5	0	0	100.0%	0.0%	0.0%
Pumpkin	2	2	0	0	100.0%	0.0%	0.0%
Eggplant	1	1	0	0	100.0%	0.0%	0.0%
TOTAL-all crops	702	499	122	81	71.1%	17.4%	11.5%

Seed sources and quantities to be planted 2013-14 Main season ('next season')—and possible stress

Farmers in the three sites were also asked about seed sources and quantities to be planted for the next season, starting Nov 2013. While planned seed sources are not proven 'hard' data, they are a good indicator of whether farmers expect seed stress or other related troubles. The results below show a fairly stable trend. In Alieu, seed use is overall is projected to go up (+ 6.1%) with maize and cassava planting material being intensified. In Baucau, there is an anticipated slight negative decline (- 6.7%) with Irish potatoes and maize being particularly affected. Ainaro has the strongest trend and a positive one in seed use (+11.2%) with rice particularly shooting up due to the expected increased of tractors. Hence, across seasons, production is fairly stable overall, with some notable shifts in crop profiles.

Focusing on potential problems areas + spurring production

Potential problem areas

The relatively normal picture for the 2012-14 period should not obscure that there may be vulnerable populations, or other key factors, why can give insight into why farmers are planting less---- factors would could influence design of critical assistance. In terms of

household numbers, slightly less than 20% of households were sowing less of a given crop for both the 2012 -13 and 2013-2014 growing seasons (see Annex II for site-specific tables).

Diverse reasons were given for this decline in seed use (Table 5.4). As examples: “ I had no money to buy more seed’ or ‘ I have no husband to help with the labor” , or ‘ the rains came late . A positive development was driving the fourth factor: less seed use was linked to adoption of ICM- for rice. Note that the only seed-related problem was tied to access problems (i.e. seed availability was not a cited as a key constraint). Lack of cash affects sowing rates for purchased seed such as common beans. Other key factors associated with declining seed use were linked to the general vulnerability of households (labor, poor weather, or land constraints). **Problems with labor were the # 1 constraint** (Box 8).

Table 5.4: Reasons (% of responses) all farmers cited for plant less of a given crop in Timor-Leste , two consecutive seasons

Reasons- LESS	% responses 2012-13 season N=99	% responses 2013-14 season N=102
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
No seed available in market	1.0	0.0
No seed/cuttings available from neighbors	3.0	5.9
<i>Seed access</i>		
No money to buy seed/poor finances or seed too high	12.1	12.7
<i>Seed quality</i>		
Seed available is not good quality or the variety is not liked	2.0	3.9
Sub-total: seed-related	18.2	22.5
NON-SEED FACTORS OF PRODUCTION (limits)		
No/insufficient labor	35.4	41.2
Illness/health problems	0.0	1.0
No/insufficient land or land not appropriate/sufficiently fertile	8.1	6.9
Lack of tools/tractor/ other machinery to farm	0.0	0.0
Plant pests/diseases make production not possible	2.0	4.9
Animals/predator make production not possible	3.0	2.9
Lack of other inputs: controlled water supply/irrigation/ fertilizer	0.0	0.0
Poor weather/rainfall	15.2	8.8
Insecurity (e.g. theft)	0.0	0.0
Sub-total: Factors of Production	63.6	65.7
OTHER PRIORITIES/STRATEGIES		
Markets for crop or crop products not well-developed	0.0	0.0
Other priorities than agriculture (e.g. have shop)	0.0	0.0
Changing Crop priorities or changing agricultural practices	1.0	0.0
New Farming methods allow lower seeding rate	16.2	6.9
Other	0.0	2.9
TOTAL	99.0%	98.0

Box 8. What to do about compelling labor constraints? We need to learn more

Labor constraints were cited as the #1 reason for a household's sowing less, across both seasons of the SSSA.

Purchasing extra labor was described as 'expensive' and a women's group discussion in Haiconi outlined the standard daily hire costs:

Initial rate: \$5/day (the same rate for land preparation, weeding, planting)
+ feeding worker:
 • Breakfast
 • Lunch
 • Afternoon tea
+ worker may asks for extra taro to bring home with them

Hence, paid labor may be beyond the reach of many. While labor sharing arrangements do exist, many of the vulnerable (widows and the elderly) felt least able to contribute to working elsewhere.

To start to alleviate labor constraints, more needs to be learned about the type of challenges. Constraints for what tasks, when, why? Would labor vouchers work as a form of assistance? Is surplus labor available?

Spurring production

To further understand farmers' planting decisions, we end on a positive note: why those who planted (will plant) more in 2012-13 and 2013-14 do so (Table 5.5). The major reason hinges on farmers' receiving a new variety free (especially the maize Sele). Hence, given the bottle-size of seed given free, increased sowing rates are modest. Getting access to more land, and also deciding to give more priority to agriculture also directly expanded seed use (and hence expanded land area sowed).

Table 5.5: Reasons all farmers (% of responses) gave for planting MORE than normal of a given crop , Timor-Leste, two consecutive seasons.

Reasons-MORE	% responses 2012-13 season N=59	% responses 2013-14 season N=82
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
More seed available due to good harvest	10.2	7.3
More seed available due to free seed	23.7	12.2
<i>Seed access</i>		
More money to buy seed or seed price low	0.0	1.2
Got credit to buy seed	0.0	0.0
<i>Seed quality</i>		
Have especially good seed or good variety	6.8	3.7
Sub-total: seed-related	40.7	24.4
NON-SEED FACTORS OF PRODUCTION (opportunities)		
Good/increased labor	6.8	7.3
Feeling strong/healthy	1.7	0.0
Have more land/more fertile land	16.9	34.1
Have tools/tractor, other machinery to help farm	5.1	4.9
Good weather/rainfall	3.4	0.0
Good security (peace has arrived; less theft)	0.0	0.0
Sub-total: Factors of Production	33.9	46.3
OTHER PRIORITIES/STRATEGIES		
Well-developed /new markets for crop or crop products	1.7	4.9
Have decided to give more priority to agriculture	11.9	11.0
Changed crop profiles or priority to certain crops	1.7	4.9
Re-sowing due to stress (e.g. poor soils, germination, rain)	5.1	4.9
Other	1.7	2.4
TOTAL	96.6	98.8

Can the markets deliver seed 2013-14?

To complement farmers' own stocks for November 2013 sowing season an important question becomes, "Can the markets also deliver seed (especially for the legumes)? Concretely, will seed be put on offer, with the quality that farmers want, and at prices that make purchase accessible for smallholder farmers?"

Chapter IV looked at general seed/grain market functioning, here we summarize the salient issues to determine if there are supply problems- for 2013-14-- or not.

Formal sector agro-dealer outlets: seed—supply 2013-4

Dedicated agricultural input shops have started to operate in Timor-Leste only within the last decade. At the time of the SSSA, three or four existed countrywide: Loja Agrikultura Dili and Jupiter Agri in Dili; Loja Agrikultura in Baucau District and Fini Diak in Liquica District (ms. 2014 'Vegetable value chain in Timor-Leste'). At present, such agro-dealers serve very few, although select farmers in both Alieu and Baucau indicated they occasionally travel to Dili (1- 3 hours) to purchase seed packets.

In September 2013, the president of Loja Agrikultura in Dili, the country's main agro-dealer, estimated that he was serving 400-500 customers a month. The range of seed products on offer was narrow (vegetable seeds and sweet maize), but the outlet also sold animal feed (for pig and fish), organic and inorganic fertilizers, fishing accessories, veterinary medicines, drip irrigation accessories and even seed storage airtight GrainPro bags. In 2013, MAF/SoL started to explore with this Loja Agrikultura possibilities to sell released varieties of maize, peanut and paddy (*B. Kunwar, field visit notes, September 30, 2013*).

In efforts to extend the reach of 'formal sector' agro-input shops, one NGO, Mercy Corps has been working to train general goods supplies to also sell horticultural seed (see section below, 'Kiosk model'). There are potential advantages to such an operational model. New infrastructure costs are kept minimal. Also, farmers can buy seed in shops close to their communities and combine domestic shopping with agricultural tasks. However, there are important challenges: among others, store owners have to keep seed in conditions which allow it to remain viable; and they have to become sufficiently informed about the agricultural products so as to give targeted advice (planting conditions, dates, etc.). At the time of the SSSA, the quantities being moved by some kiosks were 'modest'. This is an important development, but not yet one that has a major impact on farmers' seed supply.

Overall, in October 2013 the network of formal sector seed supply was fledging and delivering <1% of the seed farmers' sowed). In terms of further enhancing seed security, agro-dealers' effectiveness: a) will partly hinge on their placement --they need to be closer to rural areas; and b) on the range of crops they offer for sale-- they might usefully broaden beyond the horticultural and sweet maize seed currently stocked.



Box 9. Agro-dealer shops

A small number of formal agro-dealer shops (3-4 countrywide) are starting to serve farmers.

In terms of seed, their focus is on horticultural crops, most of which come from Indonesia

Local seed/grain market-supply 2013-14

Outside of farmers' own stocks, the main source for Timor-Leste seed proves to be the local markets. Farmers obtain especially legume seed from local markets: they carefully seek out 'potential seed' from the grain supplies (Chapter IV, Box 7). The issue is whether supplies of local market seed could meet the 2013-14 needs.

Market seed availability: legume seed

Interviews were conducted with those traders who supply seed/grain at each site (N=62). Interestingly, the SSSA team could find no real aggregators (those who monopolize overall supply) but rather identified many traders who work 'locally' and also bring potential seed from other regions. For the 2013-14, the large majority of traders indicated that supplies were 'good' or 'normal'. There were no particular supply stresses to be noted.

This availability of potential seed was given further confirmation by mapping the actual flows of seed. Distances across Timor-Leste are small and there are numerous catchment zones (i.e. similar agro-ecological areas) whereby seed can be moved from one region to another fairly easily (roads are in place, distances may be 50-100 km or less). Figure 5.3 gives an example for movement of bean potential seed, based on trader interviews. Table 5.6 further maps seed potential seed sources for a range of crops, using Alieu as the focal point for delivery and sale.

The larger implications of these routine seed flows are important. Even if seed is not quickly available locally, for instance due to poor local harvests, it can be easily trucked in from a wider zone of adaptation (with actual practicing already doing this). **In light of this observation, government seed security plans which promote District level self-sufficiency might best be reviewed. Simply, depending on the crop and flows, one District might easily promote seed security in another.** (see Chapter IV for specific discussion of adaptation zones for grain which can be used as seed).

Figure 5.3. Timor-Leste Bean Potential Seed Flows (practice 2013, trader interview)

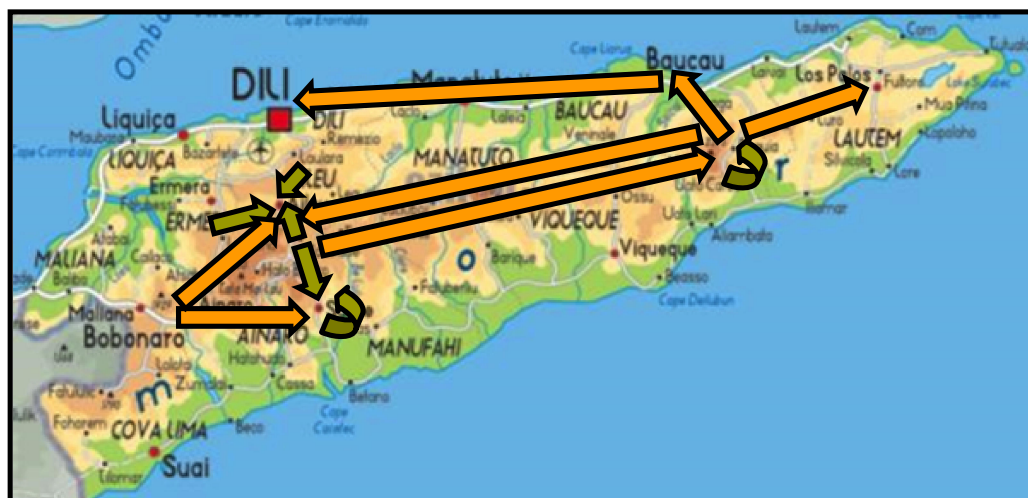


Table 5.6: SEED FLOWS from the perspective of ALIEU traders (where can we get seed?)

SEED/GRAIN ORIGINS	POTENTIAL SEEDS (crop type)
Maubisse	Beans (Koto), Soy Beans, Fore Masin, Cowpea
Suai	Mung Beans, Maize, Rice, Fore Masin, Peanuts, White Maize,
Same	Maize,
Bobonaro	Peanuts,
Baguia	Beans (koto manteiga)
Aileu	Maize, Soybeans, Pigeon Pea, White Beans
Ermera	Maize,
Dili	Vegetables (packed seeds imported)
Natarbora	Maize

Market seed availability: vegetable packaged seed

One unexpected finding in assessing availability of seed in the local seed/grain markets proved to be the proliferation of vegetable seed sale points. The team had worked from an initial assumption that such certified seed would be scarce- due to the scarcity of agro-dealer outlets countrywide.

In contrast, the SSSA revealed an abundance of sale points, in local markets, small grocery stores, general goods shops, open air stands. In Baucau, 6 sale outlets were located in 30 minutes ; in Ainaro, 8 were quickly located , including vegetable seed packets on sale in a hardware shop and a motorcycle accessory store (Box 10 for sampling of venues).

Box 10. Sample of venues where packages of vegetable seed sold



Sale outlets vegetable seed

There were many positive aspects linked to this plentiful vegetable seed sale. While the oldest seller interviewed in Ainaro had started in 2004, a good number had opened shop in the last two years—citing a marked increasing demand. Some shops also had high variability of horticultural seed on offer: for example, in one store, 16 different types of seed were displayed (i.e. a greater range than in the formal agro-dealer enterprises): bok choy, lettuce, tomato, celery leaf, eggplant, watermelon, bitter gourds, mustard.

The vegetable seed phenomenon also flags some concerns. Most of the packets had information printed in ‘foreign languages’, that is not Tetum or English. Farmers could not interpret the expiry date or make informed choices around management requirements. Also, it is not clear if the crops/varieties would actually be adapted to specific Timor-Leste regional agro-ecological conditions, or if they had even been tested in country. Further, an unknown supplier cannot be held accountable for the quality of planting material.

As a way forward, this wealth of vegetable seed material might be usually screened in country, and at diverse elevations. Mechanisms might also be explored for making the packet information accessible. Projects such as FarmPro might be well placed to help with these testing and communication services (*P. Dougan, pers.l communication, October 2013.*)

Market seed access/price

As a final issue linked to market seed, the SSSA team assessed seed price and subsequent farmer access. Financial constraints were cited as a one reason for farmer’s sowing less in both seasons being reviewed, 2012-13 and 2013-14 (Table 5.4 above; 12% of responses). Table 5.7 presents seed expense calculations for farmers for the late 2012- early 2013 season as well as projected seed purchases for the November 2013 sowing season. Overall, the sums needed per farmer fall between \$US 9 and \$19 , with the amount markedly higher for Baucau due to the emphasis on beans (where seed is routinely purchased on local markets). These sums appear relatively modest, that is ‘affordable for most’. Of more general note is that farmers *do* buy seed.

So, in brief, seed/grain market assessments showed potential seed to be immediately available in each area, with acceptable quality on offer. Financially, the purchased seed amounts needed seemed to translate into ‘affordable’ sums for the majority.

Table 5.7: Timor-Leste farmers’ cash needs for seed purchase: ‘major crops, (\$)US

Average Expenses per farmer, season late 2012/early 2013							
key crops	N growing this crop	Spending (\$)				all purchases	% of total
		Local market	Neighbors	Ag-input shops			
							Ainaro
Maize	58	2.55	0.42	0.00	2.97	32.5%	Nov 2013 sowing: \$11.09
Rice	36	1.92	0.73	0.00	2.65	29.0%	
Peanuts	11	3.24	0.28	0.00	3.52	38.5%	
Total		\$ 7.71	\$ 1.44	\$ 0.00	\$ 9.15	100.0%	
							Baucau
							Nov 2013 season: \$19.23
Maize	54	1.47	0.74	0.00	2.21	12.2%	
Beans	50	11.00	4.90	0.00	15.90	87.8%	
Total		\$ 12.47	\$ 5.64	\$ 0.00	\$ 18.11	100.0%	

Community assessment of seed security

As a crosscheck to the above quantitative data, the communities themselves were asked to assess the seed security of their members. Seed Security was defined as either having the seed already in hand, or being able to access the seed with some certainty (through purchase, barter, gift, or other). Community meetings at all sites involved upwards of 40 people, men and women, and the discussions were intense and interactive. Table 5.8 presents two communities' assessment of those in their area who they deemed seed secure for the upcoming season, 2013-14. For all crops cited, communities sensed their members had seed or could get seed: i.e. 100% would be seed secure, across a good range of crops.

Table 5.8: Community assessment of% of its members who are seed secure for Nov 13 sowing season

<i>CROP</i>	<i>ALIEU</i>	<i>AINARO</i>
<i>Maize</i>	<i>100</i>	<i>100</i>
<i>Rice</i>	<i>100</i>	<i>100</i>
<i>Cassava</i>	<i>100</i>	
<i>Vegetables</i>	<i>100</i>	
<i>Mungbean</i>		<i>100</i>
<i>Pigeonpea</i>		<i>100</i>

Summary: Acute Seed Security Findings

1. This assessment revealed no significant acute seed security stresses. Sowing rates were stable for the 2012-13 season (varying across sites from -1.4 to + 0.3%), with projections of sowing increases for the 2013-14 season (+3.74%). Yields, across crops, were also assessed as generally 'good' or 'average' (90% cases).
2. Among the minority of households indicating a reduction in sowing amounts for the 2012-13 and 2013-14 seasons, labor constraints were cited as the driving factor (over 1/3 of reasons for both seasons). Lack of money and poor weather also figured important in about 10% of cases. A positive development was the fourth major factor cited: use of less seed due to better integrated crop management (ICM on rice,). Lack of cash particularly affects sowing rates for purchased seed such as common bean. Note that 'lack of seed' (i.e. non-availability) was not highlighted — except in a small number of cases associated with cassava cuttings.

3. For those 'sowing more than usual', 'having access to more land' and 'getting new varieties' were important positive factors.
4. Overall, over 90% of the seed farmers sowed came from local channels, including from farmers' own stocks, the local market, or through social networks of neighbours, friends and relatives. This suggests the importance of informal seed systems as the core seed sources. Farmers' own stocks were, by far, the main source of seed, supplying 71.8% of total seed sown.
5. The local seed/grain markets were the second major source for seed. Across crops, these markets provided 12% of the seed. Local seed/grain markets proved particularly important for the legumes (supplying 15-50% of the seed of peanut, common bean, long beans, mung beans and black beans). Support of this seed channel might be key for those interested in supporting nutrition.

Can the markets deliver seed for 2013-14?

6. Agro-dealer outlets and networks are just starting to function in Timor-Leste and, during the assessment periods supplied <1% of the seed sown (and only of maize and vegetable seed). Likewise, kiosks- that is, general goods stores also selling agro-input supplies, were just being catalyzed 2012-14.
7. Local seed/grain markets, important for legume seed, were functioning at normal levels of quantity and quality, as assessed by a large group of traders (N=62). Mapping of actual supplies and potential seed flows indicated there would be no availability problem.
8. Linked to #6, seed flows from one region to another are so extensive that lacks in any one area, are likely to be compensated by incoming supplies from another (for instance, moving bean seed from Baucau to Alieu). Any seed security district-level plans might practically project for inter-district flows rather than (falsely) assume 'self-sufficiency' within any one District entity.
9. The wide availability of vegetable seed, sold in packets, was an unexpected finding. Packaged vegetable seed is being sold in open markets, general stores, and even in hardware and motorcycle supply stores. Demand is rising and sellers are responding by putting on offer variability (e.g. in a single store, 16 different types of seed, a greater range than in the formal agro-dealer enterprises).
10. The vegetable seed phenomenon flags some concerns. Packet information was often printed in 'foreign languages', that is not Tetum or English. Farmers could not interpret the expiry date or make informed choices around management requirements. Also, it is not clear if the crops/varieties would actually be adapted to specific Timor-Leste regional agro-ecological conditions, or if they had even been tested in country. Third, an unknown supplier cannot be held accountable for the quality of planting material.

Can farmers afford to buy supplies available?

11. Expenses slated for seed purchase seem relatively modest and affordable for most farmers. The sums needed per farmer roughly fell between \$US 9 and \$18 for 2012-13 and \$11-\$19 for 2013-14. The cash needs were markedly higher for Baucau due to the emphasis on common beans (where seed is routinely purchased on local markets). Of more general note is that farmers *do* buy seed.

Communities' assessment of seed security

12. The communities themselves deemed their members as 100% seed secure for the 2013-14 season. Seed security was defined as having the seed in hand or being able to access seed for the major crops

Hence, the 2012-13 season was a stable if not promising one. There are some seed system stresses, but are chronic ones, rather short-term constraints.

Chronic seed system concerns + emerging opportunities

We now move to examining more systemic trends in Timor-Leste agricultural and seed security. Community-level assessments were done in all sites and involved a range of methods: community meetings, special focus group discussions with women, key informant interviews (with government leaders, business men, NGOs staff and others), and market analyses. The varied methods allowed for cross-verification and opened possibilities to assess medium-term trends. The following topics are highlighted below: dynamism in use of seed sources, crop diversification, decentralized seed production, access to new varieties and non-seed input use. A final section discussed possible seed security differences between male and female-headed households.

Seed system sourcing-- dynamic trends

Community mapping of seed sources traced trends in seed source strategy. Groups mapped seed sources for a particular crop and compared current sources with those used five years previous. The analysis shows that there has been some dynamism in sources, but mostly for packaged vegetable seed. Also, in many cases, seed source 'innovations are not sustainable—hence NGOs give new varieties one-off, or governments give free aid. Several mapping examples below give of sense of how variable seed system innovation has been in Timor-Leste.

Figure 5.4. Seed sources peanut Alieu

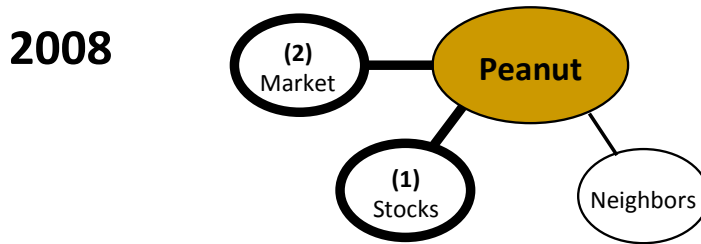
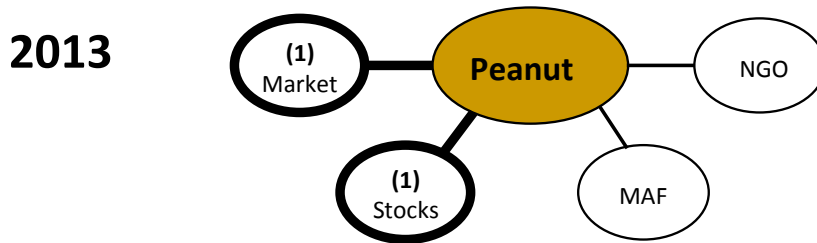
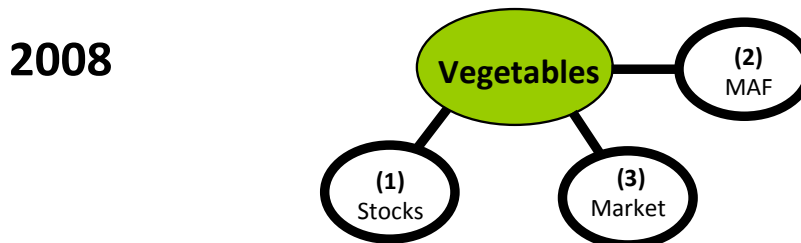
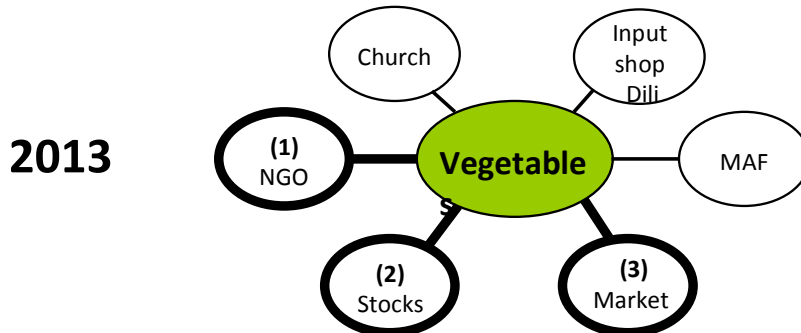


Figure 5.4 shows that there has been only modest dynamism in peanut seed sources. Own stocks and local markets have long been the main sources of seed. In the last five years, the major change has to do with some variety introductions from the MAF/ Seeds of Life partnership.

Figure 5.5. Seed sources- Vegetable Alieu



In contrast, within the last five years, sources for vegetable seed have multiplied significantly. Along with subsidized new channels (e.g. church and NGO), the private sector has started to enter the vegetable seed market, and farmers are paying for seed.

Crop diversification and (few) value added products

Communities also provided overviews of major crops sown in their area and rated their respective importance for food consumption, income, and possible transformation from raw agricultural into value-added products geared to increasing revenue margins. Table 5.9 sketches the results of a community assessment in Alieu. While a good of crops are grown, few are transformed at any scale. Also, surprising is that the legumes and vegetables are largely being targeted for sale. This may have important negative ramifications for household nutrition.

Table 5.9: Alieu Diversity of crops, but --little transformation

Crop	Importance for food	Importance for income	Transformation?
Maize	+++	++	meal, animal feed
Rice	+++	++	meal, animal feed
Cassava	+++	++	Bread, sweets, chips
Arrowroot	+++	----	animal feed
Taro	+++	----	bread
Sweet potato	++	++	chips
Banana	+	+++	Bread, chips
Tomato	+	+++	-----
Mustard greens	+	+++	-----
Cabbage	+	+++	-----
Green beans	+	+++	-----
Peanut	+	++	

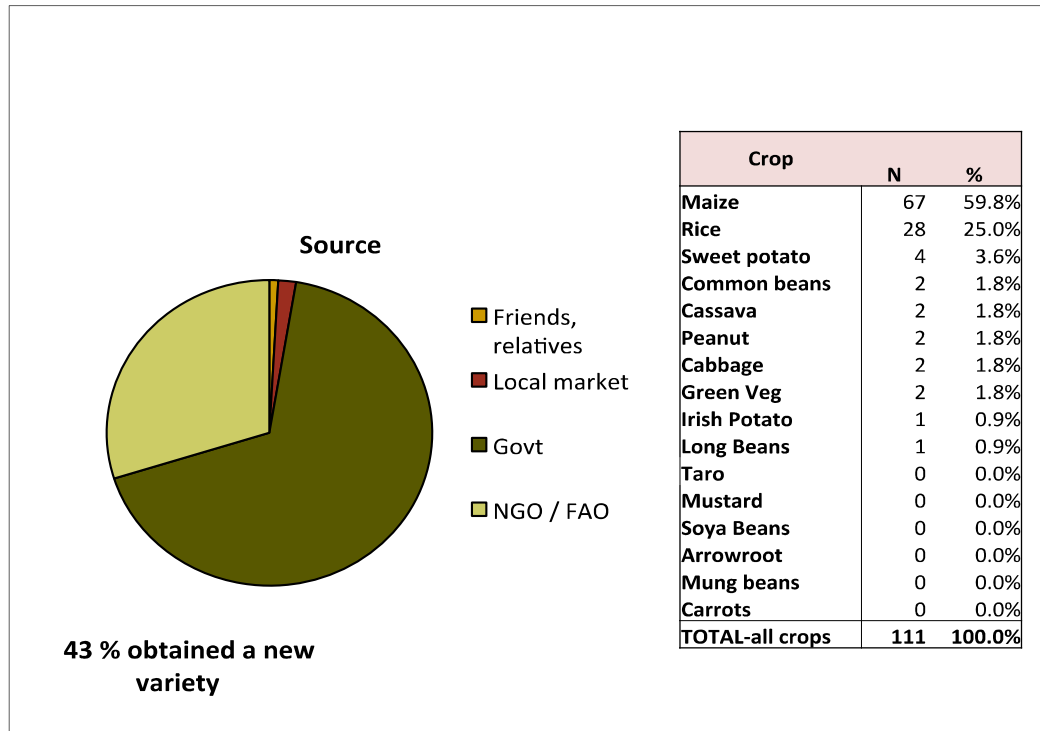
+ indicates relative levels of importance, with more +'s being relatively more important

New varieties

Continuing to search for innovation, the issue of new varieties is addressed. Within the context of seed security, variety introductions can be an economical way to increase production quickly. Overall, 43% of farmers in the SSSA sample had accessed a new variety within the last five years, which seems a relatively promising figure. However, upon closer look, access to new varieties is quite constrained: About 85% of the new entries were either of maize or rice, with few farmers a new variety of key legumes. Also, the lion's share of accessions (> 95%) was obtained free (through government or NGO/FAOs).⁶ Few sustainable channels supply farmers with an array of new varieties on a continuing basis.

⁶ Note that the farmers may have slightly overestimated the % of new varieties coming from the government and NGOs by neglecting to recognize that 'new varieties' do not always have to be ones emerging from the research system.

Timor-Leste farmers' source + type of new varieties 2008-2013 (Figure 5.6. Table 5.10).



With seed production groups on the rise, the opportunities for obtaining and even purchasing new varieties could change in the near future. Key is that sustainable conduits be developed which can serve many farmers and put an offer a real array of crops and varieties. Several innovative approaches are suggested in Boxes 11 and 12 which broaden the outlets for sale and also put seed on offer in very small units ('small packs') which should be affordable for most farmers.

Box 11. Getting varieties out : the Uma Ita Nia example

There are a range of innovative approaches to get new varieties into farmers' hands. 'Uma Ita Nia' provides an excellent example of one of them. Linked to the Maryknoll Sisters, this local NGO based in Aileu has organized farmer groups for vegetable production for nutrition and income. This includes vegetables new to the area, such as celery, broccoli, and zucchini (courgette). The latter has proven so popular in nearby Aileu town that farmers selling it "can't take any home" (U. Engelberg, *pers. comm.*).

What is interesting is that these farmers pay for this seed. Uma Ita Nia staff buy seed in large packets and subdivide it into smaller units for sale to farmers. For example, a \$20 packet of broccoli seed is divided into \$1 sized packets. Initially, farmers were cautious even with that, and bought even smaller quantities - e.g. \$0.25. But after trying it, they now are happy to buy larger amounts, \$1 or more. Last year, this small NGO sold around \$1000 in vegetable seed to small farmers – a great achievement!

Several factors contribute to this success. One is trust: the charity has a long presence in the area, including building a hospital, and working with organized groups. Farmers know from whom they are buying. Secondly, small and flexible quantities have allow farmers to limit risk and then build up when they were more familiar with the new types. And finally, farmers received additional information, including on cultivation (the NGO has local testing sites to fine-tune their advice) and on how to cook these new vegetables.

Box 12. Innovative channels using a small pack model to put new varieties on offer

Timor-Leste farmers need better access to new varieties and especially to the legumes. No sustainable conduit currently gives them easy seed access—except to vegetable seed

Why not build **multiple channels** to render seed accessible to ALL: In particular small pack sale might usefully be tested through:

- Lojas Agrikulturadas (agro-dealers)
- General good shops (Mercy Corps)
- Vendors at open markets
- Faith-based groups

There are wonderful possibilities for enhancing farmers' access to new varieties ---quickly.



small packs

Kiosk Model

Of particular interest in this effort to broaden accessibility to new varieties are the experimental efforts to support general goods shops as seed sellers. Rather than set up specialized seed store outlets (e.g. agro-dealer shops), one NGO, Mercy Corps, has been working to help routine kiosks expand their repertoire and just add a seed sector within their large rural shop. Hence, a rural shop may add a display cabinet and devote a small corner of the store to seed sale. As one example, one general goods store visited during the SSSA in Cassa had its central commerce around selling household foods stuffs: sugar, matches, milk tins (etc.). In one section, Shopkeepers also put on offer small packs of chili, cabbage, long bean, eggplant, and tomato seed. There are potential advantages to such an operational model. New infrastructure costs are kept minimal. Also, farmers can buy seed in the routine shops close to their communities combine domestic shopping with agricultural tasks. However, there are important challenges: among others, store owners have to keep seed in conditions which allow it to remain viable; and they also have to be sufficiently informed about the agricultural products as to give targeted advice (planting conditions, dates. etc.). At some point such general goods might be important links for selling seed of the registered seed producers. Much of the flexibility in seed sale outlets will hinge on the stipulations of the newly formed Timor-Leste seed laws. Such a 'general good model' has tested and proven effective in other regions, especially in Africa (CARE agent program, CARE, 2005).

Decentralized Seed Production

Multiplying and diffusing new varieties

Getting access to good quality seed and new varieties will also be contingent on their being multiplied. Decentralized seed producers will be particularly important for crops not taken up by the private sector, that is, most crops except for hybrid maize and vegetable seed.

The extensive program on decentralized seed multiplication has been described in Chapter IV. SoL also publishes updates on seed producer progress on a regular basis. As of July 2013, three farmers associations had achieved the status of 'registered seed producers', a quality grade that is roughly equivalent to those producing certified seed. Each such association produces 1-4 MT a season (generally of maize or rice), with quality control being encouraged by four 'spot checks per season'. Theoretically, such registered producers could lose their registration status should the quality of seed not meet agreed upon standards.

At one level down for registered producers, community seed producer groups (CSPGs) are being established in each suco, again catalyzed by MAF/Seeds of Life. The establishment of such groups has been rapid: in 2012/13, 681 CSPGs covered 135 of 442 sucos in the country (Table 5.11). In 2013/14, MAF/SoL has plans to expand CSPGs from 681 to 1200, covering 370 sucos, excluding urban sucos. The primary objective of CSPG is to produce enough quality seeds for the group members. If there is any surplus, such members are to sell or barter with neighbors. As a general process, one CSPG receives 5 kg maize seed or paddy from SoL and is expected to produce 150-300 kg of good quality seeds for the group members. Such groups are trained in techniques of seed production and some also have access to equipment which sorts by seed size (with size being a proxy for variety purity). The processes are still novel but, in theory, seed producers are only allowed to sell within a suco so as to get dense, neighbor coverage. They are also paid a guaranteed premium so as to encourage a well-managed product (for maize \$1/kg versus 0.50 -0.60 on the open market). The MAF/SoL aim is to support three community groups per suco (B. Kunwar, SoL, *personal communication*).

Table 5.11: Number of CSPGs from MAF/SoL in 2012/13

N	District	# Groups	Men	Women	Total
1	Aileu	78	694	426	1120
2	Ainaro	79	799	267	1066
3	Baucau	80	696	253	949
4	Bobonaro	80	753	380	1133
5	Liquica	80	534	319	853
6	Manufahi	80	782	263	1045
7	Viqueque	80	728	265	993
8	Lautem	24	153	116	269
9	Ermera	27	226	86	312
10	Manatuto	24	219	79	298
11	Oecussi	49	337	312	649
12	Covalima	-	-	-	-
13	Dili	-	-	-	-
	TOTAL	681	5921	2766	8687

Source: SoL, B. Kunwar, personal communication, October 2013.

Initial work has focused on maize and rice but an ambitious plan is also moving forward on sweet potato multiplication (Box 13).

Box 13. MAF/SoL SWEET POTATO MULTIPLICATION PLAN

MAF/Sol found rapid increase in dissemination of maize and paddy among farmers/groups 2010-2012, but dissemination of sweet potato and cassava among farmers has been a constraint. According to an SoL 2013 study, adoption of SoL released sweet potato varieties is around 3%, which the project deems is very low. One of the major constraints of sweet potato is that sweet potato production centers are far from the areas of planting. By the time sweet potato cuttings are delivered and planted they are often not in good condition (due to various reasons like handling during travel, drying, etc). MAF/SoL realize that the best way to promote sweet potato among farmers is to establish the production centers closer to their locations. Therefore, MAF/SoL has decided to establish the production centers in each district (as a source center) and at each sub-district (as satellite production centers). Until now, more than half of the districts and one quarter of sub-districts (out of total 65 sub-districts) sweet potato production centers has already been established. This year, 2013, year we have nearly 1 million cuttings available for upcoming planting season. We hope situation will improve for dissemination of improved varieties of sweet potatoes this year. We are also looking possibilities of engaging Loza Agrikultura to establish some sweet potato nurseries in the Dili and the districts. The owner of Dili based Loza Agrikultura has already shown interest to establish small nurseries of sweet potato in Metinaro Sub-District at his private farm. He plans to sell the cuttings once a week from his Loza in future. We will try to convince to other owners of Loza Agricultura like in Casa and Hatuudo in Ainaro. Moreover, we have also started distribution of the cuttings to vulnerable households in the sucos where we have reserve of sweet potato cuttings at CSPGs.

In terms of scale, SoL is aiming to produce 100,000 cuttings by season three.

i

Fledgling though they may be, these decentralized seed production initiatives represent important steps forward. Issues raised during the SSSA were two fold. Can such groups produce new varieties at a speed and quantity needed to achieve impact, 'at scale'? Note that the demand for such a service will increase as MAF/Sol moves to release a wider portfolio of crops and varieties. Second, will such groups remain viable without subsidy and/or how can a select sub-sector of these community groups transition into agro-enterprise entities THAT stand self-sufficient apart from MAF/SoL aid? The decentralized multiplication programs reviewed during the SSSA either: gave seed free, gave farmers vouchers to 'buy' seed, or sold seed at subsidized prices.

In terms of possible ongoing links, several of the traders and agro-dealers interviewed during the SSSA indicated interest to work directly with farmer groups to sell inputs and to buy outputs: these links need now to be expressly facilitated. Also, those working on seed production models might usefully compare multiple production options (beyond have many smallholder farmers produce at very modest scale) for their neighbors. In particular, cost efficiency, speed and coverage might be useful variables for screening varied seed production and delivery possibilities.

Seed for vulnerable households

MAF/SoL also has a seed-related program for vulnerable households. Beneficiaries are able to access seed from seed producer groups by means of a voucher system (supported through humanitarian aid). Beneficiaries are chosen via a list drawn up by the Chief of the Aldeia, and along an agreed set of criteria (those who are poor but have land; those who have interest in a crop but are not part of a farmer group). As of December 2013, the aim was to reach 30 beneficiaries in each suco where SoL is working (270 at that time) with a money allotment was calculated at \$US 300/suco. In theory such a model not only helps the vulnerable but spurs the CSPGs to earn income.

Agro- enterprise

The SSSA teams saw almost no agro-enterprise in the sites visited, beyond basic milling of maize. However, several agricultural-linked business initiatives were on the horizon. One key project, starting 2010, has focused on developing the fresh vegetable market for Timor-Leste (Gusmao and Johnston, 2013). Another, the Market Development Facility (MDF), is analyzing a range of opportunities for processing agricultural goods. As of 2013, the MDF had exploratory value chain analyses on a large range of crops and animal products, including looking at possibilities for processing maize, rice, cassava, potatoes, common bean, mungbean, banana, peanut, vegetables, chicken, prawn and 'meat (M. Mohsin, personal communication, October 2013). Possibilities for several value-added products had also been costed. The MDF is working broadly: strengthening general agri-business processes, distribution and trading structures, mostly in Dili and district capitals.

Manure/Compost, Fertilizer + Pesticide Use

Select input use was also examined during the Timor-Leste SSSA as a complement to the seed security analysis. This included examining farmers' use of a) organic fertilizer: manure and compost; b) inorganic fertilizer; c) pesticides and d) storage chemicals. As an overview, Table 5.12 summarizes the % of farmers across sites using or intending to use these inputs for 2012-13 main season and the 2013-14 seasons. Manure/compost are used by about ½ the population and pesticide/foiar sprays by ¼ of households. Other inputs are used at only modest levels, with the lack of protection in storage management being a serious management gap (see section on storage chemicals below). For those using these non-seed inputs, Table 5.13 Indicates the main crop priorities for application, with green vegetables being a particular focus. Select notes on each input follow.

Table 5.12: Percent (%) of Farmers across sites using (or intending to use) select inputs.

Input	Main season 2012-13 (N= 190)	Main season 2013-14 (N=188)
Manure/compost	46.8	48.1
Mineral fertilizer	7.4	10.5
Pesticides: foliar sprays	21.6	24.6
Storage chemicals	3.7	9.6

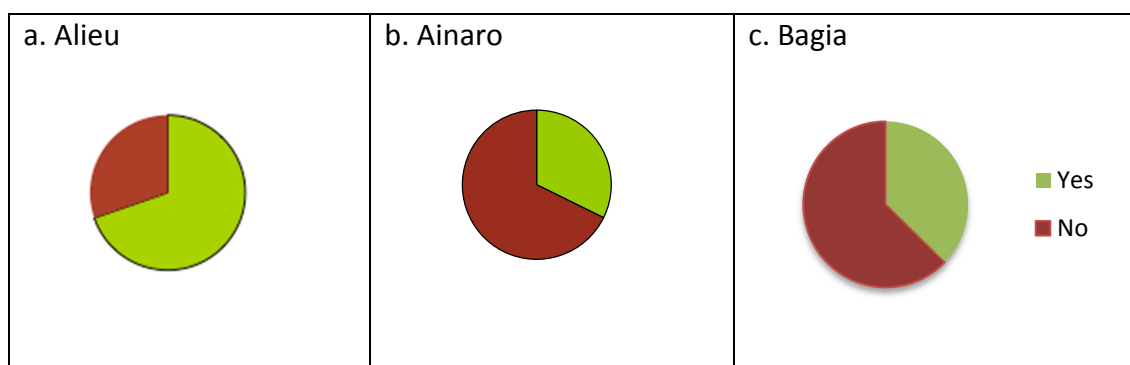
Table 5.13: Crops on which inputs were used 2012-13 (% cases where inputs applied).

Input	Rice	Green Vegetables	Maize	Common beans
Manure/compost		23.1	23.7	
Mineral fertilizer		72.2		
Pesticides: foliar sprays	75.5	13.2		
Storage chemicals			55.6	33.3

Manure/Compost Use

Use of compost/manure varied greatly by site, with proportionally more use in Alieu, associated with green vegetable production (Figure 5.7)

Figure 5.7. (a, b, and c) . Manure/compost use in three sites, 2012-13.



Mineral Fertilizer use

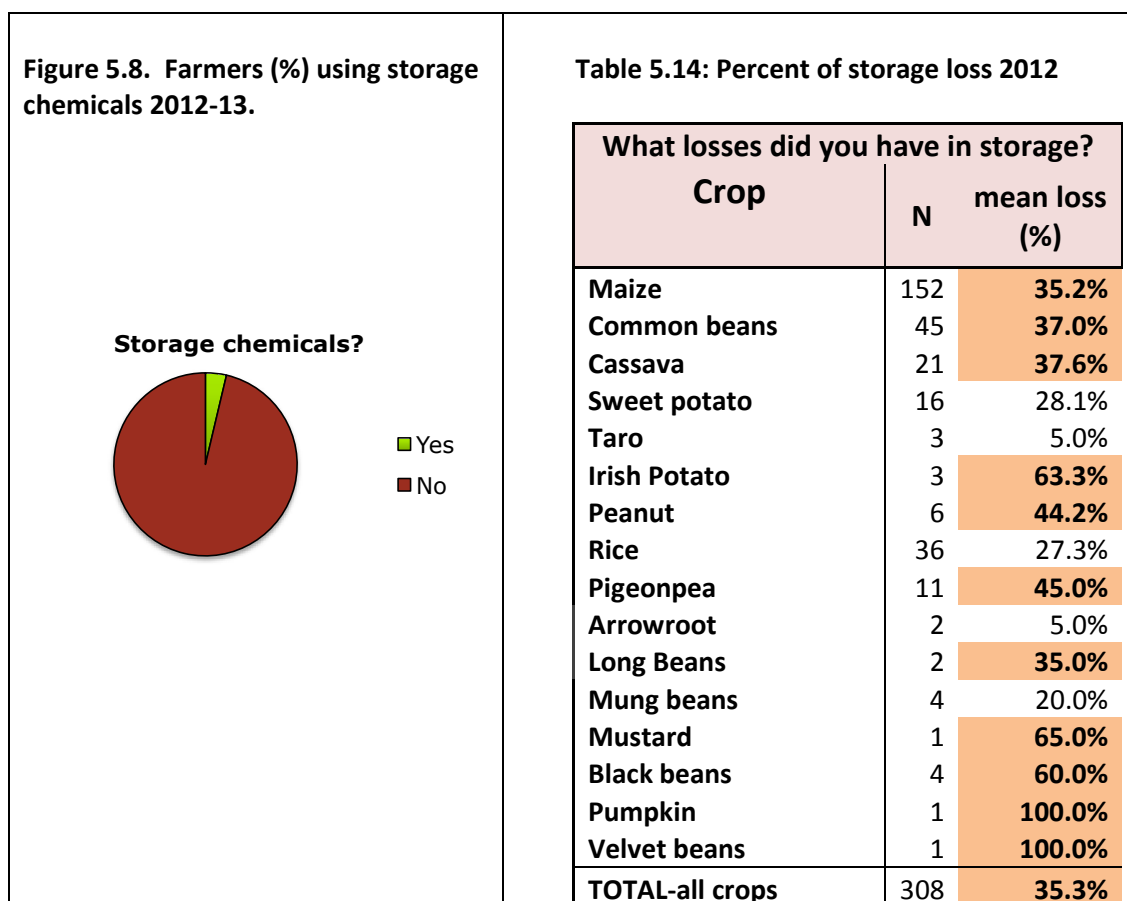
Relatively few farmers in the sample used mineral fertilizers (<10%) mainly because it was not available (52% of responses), they did not know how to use them (16% of responses) or farmers deemed them 'not necessary' (14% responses). When applied, vegetables were given priority application (Table 5.13 above).

Pesticide Use

About ¼ farmers used pesticides, foliar sprays, mostly on rice. The overwhelming reason for farmers' not using sprays was their 'not being available (70% of responses).

Storage chemical use

Storage losses raised among the more marked constraints identified during the SSSA fieldwork. The large majority of farmers, 86.3%, reported average losses of over a third of their stored crops, across a range of crops. Also, in response, very few farmers (4%) applied protective chemicals to halt especially bruchid damage (Figure 5.8 and Table 5.14).



Seed storage improvements have been identified as a major thrust for action particularly by the NGOs, Mercy Corps and CRS. Since 2012, various methods of storage have been tested with several being recommended: metal and plastic drums, plastic water bottles or bags inside steel silos, wooden containers and boxes (Elliott-Litchfield 2012). At the time of the SSSA, metal drums were being promoted in several regions with 1300 drums having been sold in Ainaro alone (40% of these unsubsidized). Key is that implementers are promoting market-based approaches. On the demand side, farmers are being increasingly asked to pay for such metal drums (Box 14). On the supply, side, local entrepreneurs, blacksmiths, are already transitioning to profitable drum production enterprises (Box 15). The bottom line is that metal drums are proving to be quite effective, reducing storage losses by 85%. (*personal communication*, J. Walshe, Mercy Corps).

Box 14. Seed storage bins- farmers CAN pay for what they want

Background/Problem:

Farmers in Timor-Leste save and store seeds (sometimes mixed with grain) for the next planting season, in particular for the main staples of rice and maize. Limited knowledge and few resources for effective post-harvest commonly results in both high storage losses of 30-40% and low quality seed ---translating to low yields.

In February 2012, the NGO Mercy Corps commissioned a study to assess existing practices and to develop a farmer storage model for use in Timor-Leste. Several prototypes were recommended, and, following a consultation process with farmers, the preferred storage unit was identified. This consisted of custom designed metal silo that is hermetic/airtight, rat- and fire-resistant, and is durable in humid tropical climates. The design also embraces the 'drum culture' of Timorese farmers.

The Solution/Intervention:

The USAID-OFDA funded Effective Seed Storage (ESS) program is designed to encourage sustainable and entrepreneurial activity in the rural areas, and to increase access to improved storage systems through market-based approaches. It aims also to build the capacities of farmers and extension workers, partially through supporting activities to connect farmers with viable input and output markets.

Farmers and Importance of Cash Contribution

The program uses a voucher system to facilitate demand creation rather than simply handing out units free. Providing vouchers encourages direct 'transactional interaction' between the producers and the buyers. Rather than directly distributing the units or providing full-value vouchers, it is expected this method, which gives exposure to the unit's actual cost, will enhance farmers' 'sense of ownership' of the product. Requiring this individual investment increases farmers' valuing of the silo and further increases their awareness of the importance of high quality seeds. Subsidized vouchers are carefully targeted to those who are identified within communities as both vulnerable and 'early adopters'.



Initially targeting two Districts, in partnership with Catholic Relief Services (CRS), the program was scaled up in 2013 to reach more than 10 Districts (out of a total of 13). The program has been able to develop a system of seed storage drum production that is customized, locally manufactured and available in different size and models. The system has facilitated access for farmers to the storage solutions that can be easily replicated/scaled-up nation-wide.

By the end of the first phase of the program (February 2013), a total of 3,378 rural farmers had accessed seed storage units and of that number, 1,041 farmers had paid full price for the units – an average cost of \$27.60. The ability of farmers to make that choice to spend cash demonstrates not only the importance of this technology to their livelihood, but also suggests that farmers in rural areas *do* have cash and will make smart purchasing choices.

Box 15. Transitioning to sustainable market business models: The case of local blacksmiths.

The Problem

When it comes to supporting market development that promotes the use of new technologies, there are often both supply and demand constraints that need to be addressed. End users (i.e. farmers) need time to be convinced of the benefits of innovations if the aim is to increase their willingness to pay for innovation. Further, planning needs to ensure that any initial support given to suppliers and/or producers for getting new materials to the market is withdrawn or made redundant as quickly possible.

This perspective is being applied by the Effective Seed Storage (ESS) Project implemented by Mercy Corps and Catholic Relief Services (CRS). Many of the collaborating manufacturers had worked previously with a project that produced grain silos with provided materials completely subsidized. When the project ended, so did the supply of materials----- grinding production to a halt.

The Solution

The ESS Program is working with small manufacturers to develop a market system for high-quality and affordable metal storage silos. The ESS project has now linked the manufacturers directly with national level input suppliers to procure materials to make seed storage containers.

One local manufacturer, Mario, says this experience of starting a business has changed the way he looks at old problems in his community: now he is starting to see possible solutions where once things seemed impossible. In the last few months, he has started work on new metal products to expand his business, including rainwater harvesting containers and cold-storage boxes for fish. “When I was a farmer, it felt like things for me and my family would never change. Now with the profits I’ve made from my new business supported by Mercy Corps, it seems anything is possible.”

Manuel Gaspar is the team leader of the Local Blacksmith Cooperative in Baucau District. Today, he is employing 10 permanent workers and 15 temporary workers. He has organized them into two teams, each focusing on producing one type of silo. In September 2013, he reached out to the other blacksmiths with a proposition that will increase his business by facilitating the procurement of silo materials. He is offering to transport materials for all blacksmiths to Baucau, for only small increase in cost to cover transportation from Dili to Baucau. They are still in negotiations but positive progress is being made.

This is one example allowing markets to develop, turning local needs into demand and local production capacity into enterprise. This sort of thinking should inform interventions on developing markets for new varieties of seed. Just as blacksmiths now engage with markets and respond to demand, so too could seed producers become responsive to increases in farmers’ willingness to pay for innovation.

Seed Aid

Finally, as the last ‘input’ we look at seed aid, which has been an important form of assistance in across Timor-Leste. Here we include both emergency assistance and developmental aid, as farmers themselves often cannot make the distinction.

Results show that about half of the total population (47.1%) has received seed aid sometime between period 2008-2013. In this period, they have received it a mean of 1.6 times, with some farmer having received aid up to 5 times, or once every year (Table 5.15). All aid delivery (100%) has been in the form one of Direct Seed Distribution.

Table 5.15: Farmers and seed aid, 2008-2013

N farmers	Seed aid in last 5 yrs? (%)			# of times seed aid obtained among recipients				
	Yes	No	Total *	# obtaining seed aid	Mean	SD	Min	Max
189	47.1%	52.9%	100.0%	89	1.6	0.99	0	5

Comparing possible differences in seed security-related issues: Male and female-headed Households

The SSSA teams also examined possible differences between male-headed and female-headed households for all issues above, for example, seed sources used, quantities planted, use of new varieties, manure/compost, pesticides, access to seed aid.

Three statistically-significant trends were noted: Female-headed HH tend to have smaller family sizes and small field sizes. They also used compost and manure less frequently than male-headed HH. Important is that there seemed to be no major differences in terms of access to new varieties and seed aid.

Table 5.16: Differences in select seed security issues among M/F headed households, Timor-Leste, 2012-13

Question	Differences?
# new varieties	No
Seed aid	No
Quantities sown	No
Field sizes	YES – Female-headed farms smaller
Family size	YES – Female-headed families smaller
Chemical input use	No
Compost/Manure use	YES – Female-headed farms use less

Summary: Chronic Seed Security Findings and Emerging Opportunities

The review of longer-term trends in seed security in Timor-Leste showed both positive moves forward as well as ongoing bottlenecks.

1. There has been modest dynamism in seed channels. The catalyzing of agro-dealers networks and kiosks to sell certified seed are notable steps. The blossoming of the informal vegetable seed sector shows strong demand and quick informal seed sector response.
2. There is important crop diversification with communities, although few crops are transformed beyond local domestic use. Also of concern is the degree to which legumes and vegetables are targeted for sale, rather than home consumption. This may have important negative ramifications for household nutrition.
3. Overall, 43% of farmers in the SSSA sample indicate they had accessed a new variety within the last five years, which seems a relatively promising figure. However, upon closer look, access to new varieties is quite constrained: About 85% of the new entries were either of maize or rice, with few farmers accessing a new variety of key legumes.
4. The lion's share of accessions (> 95%) has been obtained free (through government or NGO/FAOs). Few sustainable channels can supply farmers with an array of new varieties on a continuing basis.
5. Decentralized seed multiplication initiatives are growing: In 2012/13, 681 Community seed producer groups (CSPGs) covered 135 of 442 sucos in the country. In 2013/14, MAF/SoL has plans to expand CSPGs from 681 to 1200, covering 370 sucos, excluding urban ones. The scale of operation is impressive. This model of production might now be reviewed for its sustainability and for its ability to move new varieties quickly and widely.
6. Increased attention to cassava and sweet potato will be required to move the planting material of these vegetatively-propagated crops. Efforts are being catalyzed for sweet potato vine production. Cassava planting material presents a next major challenge.
7. Manure/compost are used by about ½ the population and pesticide/foiar sprays by ¼ of households. Other inputs are used at only modest levels (e.g. mineral fertilizer, storage chemicals).
8. Storage loss raises among the more marked constraints. The large majority of farmers, 86.3%, reported average losses of over a third of their stocks, across a range

of crops. In response, very few farmers (4%) applied protective chemicals to halt especially bruchid damage.

9. To help combat such storage losses, the rise in use of storage drums has been a positive development. By February 2013, 3378 rural farmers had accessed seed storage units, with 1,041 paying full price (an average cost of \$US 27.60). Attention to a market based approach, with local blacksmiths producing the drums, holds promise for this innovation to be both profitable and sustainable.

10. In terms of male-headed versus female-headed households, three statistically-significant trends were noted revolving around seed security: Female-headed HH tend to have smaller family sizes and small field sizes. They also used compost and manure less frequently than male-headed HH. Important is that there seemed no major differences in terms of access to new varieties and seed aid.

Having summarized the findings, we now move to Recommendations for Action. Each constraint (and opportunity) will require a focused set of initiatives.

VI. OVERALL RECOMMENDATIONS: ACROSS SITES

The opportunity to conduct assessments in distinct sites provided the field teams a useful perspective on seed security in select regions of Timor-Leste.

Below, we put forward a set of recommendations that is applicable across sites. All can be moved forward in the short to medium term: 1-5 seasons. Annex 1 gives more detailed insights on proposed action plans.

Of special note is that the SSSA teams identified no problems in the assessed zones of action that might be labeled as 'emergency ones'. All constraints require actions linked to chronic stress and more developmental opportunities.

The recommendations below are clustered into distinct sections. These include : a) seed system actions linked to addressing chronic stress and developmental possibilities; b) emergency response and seed system security assessment ; and c) broader seed security goals and vision for Timor-Leste.

Overall, substantial progress has been made in Timor-Leste over the last decade in developing systems that strengthen seed security for smallholder farmers. Recommendations below are put forward in order to stimulate further these positive processes.

I. **Seed-linked responses linked to chronic stress + development concerns.**

Practical recommendations are made here in the following domains: decentralized seed production, variety delivery systems, seed storage improvements and information systems for helping famers make informed choices

Decentralized seed production

Decentralized seed production needs to become a strategic and effective force in serving smallholder farmers: the formal seed sector alone will never be able to handle a) the range of crops needed for diverse agro-ecological zones; nor b) the range of varieties. At this point, the seed multiplication initiatives in Timor-Leste are new and seem to be having modest impacts among farmers. They are being propped up by institutional buyers rather than from demand of smallholder farmer clients. At this point, they are also operating at small scale and focus on a handful of crops and varieties. Sustainable decentralized seed production models need to be confirmed that can operate at scale.

1. **Cost-effectiveness seed production models.** The cost-effectiveness of existing seed production models need to be carefully assessed, examining separately the organization of certified production, registered commercial seed producers and community seed producer groups (CSPGs). (What are the costs of maintaining these groups? At what scale can they feasibly operate? What is the cost of seed being produced?)

2. **Developing ongoing links among diverse segments of seed chain.** Ongoing links should be further catalyzed between a) the registered commercial growers and the CSPGs and b) between the registered growers and the Loja Agrikultura shops. For moving new varieties (rather than certified seed), links between the CSPGs and local seed/grain traders might also be promoted.
3. **Maintenance of seed producer/institutional inventory.** The countrywide seed producer inventories initially amassed for the SSSA might be usefully maintained to ensure that producers can be more efficiently linked with buyers, at varied scales. In this vein, information available with MAF in Dili needs to be shared systematically out to the Districts. Feedback mechanisms also have to allow District local authorities to routinely add information to Ministry level databases.
4. **Merging /paring down CSPGs.** The community seed producer group model, in particular, might be honed to focus on the few more effective producers who can serve many (rather than a widespread diluted network). Linked to this concentration, the CSPG's might logically move to marketing seed, so as to become self-sustaining.
5. **Training CSPGs in enterprise skills.** In addition to seed production training, CSPG's will require capacity building in agro-enterprise and marketing skills. These groups need to develop realistic business plans. They might be better geared to serving a large smallholder client base (rather than focus on a set of institutional aid buyers). Possible links to select agro-enterprises might also be analyzed.
6. **Modeling of options for moving varieties fast and widely.** Ultimately, the goal of much of the seed production work is to move the new varieties being evaluated by MAF/Sol. Different options should be modeled to do this quickly and efficiently—recognizing that a good number of crops and varieties need soon to be in diffusion. For instance, would the sale of 50,000 small packs of certified seed (in 25g sizes) be a quicker way to get new germplasm out than assuming diffusion through CSPGs (and relying on farmer-to-farmer gift or exchange)?

i.

Variety Delivery systems

Currently. Over 95% of new varieties are obtained by Timorese farmers through government and NGO aid, and free. This type of system creates a ethic of farmers dependency and undermines the development of more ongoing systems, based either formal or informal seed channels. Simply, giving away free seed, repeatedly (across crops and varieties) is bad practice. Further, as the Uma ite Nia and vegetable packet experience show, Timorese farmers are willing to buy seed if it is available, accessible and of a quality that meets there needs.

Variety delivery systems need to move from a 'donor aid optic'—to market-oriented ones that can serve all farmers on an ongoing basis.

Across Crops

7. **Outlet channels expanded.** While the formal agro-dealer network (Lojas Agrikulturas) is slowly growing, it will never be able to reach deep into rural areas. Certified can be sold in additional ways : for example by building on general good shops (the Mercy Corps, kiosk model), commissioning vendors at open markets, and selling seed through faith-based groups. These are but a few options to be tested for stimulating multiple variety delivery channels.
8. **Kiosk sale model- evaluation.** The Kiosk sale model heralds to be a particularly promising one as no new institutional infrastructure is required. Key here is to reinforce shopkeepers' capacity to a) keep seed viable; and b) pass on refined technical information along with the physical seed sale.
9. **Linking CSPGs to grain traders.** For non-certified seed of new varieties, to be sold as grain, CSPGs might best be specifically linked to seed/grain traders. Such traders need to be brought into the 'variety information circles (though field days? Organized visits in Districts?).
10. **Testing small seed size packaging.** The small pack model of sale, 50g, 100g, etc. has proven useful for making seed more accessible to famers in many regions of the world. This packaging option might be tested in both the Lojas Agrikulturas and the kiosks.

Vegetable seed

The abundance of vegetable seed packets found in multiple venues outside of formal agro-dealers (Lojas Agrikulturas) proves to be a positive sign of demand. This phenomenon also flagged some concerns. Most of the packets had information printed in 'foreign languages'. Also, there was not always evidence that the crops/varieties on offer would be adapted to specific Timor-Leste regional agro-ecological conditions, or if they had even been tested in country.

As a way forward in promoting more transparent vegetable packet seed sale and use, several actions are proposed

11. **Organized vegetable seed screening.** The wealth of vegetable seed packet material (found in open markets, general goods shops) might be collected and systematically screened by researchers in on-station trials at diverse agro-ecologies and elevations.
12. **Translation of seed packet information into Tetum.** Seed Sector services should be leveraged to encourage that seed packet information is intelligible to smallholder farmers. Mechanisms for doing this need to be tested. Posters at suco offices? Via Radio? Labels added to seed packs?

Seed storage improvements

The seed storage work and particularly the development of storage bin enterprise, represent impressive achievements with a short three-year period. The scale of the task, however, is

formidable given that farmers lose 1/3 of stored crops countrywide. Two additional areas are signaled for action.

13. Seed/grain traders and storage- diagnostic. To-date, the seed storage options have been focused at the farm household level. Traders, however, also report high storage losses, especially for maize and the legumes. Trader storage management concerns might require a novel diagnostic, especially as traders save in bulk quantities and may move potential seed cross considerable distances.

14. Farmers' management information needs on storage. To-date, storage work has focused on the vessels for storage. Complementary emphasis needs to be put on management options and farmer knowledge: e.g. how to do better selection the field; varied types of drying strategies.

Information systems to help farmers make informed choices

As a final thrust in the area of addressing chronic stress and developmental actions, we make a general recommendation on developing farmer-oriented information systems. Simply, Timorese are eager for new knowledge in a large range of areas. As one example, focusing on new varieties, they seek information on: a) what range of varieties might be available; b) what their suitability is for different types of stresses; c) how farmers can access these; d) how farmers can quickly share information with others.....

15. Farmer-oriented information systems on technical options. Substantial and explicit efforts need to be devoted to developing farmer-oriented novel information systems. Primary conduits signaled during the assessment included: rural radio, schools, LaFaek Magazine, SISCA, and 'social events in the evenings'. Certainly, there may be others.

II. Emergency Seed aid + Seed Security Assessments

The SSSA teams also reviewed actions related to acute or emergency responses. While no 'emergency' was ongoing, past practice and programs gave cause for reflection.

Seed aid frequency and targeting

16. Repetitive seed aid and programmed review. Emergency seed aid is becoming repetitive (and farmer dependency was particularly noted in Ainaro). In zones where emergency seed aid has been implemented three seasons in a row, decision-makers (donors, GoTL, NGOs and other humanitarian partners) should program a formal review so as to determine the necessity of the aid. Also, repeated distribution over multiply years to the same groups should be closely scrutinized.

17. Better coordination seed security actors- District Committee? Those involved in the SSSA lamented 'poor coordination between the government and NGOs on a range of seed-linked issues'. Seed security groups might be catalyzed by MAF, especially giving focus to District-level complementary field activities.

Seed aid responses

- 18. Testing range of seed aid responses.** Seed assistance in Timor-Leste in crisis periods unfolds around a single response: 'Direct seed distribution'. This response gives farmers no choice in deciding which crops and varieties might be needed; it assumes seed is not available in a region; it also is currently being affected only with maize and rice (as these are crops for which certified seed is available in bulk). Depending on the problem encountered, alternative aid responses might be tested which address other seed security problems (e.g. farmers having problems with seed access).
- Voucher models might be tested in Timor-Leste, with and without accompanying fairs. This needs to be done in ways which do not encourage further dependency and which promote farmer choice
 - Vouchers might be better used to link those in need (i.e. vulnerable households) to those who provide seed commercially (at Lojas Agrikulturas; CSPGs).
 - Voucher models might be tested to address problems of 'labor shortage'. Note that this would be high exploratory work and would have to be monitored closely.

Seed system security assessment

Need assessments in Timor-Leste inevitably conclude that 'seed is needed' and advise that the response should be a direct seed distribution- and with maize and rice. While perhaps innovative at their inception (as they distinguished seed aid need from food aid need), such assessments now need to be sharpened. Worldwide, understanding of what happens to seed systems during disaster has become markedly more refined in the ten years: experience shows that *distinguishing among seed security constraints is key for recovery*. In Timor-Leste seed security assessment methods might usefully be revamped.

- 19. Seed security methods and processes.** National and regional formats for assessing seed security status should shift from those which calculate simplistic 'seed needs' to frameworks which recognize different types of seed security problems, and which tailor responses accordingly. These problems might include diverse constraints of seed availability, seed access and seed quality, which are distinguished by their presence in the short and in the long term.
- Linked to this general shift, seed security assessment capacity needs to be built at regional and local levels. Technical tools already exist to help NGO and government agricultural officials move forward on seed security assessments.
 - More generally, a political environment for 'real seed security assessment' has to be established. This is no easy task. *Technical advances in methods alone will not lead to more accurate assessments. Political leaders need to spearhead the change*.

III. Seed security goals and vision

We end this section on needs for implementation with a 'higher level' recommendation. There is a need for review and basic reflection on the overall seed security strategy that shapes actions on the ground.

20. **Sharpening goals of seed security vision.** Seed security vision in Timor-Leste has been shaped largely around visions of moving towards food security, particularly in the staple foods. Realities on the ground suggest that this 'brute seed security for food security' vision could be usefully broadened.

Seed Security for Nutrition

High stunting and malnutrition rates in Timor-Leste suggest that '**Seed Security for Nutritional Security**' is one avenue that needs to be promoted much more aggressively. In practice, this might mean such actions as (*inter alia*):

- Testing and promoting a large range of legumes;
- Linking voucher use to 'nutritional' agricultural options (as is done in the 'DiNERS'-fair for Diversity, Nutrition, and Environmental Resilience');
- Promoting production of nutrient-dense foods.

Much has been written on nutrition and agriculture in Timor-Leste (e.g. Fanzo, 2013) We need not repeat the multiple suggestions for quite detailed programming. Simply, seed security actions might be pragmatically tied to enhancing better nutritional outcomes. This will not happen 'naturally': it needs to be programmed in deliberate, smart ways.

Seed Security for Resilience

The abundant and repeated nature of climatic stresses, (drought, flood, typhoons) suggests that seed systems have to be designed to built greater resilience. '**Seed security for Resilience**' will take many forms. Attributes/actions, *inter alia*.

- *Widen **portfolio of crops** on offer (speed process up?)*
- *Screen **local as well as improved varieties** for 'best bets'*
- *Develop/identify **varieties tolerant to stress** (flood, drought, wind, pests)*
- ***Identify ongoing and diverse delivery channels***
- ***(Focused) Information:** suitability, sourcing, options to address constraint*
- ***Choice:** farmers need room to strategize in stress periods*

Again, there is a growing literature on seed security and resilience and detailed information can be found elsewhere (e.g. McGuire and Sperling 2013). Here we emphasize that a resilience-perspective will demand a re-thinking of a range of seed security actions.

Overall, there has been great progress in strengthening seed systems in the last decade. These 20 recommendations aim to catalyze even further positive changes geared to meet the needs of Timorese farmers.

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VIII. ANNEXES

- 1. SEED SECURITY ACTION PLANS**
- 2. HOUSEHOLD SURVEY DATA TABLES, B SITE**

Annex 1. Work Plan_ All three sites

Constraint (Limitasaun) (Aileu)	Ainaro	Baguia/Baucau	Actions
<p>Practice of free seed distribution undermines development of commercial seed enterprises.</p> <p>Fini gratuito trava produusaun fini komersial.</p>	<p>Free government seed. Depend on government for seed rather than their own stock (@50% HH received seed aid).</p> <p>NB. It's not a system of dependency, just poorly targeted seed aid.</p>	<p>Not confirmed in Baguia, as much less free seed distribution found (only 22% from HH interviews)</p>	<p>Seed actors move to more targeted seed distribution (vulnerable HH's, emergency cases, etc.)</p> <p>Seed aid/distribution based on assessed seed security needs</p> <p>Increase use of vouchers to match those who need seed (i.e. vulnerable households) to those who provide seed commercially (i.e. seed producer groups)</p> <p>Increase understanding of voucher models and explore viability of adopting in TL with or without seed fairs. Needs to be done in a way that does not further create dependency and increases choices.</p> <p>Avoid repeated seed aid distribution over multiple years to same HH's/groups</p> <p>Promote HH level multiplication to meet own seed needs. Messages need to be credible.</p>
<p>Availability (production) of new varieties of seed at the community level (shortfall)</p> <p>Variadade fini foun iha nivel</p>			<p>Piloting ways to increase number of farmers producing small amounts of new varieties of seed</p>

<p>komunidade ne'ebe oituan.</p>			<p>Conduct cost/benefit analysis of existing seed production in order to promote more effective models of seed production</p> <p>Exploit the existing capacity of the stronger seed producer groups (already exists a system to upgrade via more members, etc, therefore could also look at concentrating/merging, etc.)</p> <p>Develop business skills of commercial groups—e.g. strategy for scaling-up, appropriate pricing and marketing</p>
<p>Limited access to new varieties by individual farmers on a large scale Toos nain sira difencil atu asesu ba variadade foun</p>		<p>Limited access to new varieties by individual farmers on a large scale (but potentially high demand) Toos nain sira difencil atu asesu ba variadade foun</p>	<p>Moving CSPG's towards a more explicit marketing model (logical evolution)</p> <p>Link to Loja Agrikultura and shops from seed production groups/Farmer Associations</p> <p>Building upon the existing commercial growers/farmers associations to link directly to individual farmers</p> <p>Test small pack model</p> <p>Test delivery outlets for 1) seed and/or new varieties and 2) information (need to pinpoint the most efficient/worthwhile delivery outlets, etc)</p>

<p>Examples: Loja Agrikultura, Kiosks, Church (diocese and/or congregations), Contract Growers, Dry Goods Distributers,)</p> <p>Follow up on free seed to vulnerable households—are they still using them?</p>			
<p>Scale up model of “Uma Ita Nia” and look at ways to increase this option.</p> <p>Agro-entrepreneur (could be within a shop, or could piggy back on itinerant traders, train market-stall (kiosk) keepers to sell seed)</p> <p>Look at ILO mobile pricing information project (BOSS?)</p> <p>Increase information about seed availability, access points and quality for vegetables. How: make information available in simple Tetun; IEC materials; BCC via radio, TVTL, SMS, etc.; Signage; make information available to traders on seeds, i.e. new varieties, adaptation, planting techniques, etc.</p> <p>Work with traders on storage.</p>	<p>Vegetable seeds were found available and accessible in Haeconi (NGO), Bagaia (Kiosk) and Baucau (Loja Agrikultura, Mercado, Kiosk (6))</p> <p>Limited information/publicity around increasing access/availability of seed.</p> <p>Seed from unintelligible sources, so buyers are not informed on quality, suitability, use, expiration dates, etc.</p> <p>NB: need to learn more about licenses around seed sale</p>	<p>Access to Vegetable Seeds (Dili is far and transport not easy)</p> <p>Asesu fini hortikultura ne’ebe dook.</p>	
	<p>Variable seed on offer in market.</p>	<p>Variable quality of seed on offer in market</p> <p>Fini iha merkado laos ho kualidade diak hotu (Fini iha merkado la sempre ho kualidade diak).</p>	<p>Farmers knowledge on how to</p>
<p>Make information available to farmers on</p>	<p>Farmers knowledge on how to</p>		<p>Farmers knowledge on how to</p>

<p>do seed storage, handling Menus kuinesementu toos nain kona ba tekniko rai fini fatin.</p>		<p>do seed storage, handling Menus kuinesementu toos nain kona ba tekniko rai fini fatin.</p>	<p>improved storage and handling (see BCC materials from ESS) and the suitability for storing legumes in addition to maize for all aspects of post-harvest management</p> <p>Continued focus on maize storage losses (not such an issue for rice)</p> <p>Continue to scale up seed storage (come up with plan for reducing/tapering off subsidies)</p>
<p>Limited information to make informed choices on varieties/crops strategies (i.e. nutrition, resilience, etc) inputs, agronomic techniques. (Reach of extension services is limited.) Toos nain menus informasaun atu foti decisaun kon ba hodi eskolla; - Nutrisaun - Resiliente</p>		<p>Limited information to make informed choices on varieties/crops strategies (i.e. nutrition, resilience, etc) inputs, agronomic techniques. (Reach of extension services is limited.) Toos nain menus informasaun atu foti decisaun kon ba hodi eskolla; - Nutrisaun Resiliente</p>	<p>Create demand for new varieties (i.e. farmer field days, within communities on farmers' land, cross-visits.</p> <p>More demonstration trials in communities of new varieties (focused on nutrition and resilience profiles)</p> <p>NB: need to learn more about DemFarms (MAF), DemPlots (RDPIV) and coordination</p> <p>Cooking demonstrations for new varieties (mainly vegetables) for how to incorporate into existing diets/tastes/customs, etc.</p> <p>Use mix of Mass Media: Radio, Cell Phone, TVTL, Theater Groups, Church, Posters, Ritual Ceremonies, Schools, LaFaek Magazine, Social Events, Sede Suco,</p>

			<p>Sporting Events, Market Days, SISCA, etc.</p> <p>Training information to Loja Agrikultura shops (but do they have interest?) emphasize expiry date.</p> <p>Link local projects (church, Mercy Crops, CARE) that are supporting vegetable growing in communities</p> <p>NGOs and SoL coordinate tests of range of vegetable packet to develop information guides: well=adapted and poorly adapted</p> <p>Information sheets to farmers on key information: how to read expiry date.</p>
<p>Nutritious crops sold, limited consumption (not a seed problem) Aihoris nutrisaun sira ne'ebe kuda oituan.</p>		<p>n/a in Bauguia, especially looking at beans, sweet potato, maize, etc.</p>	<p>Diversity in Nutrition Fairs for Environmental Resilience (DINERS)</p> <p>Social Status mentality related to food.</p> <p>Need to confirm if there is any interest in consumption when nutritious crops grown as a cash crop. Promotion of consumption needs to take into account need for cash.</p>
<p>Limited agricultural commercial transformation (commercial opportunities) Kuaze laiha transformasaun komersial. Kanal merkado ba faan sasan</p>		<p>Same. No value chains to link.</p>	

<p>agrikultura ne'ebe oituan (laila numeru ne'ebe hakarak hamosu surplus).</p> <p>Poor coordination between NGO's and Government on seed issues Kordenasaun lao ladun diak entre Gov. no ONG sira kona ba fini nian.</p>		<p>Poor coordination between NGO's and Government on seed issues Kordenasaun lao ladun diak entre Gov. no ONG sira kona ba fini nian.</p> <p>NB: potentially getting better, and MAF has taken the lead to do this at the district level</p> <p>Lack of explicit seed security strategies to deal with climate variability Menus pratika kona ba stratejia siguransa fini atu responde ba formas iklim.</p>	<p>NB: discuss the roles of local authorities (i.e. suco chiefs) in coordination of all development initiatives.</p>
<p>Lack of practical seed security strategies to deal with climate variability Menus pratika kona ba stratejia siguransa fini atu responde ba formas iklim.</p>			<p>Seed banks (?); UNDP and MSS on seed banks</p> <p>Plant more improved varieties that do well with wind</p> <p>Diversify crop varieties that respond to distinct stresses</p> <p>Look at changing cropping cycles to avoid climate vulnerability</p> <p>Seed storage: increase own stocks and factor in re-sowing (total reserves > seed needs)</p> <p>Better information for informed decision based on climate data, etc.</p>

<p>VPC's are reducing in area due to cutting constraints (i.e. Sweet Potato, Cassava)</p>			<p>Particular programs to focus on VPC's need to be focused (SoL currently working on this)</p>
<p>Labor is expensive and a determinant factor in seed security (i.e. insufficient labor, specifically for elderly households , as well as competing opportunities for use of labor.</p> <p>Farmers themselves may have NF opportunities that yield higher returns, hence shift away from agriculture</p>			<p>Investigate more varied issues around labor constraints (labor vouchers?)</p> <p>Do gap analysis on women and rural agricultural constraints more generally.</p>

Annex 2. Household survey data tables (Select sample, by site)

A. Aileu

1) Gender of HH Head

HH Head	N	%
Male	60	90.9%
Female	6	9.1%
total	66	100.0%

2) Area cultivated by household

Area cultivated	N	%
< 0.5 ha	19	29.2%
0.5 - 1.0 ha	31	47.7%
>1.0-2.0 ha	13	20.0%
> 2.0 ha	2	3.1%
total	65	100.0%

3) HH size (resident)

Mean size	Std. Dev.	Minimum	Maximum
7.0	2.8	1	15

4) Age of HH Head

Mean Age	Std. Dev.	Minimum	Maximum
49.2	13.0	28	82

5) Key crops - crops named most frequently as 'most important' by households

Recent (current) season			Next Season		
Crop	N of HHs	% of HHs	Crop	N of HHs	% of HHs
Maize	65	98.5%	Maize	64	97.0%
Cassava	56	84.8%	Cassava	53	80.3%
Rice	48	72.7%	Rice	48	72.7%
Sweet potato	13	19.7%	Sweet potato	11	16.7%
Common beans	4	6.1%	Common beans	5	7.6%

Annex 2 A. Aileu data tables

Crop	Total kg sowed	% of total									
		Home saved /own stock	friends, neighbours, relatives	local market	agro-input dealer	community-based seed groups	government	NGO / FAO	contract seed growers	Other	
Maize	648.9	71.7	1.0	7.1	0.0	0.2	11.6	8.3	0.0	0.0	
Common beans	12.0	64.6	14.6	20.8	0.0	0.0	0.0	0.0	0.0	0.0	
Cassava	75.7	92.8	4.3	0.0	0.7	0.0	1.4	0.8	0.0	0.0	
Sweet potato	12.9	65.1	25.3	0.0	0.0	0.0	9.3	0.3	0.0	0.0	
Taro	0.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Peanut	1.0	50.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	
Rice	761.5	75.2	3.4	2.0	0.0	2.0	12.8	4.6	0.0	0.0	
Pigeonpea	9.7	82.9	7.8	9.3	0.0	0.0	0.0	0.0	0.0	0.0	
Arrowroot	45.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Mustard	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pumpkin	0.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL-all crops	1567.3	75.2	2.6	4.2	0.0	1.1	11.2	5.7	0.0	0.0	

**Amounts for current/most recent season:
more, less, or same?**

Crop	Number of HHs	% of HHs			Change sowing quantities for all growing the crop
		MORE	SAME	LESS	average % change
Maize	65	24.6	64.6	10.8	8.32
Common beans	4	25.0	50.0	25.0	
Cassava	56	10.7	76.8	12.5	0.76
Sweet potato	13	7.7	69.2	23.1	1.90
Taro	2	0.0	100.0	0.0	
Irish Potato	0				
Peanut	1	0.0	100.0	0.0	
Rice	48	4.2	70.8	25.0	-12.23
Pigeonpea	3	0.0	100.0	0.0	
Cabbage	0				
Arrowroot	2	0.0	100.0	0.0	
Long Beans	0				
Mung beans	0				
Mustard	1	0.0	100.0	0.0	
Yam	0				
Green Veg	0				
Black beans	0				
Pumpkin	1	0.0	100.0	0.0	
Velvet beans	0				
Eggplant	0				
TOTAL-all crops	196	13.3	71.9	15.3	0.34

NOTE - means calculated only for crops with 5 or more cases

Why are you sowing LESS or MORE than normal? Current/most recent season

Reasons farmers gave for planting **LESS** than normal in most recent season

Reasons	N	% of responses
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
No seed available in market	0	0.0%
No seed/cuttings available from neighbors	0	0.0%
<i>Seed access</i>		
No money to buy seed/poor finances or seed too high	0	0.0%
<i>Seed quality</i>		
Seed available is not good quality or the variety is not liked	0	0.0%
Sub-total: seed-related	0	0.0%
NON-SEED FACTORS OF PRODUCTION (limits)		
No/insufficient labor	10	33.3%
Illness/health problems	0	0.0%
No/insufficient land or land not appropriate/sufficiently fertile	0	0.0%
Lack of tools/tractor/ other machinery to farm	0	0.0%
Plant pests/diseases make production not possible	1	3.3%
Animals/predator make production not possible	3	10.0%
Lack of other inputs: controlled water supply/irrigation or fertilizer	0	0.0%
Poor weather/rainfall	3	10.0%
Insecurity (e.g. theft)	0	0.0%
Sub-total: Factors of Production	17	56.7%
OTHER PRIORITIES/STRATEGIES		
Markets for crop or crop products not well-developed	0	0.0%
Other priorities than agriculture (e.g. have shop)	0	0.0%
Changing Crop priorities or changing agricultural practices	0	0.0%
New Farming methods allow lower seeding rate	12	40.0%
Other	0	0.0%
TOTAL	30	96.7%

Reasons farmers gave for planting **MORE** than normal in most recent season (ALL SITES)

Reasons	N	% of responses
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
More seed available due to good harvest	0	0.0%
More seed available due to free seed	10	38.5%
<i>Seed access</i>		
More money to buy seed or seed price low	0	0.0%
Got credit to buy seed	0	0.0%
<i>Seed quality</i>		
Have especially good seed or good variety	2	7.7%
Sub-total: seed-related	12	46.2%
NON-SEED FACTORS OF PRODUCTION (opportunities)		
Good/increased labor	2	7.7%
Feeling strong/healthy	0	0.0%
Have more land/more fertile land	3	11.5%
Have tools/tractor, other machinery to help farm	1	3.8%
Have access to irrigation, fertilizer or other inputs (for example, stakes)	0	0.0%
Good weather/rainfall	1	3.8%
Good security (peace has arrived; less theft)	0	0.0%
Sub-total: Factors of Production	7	26.9%
OTHER PRIORITIES/STRATEGIES		
Well-developed /new markets for crop or crop products	0	0.0%
Have decided to give more priority to agriculture	4	15.4%
Changed crop profiles or priority to certain crops	0	0.0%
Re-sowing due to stress (e.g. poor soils, germination, rain)	3	11.5%
Other	0	0.0%
TOTAL	26	100.0%

Seed planted by source for next season.

Crop	Total kg sowed	% of total										TOTAL %
		Home saved /own stock	friends, neighbours, relatives	local market	agro-input dealer	community-based seed groups	government	NGO / FAO	contract seed growers	Other		
Maize	614.0	74.1	5.8	9.4	0.8	0.8	0.8	2.7	0.0	0.0	100.0	
Common beans	7.3	17.2	0.0	82.8	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Cassava	86.7	92.2	5.8	0.0	0.0	0.0	2.0	0.0	0.0	0.0	100.0	
Sweet potato	12.2	67.9	32.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Taro	0.1	55.7	44.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Peanut	1.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Rice	2406.10	96.7	0.9	0.0	0.0	0.6	1.5	0.2	0.0	0.0	100.0	
Pigeonpea	36.8	32.1	27.2	40.8	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Arrowroot	67.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Long Beans	0.5	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Mustard	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Pumpkin	0.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Velvet beans	0.8	0.0	66.7	33.3	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
TOTAL-all crops	3232.9	91.3	2.4	2.5	0.2	0.6	2.4	0.7	0.0	0.0	100.0	

**Amounts for next season:
more, less, or same?**

Crop	Number of HHs	% of HHs			Change sowing quantities for all growing the crop
		MORE	SAME	LESS	average % change
Maize	64	32.8	57.8	9.4	9.24
Common beans	5	0.0	60.0	40.0	
Cassava	53	13.2	79.2	7.5	14.92
Sweet potato	11	18.2	72.7	9.1	6.36
Taro	2	50.0	50.0	0.0	
Peanut	1	0.0	100.0	0.0	
Rice	48	8.3	70.8	18.8	-3.30
Pigeonpea	5	0.0	100.0	0.0	
Arrowroot	4	0.0	100.0	0.0	
Long Beans	1	0.0	100.0	0.0	
Mustard	1	0.0	100.0	0.0	
Pumpkin	1	0.0	100.0	0.0	
Velvet beans	1	0.0	0.0	100.0	
TOTAL-all crops	197	17.8	70.1	11.7	6.14

Input usage

Proportion (%) of HHs using mineral fertilizer

HHs using mineral fertilizer			
Current/most recent season		Next season	
Yes	18.2%	Yes	24.2%
No	81.8%	No	75.8%
N total	66	N total	66

Reasons to not use fertilizer

Reasons fertilizer not used				
Reason	Current/most recent season		Next season	
	N	%	N	%
Not available	15	27.8%	12	24.0%
Not necessary (fertile soils)	6	11.1%	6	12.0%
Too expensive	12	22.2%	11	22.0%
I do not know how to use them	11	20.4%	8	16.0%
They are not profitable for me	1	1.9%	3	6.0%
Not allowed to use them	0	0.0%	0	0.0%
Lack equipment to make use (e.g. sprayer)	0	0.0%	0	0.0%
Use integrated/ biological methods	0	0.0%	0	0.0%
Toxic / noxious	7	13.0%	7	14.0%
Other	2	3.7%	3	6.0%
Total	54	100.0%	50	100.0%

Proportion (%) of HHs using pesticides

HHs using pesticides			
Current/most recent season		Next season	
Yes	36.4%	Yes	40.0%
No	63.6%	No	60.0%
Total N	66	Total N	65

Reasons for not using pesticides

Reasons for not using pesticides				
Reason	Current/most recent season		Next season	
	N	%	N	%
Not available	19	45.2%	16	42.1%
not necessary (fertile soils)	5	11.9%	6	15.8%
too expensive	6	14.3%	7	18.4%
I do not know how to use them	10	23.8%	7	18.4%
They are not profitable for me	0	0.0%	0	0.0%
Not allowed to use them	0	0.0%	0	0.0%
Lack equipment to use (e.g. backpack sprayer)	1	2.4%	1	2.6%
Use integrated/ biological methods	0	0.0%	0	0.0%
toxic / noxious	0	0.0%	0	0.0%
Other	1	2.4%	1	2.6%
Total	42	100.0%	38	100.0%

Proportion (%) of HHs using compost / manure

HHs using compost / manure			
Current/most recent season		Next season	
Yes	69.7%	Yes	71.9%
No	30.3%	No	28.1%
Total N	66	Total N	64

Proportion (%) of HHs using storage chemicals

HHs using storage chemicals			
Current/most recent season		Next season	
Yes	7.7%	Yes	17.2%
No	92.3%	No	82.8%
Total N	65	Total N	64

Proportion (%) of HHs reporting STORAGE LOSSES

HHs having storage losses last season	
Yes	72.7%
No	27.3%
Total N	66

Average storage losses, by crop

What losses did you have in storage?		
Crop	N	mean loss (%)
Maize	45	37.2%
Common beans	7	53.6%
Cassava	8	26.3%
Sweet potato	4	37.5%
Rice	20	21.8%
Pigeonpea	7	52.9%
TOTAL-all crops	93	36.7%

Obtained any new variety in last five years?

Number of HHs*	Obtained a new variety in past 5 years? (%)			HHs who received	N of varieties received in past 5 years			
	Yes	No	total		Mean	Std Dev	Min	Max
63	55.6%	44.4%	100.0%	35	2.1	1.11	0	5

* total who answered either 'yes' or 'no' to this question

Sources of new varieties

Sources of new varieties obtained in past 5 years		
Source	N	%
Friends, neighbours, relatives	1	1.5%
Local market	2	2.9%
Agro-input dealer	0	0.0%
Community-based seed groups	0	0.0%
Government	43	63.2%
NGO / FAO	22	32.4%
Contract seed growers	0	0.0%
Other	0	0.0%
Total	68	100.0%

Means of access to new varieties

Means of access to new varieties		
Access	N	%
Exchange / barter	0	0.0%
Gift (friends, family, neighbors)	3	4.4%
Purchase	2	2.9%
Vouchers (s/times with fairs)	0	0.0%
Direct seed distribution	63	92.6%
Seed loan	0	0.0%
Food aid	0	0.0%
Money credit	0	0.0%
Other	0	0.0%
total	68	100.0%

Summary: overview of seed aid frequency

Number of farmers	Seed aid in last 5 yrs? (%)			# of times seed aid obtained among recipients				
	Yes	No	Total *	# obtaining seed aid	Mean	SD	Min	Max
65	73.8%	26.2%	100.0%	48	2.0	1.17	0	5

* total of who responded 'yes' or 'no' to this question

Seed aid - by means of distribution

Mode of distribution	No.	%
Free - direct distribution	94	100.0%
Vouchers (and Fairs)	0	0.0%
Seed Loan	0	0.0%
Other	0	0.0%
Total	94	100.0%

Statistics (only significant trends shown)**7) Compost / manure in most recent (current) season?**

Compost / manure most recent (current) season?				
HH Head	N	Yes	No	Chi-Sq prob.
Male	60	44	16	0.0421
Female	6	2	4	
Total	66	46	20	

8) intention to use compost / manure next season?

Compost / manure next season?				
HH Head	N	Yes	No	Chi-Sq prob.
Male	58	44	14	0.0274
Female	6	2	4	
Total	64	46	18	

13) Area farmed

Area cultivated (ha)						
HH Head	N	<0.5	0.5-1.0	1.0-2.0	>2.0	Prob. Chi. Sq.
Male	60	15	30	13	2	0.0346
Female	5	4	1	0	0	
total	65	19	31	13	2	

17) Proportion who received seed aid

Seed aid in last 5 years?				
Farm area (ha)	N	Yes	No	Chi Sq. Prob.
< 0.5	19	9	10	0.0215
0.5 - 1.0	30	25	5	
1.0 - 2.0	13	11	2	
>2.0	2	2	0	
total	64	47	17	

20) Use of mineral fertilizer in most recent (current) season?

fertilizer most recent (current) season?				
Farm area (ha)	N	Yes	No	Chi Sq. Prob.
< 0.5	19	7	12	0.0272
0.5 - 1.0	31	4	27	
1.0 - 2.0	13	0	13	
>2.0	2	1	1	
total	65	12	53	

26) Amount sowed in most recent (current) season, compared with quantity normally sowed (across all crops).

Quantity sowed most recent (current) season					
Farm area (ha)	N	More	Same	Less	Chi Sq. Prob.
< 0.5	57	8	40	9	0.0271
0.5 - 1.0	92	14	68	10	
1.0 - 2.0	39	4	28	7	
>2.0	6	0	2	4	
total	194	26	138	30	

27) Amount sowed next season, compared with quantity normally sowed (across all crops).

Quantity sowed next season					
Farm area (ha)	N	More	Same	Less	Chi Sq. Prob.
< 0.5	56	5	47	4	0.0048
0.5 - 1.0	92	23	60	9	
1.0 - 2.0	39	5	27	7	
>2.0	6	1	2	3	
Total	193	34	136	23	

B. Ainaro

1) Gender of HH Head

HH Head	N	%
Male	59	90.8%
Female	6	9.2%
total	65	100.0%

2) Area cultivated by household

Area cultivated	N	%
< 0.5 ha	17	26.2%
0.5 - 1.0 ha	27	41.5%
>1.0-2.0 ha	15	23.1%
> 2.0 ha	6	9.2%
total	65	100.0%

3) HH size (resident)

Mean size	Std. Dev.	Minimum	Maximum
7.4	2.7	3	15

4) Age of HH Head

Mean Age	Std. Dev.	Minimum	Maximum
44.8	13.7	20	75

5) Key crops - crops named most frequently as 'most important' by households

Recent (current) season			Next Season		
Crop	N of HHs	% of HHs	Crop	N of HHs	% of HHs
Maize	58	89.2%	Maize	50	76.9%
Cassava	39	60.0%	Rice	33	50.8%
Rice	36	55.4%	Cassava	30	46.2%
Sweet potato	11	16.9%	Sweet potato	12	18.5%
Sweet potato	11	16.9%	Peanut	10	15.4%

Seed planted by source in current/most recent season

Crop	Total kg sowed	% of total									
		Home saved /own stock	friends, neighbours, relatives	local market	agro-input dealer	community-based seed groups	government	NGO / FAO	contract seed growers	Other	
Maize	787.7	64.2	8.5	18.8	0.0	0.0	0.0	4.1	4.4	0.0	0.0
Cassava	39.9	81.8	16.9	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0
Sweet potato	5.5	88.0	9.1	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taro	0.8	93.3	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irish Potato	1.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Peanut	56.6	45.2	4.4	50.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rice	1744.5	76.8	9.2	7.9	0.0	0.0	6.0	0.0	0.0	0.0	0.0
Pigeonpea	1.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long Beans	4.0	50.0	12.5	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mung beans	10.1	85.1	0.0	14.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yam	3.8	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Green Veg	0.1	0.0	34.2	54.8	11.0	0.0	0.0	0.0	0.0	0.0	0.0
Black beans	12.3	67.5	0.0	32.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pumpkin	1.3	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eggplant	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL-all crops	2669.0	72.5	8.9	12.1	0.0	0.0	5.2	1.3	0.0	0.0	0.0

**Amounts for current/most recent season:
more, less, or same?**

Crop	Number of HHs	% of HHs			Change sowing quantities for all growing the crop
		MORE	SAME	LESS	average % change
Maize	58	8.6	79.3	10.3	-0.38
Rice	36	11.1	77.8	11.1	2.03
Cassava	39	5.1	79.5	15.4	-0.73
Sweet potato	11	0.0	90.9	9.1	-6.82
Taro	3	0.0	100.0	0.0	
Peanut	11	0.0	100.0	0.0	0.00
Pigeonpea	1	0.0	100.0	0.0	
Irish Potato	1	0.0	100.0	0.0	
Eggplant	1	0.0	100.0	0.0	
Long Beans	4	0.0	100.0	0.0	
Mung beans	6	0.0	66.7	33.3	-14.17
Black beans	4	25.0	50.0	25.0	
Yams	1	0.0	100.0	0.0	
Green Veg	3	0.0	100.0	0.0	
Pumpkin	1	0.0	100.0	0.0	
Banana	2	100.0	0.0	0.0	
TOTAL-all crops	182	7.7	81.3	11.0	0.21

NOTE - means calculated only for crops with 5 or more cases

Why are you sowing LESS or MORE than normal? Current/most recent season

Reasons farmers gave for planting **LESS** than normal in most recent season

Reasons	N	% of responses
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
No seed available in market	1	5.0%
No seed/cuttings available from neighbors	0	0.0%
<i>Seed access</i>		
No money to buy seed/poor finances or seed too high	2	10.0%
<i>Seed quality</i>		
Seed available is not good quality or the variety is not liked	0	0.0%
Sub-total: seed-related	3	15.0%
NON-SEED FACTORS OF PRODUCTION (limits)		
No/insufficient labor	8	40.0%
Illness/health problems	0	0.0%
No/insufficient land or land not appropriate/sufficiently fertile	3	15.0%
Lack of tools/tractor/ other machinery to farm	0	0.0%
Plant pests/diseases make production not possible	0	0.0%
Animals/predator make production not possible	0	0.0%
Lack of other inputs: controlled water supply/irrigation or fertilizer	0	0.0%
Poor weather/rainfall	1	5.0%
Insecurity (e.g. theft)	0	0.0%
Sub-total: Factors of Production	12	60.0%
OTHER PRIORITIES/STRATEGIES		
Markets for crop or crop products not well-developed	0	0.0%
Other priorities than agriculture (e.g. have shop)	0	0.0%
Changing Crop priorities or changing agricultural practices	1	5.0%
New Farming methods allow lower seeding rate	4	20.0%
Other	0	0.0%
TOTAL	20	100.0%

Reasons farmers gave for planting **MORE** than normal in most recent season (ALL SITES)

Reasons	N	% of responses
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
More seed available due to good harvest	3	21.4%
More seed available due to free seed	1	7.1%
<i>Seed access</i>		
More money to buy seed or seed price low	0	0.0%
Got credit to buy seed	0	0.0%
<i>Seed quality</i>		
Have especially good seed or good variety	0	0.0%
Sub-total: seed-related	4	28.6%
NON-SEED FACTORS OF PRODUCTION (opportunities)		
Good/increased labor	2	14.3%
Feeling strong/healthy	0	0.0%
Have more land/more fertile land	4	28.6%
Have tools/tractor, other machinery to help farm	2	14.3%
Have access to irrigation, fertilizer or other inputs (for example, stakes)	0	0.0%
Good weather/rainfall	0	0.0%
Good security (peace has arrived; less theft)	0	0.0%
Sub-total: Factors of Production	8	57.1%
OTHER PRIORITIES/STRATEGIES		
Well-developed /new markets for crop or crop products	0	0.0%
Have decided to give more priority to agriculture	0	0.0%
Changed crop profiles or priority to certain crops	1	7.1%
Re-sowing due to stress (e.g. poor soils, germination, rain)	0	0.0%
Other	1	7.1%
TOTAL	14	100.0%

Seed planted by source for next season.

Crop	Total kg sowed	% of total											
		Home saved /own stock	friends, neighbours, relatives	local market	agro-input dealer	community-based seed groups	government	NGO / FAO	contract seed growers	Other	TOTAL %		
Maize	686.0	72.7	4.3	22.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Cassava	23.5	96.3	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Sweet potato	5.8	86.2	13.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Taro	0.8	93.9	0.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Irish Potato	1.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Peanut	47.2	62.9	4.2	32.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Rice	1918.50	75.8	6.6	15.5	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	100.0
Pigeonpea	5.0	60.0	30.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Long Beans	12.0	52.1	18.8	29.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Mung beans	18.0	38.9	16.7	44.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Mustard	0.1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Yam	3.8	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Green Veg	0.1	9.1	0.0	90.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Black beans	17.5	48.6	0.0	51.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Eggplant	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
TOTAL-all crops	2739.3	74.4	6.1	17.8	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	100.0

**Amounts for next season:
more, less, or same?**

Crop	Number of HHs	% of HHs			Change sowing quantities for all growing the crop
		MORE	SAME	LESS	average % change
Maize	50	18.0	60.0	22.0	4.71
Rice	33	24.2	66.7	6.1	45.43
Cassava	30	10.0	76.7	10.0	14.56
Sweet potato	12	0.0	83.3	16.7	-9.72
Taro	4	25.0	75.0	0.0	
Peanut	10	20.0	60.0	10.0	8.15
Pigeonpea	4	0.0	100.0	0.0	
Irish Potato	1	0.0	100.0	0.0	
Eggplant	1	0.0	100.0	0.0	
Mustard	1	0.0	100.0	0.0	
Long Beans	8	0.0	100.0	0.0	0.00
Mung beans	8	0.0	75.0	25.0	-12.50
Black beans	9	11.1	55.6	33.3	-13.00
Yams	1	0.0	100.0	0.0	
Green Veg	2	0.0	50.0	50.0	
Banana	3	33.3	66.7	0.0	
Kankorai Maran	1	0.0	0.0	0.0	
TOTAL-all crops	178	14.0	69.7	14.0	11.22

Input usage

Proportion (%) of HHs using mineral fertilizer

HHs using mineral fertilizer			
Current/most recent season		Next season	
Yes	0.0%	Yes	1.5%
No	100.0%	No	98.5%
N total	65	N total	65

Reasons to not use fertilizer

Reasons fertilizer not used				
Reason	Current/most recent season		Next season	
	N	%	N	%
Not available	43	66.2%	42	65.6%
Not necessary (fertile soils)	7	10.8%	7	10.9%
Too expensive	1	1.5%	1	1.6%
I do not know how to use them	11	16.9%	12	18.8%
They are not profitable for me	2	3.1%	2	3.1%
Not allowed to use them	0	0.0%	0	0.0%
Lack equipment to make use (e.g. sprayer)	0	0.0%	0	0.0%
Use integrated/ biological methods	0	0.0%	0	0.0%
Toxic / noxious	0	0.0%	0	0.0%
Other	1	1.5%	0	0.0%
Total	65	100.0%	64	100.0%

Proportion (%) of HHs using pesticides

HHs using pesticides			
Current/most recent season		Next season	
Yes	26.2%	Yes	27.0%
No	73.8%	No	73.0%
Total N	65	Total N	63

Reasons for not using pesticides

Reasons for not using pesticides				
Reason	Current/most recent season		Next season	
	N	%	N	%
Not available	39	81.3%	37	80.4%
not necessary (fertile soils)	1	2.1%	1	2.2%
too expensive	0	0.0%	1	2.2%
I do not know how to use them	8	16.7%	7	15.2%
They are not profitable for me	0	0.0%	0	0.0%
Not allowed to use them	0	0.0%	0	0.0%
Lack equipment to use (e.g. backpack sprayer)	0	0.0%	0	0.0%
Use integrated/ biological methods	0	0.0%	0	0.0%
toxic / noxious	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%
Total	48	100.0%	46	100.0%

Proportion (%) of HHs using compost / manure

HHs using compost / manure			
Current/most recent season		Next season	
Yes	32.3%	Yes	32.3%
No	67.7%	No	67.7%
Total N	65	Total N	65

Proportion (%) of HHs using storage chemicals

HHs using storage chemicals			
Current/most recent season		Next season	
Yes	0.0%	Yes	6.2%
No	100.0%	No	93.8%
Total N	65	Total N	65

Proportion (%) of HHs reporting STORAGE LOSSES

HHs having storage losses last season	
Yes	89.2%
No	10.8%
Total N	65

Average storage losses, by crop

What losses did you have in storage?		
Crop	N	mean loss (%)
Maize	55	33.2%
Cassava	8	51.3%
Sweet potato	2	50.0%
Irish Potato	1	100.0%
Peanut	6	44.2%
Rice	16	34.3%
Pigeonpea	4	31.3%
Long Beans	2	35.0%
Mung beans	4	20.0%
Black beans	4	60.0%
TOTAL-all crops	102	36.9%

Obtained any new variety in last five years?

Number of HHs*	Obtained a new variety in past 5 years? (%)			HHs who received	N of varieties received in past 5 years			
	Yes	No	total		Mean	Std Dev	Min	Max
65	46.2%	53.8%	100.0%	30	1.3	0.80	0	3

* total who answered either 'yes' or 'no' to this question

Sources of new varieties

Sources of new varieties obtained in past 5 years		
Source	N	%
Friends, neighbours, relatives	0	0.0%
Local market	0	0.0%
Agro-input dealer	0	0.0%
Community-based seed groups	0	0.0%
Government	19	70.4%
NGO / FAO	8	29.6%
Contract seed growers	0	0.0%
Other	0	0.0%
Total	27	100.0%

Means of access to new varieties

Means of access to new varieties		
Access	N	%
Exchange / barter	0	0.0%
Gift (friends, family, neighbors)	0	0.0%
Purchase	0	0.0%
Vouchers (s/times with fairs)	0	0.0%
Direct seed distribution	27	100.0%
Seed loan	0	0.0%
Food aid	0	0.0%
Money credit	0	0.0%
Other	0	0.0%

Summary: overview of seed aid frequency

Number of farmers	Seed aid in last 5 yrs? (%)			# of times seed aid obtained among recipients				
	Yes	No	Total *	# obtaining seed aid	Mean	SD	Min	Max
65	43.1%	56.9%	100.0%	28	1.2	0.50	0	3

* total of who responded 'yes' or 'no' to this question

Seed aid - by means of distribution

Mode of distribution	No.	%
Free - direct distribution	37	100.0%
Vouchers (and Fairs)	0	0.0%
Seed Loan	0	0.0%
Other	0	0.0%
Total	37	100.0%

**Analysis of spending on seed for 3 most important crops
most recent (current) season**

key crops	N growing this crop	Spending (\$)				
		Local market	Neighbors	Ag-input shops	all purchases	% of total
maize	58	2.55	0.42	0.00	2.97	32.5%
rice	36	1.92	0.73	0.00	2.65	29.0%
peanuts	11	3.24	0.28	0.00	3.52	38.5%
total (of 3)		7.71	1.44	0.00	9.15	100.0%

**Analysis of spending on seed for 3 most important crops
next season**

key crops	N growing this crop	Spending (\$)				
		Local market	Neighbors	Ag-input shops	all purchases	% of total
maize	50	3.05	0.59	0.00	3.64	32.8%
rice	33	4.51	0.76	0.00	5.27	47.5%
peanuts	10	1.94	0.25	0.00	2.19	19.7%
total (of 3)		9.50	1.60	0.00	11.09	100.0%

C. Baucau

1) Gender of HH Head

HH Head	N	%
Male	53	88.3%
Female	7	11.7%
Total	60	100.0%

2) Area cultivated by household

Area cultivated	N	%
< 0.5 ha	4	6.7%
0.5 - 1.0 ha	34	56.7%
>1.0-2.0 ha	17	28.3%
> 2.0 ha	5	8.3%
Total	60	100.0%

3) HH size (resident)

Mean size	Std. Dev.	Minimum	Maximum
6.4	2.7	2	13

4) Age of HH Head

Mean Age	Std. Dev.	Minimum	Maximum
50.7	13.5	22	75

5) Key crops - crops named most frequently as 'most important' by households

Recent (current) season			Next Season		
Crop	N of HHs	% of HHs	Crop	N of HHs	% of HHs
Maize	54	90.0%	Maize	55	91.7%
Common beans	50	83.3%	Common beans	38	63.3%
Cassava	33	55.0%	Cassava	29	48.3%
Sweet potato	14	23.3%	Sweet potato	19	31.7%
			Taro	10	16.7%

Seed planted by source in current/most recent season

Crop	Total kg sowed	% of total										TOTAL %
		Home saved /own stock	friends, neighbours, relatives	local market	agro-input dealer	community-based seed groups	government	NGO / FAO	contract seed growers	Other		
Maize	869.1	79.8	5.9	9.1	0.0	0.0	4.6	0.6	0.0	0.0	100.0	
Common beans	1788.5	71.9	9.9	15.4	0.0	0.0	0.0	0.0	0.0	2.8	100.0	
Cassava	50.2	98.8	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	100.0	
Sweet potato	18.8	99.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	100.0	
Taro	29.6	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Irish Potato	265.0	26.4	7.5	28.3	0.0	0.0	37.7	0.0	0.0	0.0	100.0	
Cabbage	0.1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Kontas	36.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Long Beans	2.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Mung beans	1.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Teli	90.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
TOTAL-all crops	3150.8	69.4	7.9	16.5	0.0	0.0	4.5	0.2	0.0	1.6	100.0	

NOTE: the 'total kg' by crop comes from the single 'total kg' figure (ex CrCuAkgTot, CrCuBkgTot, etc). Quantities for individual sources are calculated by adding the individual kg amounts given for a particular source (ex. A1, A2, A3, B1, B2, etc.).

Thus, if the total is not equal to 100%, the source of error could be 1) a difference between the total kg by crop and the sum of individual sources 2) code for quantity (kg) of a source, but error or missing code for source (or vice-versa)

* vegetative converted to kg equivalence for cuttings or suckers. CASSAVA: 400 cuttings = 1 kg maize equivalence; SWEET POTATO: 500 cuttings = 1 kg

**Amounts for current/most recent season:
more, less, or same?**

Crop	Number of HHs	% of HHs			Change sowing quantities for all growing the crop
		MORE	SAME	LESS	average % change
Maize	54	13.0	59.3	27.8	-5.07
Common beans	50	16.0	52.0	32.0	8.87
Cassava	33	6.1	63.6	30.3	-4.05
Sweet potato	14	0.0	78.6	21.4	-9.52
Taro	14	7.1	85.7	7.1	4.46
Irish Potato	5	20.0	40.0	40.0	-28.33
Cabbage	2	0.0	100.0	0.0	
Kontas	3	0.0	100.0	0.0	
Long Beans	1	0.0	0.0	100.0	
Mung beans	1	0.0	100.0	0.0	
Teli	1	0.0	0.0	100.0	
TOTAL-all crops	178	10.7	62.9	27.5	-1.39

Reasons farmers gave for planting **LESS** than normal in most recent season

Reasons	N	% of responses
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
No seed available in market	0	0.0%
No seed/cuttings available from neighbors	3	6.1%
<i>Seed access</i>		
No money to buy seed/poor finances or seed too high	10	20.4%
<i>Seed quality</i>		
Seed available is not good quality or the variety is not liked	2	4.1%
Sub-total: seed-related	15	30.6%
NON-SEED FACTORS OF PRODUCTION (limits)		
No/insufficient labor	17	34.7%
Illness/health problems	0	0.0%
No/insufficient land or land not appropriate/sufficiently fertile	5	10.2%
Lack of tools/tractor/ other machinery to farm	0	0.0%
Plant pests/diseases make production not possible	1	2.0%
Animals/predator make production not possible	0	0.0%
Lack of other inputs: controlled water supply/irrigation or fertilizer	0	0.0%
Poor weather/rainfall	11	22.4%
Insecurity (e.g. theft)	0	0.0%
Sub-total: Factors of Production	34	69.4%
OTHER PRIORITIES/STRATEGIES		
Markets for crop or crop products not well-developed	0	0.0%
Other priorities than agriculture (e.g. have shop)	0	0.0%
Changing Crop priorities or changing agricultural practices	0	0.0%
New Farming methods allow lower seeding rate	0	0.0%
Other	0	0.0%
TOTAL	49	100.0%

Reasons farmers gave for planting **MORE** than normal in most recent season (ALL SITES)

Reasons	N	% of responses
SEED- RELATED (or indirectly linked to seeds)		
<i>Seed availability</i>		
More seed available due to good harvest	3	15.8%
More seed available due to free seed	3	15.8%
<i>Seed access</i>		
More money to buy seed or seed price low	0	0.0%
Got credit to buy seed	0	0.0%
<i>Seed quality</i>		
Have especially good seed or good variety	2	10.5%
Sub-total: seed-related	8	42.1%
NON-SEED FACTORS OF PRODUCTION (opportunities)		
Good/increased labor	0	0.0%
Feeling strong/healthy	1	5.3%
Have more land/more fertile land	3	15.8%
Have tools/tractor, other machinery to help farm	0	0.0%
Have access to irrigation, fertilizer or other inputs (for example, stakes)	0	0.0%
Good weather/rainfall	1	5.3%
Good security (peace has arrived; less theft)	0	0.0%
Sub-total: Factors of Production	5	26.3%
OTHER PRIORITIES/STRATEGIES		
Well-developed /new markets for crop or crop products	1	5.3%
Have decided to give more priority to agriculture	3	15.8%
Changed crop profiles or priority to certain crops	0	0.0%
Re-sowing due to stress (e.g. poor soils, germination, rain)	0	0.0%
Other	0	0.0%
TOTAL	19	89.5%

Seed planted by source for next season.

Crop	Total kg sowed	% of total										TOTAL %	
		Home saved /own stock	friends, neighbours, relatives	local market	agro-input dealer	community-based seed groups	government	NGO / FAO	contract seed growers	Other			
Maize	988.1	68.8	4.8	23.8	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	100.0
Common beans	1241.5	73.9	10.6	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Cassava	45.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Sweet potato	37.1	98.1	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Taro	14.9	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Irish Potato	445.0	24.7	6.7	68.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Peanut	21.5	7.0	23.3	69.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Rice	45.00	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Cabbage	0.1	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Arrowroot	58.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Long Beans	5.5	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Mustard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0
TOTAL-all crops	2901.6	64.2	9.2	25.7	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	100.0

Amounts for next season: more, less, or same?

Crop	Number of HHs	% of HHs			Change sowing quantities for all growing the crop
		MORE	SAME	LESS	average % change
Maize	55	16.4	45.5	38.2	-4.51
Common beans	38	18.4	50.0	31.6	-3.60
Cassava	29	0.0	72.4	27.6	-12.59
Sweet potato	19	10.5	57.9	31.6	-10.70
Taro	10	10.0	90.0	0.0	4.29
Irish Potato	6	33.3	33.3	33.3	8.00
Peanut	4	0.0	25.0	75.0	
Mustard	1	100.0	0.0	0.0	
Cabbage	2	0.0	100.0	0.0	
Kontas	4	0.0	75.0	25.0	
Long Beans	2	0.0	50.0	50.0	
Rice	1	0.0	100.0	0.0	
TOTAL-all crops	171	12.9	56.7	31.6	-6.73

Input usage

Proportion (%) of HHs using minreal fertilizer

HHs using mineral fertilizer			
Current/most recent season		Next season	
Yes	3.4%	Yes	5.1%
No	96.6%	No	94.9%
N total	59	N total	59

Reasons to not use fertilizer

Reasons fertilizer not used				
Reason	Current/most recent season		Next season	
	N	%	N	%
Not available	34	60.7%	32	58.2%
Not necessary (fertile soils)	11	19.6%	10	18.2%
Too expensive	2	3.6%	2	3.6%
I do not know how to use them	6	10.7%	8	14.5%
They are not profitable for me	0	0.0%	0	0.0%
Not allowed to use them	0	0.0%	0	0.0%
Lack equipment to make use (e.g. sprayer)	0	0.0%	0	0.0%
Use integrated/ biological methods	0	0.0%	0	0.0%
Toxic / noxious	3	5.4%	3	5.5%
Other	0	0.0%	0	0.0%
Total	56	100.0%	55	100.0%

Proportion (%) of HHs using pesticides

HHs using pesticides			
Current/most recent season		Next season	
Yes	0.0%	Yes	5.1%
No	100.0%	No	94.9%
Total N	59	Total N	59

Reasons for not using pesticides

Reasons for not using pesticides				
Reason	Current/most recent season		Next season	
	N	%	N	%
Not available	47	81.0%	43	78.2%
not necessary (fertile soils)	6	10.3%	7	12.7%
too expensive	1	1.7%	1	1.8%
I do not know how to use them	4	6.9%	4	7.3%
They are not profitable for me	0	0.0%	0	0.0%
Not allowed to use them	0	0.0%	0	0.0%
Lack equipment to use (e.g. backpack sprayer)	0	0.0%	0	0.0%
Use integrated/ biological methods	0	0.0%	0	0.0%
toxic / noxious	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%
Total	58	100.0%	55	100.0%

Proportion (%) of HHs using compost / manure

HHs using compost / manure			
Current/most recent season		Next season	
Yes	37.3%	Yes	39.7%
No	62.7%	No	60.3%
Total N	59	Total N	58

Proportion (%) of HHs using storage chemicals

HHs using storage chemicals			
Current/most recent season		Next season	
Yes	3.4%	Yes	5.1%
No	96.6%	No	94.9%
Total N	59	Total N	59

Obtained any new variety in last five years?

Number of HHs*	Obtained a new variety in past 5 years? (%)			HHs who received	N of varieties received in past 5 years			
	Yes	No	total		Mean	Std Dev	Min	Max
58	25.9%	74.1%	100.0%	15	1.3	0.46	1	3

* total who answered either 'yes' or 'no' to this question

Sources of new varieties

Sources of new varieties obtained in past 5 years		
Source	N	%
Friends, neighbours, relatives	0	0.0%
Local market	0	0.0%
Agro-input dealer	0	0.0%
Community-based seed groups	0	0.0%
Government	15	78.9%
NGO / FAO	4	21.1%
Contract seed growers	0	0.0%
Other	0	0.0%
total	19	100.0%

3) Means of access to new varieties

Means of access to new varieties		
Access	N	%
Exchange / barter	0	0.0%
Gift (friends, family, neighbors)	0	0.0%
Purchase	0	0.0%
Vouchers (s/times with fairs)	0	0.0%
Direct seed distribution	19	100.0%
Seed loan	0	0.0%
Food aid	0	0.0%
Money credit	0	0.0%
Other	0	0.0%
Total	19	100.0%

Summary: overview of seed aid frequency

Number of farmers	Seed aid in last 5 yrs? (%)			# of times seed aid obtained among recipients				
	Yes	No	Total *	# obtaining seed aid	Mean	SD	Min	Max
59	22.0%	78.0%	100.0%	13	1.3	0.63	1	3

* total of who responded 'yes' or 'no' to this question

Seed aid - by means of distribution

Mode of distribution	No.	%
Free - direct distribution	17	100.0%
Vouchers (and Fairs)	0	0.0%
Seed Loan	0	0.0%
Other	0	0.0%
Total	17	100.0%

Analysis of spending on seed from markets and input shops for 3 most important crops most recent (current) season

key crops	N growing this crop	Spending (\$)				% of total
		Local market	Neighbors	Ag-input shops	all purchases	
maize	54	1.47	0.74	0.00	2.21	12.2%
beans	50	11.00	4.90	0.00	15.90	87.8%
total (of 3)		12.47	5.64	0.00	18.11	100.0%

Analysis of spending on seed from markets and input shops for 3 most important crops next season

key crops	N growing this crop	Spending (\$)				% of total
		Local market	Neighbors	Ag-input shops	all purchases	
maize	55	5.35	1.30	0.00	6.65	34.6%
beans	38	10.08	2.51	0.00	12.59	65.4%
total (of 3)		15.43	3.80	0.00	19.23	100.0%

Statistics (only significant trends shown)

5) Mineral fertilizer in most recent (current) season?

HH Head	N	Mineral fertilizer in most recent (current) season?		Chi-Sq prob.
		Yes	No	
Male	52	1	51	0.0897
Female	7	1	6	
total	59	2	57	

9) Used chemical storage products in most recent (current) season?

HH Head	N	chemical products current most recent (current) season?		Chi-Sq prob.
		Yes	No	
Male	52	1	51	0.0897
Female	7	1	6	
Total	59	2	57	

24) Use of storage chemicals in most recent (current) season?

Storage chemical in most recent (current) season?				
Farm area (ha)	N	Yes	No	Chi Sq. Prob.
< 0.5	4	1	3	0.0901
0.5 - 1.0	33	1	32	
1.0 - 2.0	17	0	17	
>2.0	5	0	5	
total	59	2	57	

26) Amount sowed in most recent (current) season, compared with quantity normally sowed (across all crops).

Quantity sowed most recent (current) season					
Farm area (ha)	N	More	Same	Less	Chi Sq. Prob.
< 0.5	12	0	11	1	0.0041
0.5 - 1.0	102	15	66	21	
1.0 - 2.0	51	3	24	24	
>2.0	15	1	11	3	
Total	180	19	112	49	

27) Amount sowed next season, compared with quantity normally sowed (across all crops).

Quantity sowed next season					
Farm area (ha)	N	More	Same	Less	Chi Sq. Prob.
< 0.5	10	1	9	0	0.0198
0.5 - 1.0	99	14	60	25	
1.0 - 2.0	51	4	23	24	
>2.0	13	3	5	5	
total	173	22	97	54	