The Democratic Republic of Timor-Leste
Ministry of Agriculture and Fisheries

Seeds of Life
Fini ba Moris

End-of-Program Survey, 2016
Volume 1: Main Report

Seeds of Life
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End-of-Program Survey

Volume 1

Main Report

Ministry of Agriculture and Fisheries
Seeds of Life / Fini ba Moris

Dili, May 2016

Australian Aid

This report summarizes the findings of the 2016 Seeds of Life End-of-Program Survey carried out by the Ministry of Agriculture and Fisheries/ Seeds of Life program, with the assistance of an External Consultant recruited by Seeds of Life.

The report of the survey consists of two volumes:

- Volume 1: Main Report
- Volume 2: Data Tables

Seeds of Life (Fini ba Moris) is a program within the Timor-Leste (East Timor) Ministry of Agriculture and Fisheries (MAF). The Governments of Timor-Leste and Australia collaboratively fund the program. Australian funding is through Australian Aid, Department of Foreign Affairs and Trade (DFAT), plus the Australian Centre for International Agricultural Research (ACIAR) and is managed by ACIAR. The Centre for Plant Genetics and Breeding (PGB) within the University of Western Australia (UWA) coordinates the Australian funded activities.

Cover photo

A family have their annual maize harvest weighed by Seeds of Life staff. A number of families in Lissadilla vilage, Maubara sub-district, Liquiça district received seed stock from Seeds of Life.

Photo by Conor Ashleigh, 2012

Foreword

The Ministry of Agriculture and Fisheries of Timor-Leste, with assistance from the Seeds of Life program, has been establishing a sustainable national seed system to ensure that farming families throughout Timor-Leste have access to quality planting materials of higher yielding varieties of food crops at the time and in the quantities they require.

Timor-Leste National Seed System is composed of four components. Each functions individually while also linking with other components to produce the desired outcomes:

The **crop identification & development** component, managed by the Minstry's Research Department, is focused on identifying and testing more productive varieties of the food crops farmers cultivate in Timor-Leste by conducting extensive research on stations and in farmers' fields. To date, the Ministry has released 19 improved varieties of maize, rice, peanut, cassava, sweet potato, kidney beans and mung beans. Grown under normal farmers' practice these released varieities produce 25-130% higher yield than local varieties of the same crops.

The **source seed & quality control** component is managed by the Ministry's Seed Department. It ensures a supply of quality certified seed of released varieties is available for wider multiplication. It also ensures the large quantities of commercial seed produced by registered commercial seed producers is of guaranteed quality, thereby safeguarding farmers' trust in the '***Fini ba Moris***' brand of the national seed system.

The **community & commercial seed component** focuses on ensuring the 1,200 community seed production groups (CSPG) and 70 commercial seed producers (CSP) are able to produce the 200 metric tons of community seed and 300 Mt of commercial seed as well as quality cuttings of improved varieties of sweet potato and cassava so they are widely and readily accessible to farmers throughout the country.

The fourth component, **seed system management** includes the National Seed Policy, the National Seed Council and each Municipal Seed System. It enables all stakeholders to coordinate and manage the national seed system to ensure Timor-Leste maintains its seed security and seed sovereignty at national and municipal levels, thereby removing the need for any seed imports.

This **End-of-Program Survey report** provides clear evidence that the national seed system that has been established is already enabling half of all Timor-Leste crop farmers to grow one or more of the improved varieties. All stakeholders must continue to work together to maintain the national seed system to ensure **all farming households** are able to regularly access quality planting materials of improved varieties and the opportunity to improve their food security, nutrition and farm income.

Dili, 31 May 2016

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Abbreviations and acronyms

ACIAR	Australian Centre for International Agricultural Research
AS	Adoption Survey (2014)
BS	Baseline Survey (2011)
CSP	Commercial Seed Producer
CSPG	Community Seed Production Group
CCT	Cooperativa Café Timor
DFAT	Department of Foreign Affairs and Trade
EoPS	End-of-Program Survey (2016)
FCS	Food Consumption Score
HH	Household
HoH	Head of Household
IFAD	International Fund for Agricultural Development
MAF	Ministry of Agriculture and Fisheries
MTS	Mid-Term Survey (2013)
NGO	Non Governmental Organization
PPI	Progress out of Poverty Index
r-CSI	Reduced Coping Strategy Index
SEO	Suco Extension Officer
SoL	Seeds of Life
TL-FNS	Timor-Leste Food and Nutrition Survey

Executive summary

The third phase of the Seeds of Life program ends on 30 June 2016. The End-of-Program Survey provides data on the program's achievements in terms of increased adoption of improved foodcrop varieties and how this adoption has impacted on rural households' food security as well as their economic situation.

A sample of 700 foodcrops growing households (HHs) were interviewed across 60 rural sucos selected randomly in the 13 municipalities of the country. Data collection took place in February-March 2016 using electronic forms displayed on tablets.

The data collected in this survey was very much impacted by the severe dry season caused by El Niño during the 2015-16 cropping season. Fewer crops were planted, especially rice, and smaller areas were grown.

Increase in adoption of MAF varieties

		Baseline survey (2011)	Mid-term survey (2013)	Adoption survey (2014)	End-of-Program Survey (2016)
Adoption of one or more MAF varieties (national):		**18%**	**25%**	**33%**	**48%**
Per region:	West	12%	18%	25%	39%
	Centre	20%	26%	39%	63%
	East	31%[1]	32%	39%	53%
Adoption per variety:	Sele	13%	15%	20%	30%
	Noi-Mutin	-	2%	10%	22%
	Nai	-	-	0.3%	0.6%
	Hohrae	7%	7%	9%	10%
	Nakroma	11%	15%	14%	21%
	Utamua	16%	11%	12%	6%
	Ai-luka	3%	3%	5%	5%

Given the sampling criteria, there is a 99% chance that the adoption rate is between 45% and 52%. The Seeds of Life program therefore as good as reached its key Performance Indicators: "50% of crop producing households are growing one or more MAF/SoL varieties". Also, male and female headed HHs have equal access to improved varieties (no statistically significant difference).

[1]Excluding Viqueque and Lautem

Some of the key determinants of adoption are:

- The longer-term presence of the program in some municipalities like Aileu, Liquica, Manufahi or Baucau where research stations have been active for many years.
- The distribution of improved maize seed with maize storage drums by the Timor-Leste Maize Storage Project.
- The presence of Communtiy Seed Production Groups (CSPGs) or Commercial Seed Producers (CSPs) in the suco.
- The households' involvement in agriculture, especially in terms of how many household members are working on the farm.

Characteristics of adopters

	First source of seeds or cuttings	Average area grown	Proportion of crop area under MAF varieties	Proportion of adopters growing MAF varieties for the first time	Average duration of adoption (years)	Proportion of adopters planning to continue growing the MAF variety
Sele	56% own	0.3 ha	76%	33%	2.3 years	100%
Noi-Mutin	50% MAF	0.4 ha		54%	1.7 years	100%
Nakroma[2]	63% own	1.1 ha	91%	38%	4 years	100%
Utamua	56% own	0.2 ha	86%	54%	2.2 years	100%
Ai-luka	69% own	0.3 ha	67%	34%	1.9 years	96%
Hohrae	42% own	0.2 ha	78%	44%	2 years	98%

Familiarity with MAF improved varieties

Overall, 43% of the farmers interviewed knew at least one of the improved varieties by memory or by name, i.e. recalling the name of the variety by themselves or remembering the variety after enumerators read out loud a list of varieties.
Varieties farmers know the best are Sele (37% know this variety) and Noi Mutin (35%). The other MAF varieties are known by less than 15% of the farmers: Ai-luka 11%, Nakroma 10%, Utamua 9%, Hohrae 7% and Nai 2%.

Factors fostering farmers' familiarity with improved varieties are the presence of a CSPG in the aldeia, the road accessibility of the aldeia and the presence of an active Suco Extension Officer (SEO). Also, women farmers have significantly less access to such information compared to men.

[2] Data on area grown and proportion of crop area grown are based on 29 Nakroma adopters while other results are based on eight Nakroma adopters only.

Food-security

- Reduction of hungry season

The proportion of HHs saying they experienced hunger during the last 12 months prior to the data collection went down from 82% in 2013 to 65% in 2016. And when looking only at adopters, it in fact went down from 77% to 54%. Similarly, the average length of the hungry season went down from 4 months in 2013 to 3.3 months in 2016, and down to 3 months when looking at adopters only.
Also, 81% of adopters agree that growing MAF varieties has reduced the number of months during which their HH experiences hunger.

- Increased food-self-sufficiency

In 2015, households were able to eat their own foodcrops for longer periods than in previous years. Also, HHs who grew an improved variety of maize last year were able to eat their own maize for 8.3 months on average vs. 7.6 months only among other HHs.
This was confirmed by farmers' qualitative feedback: 84% of the adopters interviewed agreed or strongly agreed that growing MAF varieties has helped their family produce more food.
As a result, less rice needs to be purchased from outside: in 2015, adopters purchased on average 371 kg of rice vs. 396 kg among non-adopters.

- HH food security indicators

The average reduced Coping Strategy Index (r-CSI) among adopters who were growing improved varieties since 2014-15 is slightly lower than among other HHs (4.9 vs. 5.4 among non-adopters), which means adopters have to rely less on coping strategies during the hungry season compared to other HHs.
Also, HHs who were growing improved varieties since 2014-15 have a slightly higher Food Consumption Score (FCS) than other HHs (59 vs. 57) meaning they have a somewhat better diet, even during the hungry season.

Economic situation

23% of the HHs interviewed live under the national poverty line and this proportion is very similar among adopters and non-adopters. In other words, improved varieties are accessible by all types of HHs.
On the other hand, the more agricultural assets (land, equipment, and livestock) a HH owns, the more likely this HH will be growing MAF varieties: the "agricultural assets score"[3] is 112 among longer-term adopters and 83 among other HHs.

Also, longer-term adopters more often earn money from selling foodcrops compared to other HHs: 56% vs. 43% among other HHs. This is probably due to the higher productivity of the MAF varieties. For example, most of the farmers growing improved maize varieties and who sold part of their maize harvest in 2015 said they purposely chose to sell harvest coming from the MAF varieties.

[3] See appendix II for more explanation about this indicator.

Still, when compared to other sources of revenue, most farmers do not see "selling crops" as a very lucrative activity: 65% estimated that only a little proportion of the last year's household income came from selling crops they produced.

Finally, a significantly higher proportion of long-term adopters believe they are better off now than five years ago: 51% vs. 40% among other HHs. Part of this improved situation is certainly the result of growing MAF varieties.

Participation in Community Seed Production Groups

21% of the HHs interviewed said they knew there was a CSPG/CSP in their suco while more than 90% of the sample was in fact living in sucos with such groups. Still, adopters are better informed: 29% of longer-term adopters knew about the existence of such groups in their suco vs. 12% among non-adopters.

4% of the HHs interviewed (i.e. 28 HHs) had at least one of their members participating in a CSPG/CSP. Among these 28 HHs, 26 were growing improved varieties (others had not yet received seeds from the groups).
On average, HHs participating in CSPGs are slightly more food-secure (higher FCS, lower r-CSI) and significantly more involved in agriculture (more agricultural assets owned and more HHs earning money from selling crops).

Conclusion

About half of Timorese rural households are growing improved varieties which are now well established in the country. More families are now using their own stock of improved varieties seeds and cuttings to plant on their fields, and are therefore able to grow these for longer periods.
The EoPS also showed that families growing improved varieties suffer less from hunger because they are able to produce and consume more of their own food. Clearly, adoption contributes to improving food security in the country. Furthermore, higher volumes produced gives the opportunity for adopters to sell part of their harvest and thus, increase their HH income.

Rezumu ezekutivu

1. Survey design

1.1 Background

The Seeds of Life (SoL) Program is reaching the end of its Phase 3 in June 2016. This survey was designed to assess the impact the program had on Timorese foodcrop farmers through the adoption of 11 improved varieties released by the Ministry of Agriculture and Fisheries: Sele, Noi Mutin, and Nai for maize, Nakroma for rice, Utamua for peanuts, Ai-luka 1, 2 and 4 for cassava and Hohrae 1, 2 and 3 for sweet potatoes[4]. This impact was assessed at several levels:

- Measuring and understanding adoption of improved varieties through different dimensions: How long have farmers used these varieties? On what area do they grow these varieties? And how do they rate the productivity of these varieties?
- Measuring the impact on food security, and more specifically on the length of the hungry season which affects Timorese farmers at the end of the dry season.
- Measuring the impact on the economic situation of these HHs in terms of increased crop sales and consequently, increased revenue for the HHs.

1.2 Sampling methodology

The End-of-Program Survey (EoPS) sample is composed of 700 HHs spread across the 13 municipalities of the country. This corresponds to a 5% margin of error and 99% level of confidence, as for the SoL Mid-Term Survey (MTS) which was implemented in 2013 and the Adoption Survey (AS) which was done in 2014.
This sample size was selected based on the data from the 2015 Population Census: rural population and average HH size (rural and urban) per municipality were used to approximate the number of rural HHs in the country: 152,429 rural HHs.

These 700 HHs were distributed proportionally to the population size in each municipality to ensure results are representative of the national level. The number of HHs to be interviewed in the municipality was then divided by 12, which is the average number of HHs that is the most practical for one day survey in a suco. In the end, 11 to 13 HHs were interviewed in each suco.

Sucos and aldeias were selected randomly in each municipality. Three aldeias were chosen in each suco, instead of two in previous surveys, to improve representativeness. Overall, six of the 173 aldeias visited for this survey were not accessible by car which required several hours walk before reaching farmer's houses. To reduce enumerators' burden, in sucos where two of the randomly selected aldeias were not accessible by car, one of these aldeias was exchanged with another aldeia of the suco which was accessible by car. In total, seven aldeias and one suco from the initial sample were changed.

[4] In this report, we refer to these 11 varieties collectively as "improved varieties" or "MAF varieties".

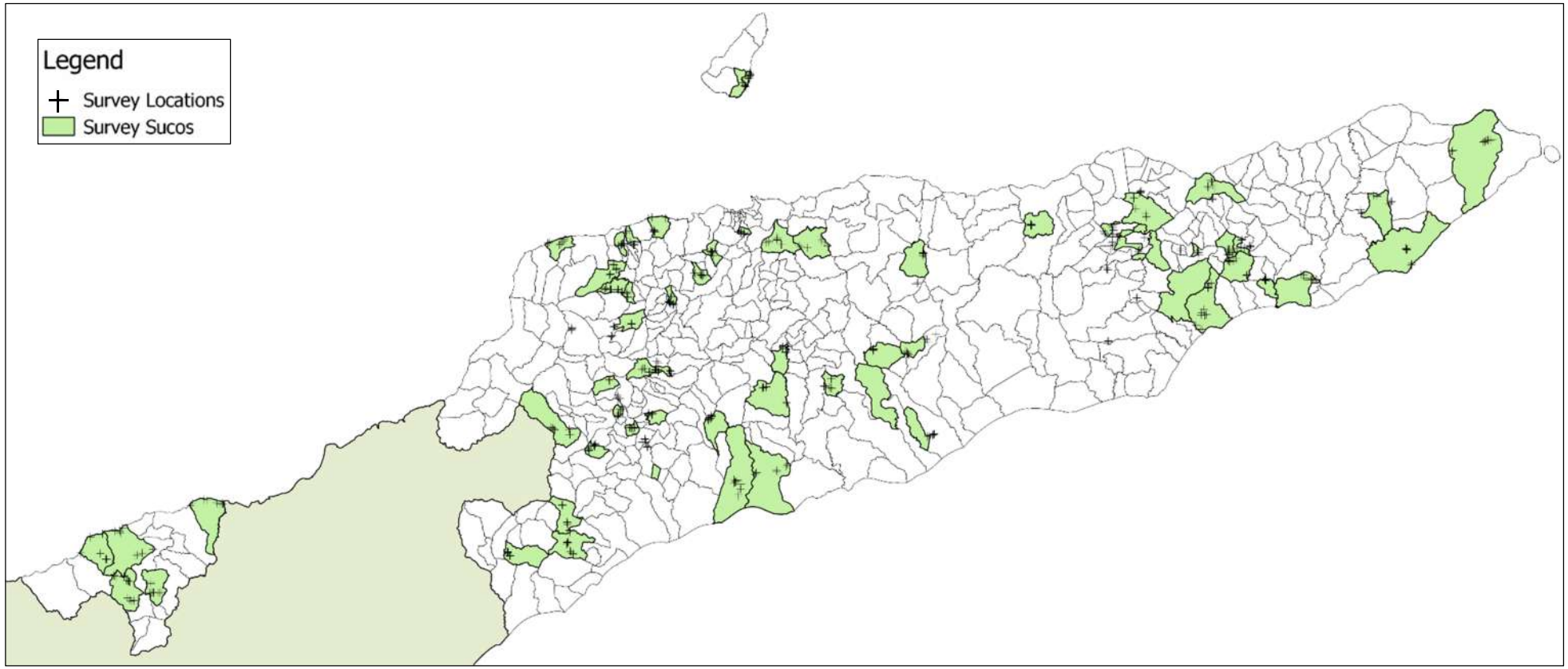


Figure 1. Location of sample sucos and respondents surveyed during the EoPS[5]

[5] All the maps presented in this report were produced by Samuel Bacon, SoL3's Cropping Systems Advisor.

As shown in Table 1, the EoPS covered 60% of the country's rural subdistricts, 15% of its' rural sucos and 0.5% of Timorese rural HHs. The detailed list of sucos and aldeias visited during the EoPS is in Annex I.

Table 1. Sample's representativeness

	Municipalities	Subdistricts	Rural sucos	Rural households[6]
Number sampled	13	40	60	700
Number in the country	13	67	400	152,429
Proportion sampled	100%	60%	15%	0.5%

The following summarizes additional data about the visited locations:

- 53% of the sucos and 32% of the aldeias sampled in the EoPS were also surveyed in either the 2011, 2013 or 2014 surveys.
- During data collection, supervisors took notes on the accessibility of the visited sucos and aldeias. As a result, about 70% of the aldeias for which such information is available were easily accessible (i.e. could be reached by car and were located close to the centre of the suco).
- 55 of the 60 sucos visited had Community Seed Production Groups (CSPGs) and 11 had Commercial Seed Producers (CSPs). Note that at aldeia level, only 51% of the aldeias sampled had CSPGs or CSPs within the aldeia boundaries.

1.3 Questionnaire, data collection and analysis

Interviews with respondents covered different topics: general HH information, area farmed and crops/varieties grown on this area, in-depth questioning about growing improved varieties, food security, overall HH economic situation and participation in groups.
Several methods were used to assess HHs' food security and economic conditions:

- Ratings using pre-designed tools such as the Progress out of Poverty Index (PPI), the reduced Coping Strategy Index (r-CSI) or the Food Consumption Score (FCS).
- Measuring farmers' perceptions using subjective well-being questions and Likert scales.

Whenever possible (which was in 192 out of the 700 households surveyed), two members of the household were interviewed:

- The main respondent was the head of household or another person of the family who knows best about the agricultural activities of the HH.
- A second much shorter interview was conducted with the person who usually cooks for the family (most of the time the wife of the head of household).

[6] From the Preliminary Results of the 2015 Timor-Leste Population and Housing Census 2015.

The second shorter interview had several objectives:

- To ask some food security questions to the person who knows best about this in the family, i.e. the person who usually prepares meals for everyone.
- To cross-check some of the more difficult questions on hungry season and months of consumption of self-grown crops (asked to both man and woman).
- To get a male and a female point of view on the more gender-related questions about decision making in the family.

As during the 2014 survey, it was decided to conduct the interviews using 7" tablets in order to avoid data entry and allow rapid verification of the data.

Figure 2. Interview of a farmer in Maumeta, Liquica

Data collection lasted five weeks, from 1 February to 7 March 2016, and was performed by a team of 12 to 13 enumerators. Enumerators were dispatched into different teams and were supervised by a team supervisor. Team supervisors were in charge of contacting local leaders, adapting the schedule if needed, select randomly the HHs to be interviewed, provide support during interviews, and check the data before submission.

Specifically for a selection of 51 rice farmers, there was a revisit by two supervisors between 26 April and 6 May. During the February-March interviews many of the rice farmers had not yet started to grow their rice crop, and this gave an unrepresentative image of improved variety adoption for rice. It was therefore decided to revisit the same rice farmers some two months later, to check if they had already planted rice, which varieties they were growing and – if they were growing Nakroma – to measure the area planted with that variety. Farmers to revisit were selected among those who said they had grown rice the year before and not anymore during the EoPS data collection. Note that no other data about rice production was collected. Therefore, besides data on rice varieties planted and data on the area of rice and Nakroma grown, other data related to rice presented in this report only reflect the 95 rice producers interviewed during the main data collection (February-March). For practical reasons, the revisits were limited to the municipalities Baucau, Lautem and Viqueque as the largest concentrations of rice growers were encountered in these locations.

The result of these follow-up visits is that 43 among the 51 farmers met had started growing rice (or were going to very soon) and 21 among these were growing Nakroma.

Data was analysed in SPSS and whenever possible, it was compared to results of previous surveys conducted within the Seeds of Life program: the 2011 Baseline Survey, the 2013 Mid-Term Survey, and the 2014 Adoption Survey. In this report, these surveys are referred to by the year when they were conducted, i.e. " the 2013 survey" or simply "2013" is used to refer to data collected during SoL's Mid-Term Survey.

A few points regarding results of data analysis should be noted here:

- For the question on hungry season, answers collected from 165 HHs by three enumerators were biased because the question was not asked exactly as it was meant to be asked. Thus, the hungry season data presented and used in this report is based only on 535 HHs (531 when excluding those who didn't know what to answer).
- As explained above, questions on hungry season and months of consumption of self-grown crops were asked to two different HH members. However, during analysis, only very little difference was found between answers from both respondents. As a result, for the hungry season data, this report is based on the combination of answers from those two respondents and for the self-grown food crops consumption data, it is based only on answers from the main respondent.
- Because some of the questions referred to the HH's situation five years earlier, at the beginning of the interview, enumerators asked if the respondent was living in this same HH in 2011 (five years earlier). Only 27 respondents said they were not living in this same HH in 2011. However, analysis of all the questions involving farmers' perception about their situation five years ago revealed that there was no statistically significant relation between farmers' answers and the fact that they were or weren't living in the same HH in 2011.

Figure 3. The training of enumerators lasted two weeks with a lot of field practice

2. Household demographic characteristics

2.1 Basic data on respondents and heads of household

For 57% of the HHs surveyed, the main interview was conducted with the head of household, who was most of the time a man. In other cases, interviews were conducted mostly with the wife of the HoH or with one of the eldest sons/daughters.
As in previous surveys, a higher proportion of men were interviewed as the main respondents (55%). Among the 192 HHs where a second respondent was also interviewed, the other person was always a woman (person cooking for the HH).

The EoPS sample is composed of 6% female headed HHs, which is considerably lower than the 16% female headed HHs measured nationally by the 2010 Census data.

In order to calculate the PPI, additional data was collected on the educational level of the HoH and his main occupation. Overall, HoHs have a very low educational level: 46% did not go to school or went maximum up to class 1 of primary school. As expected, 88% of the HoHs said their main occupation was agriculture. The most frequent occupations of other HoHs was teaching (22) and doing small businesses as construction, carpenter, retailing (16). Six HoHs were local leaders (*chefe suco, chefe aldeias, secretaris suco*).

2.2 Household composition

On average, an interviewed HH had 6.3 members[7] which is slightly higher than the mean HH size as reported in the 2015 census (5.7 members).
Interestingly women headed HHs have significantly fewer members than men-headed HHs: 4.7 vs. 6.5. This is probably because women headed HHs are often widows and do not have as many children as other families.

For each HH member, information on age, gender, schooling, and involvement in agricultural activities was collected. Such information was used to calculate the PPI scores, assess how many men and women the SoL 3 program has benefited, etc.

In summary, regarding the schooling situation of the HH members:

- 63% of the HHs had all their members aged 8 to 17 years old going to school.
- 12% had none or some of their HH members aged 8 to 17 years old not going to school. Among these, boys were more often those not going to school.
- Finally, 25% of the HHs had no members between 8 and 17 years old.

And regarding the time HH members spend in agriculture:

- On average, 2.8 HH members out of 6.3 are involved in agriculture[8]. Female headed HHs have much less agricultural workforce than male headed HHs: 2.2 HH members vs. 2.9 among male headed HHs.[9]

[7] Calculated among 699 cases with complete data on household composition.

- Men and women's involvement in agriculture within the HH seems very balanced: on average about half of the workforce in a HH comes from men and half from women.
- HH members spending the highest amount of time in agriculture are between 35 and 54 years old: 75% and 68% of the men and women in this age range work full time on the farm.
- Women's contribution to agriculture decreases slightly as they get older: among the 55 years old and more, 43% of women do not work anymore in the fields or work only part-time, vs. 25% for men.

2.3 Gender in decision making

Three questions on decision making were asked to the main respondent as well as the secondary respondent whenever that was possible. These questions focused on who in the HH usually took the major decisions related to:

- farming (which crop/variety to grow, area to grow, buying seeds, etc.)
- selling agricultural productions (what to sell, where to sell, price, go to sell)
- how to use the money from selling crops

Table 2. Decision making in the household

	Men	Women	Both	Not selling
Q1 - Main decision maker about farming activities				
All respondents	23%	15%	62%	
Male respondents	26%	6%	68%	
Female respondents	19%	27%	55%	
Q2 - Main decision maker about selling agricultural production				
All respondents	7%	23%	35%	36%
Male respondents	8%	17%	38%	37%
Female respondents	5%	31%	30%	34%
Q3 - Main decision maker about use of the money from selling crops				
All respondents	3%	36%	26%	35%
Male respondents	4%	32%	28%	36%
Female respondents	1%	41%	24%	34%

The general trend is that men and women take decisions together, followed by men only.

Secondly, there is a very clear tendency to say that women are much more involved than men in decision making related to selling agricultural production or managing the earnings from these sales. Indeed, managing the HH income is often more in the hands of the women only than of both men and women.

[8] A HH member involved full time in agriculture was counted "1" and if only part time, s/he was counted "0.5".
[9] Result of Anova test: Sig. = 0.0002, $p<0.05$.

Interestingly, when the respondent is a woman, a higher proportion of respondents say that it is women alone who mostly take decisions related to agriculture, and similarly for male respondents (more decision making by men alone). Also, a smaller proportion of decision making by both men and women were reported if the respondent was a woman, while men tend to say that decisions are more often taken together.
So clearly the gender of the respondent influenced how these questions were answered.

For 192 HHs, the three questions on decision making were asked also to a second HH member who was the person who usually prepares food for the family. In 98% of these HHs, the person interviewed with the main questionnaire was a man while the person who cooks was always a woman.
When comparing the answers given by those two HH members, it appears that in many cases, the answers given were the same: 73% similar answers for Q1, 66% for Q2 and 67% for Q3. The only differences are that women tend to very slightly more often report that they are the major decision makers. Similarly for men.

In fact, when two respondents were interviewed in a HH, interviews were most of the time done one after the other and both respondents were often listening to each-others' responses. This very likely influenced the answers of the person who cooks who was interviewed in second position. This explains why answers given by both HH members are very similar, especially for these gender-related questions.

Answers given to these decision making questions were compared to information on women and men's involvement in agriculture (Table 3). On average, cases where the main respondent said that women usually take decisions are also HHs where women spend slightly more time in agricultural work compared to men. This is especially true for the first question on agricultural decision making.

Table 3. Decision making and women's involvement in agricultural work

	Men	Women	Both	Not selling
Q1 - Main decision maker about farming				
# of cases	160	106	431	
Proportion of women's time among the total agricultural labour in the HH	44%	62%	47%	
Q 2 - Main decision maker about selling agricultural production				
# of cases	46	161	240	250
Proportion of women's time among the total agricultural labour in the HH	42%	51%	49%	49%
Q 3 - Main decision maker about use of the money from selling crops				
# of cases	19	248	183	248
Proportion of women's time among the total agricultural labour in the HH	34%	50%	48%	49%

In conclusion, there seems to be some parity: in households where women contribute more to agricultural activities, they also have a greater control on how to manage the production.

3. Familiarity with improved varieties

Familiarity with the varieties released by MAF was measured at different levels[10]:

- A first very open questioning was meant to assess farmer's ability to remember by themselves the names of the varieties. Respondents were simply asked if they knew MAF had released improved foodcrop varieties, and if yes, what were these varieties. This self-reported measure is called "**know by memory**".
- After respondents recalled the varieties they knew, enumerators read the actual list of improved varieties released by MAF, and for each of these asked to the respondent if he had already heard about it or not. This second measurement is called here "**know by name**". Note that this list did not include the varieties spontaneously mentioned by the farmer in the previous question but included two extra fictitious varieties "*Santalum*" and "*Soko*". These two fictitious varieties were added to the list to check farmers' sincerity when answering these questions. Moreover, in order to verify if farmers really knew these varieties, the enumerator asked the person to tell what crop the variety was.

3.1 Awareness of the existence of improved varieties released by MAF

To the question "*Do you know that MAF has released improved varieties for several crops?*", 33% of the HHs answered yes. The same question was asked in 2014 but then only 25% said yes, which seems to indicate that more farmers are now aware about this. But it is important to highlight that this question was very difficult to understand for farmers due to the concept of "released varieties". In many cases, farmers simply thought they were asked if MAF had distributed improved varieties seeds to them.
On average, men respondents were much more informed than women: 38% of men respondents said they knew MAF had released improved varieties vs. 27% among women respondents. Clearly, men have more access to outside information than women.
Respondents who said yes here then had to explain for which crops they knew MAF had released improved varieties (Table 4).

Table 4. Crops for which MAF has released improved varieties

Crops	2014	2016
Maize	93%	94%
Rice	41%	16%
Peanut	33%	21%
Cassava	42%	32%
Sweet potato	36%	26%
Other (teak, nuts, beans, fruit trees)	3%	6%
Don't know		3%

[467 HHs in the EoPS]

[10] The methodology described in this section was inspired by Kondylis Florence, Valerie Mueller and Siyao Jessica Zhu, *Measuring Agricultural Knowledge and Adoption*, Policy Research Working Paper, The World Bank, Washington DC, 2014.

Most respondents said maize as in 2014, followed by cassava and sweet potato. Interestingly, these three crops are probably those for which seeds/cuttings distributions were the most important in the last year. The fact that MAF has also released improved varieties for rice and peanuts is less known than two years ago.

3.2 Knowing varieties by memory and by name

For each of the crops they mentioned in the previous question, farmers were asked to specify the actual name of the variety they knew MAF had released. Note that this follow-up question was not asked in the previous survey. And for varieties that were not spontaneously named by farmers, the following question was asked: "*Have you heard about these other varieties released by MAF: Sele, Noi Mutin, Nai, etc.?*".
Table 5 summarizes answers collected for both these questions.

Table 5. Proportion of respondents among the total sample knowing MAF-released varieties by memory and by name

Variety	Knowing by memory	Knowing by name	Combined: knowing by memory and by name
Sele	23%	15%	37%
Noi Mutin	20%	15%	35%
Nakroma	4%	7%	10%
Utamua	3%	6%	9%
Ai-luka	3%	7%	11%
Hohrae	3%	3%	7%
Mentioned another name	2%	NA	-
Nai	1%	1%	2%
Fictitious variety 1: "*Soko*"	NA	1%	-
Fictitious variety 2: "*Santalum*"	NA	0	-

[All proportions are calculated among 700 HHs]

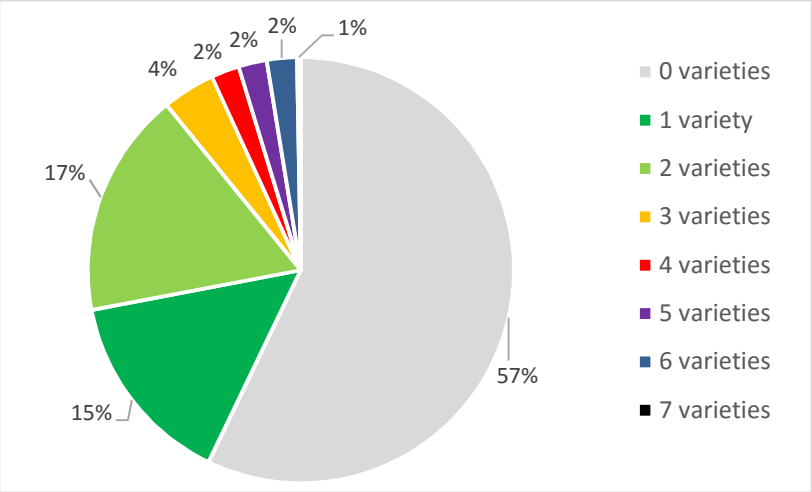
Definitely Sele is the most well-known variety closely followed by Noi Mutin. Only a very small proportion of the respondents spontaneously mentioned other improved varieties for the first question. When reminded of the name of another variety by the enumerator, a slightly higher number of farmers said they knew the varieties.

To ensure farmers really knew what those varieties were, people who said they were familiar with a MAF variety were specifically asked if they could name which crop it was. Most farmers answered correctly (only nine farmers weren't sure or thought it was another crop).

The very few farmers who said they knew one of the fictitious varieties ("*Soko*") said it was in fact a weed they usually feed their animals with. This suggests that most farmers did not over-report the fact that they knew the varieties listed by the enumerators. On the other hand, what might have happened is that farmers under-reported the fact that they knew some varieties. Indeed, farmers tend to say they haven't heard about a variety even though they did whenever they know that this variety has been distributed in their area but their own family hasn't received seeds.

The following chart summarizes the data collected above: overall 43% of the respondents knew about at least one improved variety (either by memory or by name).

Figure 4. Number of improved varieties respondents know by name or memory



[All proportions are calculated among 700 HHs]

In the 2014 survey, the question on familiarity with MAF varieties was asked only to farmers who weren't identified as growing the variety but who were growing the crop[11]. To be able to compare results, the above 2016 results were converted in the same way as was done in 2014. Table 6 presents this comparison.

Table 6. Evolution of farmer's familiarity with MAF varieties

Variety	2014	2016
Sele	15%	25%
Noi-Mutin	13%	22%
Nai	0.1%	1%
Nakroma	32%	13%
Utamua	10%	7%
Ai-luka	5%	10%
Hohrae	3%	4%

[484, 540, 685, 87, 204, 604 and 376 crop growers who do not grow respectively Sele, Noi Mutin, Nai, Nakroma, Utamua, Ai-luka or Hohrae, answered this question in 2016]

Overall, familiarity with Sele and Noi Mutin has significantly increased since 2014 followed by familiarity with Ai-luka and Hohrae. Again, these are the varieties that have been the most distributed in the past years. Far fewer farmers seem to be familiar with Nakroma which could be influenced by the fact that the 2015-16 growing season was affected by a very long dry season, due to El Niño, which had a significant impact on rice production. Still, the low familiarity of Nakroma is somewhat surprising as a larger amount of Nakroma seeds was purchased for distribution in 2015-16 compared to 2014-15.

[11] For example, the question "Have you heard about a variety named Sele" was asked only to farmers growing maize but who were not growing Sele.

3.3 Factors influencing familiarity with improved varieties

- Presence of a CSPG in the aldeia

Interestingly, the presence of a community seed production group in the suco does not seem to have an impact on farmer's knowledge about MAF varieties but at aldeia level, it does. Indeed, 47% of the respondents who live in an aldeia where there is a CSPG knew of at least one improved variety (either by memory or by name), while only 38% of the farmers who live in aldeia where there isn't a CSPG did so. This is especially true for farmers' familiarity with Noi Mutin.

- Access to the aldeia

Even though the difference isn't statistically significant, it seems that farmers living in aldeias that were accessible by car knew more improved varieties than others: 44% of the farmers knew at least one variety vs. 32% in aldeias that couldn't be reached by car.

- For Noi Mutin, 71% of the respondents who live in an aldeia where there is a CSPG/CSP knew the name "Noi Mutin" by memory while only 57% of the respondents who live in aldeias where there are no CSPG/CSPs knew the variety by memory.
- For Sele, the difference was less pronounced: 75% knew "Sele" by memory in aldeias where there is a CSPG/CSP vs. 71% in other aldeias.

- Suco Extension Officers

During data collection, team supervisors took note of sucos in which SEOs were more or less active. Even though this wasn't based on a formal evaluation or rating of the SEOs, it seems quite clear that farmers living in sucos where the Team Supervisors thought SEOs were more or much more efficient, are more familiar with improved varieties than other farmers.
More than half of the farmers living in sucos with very active SEOs knew of at least one MAF variety while this proportion was half of it in sucos where SEOs were very poorly involved in the community.

- Gender of the respondent

On average, male respondents have heard about 2.4 improved varieties vs. 2 only among female respondents. This difference is statistically significant meaning that women have significantly less access to such information than men.
Interestingly, men's source of information on improved varieties is more often SEOs (60% for male respondents vs. 40% for female respondents) while women get more information from relatives/neighbours (25% among female respondents vs. 10% among male respondents). This clearly shows that SEOs' networks in the sucos goes mainly through male farmers who are consequently more likely to learn about new technologies/varieties and probably also, more likely to receive seeds/cuttings from the SEOs.

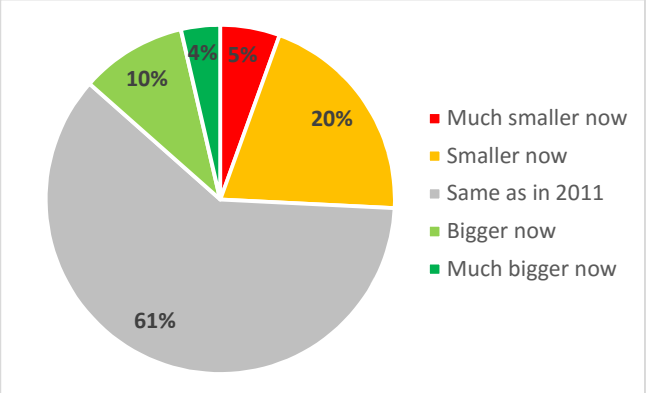
4. Area cultivated and crops grown

4.1 Area cultivated

On average farmers reported cultivating two plots with foodcrops and 0.7 plots of plantations. This corresponds to 1.72 ha of foodcrops[12] and 0.7 ha of plantations which is slightly less than what was reported in 2013 (1.85 ha for foodcrops). This year, areas cultivated were significantly impacted by the longer dry season.
Interestingly, male headed HHs cultivate significantly more land than female headed HHs: 0.75 ha vs. 0.36 ha among female headed HHs (foodcrop only). This is coherent with the fact that male headed HHs have more agriculture workforce within the family and also have larger families.

A question was also asked to assess farmers' ownership of the land. As a result 92% of the respondents said they own the land they cultivate, 4% said they do not own it, and 4% said they own some and rent some. 90% of those who do not own the land use it for free while others usually share a part of their harvest with the owner of the land.

Finally, farmers were asked: "*How is the total amount of land that your household cultivates for foodcrops now compared to 5 years ago?*". As shown in Figure 5, more than half of the sample said the area stayed the same. Others rather said the area they cultivate now is smaller than five years ago. This is directly related to the 2015-16 drought from which suffered most Timorese farmers at the time of the EoPS.



[690 respondents answered this question]

Figure 5. Comparison of area under foodcrop cultivated in 2011 and 2016

The eastern region is the one where the highest proportion of farmers said they now cultivate smaller areas compared to 2011: 32% vs. 22% and 24% in the western and central region respectively. It is also a region where El Niño had some of the most severe impact, especially in the coastal areas[13].

[12] Note that some enumerators may also have included plot sizes which were perhaps not planted at the time of the survey in February-March 2016. This average area might therefore be very slightly overestimated.
[13] "El Niño Timor-Leste Update: February 2016 crop situation report, Samuel Bacon, SoL.

4.2 Crops and varieties grown

4.2.1 Diversity of crops grown

Farmers were asked to list all the crops they had grown during the last 12 months.

Table 7. Crops grown between February 2015 and January 2016

Crop	% among 700 HHs
Maize	99%
Cassava	92%
Fruits: banana, lemon, mango, papaya, honey dew, etc.	74%
Vegetables: green leafy vegetables, carrots, pumpkin, etc.	69%
Beans, peas and other nuts: string beans, green peas, etc.	67%
Sweet potato	66%
Other root crops: taro, yam, arrowroot, etc.	50%
Coconut	43%
Peanut	34%
Coffee	31%
Rice: both wet and dry land	22%
Other: mainly plantations such as candlenut, teak, etc.	15%
Other cereals: sorghum, millet, etc.	1%

The results obtained seem to be representative of the situation in Timor-Leste with maize and cassava as the main foodcrops. Most HHs also have at least a few banana and papaya trees and grow some vegetables, beans and root crops such as sweet potatoes.
91% of the rice producers were met in Oecusse, Baucau, Viqueque, Bobonaro and Lautem. Also, 62% of coffee producers were met in Ermera, Covalima, Manatuto and Ainaro.

For maize, rice, peanut, cassava and sweet potato, a second question asked if the crop was grown "now", i.e. at the time of the survey. Indeed, some farmers grew a crop 12 or 11 months ago (during the 2014-15 planting season) but did not grow it again in February-March 2016 because of the severe drought at the time of the survey. Wherever possible, enumerators double checked by observing farmer's fields.

Table 8. Proportion of HHs cultivating maize, rice, peanut cassava and sweet potato at the time of the survey

Year	Maize	Rice	Peanut	Cassava	Sweet potato
2010 (Census)	88%	39%	NA	81%	NA
2013	95%	37%	29%	86%	60%
2014	99%	31%	35%	91%	76%
2016	99%	(1) 14% (2) 20%[14]	31%	91%	63%

[Answers collected from all 700 respondents of the EoPS]

Overall proportions are quite similar to what it was in previous surveys except for rice which was the most severely impacted foodcrop. As shown here, in February-March, many rice producers had not yet planted rice and delayed until April-May. Moreover, during the first round of interviews, half of the HHs growing rice were in fact growing up-land rice mainly because low-land rice fields were not moist enough at that time to plant irrigated/flooded rice.

4.2.2 Area of five main foodcrops

The average area grown per crop is overall smaller than what it was in 2013, especially for rice, which is again directly related to El Niño (Table 9).
But the general trend stays the same with maize and cassava grown on about the same area (about half a hectare of mixed intercropping), peanut and sweet potato grown on much smaller areas and rice grown separately on larger areas.

Table 9. Average area grown under maize, rice, peanut, cassava and sweet potato

Year	Maize	Rice	Peanut	Cassava	Sweet potato
2013	0.58ha	1.86ha	0.28ha	0.70ha	0.35ha
2016	0.47ha	(1) 0.69ha (2) 0.82ha[15]	0.23ha	0.40ha	0.36ha

[Answers collected from all 691, 95/138, 217, 636, 444 respondents growing respectively maize, rice, peanuts, cassava and sweet potato in the EoPS]

To get an idea of how intensively these five crops are grown, farmers were asked if they planted different crops on the same area or not. Maize, cassava and sweet potato are nearly always grown together on the same plots (more than 80% of the farmers) while less than half of the peanut producers grow peanut mixed with other crops. Often, a small parcel of the maize plot is kept only for peanuts, probably to ensure sufficient sunshine to the peanuts plants.
Also interestingly, a slightly lower proportion of adopters tend to grow their improved varieties mixed with other crops. This could be because some of these adopters prefer to plant their improved varieties as a monocrop, so in a more intensive way. For example, 90% of the farmers growing one of the maize improved varieties grow it in intercropping while that is true for 98% among other farmers.

[14] The first result is the proportion of rice growers interviewed in February-March 2016 while the second result is the revised proportion of rice growers after 51 HHs had been revisited in April-May 2016.
[15] The first result is the average rice area grown among the 95 rice producers interviewed in February-March 2016. The second result is the revised area that includes the 43 new rice producers revisited in April-May 2016.

4.2.3 Production of five main food crops

Due to the timing of the survey, no data could be collected on the harvests of the current season (2015-16). Therefore, to provide some comparison, farmers were asked how much they had harvested the previous year (cropping season 2014-15) followed by "*Do you think you will be able to produce the same quantity this year?".*
Quantitative results are presented in Volume 2 while Table 10 presents farmers' projections for the 2015-16 harvest.

Table 10. Farmer's projections on what will be their harvests in 2016

Crop	Will produce less this year	Will produce as much this year	Will produce more this year	Don't know
Maize	39%	14%	16%	32%
Rice	34%	13%	14%	39%
Peanut	41%	14%	15%	31%
Cassava	25%	19%	17%	39%
Sweet potato	28%	33%		39%

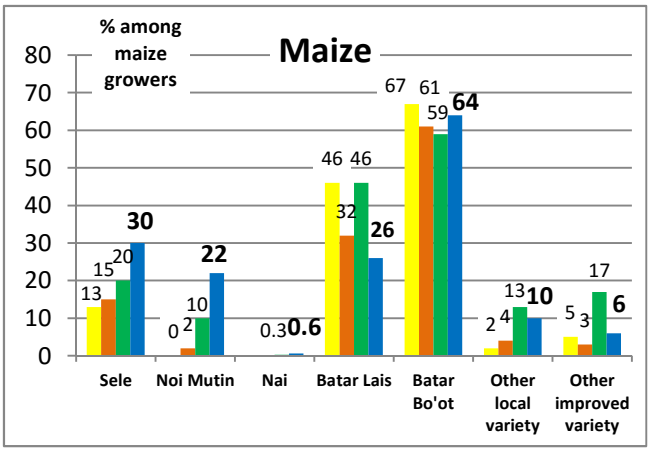
[Answers from crop growers: maize 668, rice 92, peanut 180, cassava 36 and sweet potato 18]

Very clearly, crop growers tend to believe that the 2015-16 season will be much less productive than previous year, which will certainly be the case given El Niño.
For maize, the eastern region is where the highest proportion of farmers seem to expect lower results: 46% vs. 31% in the central region and 38% in the western region. As mentioned earlier, the eastern region is also the most affected by El Niño. In Lautem more specifically, 78% of the maize farmers interviewed said they plan to harvest less this year.

Figure 6. Maize plot in coastal areas of Oecusse, suco Suni Ufe (March 2016).

4.2.4 Diversity of varieties grown

The following charts present the varieties respondents grew at the time of data collection.



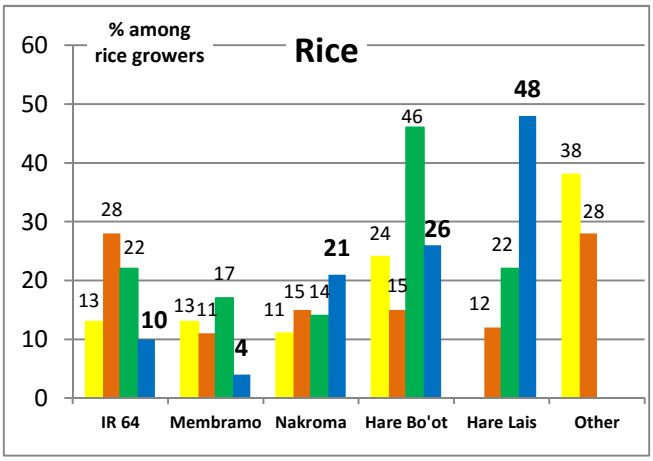
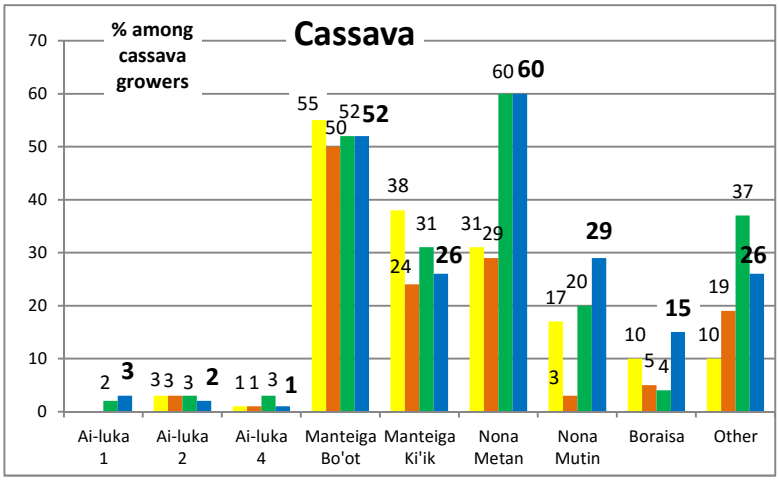
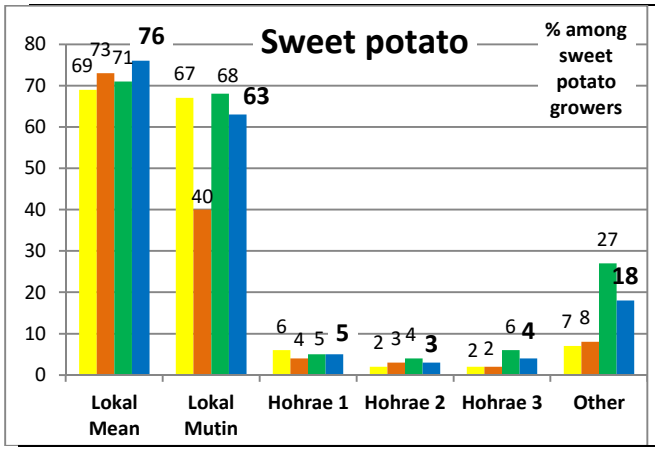
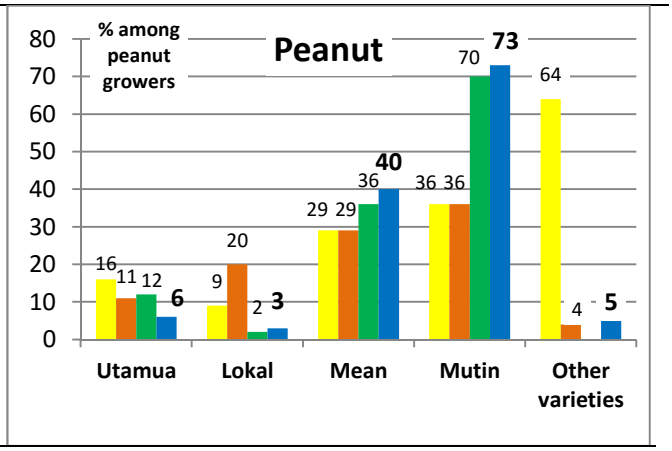


Figure 7. Proportion of local and MAF varieties grown per crop







For most varieties, the general trend is the same as in previous surveys. Note that for MAF varieties, more discussion will be conducted in Part 5.1.2.

- Maize: The most commonly grown variety is "*Batar Boot Local*" which in fact gathers several types of local varieties that have in common that they take about 3.5 months to harvest and have usually bigger cobs. "*Batar lais*" which stays the second most commonly grown variety is slightly less grown than previous years which might simply be because of the late rains.
- Rice: Rice production was the most severely impacted by the bad cropping season this year. Thus, most of the data collected about rice production in the EoPS is difficult to compare with data from previous years. Improved varieties like IR64 or Membramo and hare bo'ot seem to be slightly less common in 2016 while Nakroma and *Hare Lais* are more frequent.
- Cassava: Nona Metan, and Manteiga (*boot* and *kiik*) are still the most widespread varieties. Given mistakes might have happened when differentiating local cassava varieties, no conclusions should be made about what seems to be an increase in production of Boraisa and Nona Mutin since 2014.
- Sweet potato: The results obtained this year are very similar to that of previous years with mainly "*Lokal Mean*" varieties followed by "*Lokal Mutin*". Hohrae 1, 2, and 3 are still grown by about 3 to 5% of all sweet potato growers.
- Peanuts: Results are quite similar to what was found in the 2014 survey for which enumerators were also thoroughly trained in variety identification. In the 2011 survey, most local varieties were grouped in the same "other" category.

Figure 8. Sele and local maize varieties grown in the farm of a respondent in Tapo, Bobonaro.

5. Adoption of improved varieties

5.1 Adoption rates

5.1.1 Adoption rates combined

As shown in Table 11, in 2016, it is estimated that **48.4% of Timorese crop growers grew at least one of the 11 varieties released by MAF**. Given the sampling criteria, there is a 99% chance that the adoption rate is between 44.7% and 52.1%. The Seeds of Life program has as good as reached one of its key Performance Indicators: "50% of crop producing households are growing one or more MAF/SoL varieties"[16].

The difference between male and female headed HHs isn't statistically significant, meaning that both types of HHs have equal access to improved varieties.

Table 11. Improved varieties adoption rates – National level

Year	# of crop growers	# of improved variety adopters	% of improved variety adopters	% of male headed HHs adopters	% of female headed HHs adopters
2011	1,510	270	17.9%	17.9%	17.2%
2013	672	165	24.6%	25.4%	14.3%
2014	702	228	32.5%	31.8%	37.4%
2016	700	339	48.4%	48.2%	51.1%

[Answers from all 700 respondents in the EoPS]

There has been a significant increase in adoption since 2011 when the SoL3 program started: about 2.5 times more adopters. Note that the increase in adoption was slightly faster during the last three years of the program.

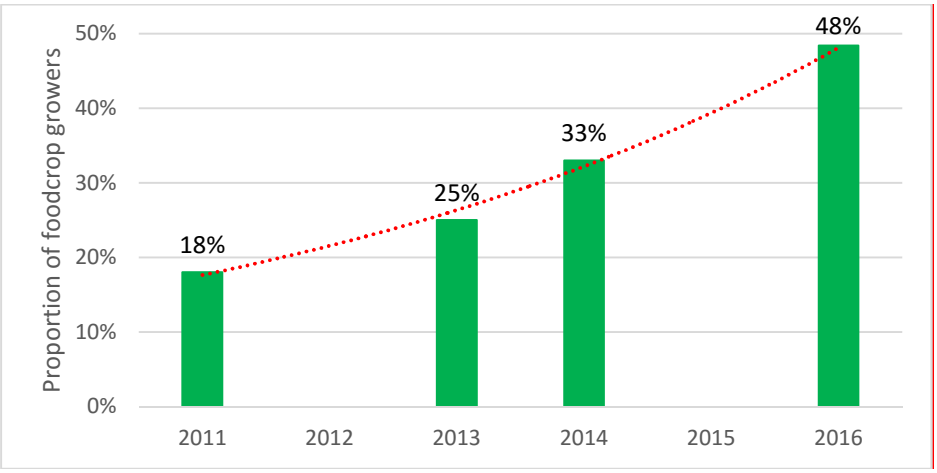


Figure 9. Progress in adoption since 2011

[16] SoL3 M&E framework, first performance indicator in the "Purpose level" of the logframe.

Table 12 presents adoption per region: Western, Central and Eastern regions. There are significant differences in adoption according to regions.

Table 12. MAF varieties adoption rates – Regional level

Region	Year	# of crop growers	# of improved variety adopters	% of improved variety adopters
West Covalima, Ermera, Liquica, Oecusse, Bobonaro	2011	827	100	12%
	2013	310	57	18%
	2014	324	80	25%
	2016	**324**	**126**	**39%**
Centre Manufahi, Aileu, Ainaro, Dili	2011	378	74	20%
	2013	133	34	26%
	2014	137	53	39%
	2016	**144**	**90**	**63%**
East Lautem, Viqueque, Baucau, Manatuto	2011[17]	305	96	31%
	2013	229	74	32%
	2014	241	95	39%
	2016	**232**	**123**	**53%**

[Answers from all 700 respondents in the EoPS]

Clearly the Central region has the highest proportion of adopters with 63% of foodcrop growing households growing at least one improved variety in 2016. In previous surveys, the Central region was also one of the two regions with the highest adoption rates, together with the Eastern region. The Western region, which is also the largest region, remained the region with the lowest adoption rate since the program's baseline survey in 2011. This difference is even more significant in the EoPS.

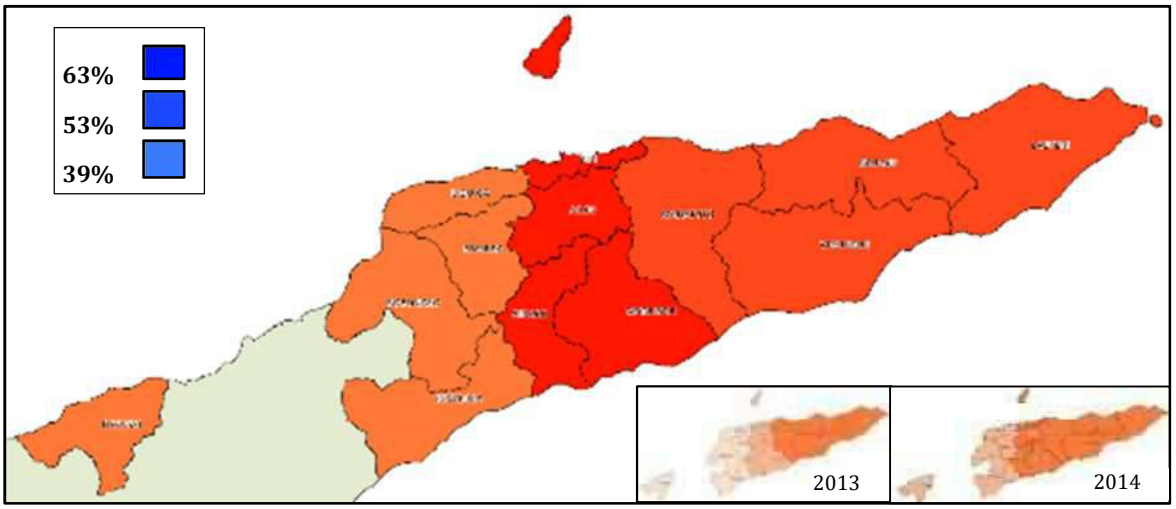


Figure 10. Adoption rate by region since 2013

[17]Without Viqueque and Lautem

Several reasons can explain these variations in each region:

- Firstly, the Central region covers only four small municipalities including two where the SoL program has been present for more than ten years. Distance-wise, these are also municipalities that are on average faster to reach from Dili and consequently where seeds/cuttings distributions are easier to organize.
- The Western region is the largest region and includes municipalities like Oecusse and Ermera which were included in the SoL program since 2012 only. Also, Oecusse is much less accessible and thus has less benefited from distributions[18].
- This year more specifically, rice production was very much impacted by El Niño which definitely resulted in fewer farmers growing Nakroma in the Eastern and Western regions which are usually leading rice production in the country. As a comparison, in the 2013 survey, 31% of the sample was growing rice (vs. 20% in the 2016 survey) and about three quarters of the Nakroma growers interviewed then were met in the eastern region.

5.1.2 Adoption rates per variety

Table 13. MAF varieties adoption rates (% among crop growers)

Variety	2011	2013	2014	2016
Sele	13%	15%	20%	30%
Noi Mutin	-	2%	10%	22%
Nai	-	-	0.3%	0.6%
Nakroma	11%	15%	14%	8% 21%[19]
Utamua	16%	11%	12%	6%
Ai-luka	3%	3%	5%	5%
Hohrae	7%	7%	9%	10%

[Percentages calculated among 691, 95/138, 217, 636, and 444 farmers growing respectively maize, rice, peanuts, cassava and sweet potato in the EoPS]

Sele, Noi Mutin and Nai

As presented in Table 13, the most commonly grown improved varieties are by far Sele and Noi Mutin. These are indeed the most widely distributed varieties: about 135 tonnes of Sele and Noi Mutin were distributed across nearly all rural aldeias of the country prior the 2015-16 cropping season[20].

The most outstanding growth is for Noi Mutin which was officially released in 2012. Noi Mutin is now grown by 22% of the maize growers, the second highest adoption rate after Sele. Finally, Nai has not been widely multiplied nor distributed, which is the main reason why it has not yet disseminated (only four HHs were growing Nai[21]).

[18] Another factor is that adoption of Nakroma in Oecusse is zero. The municipality has the fifth largest area of rice in the country, but it has deliberately chosen not to distribute Nakroma to its rice farmers, in order to safeguard the production of the Membramo rice variety.

[19] The 8% is the proportion of Nakroma growers as of February-March 2016, while the 21% is the revised proportion of Nakroma growers after 51 HHs had been revisited in April-May 2016.

[20] Overall 53% of the improved variety maize growers received seeds from government or NGOs in late 2015.

[21] Given only four HHs were found growing Nai, most of the data collected on Nai was not presented here.

Figure 11. Farmer growing Noi Mutin in Tulataqueo, Aileu

Nakroma

As mentioned several times already, rice production was severely impacted by El Niño this year which resulted in only eight farmers met growing Nakroma in February-March 2016 while another 21 were met in April-May 2016. Notwithstanding this, Nakroma is the third most commonly found MAF variety.
86% of the Nakroma adopters were met in Baucau and Viqueque which are the municipalities where the variety is the most well-known.

Utamua

The proportion of peanut producers growing Utamua has significantly decreased. It is unclear if that is mostly because of "external factors" (El Niño or limited seeds distributions) or because farmers do not appreciate this variety as much as they value Sele and Noi Mutin for example. Eight among the 13 Utamua adopters met in this survey were found in the Western region where most peanut growers are located (Oecusse, Ermera and Covalima).

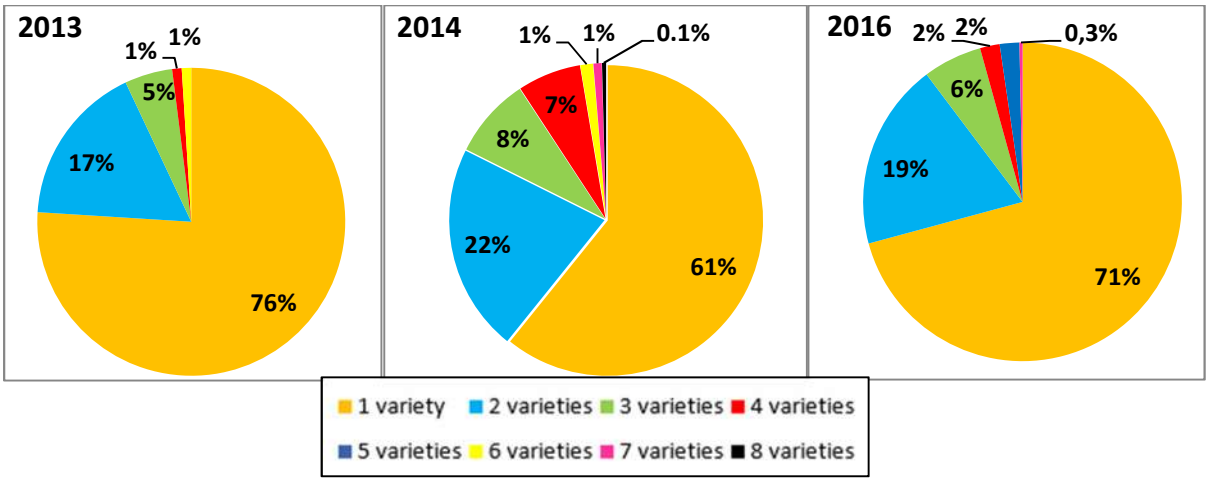
Ai-luka and Hohrae

Adoption of Ai-luka has not increased while that of Hohrae has very slightly increased (from 9% to 10%). This is rather surprising, and slightly disappointing, given important efforts were made in the last two-three years to increase farmers' access to these varieties. Indeed, 11 cassava cuttings productions centres were created across eight municipalities and important distributions of cuttings were conducted three times since 2013 in most rural sucos of the country. Still, the fact that cuttings are much more complicated to distribute than seeds remains a major barrier for its dissemination.
Note that some Ai-luka and Hohrae adopters might not have been spotted by the EoPS team because farmers often grow several varieties together and sometimes only a few cuttings of each. They are therefore more difficult to spot than maize or rice varieties.

More specifically, Ai-luka 1, 2 and 4 was grown by 2.8%, 2.4% and 1.3% respectively of cassava growers. Hohrae 1, 2 and 3 was grown by 4.7%, 3.2% and 3.8% respectively of sweet potato growers. Because these proportions are overall very low, comparisons between the different Ai-luka or Hohrae varieties would not be reliable.

5.1.3 Adoption of multiple varieties

The following charts present the number of improved varieties grown by adopters.



[Percentages among the total 165, 228 and 339 adopters of the 2013, 2014 and 2016 surveys respectively]

Figure 12. Proportion of adopters per number of improved varieties grown

In general, the proportions of single and multiple variety adopters are fairly similar to previous surveys with about 70% of adopters growing only one improved variety, 20% growing two different ones and less than 10% growing at least three improved varieties. Obviously, most of the single variety adopters are growing either Sele or Noi Mutin and farmers growing two improved varieties often grown both Sele and Noi Mutin. Indeed, those two varieties are often distributed together, either through the IFAD drum distribution program or through regular distributions from MAF.

5.1.4 Variables correlated to adoption

In Table 14 are presented the three variables that are statistically correlated to adoption and which, consequently, probably contributed to the adoption of improved varieties.

Table 14. Proportion of adopters according to different factors

Factors correlated to adoption		# of cases	% of adopters
Length of presence of the SoL Program			
	More than eight years in Baucau, Manufahi, Aileu and Liquica	219	66%
	Less than eight years in other municipalities	481	40%
CSPG or CSP in the suco of the respondent			
	There is a CSPG/CSP in the suco	644	50%
	There is no CSPG/CSP in the suco	56	27%
IFAD drums:	Owns an IFAD drum	115	69%
	Does not own an IFAD drum	585	44%
Total # of HH members working in agriculture:	0-2 members	260	45%
	2.5-4 members	353	47%
	4.5 to more members	87	63%

Firstly, adoption is significantly higher in the four municipalities were the SoL program has been present longer[22]. In Aileu for example, nearly all the respondents were growing either Sele or Noi Mutin, or both. This is also illustrated in Figure 13. Also, the presence of a CSPG/CSP in the suco boosts the chances to find adopters in this suco[23]. Definitely, such groups are one of the key determinants for diffusion of improved varieties.
Enumerators also took note of whether the HH owned drums distributed by the Timor-Leste Maize Storage Project[24] and which were often distributed together with maize improved variety seeds. Clearly, this also significantly enhanced adoption of Sele and Noi Mutin[25], especially in Manatuto, Lautem, Manufahi, Aileu and Viqueque.
Finally, the more HH members work in agriculture, the more chances they will be growing improved varieties[26]. As that will be shown again later, HHs who are more involved in agriculture, whatever their economic situation, are definitely more likely to access improved varieties.

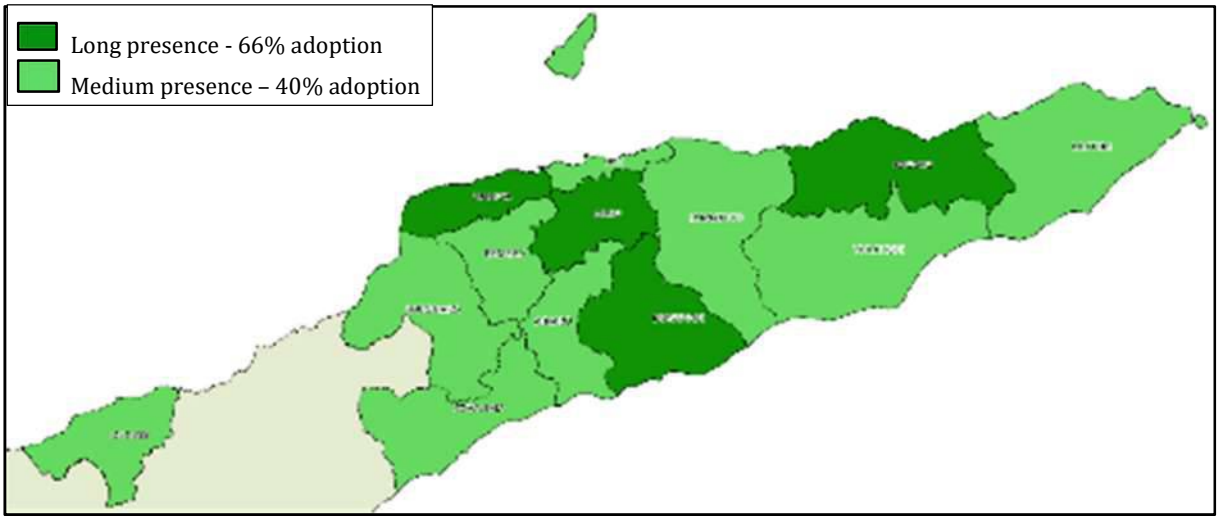


Figure 13. Adoption rate by length of presence of the program

As for farmers' familiarity with the MAF varieties, it was noted that farmers living in sucos where the Team Supervisors thought SEOs were more or much more efficient, are more likely to be growing improved varieties.

[22] Result of Chi-Square test: Exact Sig. = 0.0000, p<0.05.
[23] Result of Chi-Square test: Exact Sig. = 0.0005, p<0.05.
[24] IFAD funded program which between 2012-2015 distributed close to 42,000 metal drums (200 liter) to more than 23,000 households.
[25] Result of Chi-Square test: Exact Sig. = 0.00000.1, p<0.05.
[26] Result of Chi-Square test: Exact Sig. = 0.011, p<0.05.

5.2 Characteristics of adopters

5.2.1 Source of improved varieties seeds and cuttings

Table 15 summarizes the source of seeds or cuttings of improved varieties.

Table 15. Sources of seed/cutting

	Sele			Noi Mutin			Nai		Nakroma		
	2013	2014	2016	2013	2014	2016	2014	2016	2013	2014	2016
Given for free by an NGO	15%	26%	5%	14%	28%	5%			18%	13%	
Given for free by the Government	52%	43%	39%	44%	52%	50%	100%	25%	61%	50%	
Given for free by CSPG	NA	1%	2%	NA	2%	3%			NA	3%	
Own seed, saved from a previous harvest	15%	23%	56%	14%	12%	43%		50%	5%	30%	63%
Bought in market	10%	6%	2%	14%	2%	1%		25%			13%
Bought from CSPG/CSP	NA	1%	0.5%	NA					NA		
From a relative / neighbour / friend (bought or free)	7%	5%	5%	14%	14%	6%			13%	7%	38%
Other	1%	1%			2%				3%	17%	

	Utamua			Ai-luka			Hohrae		
	2013	2014	2016	2013	2014	2016	2013	2014	2016
Given for free by an NGO	18%	14%	8%	7%	12%	6%		28%	7%
Given for free by the Government	41%	34%	39%	60%	27%	9%	59%	32%	20%
Given for free by CSPG	NA	7%		NA	3%	3%	NA		7%
Own seed, saved from a previous harvest	32%	17%	46%	7%	18%	69%	15%	28%	42%
Bought in market	9%	24%	8%				4%	4%	2%
Bought from CSPG/SP	NA			NA			NA		
From a relative / neighbour / friend (bought or free)		14%	8%	13%	12%	9%	22%	22%	27%
Given by CCT	NA	NA		NA	30%		NA		
Other		3%		13%	3%	3%		4%	

[206, 145, 4, 13, 8, 32 and 45 farmers planting Sele, Noi Mutin, Nai, Nakroma, Utamua, Ai-luka and Hohrae answered this question in the EoPS]

The most interesting point is that in the EoPS, the main source of seeds for all improved varieties (besides Noi Mutin) is farmers' own stock of seeds/cuttings. This is very positive as it means farmers are now less relying on free distributions from the Government or NGOs. For example, 56% of Sele adopters are using seeds they saved from their previous harvest while only 39% planted seeds they recently received from the government. For Noi Mutin, it is nearly equivalent: 50% planted seeds recently received and 43% planted their own seeds.
Definitely, the improved varieties are now well established in the rural areas of Timor-Leste.

Note that several adopters said they already had their own stock of improved variety seeds from last year's harvest but they again received new seeds of that same variety for this season. This suggests that distributions are not always equitable: some farmers are favoured while others might never receive seeds.

Another interesting finding which was also observed in previous surveys, is the importance of sharing Hohrae cuttings among farmers themselves. It is the second most important source of Hohrae cuttings after farmers' own stock (27% vs. 42% for farmers' own stock). This reflects farmers' interest for this variety as they are trying to access it by their own means.

Finally, sourcing from CSPGs remains still very limited:

- Five farmers got Sele seeds for free from a CSPG and one bought Sele from a CSP, Four among them are members of CSPGs/CSPs.
- Five farmers got Noi Mutin for free from a CSPG. Three among them are members of CSPGs/CSPs.
- One farmer got Ai-luka cuttings from a CSPG and three got Hohrae cuttings from a CSPG.

Even though these numbers remains very low, it is clear that more diffusion happened thanks to seed production groups. Indeed, as reported earlier, adopters are significantly more frequent in sucos where there are seed production groups (48% vs. 27% in sucos with no groups). The difficulty is in fact to track the source of such seeds/cuttings because diffusion can take many informal paths.

Sele and Noi Mutin known in a local market of Soibada, Manatuto.
The story of Jose Soares.

Jose Soares lives in Manlala, Manatuto. A few years ago, he became very interested in the maize varieties his neighbours were growing (Sele and Noi Mutin) and which they had received from the SEO. He hoped he would also receive Sele and Noi Mutin seeds from the SEO, but as he didn't, he finally found Sele and Noi Mutin cobs sold in a local market of Soibada. Surprisingly, the seller knew the names of the maize varieties he was selling, so Jose Soares was sure he was buying the varieties he wanted. The seller explained he had purchased a yellow drum in 2013 and got two bottles of these seeds along with the drum.

Since 2014, Jose Soares has been planting only Sele and Noi Mutin on his own farm. Last year he harvested about half a ton of improved maize and made sure to keep seeds for the coming season. This year he planted more than 3000 m^2 of maize and he is still very satisfied with the production results.
Mr. Soares concluded saying that he was very thankful to the program for sharing seeds with Timorese farmers and that even if not everybody can receive seeds, people can find their own ways to get the varieties they like.

5.2.2 Growing improved varieties during the previous years

Table 16 presents data about how long adopters have grown each improved variety. Note that the second data "average duration of adoption" represents in fact the average number of cycles (main cycle only) that the improved varieties were grown. So for Hohrae in the EoPS for example, "2 years on average" means that most Hohrae farmers grew this variety during the 2014-15 season and the 2015-16 season.

Table 16. Duration of adoption of improved varieties

Variety	% of adopters growing the improved variety for the first time		Average duration of adoption		Maximum duration	
	2014	2016	2014	2016	2014	2016
Sele	58%	33%	1.9 years	2.3 years	7 years	13 years
Noi-Mutin	80%	54%	1.4 years	1.7 years	6 years	8 years
Nakroma	48%	38%	2 years	4 years	7 years	10 years
Utamua	52%	54%	1.9 years	2.2 years	7 years	6 years
Ai-luka	73%	34%	1.6 years	1.9 years	6 years	5 years
Hohrae	51%	44%	2.1 years	2 years	7 years	7 years

[202, 142, 8, 13, 31 and 45 farmers planting Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae answered these questions in the EoPS]

Interestingly, in the EoPS, fewer adopters were first time growers. This is coherent with what was said earlier about the source of MAF varieties for the 2015-16 season: fewer adopters sourced their seeds from recent distributions – many were growing improved varieties the previous year and had saved seeds to grow again during the 2015-16 season. Again, this is very encouraging because it means farmers are now more capable of managing their own stock of seeds from one year to the other.

As a result, the average duration of adoption for nearly all varieties are longer in the EoPS. Interestingly, Nakroma has the longest duration of adoption even though this represents only the eight adopters first met in February-March 2016. Informal discussion with the 21 Nakroma producers revisited in April-May revealed that they have grown Nakroma for more than two years also.

As in the 2014 survey, farmers were asked "*How much area of the MAF variety did you grow last year compared to this year?*". Results are presented in Table 17.

Table 17. Comparing the area grown during the survey and a year before

Variety	Less now		Same as before		More now	
	2014	2016	2014	2016	2014	2016
Sele	13%	19%	65%	55%	22%	26%
Noi-Mutin		15%	74%	57%	26%	28%
Nakroma		40%	62%	60%	38%	
Utamua	7%	20%	86%	60%	7%	20%
Ai-luka		15%	60%	45%	40%	40%
Hohrae	7%	23%	56%	54%	37%	23%

[129, 60, 5, 5, 20 and 22 farmers planting Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae the year before the EoPS answered this question]

As in 2014, the most common situation is that adopters grow the same area year after year. However, in the EoPS more farmers declared they grow smaller areas now compared to the year before. This is directly linked to El Niño.

Note that about one fifth of Sele, Noi Mutin and Hohrae adopters who were growing the variety in 2015 grew a second cycle. On average, the area of the second cycle was the same or smaller than during the first cycle. Clearly these farmers appreciate the improved varieties as growing a second cycle often requires more work/efforts due to the limited access to water.

5.2.3 Area grown under improved varieties

The average area grown under improved varieties among the adopters interviewed in this survey is 0.43 ha. This represents about 59% of adopters' total foodcrop area which is quite a significant proportion (more than half of the total foodcrop area).
Table 18 presents data per variety and compares that to results of previous surveys.
It is important to note that these figures are based on farmers' and enumerators estimations of the area they grow. In this survey, it is assumed that these estimations are on average fairly representative of the reality. Indeed, in 2013, spot-checks were conducted to verify the precision of farmers' estimations and on average, these estimations were only 7% bigger than the actual plot size.

Table 18. Area grown with improved varieties

Variety	Average area grown (ha)			Proportion of crop area grown under the MAF variety		Maximum area grown (ha)		
	2013	2014	2016	2013	2016	2013	2014	2016
Sele	0.5	0.3	0.3	88%	76%	2.0	4.0	1.5
Noi-Mutin	0.8	0.3	0.4			2.7	1.8	3.5
Nakroma[27]	0.8	0.4	(1) 0.8 (2) 1.1	43%	(1) 82% (2) 91%	4.0	2.2	(1) 2.0 (2) 4.0
Utamua	0.3	0.1	0.2	94%	86%	1.6	0.9	1.0
Ai-luka	0.6	0.2	0.3	86%	67%	2.0	0.7	1.7
Hohrae	0.3	0.1	0.2	86%	78%	2.0	0.9	2.0

[207, 149, 8/29, 13 32 and 45 farmers planting Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae respectively were included in the above calculations for the EoPS]

As in 2014, all varieties are usually grown on less than 0.4 ha except for Nakroma which is grown on the largest area (1.1 ha).
For most varieties, areas are significantly lower than in 2013. This could be partly explained by the fact that the 2014 and 2016 enumerators were more skilled in spotting out even small areas of improved varieties.

Areas grown under Ai-luka and Hohrae are very difficult to estimate because cassava and sweet potato plants are often very scattered and mixed with other crops.
In the EoPS, about half of the adopters met had less than 20 plants of Ai-luka or Hohrae on their plots. To harmonize the data, a farmer growing less than 20 plants of Ai-luka or Hohrae was considered as growing 20m^2 of Ai-luka or 10 m^2 of Hohrae in the EoPS.

[27] For 2016, two results are given: the first figure is the result among Nakroma growers met in February-March 2016, while the second figure is the revised results among the Nakroma growers revisited in April-May 2016.

However in previous surveys, this problem was handled differently: in 2014 such cases were excluded from the calculations of area grown while in the 2013, enumerators did not distinguish if there were only few plants on the area or not. Comparisons are therefore difficult to make.

Area of improved varieties versus area of local varieties

Adopters who were also growing a non-MAF variety of that same crop were asked to qualitatively compare the areas they grew under the improved varieties and under other varieties. Results are presented in Table 19.

Table 19. Comparison of areas of MAF varieties and local varieties

Variety	Proportion of variety adopters also growing non-MAF varieties		Comparing areas					
			MAF var. < local		MAF var. = local		MAF var. > local	
	2014	2016	2014	2016	2014	2016	2014	2016
Sele	58%	63%	28%	54%	39%	24%	33%	23%
Noi-Mutin	51%	64%	29%	47%	31%	22%	37%	31%
Nakroma	16%	38%	14%		71%	33%	14%	67%
Utamua	41%	39%	25%	40%	67%	60%	8%	
Ai-luka	82%	94%	7%	68%	52%	24%	41%	8%
Hohrae	50%	69%	12%	87%	52%	13%	36%	

[115, 85, 3, 5, 25 and 24 Sele, Noi Mutin, Nakroma, Utamua, Ai-luka, and Hohrae adopters respectively grew also a non-MAF variety and answered the question on comparing area of MAF and non-MAF varieties]

As in the EoPS, the MAF variety that is the most often grown with other varieties is Ai-luka, followed by Hohrae and the maize varieties. Compared to 2014, it appears that a slightly higher proportion of adopters also grow non-MAF varieties in 2016 but it is unclear why.

Regarding the comparison of areas grown, about half of Sele and Noi Mutin adopters grow less area under the improved varieties than under other varieties. Other grow either as much improved as other varieties, or more of the improved varieties.
The situation was significantly different in 2014: fewer farmers said they grew less of the improved varieties and more farmers said they grew as much Sele or Noi Mutin as they grew local varieties. It is unclear why the situation changed: is it because adopters had less improved seeds to plant this year? Or did they voluntarily not want to plant more improved seeds because of to the longer dry season?

5.2.4 Harvest of the improved varieties

Given the timing of the survey (before harvest), data on harvest of the improved varieties had to be collected for the previous year. Therefore, such data was collected only for adopters who harvested improved varieties during the 2014-15 season and who were able to provide clear information about this.
Totally, precise data is available for 101 Sele/Noi Mutin/Nai producers, five Nakroma producers, four Utamua producers and three Ai-luka producers. Given the very limited number of cases, the following analysis will focus on the maize improved varieties.

The average production of Sele, Noi Mutin and Nai (all combined), of last year was about 272 kg among 101 cases. This is slightly lower than the amounts reported during the 2013 survey: 382 kg for 81 Sele adopters and 328 kg for 12 Noi Mutin growers.

The five Nakroma, four Utamua and three Ai-luka producers have harvested respectively on average 1.73 T of Nakroma, 58 kg of Utamua and 130 kg of Ai-luka tubers.

About half of the 101 Sele, Noi Mutin and Nai adopters mentioned above had in fact harvested other maize varieties as well. And the amount they harvested of the MAF varieties was 50% of the total amount of maize they harvested in 2014-15.

To cross-check this information, farmers were asked to qualitatively estimate how much the improved variety represented among the total amount of maize harvested.
For 45 respondents, it was possible to compare answer. As a result, 35 among them gave rather consistent information: the qualitative estimation matched the quantitative data they also provided on the harvested quantities. In other words, most farmers provided rather reliable estimations regarding the proportion of MAF and non-MAF varieties they harvested last year.

Table 20 presents the results of the qualitative estimations of all the adopters who have harvested MAF and non-MAF varieties during the 2014-15 season. A similar question was also asked in the 2014-15 survey.

Table 20. Comparison of quantities harvested for MAF and non-MAF varieties

Variety	MAF var. < local		MAF var. = local		MAF var. > local	
	2014	2016	2014	2016	2014	2016
Sele	32%	39%	22%	29%	46%	32%
Noi-Mutin	39%		21%		40%	
Nakroma	14%		29%	50%	57%	50%
Utamua	20%	50%	30%	50%	50%	
Ai-luka	15%	50%	39%	14%	46%	36%
Hohrae	22%	50%	56%	31%	22%	19%

[93, 2, 4, 14 and 16 variety adopters growing respectively Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae answered this question]

For maize, there are slightly fewer adopters saying they harvested more of the MAF varieties than of other varieties. This is consistent with Part 5.2.3: fewer maize variety adopters said they grew more of the improved varieties than of other varieties.
Similar observations can be made with Ai-luka and Hohrae: most adopters harvested less of the improved varieties than other varieties

Use of the harvest

Enumerators asked to all the farmers who harvested one of the five staple crops in 2015, what proportion of the 2015 harvest they still had in stock or had eaten or sold.
The results obtained are presented in Table 21, by separating farmers who were and were not growing an improved variety during the 2014-15 season. It is important to remind here that these proportions are farmers' estimations. Thus, rather than looking

at each percentage individually (which might lead to false interpretations), it are the comparisons between the different percentages that provide valuable information.

Table 21. Use of the 2015 harvests, per adopter and non-adopter

Crop	Varieties grown	# of cases	Proportion still in stock	Proportion consumed	Proportion sold
Maize	Growing Sele/Noi Mutin/ Nai last year	172	24%	49%	6%
	Not growing Sele/Noi Mutin/Nai last year	489	23%	55%	7%
	All cases	661	23%	54%	7%
Rice	Growing Nakroma last year	5	66%	30%	32%
	Not growing Nakroma last year	87	18%	74%	4%
	All cases	92	21%	72%	6%
Peanut	Growing Utamua last year	6	3%	43%	50%
	Not growing Utamua last year	174	11%	61%	15%
	All cases	180	11%	60%	16%
Cassava	Growing Ai-luka last year	20	NA	48%	14%
	Not growing Ai-luka last year	569	NA	61%	6%
	All cases	589	NA	60%	6%
Sweet potato	Growing Hohrae last year	25	NA	45%	18%
	Not growing Hohrae last year	399	NA	65%	5%
	All cases	424	NA	63%	6%

Interestingly, for all crops, the proportion of the 2015 harvests which was consumed is always smaller for adopters than for non-adopters. Also, for all crops, the proportion of the harvest which is sold is always higher for adopters (except for maize where it is about the same as for non-adopters).
This suggests that growing improved varieties allows farmers to produce larger volumes and consequently, a smaller proportion of the harvest is eaten while more can be sold or could still be available for consumption several months after the harvest.

Another interesting finding is that the proportions still in stock at the time of data collection (i.e. about 9-10 months after harvest) are quite significant for maize and rice, even though data collection was conducted during the peak of the hungry season. For maize for example, about one third of the maize farmers said they had no more maize at all but about 24% said they had half or more of the total 2015 harvest still left.

A clear correlation was found when comparing this information to the data on hungry season that will be presented later: the less maize and rice was still in stock at the time of the survey, the more likely the HH reported having experienced hunger in the last 12 months. This gives more confidence in the quality of the data collected in this survey.

Farmers who were growing MAF and non-MAF varieties in 2015 and who sold part of their harvest were asked which variety they had sold.

Table 22. Preference in selling harvest of improved varieties or local varieties

Variety	# of cases	Sold only the MAF varieties	Sold MAF and local varieties	Sold only the local varieties
Sele / Noi Mutin / Nai	15	8	6	1
Nakroma	1		1	
Utamua	4		3	1
Ai-luka	4		3	1
Hohrae	6	2	4	

Given the number of cases is quite limited, the only valuable information is for maize: about half of the farmers said they sold only Sele and/or Noi Mutin and not the local varieties. Most of these farmers justified their choice to sell only the improved variety because it is the one that produced the largest volumes.

5.2.5 Productivity of the improved varieties

Farmers' perception of the productivity of the improved varieties was collected through the following question (example for Sele): "*If you plant the same quantity of Sele and local maize seed, which one do you think will produce more maize?*".

Table 23. Perception on improved varieties productivity compared to local varieties[28]

Variety	Decrease			Same			Increase		
	2011	2013	2016	2011	2013	2016	2011	2013	2016
Sele	2%	3%	6%	18%	4%	19%	80%	93%	75%
Noi-Mutin	-	7%		-		19%	-	93%	81%
Nakroma		5%	25%	7%	16%		93%	79%	75%
Utamua	4%	14%	20%	4%	5%	40%	89%	81%	40%
Ai-luka			5%	10%	7%	37%	90%	93%	58%
Hohrae	1%		10%	1%	4%	10%	96%	96%	80%
Combined[29]	2%	6%	4%	10%	6%	20%	88%	88%	77%

[Data from 121, 57, 5, 4, 19 and 20 farmers planting Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae as well as 168 growing any of these varieties combined]

Compared to previous years, it seems that a higher proportion of adopters find the improved varieties to be as productive as local varieties (20% vs 6-10%) and fewer farmers find the improved varieties more productive (77% vs. 88%).
The varieties that were perceived as the most productive are Noi Mutin, Hohrae, Sele and Nakroma. Note that these are also the four varieties with the highest adoption rates.

[28] In order to reflect the opnion of adopters who have personally experienced harvesting improved varieties, only answers of farmers who grew the variey since 2014-15 or earlier are included here.
[29] For the EoPS data, there were 14 cases out of 324 adopters for which opinions on productivity of MAF varieties varied according to the varieties. In order to simplify the data, it was decided that whenever the farmer mentioned for at least one crop that it is the MAF variety that yields better, the farmer was categorized as if he considered that all the MAF varieties yielded better (13 cases). In the other case, the farmer said one local cassava variety and Ai-luka had the same yielding while Utamua was less yielding than local varieties. This respondent was classified in the category "local and MAF varieties yield the same".

5.2.6 Plans for the 2016-17 cropping season

As in previous surveys, a set of questions were asked to adopters regarding their plan for the next cropping season. Table 24 shows the proportion of adopters who would still like to plant the improved variety for the 2016-17 season.

Table 24. Farmers willing to grow again the improved varieties in the future

Variety	2013	2014	2016
Sele	98%	99%	100%
Noi-Mutin	100%	98%	100%
Nakroma	97%	97%	100%
Utamua	92%	96%	100%
Ai-luka	92%	100%	96%
Hohrae	95%	100%	98%

[190, 134, 7, 13, 27 and 41 farmers planting Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae answered this question]

As expected, nearly 100% of adopters said they would like to replant the improved varieties during the next cropping season. This confirms what was said earlier: adopters value the improved varieties and in most cases, the complaints some of them raise are not significant enough to compel adopters to stop growing the improved varieties.
On the other hand, some farmers tend to answer positively to such questions because they expect to receive seeds if they say they still want to grow the variety.

Farmers who plan to grow again the MAF varieties were asked how much of this variety they planned to grow (Table 25)

Table 25. Area of improved variety planned to be grown

Variety	Will grow a smaller area			Will grow a similar area			Will grow a larger area		
	2013	2014	2016	2013	2014	2016	2013	2014	2016
Sele	3%	2%	1%	60%	65%	50%	37%	33%	48%
Noi-Mutin	-	2%	2%	36%	68%	46%	64%	30%	52%
Nakroma	-			69%	74%	80%	31%	26%	20%
Utamua	17%			58%	68%	33%	25%	32%	67%
Ai-luka	9%			82%	52%	24%	9%	48%	76%
Hohrae	-			45%	58%	30%	55%	42%	70%

[148, 114, 5, 9, 21 and 33 farmers planting Sele, Noi Mutin, Nakroma, Utamua, Ai-luka and Hohrae answered this question]

Overall, a higher proportion of farmers said they plan to grow the improved varieties on larger areas compared to previous years. This is probably linked to the fact that areas cropped in 2015-16 were significantly smaller than usual.

Finally, farmers were asked if they planned to grow another variety along with the improved varieties. On average more than half of the variety adopters answered yes, which is very similar to the results of previous surveys. Ai-luka, Hohrae and the maize

improved varieties are those for which the highest proportion of adopters would still want to grow another variety (89%, 75% and 70% respectively).
The main reasons for continuing to grow other local varieties are that other varieties are less sensitive to weevils and can be harvested earlier (maize), and that farmers don't have enough improved variety cuttings (Ai-luka and Hohrae).

5.2.7 Farmer-to-farmer diffusion

Overall 30%, out of 303 adopters, said they had shared some seeds/cuttings with other farmers. This is lower than what was reported in the 2014 survey (48%) and is probably because of the timing of the EoPS survey: first time growers had not yet harvested their own crops so probably did not have the opportunity to share planting materials yet.

In the EoPS, the varieties that were the most often shared with others were Sele and Noi Mutin followed by Hohrae. Only few farmers shared Ai-luka, Utamua and Nakroma.
For Sele and Noi Mutin, on average farmers said they shared seeds with five persons and gave 2 kg to each person. This figure might be slightly overestimated as some adopters were in fact refering to seed distribution organized by the groups they belonged to.

Interestingly, even though 30% of adopters said they shared planting materials with others, only 11% said the seeds/cuttings they planted this year came from other farmers. The same observation was made in previous surveys. In reality, there are probably fewer farmers giving away seeds or cuttings but these wouldn't admit it during the interview. And on the other hand, there are probably more adopters sourcing their seeds from other farmers but these weren't spotted during data collection given they are much more difficult to identify.
In conclusion, the multiplier effect representing the diffusion from farmer to farmer is probably somewhere between 1.1 and 1.3 (it was about 1.3 in the 2014 survey).

Figure 14. Ai-luka 2 and Nona metan grown in a farmer's field in Goulolo, Bobonaro

6. Food security

6.1 Adoption and reaping the benefits of adoption

In the previous chapters, an "adopter" is a farmer who in the 2015-16 season is growing one or more improved varieties; a "non-adopter" is a farmer who is only growing local varieties, or other varieties which have not been released by MAF.

For the assessment of food security, a different distinction needs to be made. As can be seen in Figure 15, at the time the EoPS survey was conducted (in February-March 2016) first time adopters, who had planted improved varieties at the start of the growing season, had not yet reaped the benefits of this adoption, because they had not yet harvested.

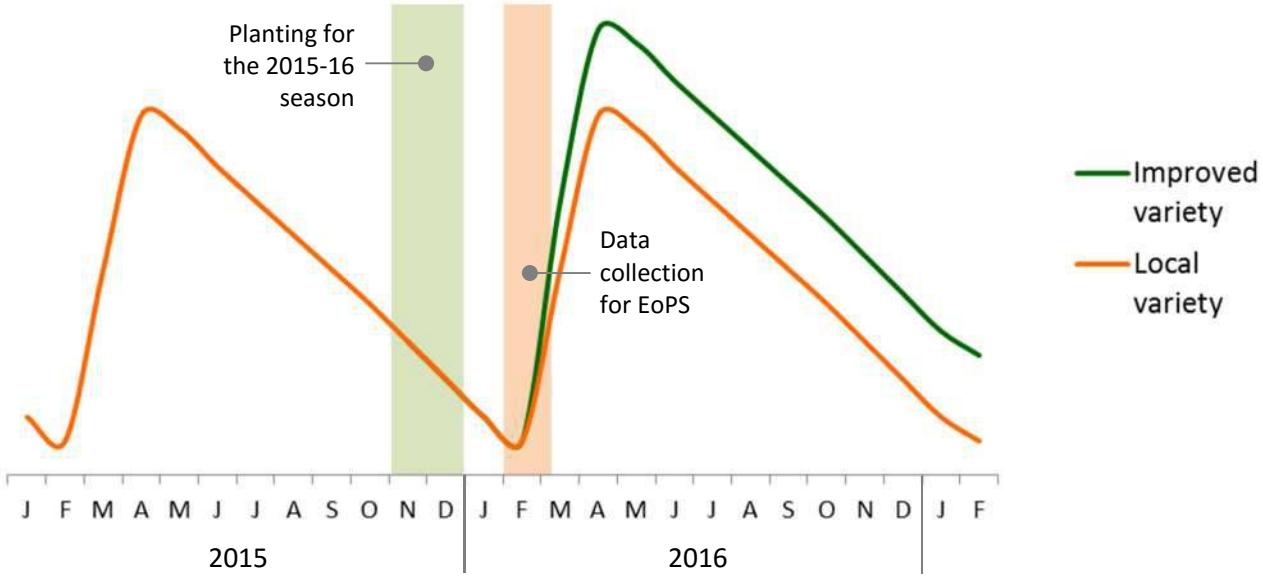


Figure 15. Foodstock difference between a first time adopter and a non-adopter

The first time adopters harvested their crops after the EoPS data was collected, and the impact – for food security and on the HH's economic situation – of their (hopefully) larger harvests will only start to be felt towards the middle of the year. So as far as the benefits of adoption concerns, as long as first-time adopters have not yet harvested, they are in a similar situation as non-adopters.

For this reason, most of the analysis in the rest of this report compares adopters who were already growing an improved variety in 2014-15 to other HHs, other HHs being either non-adopters, or first time adopters who started growing improved varieties only in 2015-16.

It should also be noted that there is no assumption that increased harvests due to the use of improved varieties are the only reason for more food security. Farmers who received Sele and Noi Mutin seeds together with an IFAD drum for example, are now able to save their harvests better, which contributes to an improved food security.

6.2 Hungry season

Farmers were asked "*Were there months in the past 12 months, in which you did not have enough food to meet your family's needs?*".
Only 65% of the 531 respondents who answered this question said that they indeed experienced hunger during the last 12 months, which is much lower than what was reported in previous surveys (82% and 84%). The average length of the hungry season is 3.3 months vs. 3.6 months and 4 months in the 2014 and 2013 surveys respectively.

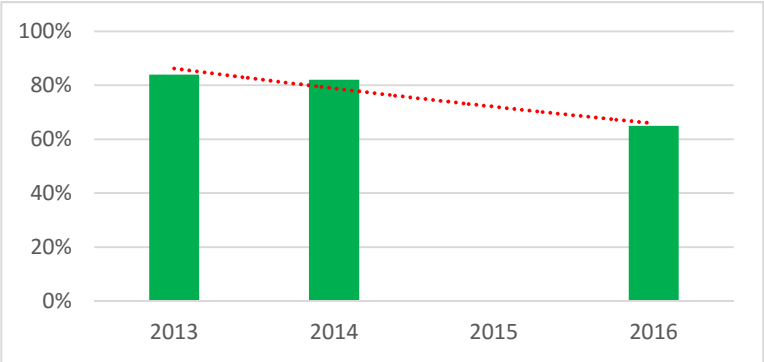


Figure 16. Proportion of foodcrop farmers experiencing hunger

It seems clear that food security in the country has improved since the last few years.
In Table 26, the proportion of households experiencing hunger was analysed according to different factors.

Table 26. Proportion experiencing hunger according to different factors

	# of cases	Proportion experiencing hunger
Adopters since 2014-15 or earlier	158	54%
Non-adopters and first time adopters	373	69%
Male headed households	493	65%
Female headed households	38	66%

While no major difference appears between male and female headed HHs, there is a significant relation between adoption and hunger[30]. Definitely, having grown improved varieties since 2014-15 already - and thus having harvested these – reduces the risk of experiencing hunger in the HH. And even among HHs who do experience hunger, the length of this hungry season is significantly shorter for adopters who have grown improved varieties since 2014-15 already[31]: 3 months vs. 3.4 months among others.
Definitely, adoption of improved varieties contributes to more food security.

[30] Result of Chi-Square test: Exact Sig. = 0.001.
[31] Result of Anova test: Sig. = 0.05, p<0.05.

Figure 17 illustrates this finding and compares it to the situation in 2013 and 2014.

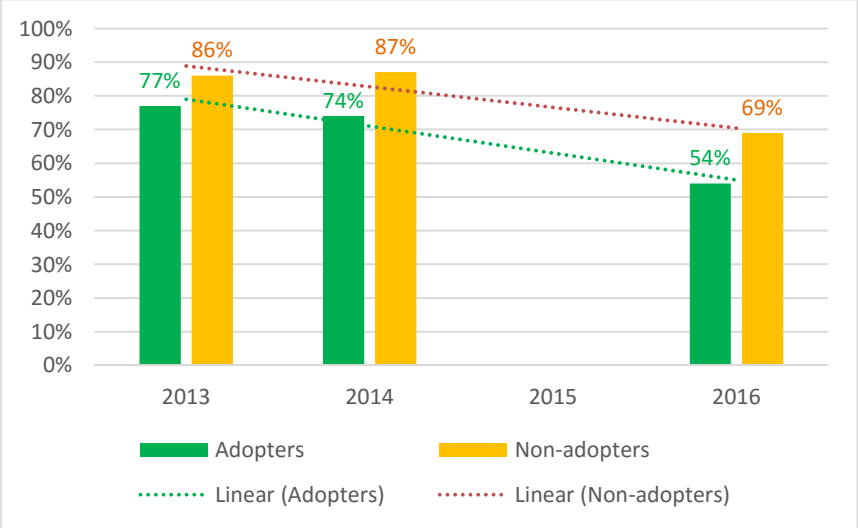


Figure 17. Evolution of the proportion of adopting and non-adopting HHs who experienced hunger[32]

Over the years, hunger has reduced in both types of rural HHs but the most significant decrease is among adopters: 77% of adopters were experiencing hunger in 2013 vs. 54% only in 2016 (i.e. 23% less).

Another key Performance Indicator of the Seeds of Life program is that the "Percentage of crop producing households experiencing periods of food shortage decreases by 33% in Timor-Leste." One can presume that if data on hunger was also available for 2011, at the start of the SoL 3 program, a 33% reduction of adopting HHs experiencing hunger could have been observed. In other words, it is very likely that the program has reached its main food security target.

Figure 18. Nakroma harvested last year by a farmer in Tirilolo, Lautem

[32] For the EoPS, the data included in the chart for adopters includes only adopters who grew MAF varieties since 2014-15 at least while the data for "non-adopters" includes non-adopters and first time adopters.

6.3 Consumption of self-grown foodcrops

All respondents were asked during which months they were able to consume the harvest of the 2014-15 season. Results are presented here under, with the results of the 2014 survey added for comparison.

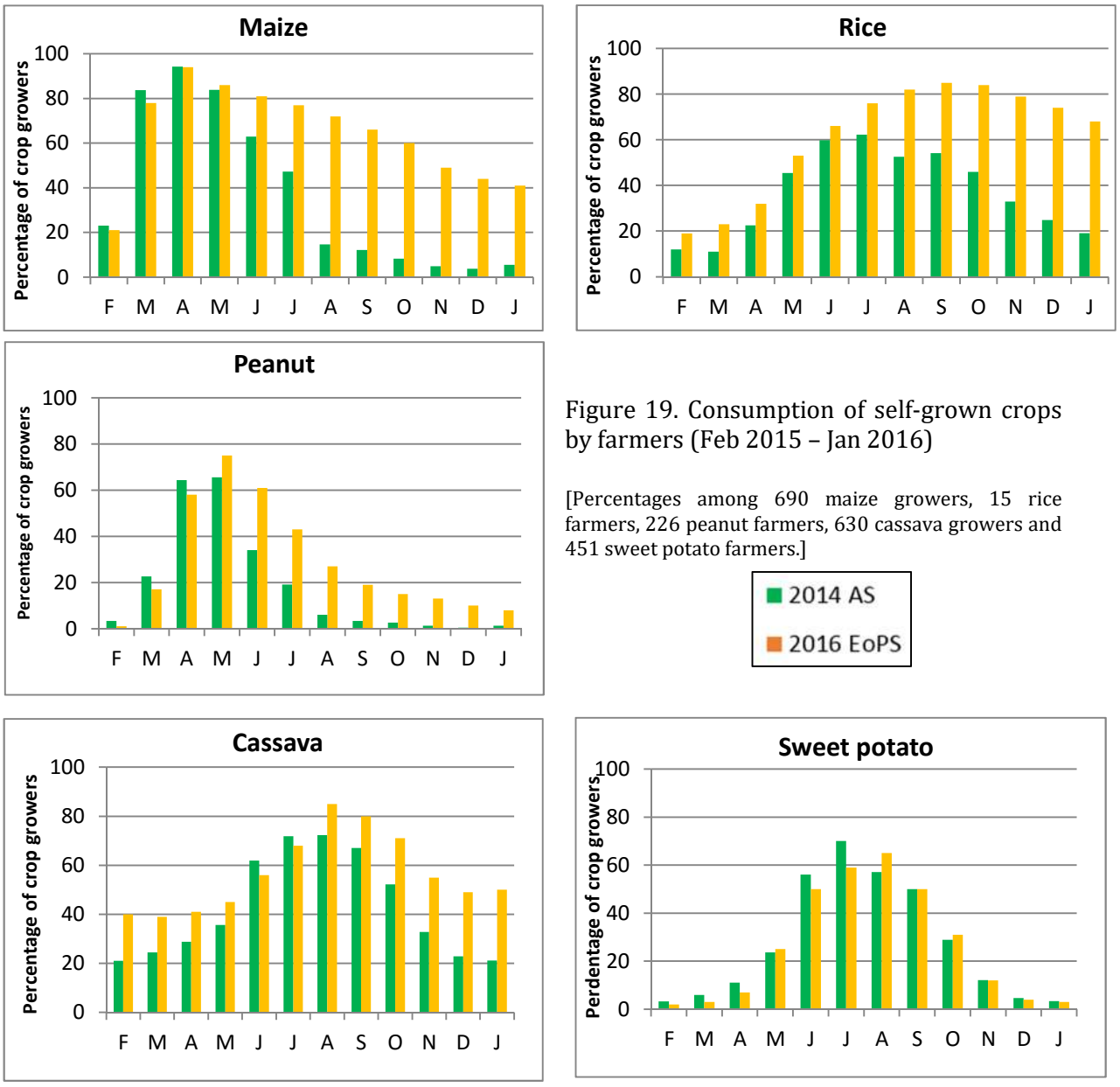


Figure 19. Consumption of self-grown crops by farmers (Feb 2015 – Jan 2016)

[Percentages among 690 maize growers, 15 rice farmers, 226 peanut farmers, 630 cassava growers and 451 sweet potato farmers.]

There is a very clear difference between the 2013-14 data and the 2015-16 data, especially for rice and maize. This is partly because during the EoPS, enumerators were more careful to ask if part of the crop harvested last year was still available for consumption at the time of the interview. Many respondents answered that they indeed had some left over which the family was still eating even though they ate smaller quantities and less frequently than just after harvest. In such cases, enumerators often reported that self-grown maize and rice was available until January 2016. This results in graphs where the proportion of farmers being able to eat their own maize and rice from

August to January is much higher than it used to be in previous surveys. This illustrates how a question which seems very straightforward, can in fact be very subjective.

Interestingly, adopters who were growing either Sele. Noi Mutin or Nai in 2014-15 reported eating their own maize during more months compared to other farmers: 8.3 months vs. 7.6 months among other farmers. Clearly, growing improved varieties helps HHs become more self-sufficient.

Maximizing the use of a small home garden plot to harvest more Noi Mutin.
The story of Yohanes Cab.

By the end of 2015, Yohanes Cab who lives in Taiboco, Oecusse, received Noi Mutin and Utamua seeds from the local SEO. Before receiving these seeds, Yohanes' family had already seen their neighbours grow Noi Mutin and liked the variety very much because it is tasty, especially when harvested young; it has a bright colour and a high yield.
Because Yohanes' family owns only a small home garden of about 1200 m2, he thought he would try to plant the seeds he was given at three different times in order to be able to harvest young Noi Mutin cobs for a longer period.

He therefore planted a first batch and waited a few weeks before planting a second batch, and finally a third batch when the first one was close to flowering. In this way, he made maximum use of his small plot. Also, the family will be able to store the rest of the harvest that was not eaten young, to be consumed during the dry season as well as to plant again for the next cropping cycle.

6.4 Purchasing rice and maize

As shown in Table 27, the proportion of HH buying rice is still above 90% with an average of ten months of buying rice per year. The amount bought also stayed very similar to what it was in previous surveys: about 380 kg yearly. Farmers were also asked if they bought maize for consumption and only 17% did so.

Table 27. Purchasing rice for HH consumption

	2011	2013	2016
Proportion of HHs buying	99.6%	94%	93%
Average # of months buying	9.8 months	9.4 months	10.7 months
Proportion buying rice every month	62%	65%	75%
Average quantity bought yearly	381 kg	378 kg	389 kg

[All 700 HHs answered the first question on buying rice.]

In Table 28, the average amount of rice bought was calculated for different types of HHs.

Table 28. Quantity of rice purchased according to different factors

		# of cases	Average quantity of rice bought yearly
Adopters since 2014-15 or earlier		187	371 kg
Non-adopters and first time adopters		460	396 kg
Per months of consumption of self-grown rice:	0 months	3	540 kg
	1-4 months	19	334 kg
	5-8 months	44	270 kg
	9-12 months	44	201 kg
Per months of consumption of self-grown maize:	0 months	9	391 kg
	1-4 months	148	340 kg
	5-8 months	175	394 kg
	9-12 months	305	409 kg

Firstly, adopters who grew improved varieties since more than a year purchase slightly less rice than others which suggests they are more self-sufficient (but the difference isn't statistically significant).
Secondly, families who can eat their own rice during fewer months need to buy more rice from outside[33]. And finally, what is more surprising is that families who can eat their own maize for fewer months do not necessarily buy more rice. In fact, whatever the volume of maize produced, a HH will still buy significant amounts of rice from outside.

6.5 Food security indicators

6.5.1 Reduced Coping Strategy Index (r-CSI)

The r-CSI is built around five questions that represent varying degrees of food coping strategies carried out by a HH within the last seven days. It measures HH's behaviour, i.e. strategies people use when they cannot access enough food. Given data collection was conducted during the hungry season, it is expected that most HHs were frequently using these coping strategies in the last few days.

The five questions asked are listed here from the most to the least frequently applied:

- In the past seven days, were there ever times when you had to limit portion size at mealtimes? (29%)
- In the past seven days, were there ever times when your family had to eat less preferred or less expensive food? (28%)
- In the past seven days, were there ever times when your household had to reduce the number of meals eaten in a day? (26%)
- In the past seven days, were there ever times when adults had to eat less quantity in order for small children to eat? (25%)
- In the past seven days, were there ever times when your household had to borrow food or rely on help from friends/relatives to get food? (20%)

[33] Result of Anova test: Sig. = 0.008, $p<0.05$.

The r-CSI score was calculated by summing up the results of multiplication of the number of days HHs adopted the strategies by the weight of the strategy[34]. A higher r-CSI score indicates a higher level of vulnerability to food security and vice versa.

Table 29. Average r-CSI score according to different factors

		# of cases	r-CSI score
Whole sample		684	5.2
Male headed households		642	5.3
Female headed households		42	4.5
Adopters since 2014-15 or earlier		207	4.9
Non-adopters and first time adopters		477	5.4
HHs experiencing hunger during the last 12 months		332	7.7
HHs not experiencing hunger during the last 12 months		184	2.3
Per months of consumption of self-grown rice:	0 months	3	1.3
	1-4 months	25	6.9
	5-8 months	62	3.6
	9-12 months	64	3.6
Per months of consumption of self-grown maize:	0 months	9	3.4
	1-4 months	152	8.7
	5-8 months	179	4.1
	9-12 months	334	4.3

On average, the r-CSI score was 5.2, which is significantly higher than the average score measured during the TL-FNS[35] which was 3. This is understandable given data collection for the TL-FNS was conducted only a few months after harvest (May-September) while the EoPS was conducted during the hungry season.
Note that male headed households have a slightly higher r-CSI than female headed households, but the difference isn't statistically significant.

Interestingly, the r-CSI score is lower for adopters who have grown the improved varieties since 2014-15 than for other HHs (4.9 vs. 5.4), which means adopters do not need to rely as much on coping strategies during the hungry season compared to other HHs. But again, the difference isn't statistically significant.

Finally, the r-CSI is closely linked to the food security information presented above:

- HHs who said they experienced hunger in the last 12 months have a much higher r-CSI score than others (7.7 vs. 2.3 among others).
- HHs who are able to eat self-grown rice or maize during less months also have a much higher r-CSI score[36].

[34] The standard weights used to calculate the r-CSI were applied here: 3 for "restricting adults", 2 for "borrowing food" and 1 for the three other strategies.
[35] The Timor-Leste Food and Nutrition Survey covered 1270 HHs across the country (UNICEF, 2013).
[36] Result of Anova tests for hunger and consumption of maize: Sig. = 0.00000, $p<0.05$.

6.5.2 Food Consumption Score

Food consumption of the HHs was assessed using the "Food Consumption Score" (FCS). The FCS is calculated using the frequency of consumption of different food groups consumed by a HH during the last seven days.
Twelve food categories were defined and are listed here from the most to the least frequently consumed:

- spices/coffee/tea (6.9 days)
- rice (6.8 days), oil/fats (6.8 days)
- sugar/sweet foods (6.2 days)
- vegetables (6.1 days), corn (2.5 days)
- other cereals in the form of bread/ noodles (2.2 days)
- beans/peas/nuts (1.9 days)
- meat/fish/eggs (1.9 days)
- roots/tubers (1.8 days)
- fruits (1.7 days)
- milk (0.5 days)

These frequencies were combined into a global score (FCS) using specific weights for each food category[37]. FCS under 28 are poor, those between 29 and 42 are borderline and those above 42 are good/acceptable.

Table 30. Proportion of HHs within each category of FCS

	Among all respondents	Among respondents in charge of food preparation	Among other respondents	TL-FNS
# of cases	698	448	250	1270
Poor	1%	2%	0%	11%
Borderline	15%	15%	14%	28%
Acceptable/good	84%	84%	86%	61%

Only seven HHs have a poor FCS while 15% have borderline FCS. This is much smaller than what was found in the TL-FNS which was conducted during the usual food secure months. This might be because the EoPS team was less careful to differentiate small and large quantities of food eaten or whether the food was eaten by all HH members or not. Such considerations are normally required to decide whether the food should be recorded in the form or not. Despite this issue, the FCS calculated for the EoPS is still very useful to compare different categories of HHs (Table 31).
Note that contrary to the r-CSI score, the result is not influenced by whether it was the person who is responsible for food preparation who answered the FCS questions, or whether it was someone else.

[37] Weights used for the EoPS were those defined in the TL-FNS: staples 2, pulses 3, meat/fish /eggs 4, milk 4, vegetables 1, fruit 1, and oil/fat, condiment and sugar 0.5 each.

Table 31. Average FCS according to different factors

		# of case	FCS
Whole sample		698	58
Male headed households		653	58
Female headed households		45	52
Adopters since 2014-15 or earlier		210	59
Non-adopters and first time adopters		488	57
HHs experiencing hunger during the last 12 months		342	55
HHs not experiencing hunger during the last 12 months		187	59
Per months of consumption of self-grown rice:	0 months	3	47
	1-4 months	26	53
	5-8 months	62	52
	9-12 months	64	57
Per months of consumption of self-grown maize:	0 months	9	52
	1-4 months	157	58
	5-8 months	182	56
	9-12 months	340	59

Firstly, adopters who have already harvested at least once improved varieties have a very slightly better FCS than others: 59 vs. 57. But the only statistically significant differences in Table 31 are:

- Between male and female headed HHs: female headed HHs have a lower FCS. In other words, they have a less diversified and poorer diet than male headed HHs[38].
- Between HHs who said they experienced hunger during the last 12 months and those who didn't. Those who do also have a slightly lower FCS than HHs who said they did not experience hunger[39].

Finally, the FCS is also coherent with the data on consumption of self-grown rice and maize, even though the differences are not statistically significant. Indeed, the more months HHs can consume their own crops, the higher the FCS.

Figure 20. This repondent in Tirilolo (Lautem) purchased an IFAD drum to store his maize harvest.

[38] Result of Anova test: Sig. = 0.017, p<0.05.
[39] Result of Anova test: Sig. = 0.008, p<0.05.

6.6 Perception questions

In order to provide some cross-checking information as well as qualitative feedback from respondents, three perception questions were asked.

- *How would you compare the food production of your household now with the food production of your household five years ago?*

Table 32. Comparing food production in 2011 and 2016

	Whole sample	Adopters since 2014-15 or earlier	Non-adopters or first-time adopters
# of cases	664	199	465
Much less now	17%	16%	18%
Somewhat less now	26%	27%	26%
Same as before	35%	33%	36%
Somewhat more now	19%	21%	17%
Much more now	3%	4%	3%

From this first question, it seems that farmers are producing slightly less food now than five years ago. Again this might be influenced by the fact that the EoPS was conducted at a time when Timor Leste's agricultural production was severely impacted by El Niño.
Note that there is a slight difference between "longer-time adopters" and other HHs: "longer-time adopters" believe they produce more food now compared to five year ago. However, this difference is not statistically significant.

Answers provided here are quite consistent with respondents' answers to the question about area cultivated now and five years ago. For example, 64% of those who reported cultivating smaller areas now, also said they produce less food now. We can therefore conclude that most farmers responded truthfully to these questions.

Answers here were also consistent with the data on buying rice five years ago. There is a higher proportion of HHs buying more rice now among those who now produce less food, and vice-versa. Still, it is interesting to see that whatever the quantity of food produced (especially for maize), HHs will still buy significant amounts of rice from outside.

Figure 21. Noi Mutin seeds from a farmer who recently received seeds from the SEO of Lela Ufe, Oecusse

- Impact of growing improved varieties on food security

Table 33. Respondents' perception on the impact of growing MAF varieties on HH food security[40]

	Do you agree to say that growing MAF varieties has helped your family to produce more food?		Do you agree to say that growing MAF varieties has reduced the number of months during which your HH experienced hunger?	
	2014	2016	2014	2016
# of cases	225	180	225	178
Strongly disagree	0	0	0	0
Disagree	3%	2%	5%	5%
Neither agree nor disagree	7%	13%	17%	15%
Agree	66%	66%	54%	61%
Strongly agree	22%	18%	22%	20%

As shown in Table 33, totally, 84% of the adopters who already grew improved varieties in 2014-15, agreed or strongly agreed that growing improved varieties has helped their family produce more food. Also, 81% said they agreed (or strongly agreed) that it has helped them to reduce the number of hungry months they experienced. Nearly all adopters were consistent in the answers they gave to both of these questions.
The same two questions were asked in the 2014 survey and in general, about the same results were obtained: 70% to 80% of adopters agreed with these statements and very few disagreed.

Interestingly, farmers who agreed (or strongly agreed) that MAF varieties helped reduce the number of hungry months did report less months of hunger than others (months of hunger as reported in part 6.2): 3 months vs. 3.3 months and 3.1 months among farmers who disagreed or neither agreed nor disagreed. Given those answers are consistent with each other, it is likely that this information is reliable.

Figure 22. Sele and Noi Mutin cobs produced by a farmer in Aileu

[40] For the 2016 data, only cases of adopters growing the improved varieties since at least 2014-15 were considered in the analysis.

7. Economic situation of households

7.1 Overall economic situation of the households

7.1.1 PPI and agricultural assets indicator

A lot of data was collected in the EoPS to reflect farmers' wealth. In order to present these data in a synthetized manner, two "wealth indicators" will be used in this section[41]:

- The Progress out of Poverty Index (PPI) which is a standard poverty measurement tool that provides statistics on the proportion of people living under a certain poverty level[42]. The calculation of the PPI includes data on housing conditions, HH demographics, education, HH assets, etc.
- An "agricultural assets indicator" which combines all of the information collected on agricultural assets (equipment, animals, land) and can therefore reflect farmers' agricultural wealth. The methodology used to build this indicator is summarized in Appendix II.

Firstly, Table 34 presents the poverty likelihoods of the HHs interviewed, based on their PPI score. On average, it is estimated that about 23% of the sample lives under the national poverty line, 22% live with less than 1.25 USD per day and 74% live with less than 2.5 USD per day. More importantly, no significant difference was found between adopters and non-adopters meaning that, whatever their economic situation, rural HHs in Timor-Leste have equal access to the MAF varieties.

Table 34. Poverty likelihoods

Proportion of respondents living...	Overall	Adopters	Non-adopters
# of cases	699	323	376
... under the national poverty line	23%	24%	23%
... with less than 1.25 $/day	22%	22%	21%
... with less than 2.50 $/day	74%	75%	73%

Table 35 presents the average scores for the PPI and agricultural assets indicator according to different criteria. For both indicators, the higher the score, the better off is the farmer / the more agricultural assets the HH owns.

[41] During data analysis, the use of a "general wealth indicator" - largely based on housing condition and household assets ownership - was tested. It was found that the correlation was very similar to that of the PPI, so it was decided to only use the PPI.

[42] For more info on the PPI, please visit www.progressoutofpoverty.org

Table 35. PPI and agricultural assets indicator according to different factors

		# of cases	PPI score	Agricultural assets score
Whole sample		695	42	92
Male headed households		652	42	94
Female headed households		45	46	63
Adopters since 2014-15 or earlier		210	42	112
Non-adopters and first time adopters		489	42	83
Number of months the HH experiences hunger:	0 months	188	45	110
	1-4 months	278	40	77
	5-8 months	47	37	75
	9-12 months	3	33	56
r-CSI score	0 (no use of coping strategies)	366	44	107
	1 – 8 (medium use of coping strategies)	165	42	80
	9 and above (more use of coping strategies)	152	37	75
FCS	Poor	7	36	48
	Borderline	103	39	80
	Acceptable/Good	587	43	95
Quantity of rice purchased	< 300 kg	117	44	92
	300 kg	293	42	86
	> 300 kg	239	40	85

The first point here is that female headed households have a significantly better PPI score than male headed households but they also have a smaller agricultural assets score[43]. This suggests that female headed households can be less active than male headed households in agricultural activities, probably due to less labour (see part 2.2).

Secondly, adoption is significantly correlated to the agricultural asset score[44]. This is very interesting because farmers' general economic situation is not related to adoption (Table 34) but their "level of engagement" in agriculture is (i.e. how much land they cultivate, how many agricultural equipment they own, how many animals they raise).

Finally, both indicators are very clearly correlated to most of the food-security data. Indeed, the wealthier is the HH, the less they experience hunger[45], the higher is the FCS[46] and the smaller is the r-CSI score[47].

What is more surprising is that HH who buy larger quantities of rice for consumption are significantly poorer[48]. Again this shows that buying rice is crucial for any HH: even the poorer families do in fact buy significant amounts of rice.

[43] Results of Anova tests with PPI and agricultural indicator: Sig. = 0.042 and Sig.= 0.019 respectively.
[44] Result of Anova tests with agricultural indicator: Sig. = 0.00003, p<0.05.
[45] Results of Anova tests with PPI and agricultural indicator: Sig. = 0.00008 and Sig.= 0.0004 respectively.
[46] Result of Anova test with the FCS and PPI: Sig. = 0.041m p<0.05.
[47] Results on Anova tests with PPI and agricultural indicator: Sig. = 0.000 in both cases.
[48] Result of Anova test with PPI: Sig. = 0.02, p<0.05.

7.1.2 Self-assessment

To cross-check the PPI data presented above and test farmers' honesty during the interview, two perception questions were asked at the very beginning of the economic section of the questionnaire. First: "*When looking at your household's situation now, would you say that your household is very poor, or poor, or just getting along, or comfortable, or wealthy*?" (Table 36). Second, "*How would you compare the economic situation of the household today with the economic situation five years ago?*" (Table 37).

Table 36. Self-assessment of households' economic situation

	% of HH	Average PPI score
# of cases	698	697
Very poor	3%	33
Poor	16%	38
Getting along	80%	43
Comfortable	1%	48
Wealthy	0	

As expected, most respondents said their family is just getting along. More importantly, farmers' self-assessment is coherent with the PPI data presented earlier[49]. For example, no significant difference was observed between farmers' self-assessment and adoption: clearly, wealthier and poorer HHs all have the same chance to access MAF varieties.

Table 37. Comparing economic situation in 2011 and 2016

	Overall	Adopters since 2014-15 or earlier	Non-adopters and first time adopters	Average PPI score
# of cases	696	211	485	695
Much worse now	3%	2%	3%	37
Worse now	9%	10%	9%	40
Same as before	45%	37%	49%	41
Better now	39%	46%	36%	43
Much better now	4%	5%	4%	48

As shown here, most HHs believe their lives are the same as before or somewhat better than before. Again, there is a clear correlation with the PPI score: the higher the respondent rated his situation now compared to before, the higher the PPI score[50].

Remarkably, a significantly higher proportion of "long-time adopters" are better off now than five years ago[51]. This is very encouraging as part of this improved situation is certainly the result of growing improved varieties.

[49] Result Anova test: Sig = 0.000006, p<0.05.
[50] Result Anova test: Sig = 0.011, p<0.05.
[51] Result of Chi-Square test: Asymp. Sig. = 0.049, p<0.05.

Also, farmers' answers here were very closely related[52] to farmers' feedback regarding their food production now compared to five years ago:

- Among HHs whose situation is worse than before, 83% said they now produce less food than before.
- Among HHs whose situation is the same as before, 50% think they produce as much food as before.
- And among those whose situation has improved, 36% believe they produce more than before which is the highest proportion from this category.

In other words, the volume of food a family can produce is clearly one of the key factors respondents took into consideration when rating their family's living standard today.

In the 2014 survey, adopters were asked "*Would you agree to say that growing MAF varieties has helped you to become less poor*". At that time 47% said they agreed which is very close to the 49% of adopters who now said they have a better economic situation than five years ago.

Figure 23. Nakroma rice fields visited in April-May 2016 in Baucau

7.2 Different sources of income

Data on HHs' sources of income during the last 12 months prior the interview was also collected. This will help to understand how agricultural revenue compares to other sources of income, and more specifically for adopters.
Note that after having listed the different sources of income of their HH, respondents ranked these from the most income generating activity (which was given the rank "1") to the least income generating one[53].

[52] Result of Chi-Square test: Asymp. Sip. = 0.0000, p<0.05.
[53] HHs who had only one source of income were automatically given a rank "1" for this source of income.

Table 38. Various sources of income of interviewed HHs

	Overall	Adopters since 2014-15 or earlier	Non-adopters and first time adopters	
# of cases	699	211	488	*per source of income*
Selling livestock	63%	69%	61%	1.9
Selling crops	47%	56%	43%	2.2
Government payments[54]	43%	42%	43%	1.9
Plantation	37%	32%	39%	1.8
Small business[55]	28%	28%	27%	1.8
Day-labour	21%	22%	21%	1.9
Monthly salary[56]	18%	20%	17%	1.4
Selling fish	4%	5%	4%	1.7
Own company	0.6%	0.5%	0.6%	1.8
Money from CSP or CSPG	0.3%	0.9%	0	2
Other	0.3%	0	0.4%	1.5

The most frequent sources of income are selling livestock (mostly chickens/pigs) followed by selling crops, government payments and money from plantations.
In fact, 88% of the HHs interviewed earn money from at least one the four agricultural sources of income listed here: crops, plantations, livestock, and fish. These can be agricultural products that the HH produces or just trades.

Even though selling crops is mentioned by nearly half of the sample, it is in fact perceived as one of the least income generating activities (rank = 2.2). The most profitable source of income is "monthly salary" (rank = 1.4) but only 18% of the sample earn money from a "monthly salary". Farmers' ranking is probably reliable given respondents who earn money from a monthly salary also have a significantly higher PPI score than others (46 vs. 42 among those who do not earn monthly salaries[57]).

Comparison was conducted between female and male headed households and the only significant difference is for daily labour which is less frequent among female headed households (7% vs 22% among male headed households). Indeed, daily labours often do hard work that are more suitable for men (building roads/houses for example).

Interestingly, two sources of income appear to be significantly more frequent among adopters than among non-adopters: selling crops and selling livestock[58]. This suggests that adopters are more market oriented than non-adopters.

[54] Pensions, veterans pension, "bolsa de mae".
[55] Small businesses range from selling local alcohol, fuel, wood, tais, processed food, etc.
[56] Ranges from government civil servants (teacher, SEO, Chefe suco, police, etc.) to taxi driver, security guard, etc.
[57] Result of Anova test: Sig. = 0.001.
[58] Result of Anova test respectively: Sig.= 0.001 and 0.03, $p<0.05$.

Finally, farmers selling their own crops were asked "*Overall, what proportion of your total household income last year would you say comes from selling crops you produce?*". This was clearly a hard question for farmers but 299 respondents still tried to give their opinion (Table 39).

Table 39. Proportion of money earned from selling crops produced by the HH among the total HH income

Propotion	Overall	Adopters since 2014-15 or earlier	Non-adopters and first time adopters
# of cases	299	107	192
Less than half	65%	54%	71%
About half	20%	31%	14%
More than half	15%	15%	15%

Most farmers reported that the money they earn from selling crops is only a small proportion of the total money their HH earns. This verifies what was observed earlier through the low ranking given for "selling crops" (Table 38).

More importantly, "longer time adopters" believe this source of income represents a larger proportion of their total HH income when compared to other HHs[59]. In other words, adopters who have already harvested improved varieties are able to earn more money from selling part of their crops. This is probably owing to the higher productivity of the improved varieties.
Indeed, as shown earlier in Table 22, most of the maize farmers growing Sele or Noi Mutin and who sold part of their maize harvest in 2015 said they chose to sell harvest coming from the improved varieties.

Figure 24. Woman farmer being interviewed in Tulataqueo, Aileu.

[59] Result of Chi-Square test: Asymp. Sig. = 0.002, P<0.05.

8. Participation in groups

8.1 Familiarity with MAF seed production groups

As in previous surveys, enumerators assessed respondents' awareness about the existence of a CSPG or a CSP in their suco. Results are presented here.

Table 40. Farmers' awareness of the existence of CSPGs/CSPs

	2013	2014	2016
Do you know if there is a CSPG/CSP in your suco:			
Yes, there are.	22%	23%	21%
No, there are none	66%	46%	26%
I don't know.	12%	31%	53%
Proportion among those who said "yes" who really live in a suco where there is a CSPG	51%	91%	98%
Proportion among those who said "no" or "I don't know" who live in a suco where there is a CSPG	NA	79%	90%

[Respectively, 668, 702 and 700 respondents answered this question in the MTS, AS and EoPS.]

The proportion of respondents who answered "yes" is still about 20% of the total sample but a higher proportion of these were correct given there are more CSPGs and CSPs in 2016 than during previous surveys. Similarly, a higher proportion among respondents who thought there were no such groups or who didn't know in fact live in a suco where there are CSPGs/CSPs.
This clearly proves that more time will be needed for CSPGs/CSPs to be better known in the sucos.

Farmers were not specifically asked if the group they knew was a CSP or a CSPG, but some comparisons are presented here:

- In the sucos where there is a CSP (which was the case for 127 HHs), 32% of the HHs knew that there was a seed production group in the suco.
- While in the sucos where there was a CSPG (which was the case for 607 HHs), only 22% of the HHs knew there was a seed production group in their village.

This suggests that CSPs are better known than CSPGs, which would seem sensible given they are much larger scale production groups.

Respondents who answered "yes" to the above question were then asked which crop/variety these groups produced. 84% mentioned either maize or rice, peanut, cassava, sweet potato. 32% (i.e. 48 respondents) were able to spontaneously mention the name of the MAF variety the group produced.

Note that 30% of the respondents who said they knew there was a CSPG in their suco said that these groups give away seeds to other farmers and 20% said these groups sell seeds. Among the 30 respondents who said the group sells seeds, 15 live in a suco where there is a CSP and therefore, where seeds are indeed sold. In Acumau (Aileu) where a CSP produces Sele, up to five respondents knew about that the group was selling seeds.

Correlation between farmers' knowledge of CSPGs/CSPs and other factors

Table 41. Proportion of respondents knowing about CSPG/CSP according to different factors

	# of cases	Proportion knowing about a CSPG/CSP[60]
Adopters – first time growers	129	13%
Adopters – grew already a MAF variety the previous year	195	29%
Non-adopters	376	12%
Male respondent	385	19%
Female respondent	315	15%
Male headed households	655	18%
Female headed households	45	9%
Familiar with MAF varieties	300	25%
Not familiar with any MAF variety	400	11%

None of the gender related factors are statistically related to the fact that the respondent knew or not about the existence of a CSP. This means men and women have equal access to such information.

The statistically significant relations are with adoption and farmers' familiarity with the improved varieties[61]:

- Adopters, especially those who have grown improved varieties for more than a year, are more aware about CSPGs/CSPs.
- Farmers who have heard about the names of some improved varieties are also more aware about CSPGs/CSPs.

Also, the work of the SEO plays an important role in raising farmers' awareness about the existence of such groups. It was noted that in sucos where SEOs are much more active, farmers' are also considerably more aware about the existence of such groups.

Note that analysis was also conducted with the PPI score and the agricultural assets score but no significant relation was found: poorer and wealthier HH have equal access to such information.

[60] The analysis in this table excludes respondents who said the group they referred to was producing none of the five staple crops and respondents who are living in sucos where there aren't any CSPG/CSP.
[61] Results of Anova tests with adoption and familiarity: Sig. = 0.000003 and 0.00006 respectively.

8.2 Participation in MAF seed production groups

Respondents who said they knew about the existence of such group in the suco were then asked if they – or another HH member – were members of these groups. 19% of these 149 HHs said they were members of a CSP or CSPG at the time of the interview (28 respondents). This represents 4% of the total sample interviewed.

This is significantly lower than the proportion of CSPG/CSP members interviewed in the previous adoption surveys: 9% in 2014 and 14% in 2013. Note that because none of these memberships were verified, it is difficult to be sure these proportions are correct. Indeed, it is not rare that respondents say they are members of a CSPG or CSP when in fact the group they refer to are other types of agriculture groups.

Interestingly, 93% of the CSPG members interviewed (i.e. 26 out of 28) were growing at least one MAF variety at the time of the survey. The two households who weren't said that all group members hadn't received seeds yet (even though they are members since two years already).

Cross analysis was conducted with the main food security and economic data collected in this survey. Even though most of these variables are not statistically related to the fact that HHs are members of a CSPG/CSP (probably because of the low number of members), some interesting information can be extracted from Table 42.

Table 42. Characteristics of CSPG members

	CSPG/CSP members		Non members	
	# of cases	Result	# of cases	Result
Number of hungry months experienced	12	2.8	317	3.3
Number of months of self-grown maize consumption	28	8.1	662	7.7
FCS score	28	63	670	58
r-CSI score	28	4.6	656	5.3
PPI score	28	43	671	42
Agricultural assets indicator	28	117	667	91
Proportion of HH earning money from selling crops[62]	28	68%	671	46%

What is shown here is that the 28 CSPG members are overall slightly more food secure than other HH: less hungry months, more months of consumption of self-grown maize, higher FCS and smaller r-CSI score. Their participation in CSPG/CSP certainly contributes to this situation.
They are also slightly better off economically (PPI score). Finally, CSPG/CSP members are obviously among the more agriculture and market oriented farmers: higher agriculture assets indicator and significantly higher proportion of HH earning money from selling crops.

In other words, it is likely that participating in a seed production group offers real opportunities for farmers to grow more food and also sell more of their products.

[62] This is the only statistically related variable. Result of Chi-Square test: Exact Sig. = 0.017, $p<0.05$.

Conclusion

Increased adoption in Timor-Leste

Firstly, adoption of improved varieties in Timor-Leste increased from 17,9% during the 2011 baseline survey to 48.4% in 2016. Given the sampling criteria, the actual adoption rate among rural HHs of Timor-Leste in 2016 is estimated to be between 45% and 52%. In other words, the Seeds of Life Program has as good as reached its main Performance Indicator: "**50% of crop producing households are growing one or more MAF/SoL varieties**".

Based on the Preliminary Result of the 2015 Census, it was estimated that the total number of households in the country is 206,483. If the proportion of crop growing HHs vs. total HHs has remained the same as in 2010 (i.e. 63%), then the Seeds of Life Program has reached about 63,000 households. With an average of 3.2 men and 3.2 women in HHs interviewed, this means the SoL program has reached totally 201,600 men and 201,600 women.

In 2016, the improved varieties released by MAF are well established in the rural areas of Timor-Leste. Indeed, farmers are able to better manage their stock of seeds and therefore rely less on seed distributions. As a result, they are also able to grow their improved varieties for longer periods (more than two years on average) and can plant more than half of their foodcrop areas with improved varieties (59% of the total foodcrop area).

Impact of adoption of improved varieties on food security in Timor-Leste

Very clearly, growing improved varieties has contributed to increasing food security in rural areas of Timor-Leste. Indeed, the proportion of adopting HHs experiencing hunger in the last 12 months went from 77% in 2013 to 54% in 2016. If projections were made for 2011, it is very likely that the second Performance Indicator of the Seeds of Life Program would also be reached: "**Percentage of crop producing households experiencing periods of food shortage decreases by 33% in Timor-Leste".**

Several findings of this survey confirmed that growing improved varieties increased food security in the country. Firstly, farmers growing improved varieties are able to consume their own harvests for more months and they therefore rely less on food purchased from outside, especially rice. In other words, they are more self-sufficient.

As a result, adopting households can also cope slightly better with the usual hungry season that is common to all rural households in December-January-February. The length of the hungry season is 3 months for "longer-term adopters" while it is 3.4 months among other households.

Finally, in 2016, 77% of adopters believe that improved varieties released by MAF are more productive, 84% believe that growing improved varieties has helped them produce more food and 81% believe that it has helped them reduce the number of months their families experienced hunger.

Impact of adoption of improved varieties on the economic situation of rural households in Timor-Leste

Firstly, whatever their economic situation, Timorese rural households in 2016 all have equal access to improved varieties. In other words, MAF has been able to reach all types of households.

Secondly, adopting households are among the more agriculturally oriented: they own more agricultural assets and a higher proportion of their HH income comes from selling livestock and crops. Even though most farmers believe selling crops is only a small proportion of their total HH income, adopters who have already harvested improved varieties believe they are able to earn more money from this activity. Indeed, the survey showed that adopters are consuming a smaller proportion of their harvests while a higher proportion can be sold.

Finally, 51% of "longer-term adopters" believe the economic situation of their households is better or much better now than five years ago, while that is the case for only 40% of other households. This is very encouraging as part of this improved situation is certainly the result of growing improved varieties.

In conclusion, growing improved varieties does not only contribute to more food-security. It also contributes to reducing poverty.

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Appendix I: Sampled sucos & aldeias

Municipality	Subdistrict	Suco	Aldeia
Aileu	Remexio	Acumau	Aimerahun, Fatumanaro, Leroliça
		Tulataqueo	Aicurus, Dacilelo, Samalete
	Laulara	Fatisi	Banro, Maubouc, Umanlau
Ainaro	Ainaro	Soro	Leolala, Poelau , Terlora
	Maubisse	Manetu	Boro-Ulo , Dau-Lelo , Rusulau
	Hato Udo	Leolima	Aimerleu, Dausur, Hutseo
		Foho-Ai-Lico	Baha, Lesso, Raimerlau
Baucau	Baucau	Uailili	Afagua, Alala , Uatubala
	Laga	Tequinaumata	Bulubai, Caicasalari, Iti-Daho
	Quelicai	Abo	Abo Cairedo, Abo-Lir, Abo-Matebian
	Baguia	Alawa Craik	Alaua, Ne-Olidae, Sorucama
		Hae Coni	Afalari, Basarauai, Bahatata
	Vemasse	Uaigae	Lari, Mota
	Venilale	Bado-Ho'o	Uaibobo, Uatubela Oli, Uma Ana Ico
		Uma Ana Ico	Betunau, Uatu Nau, Quele-Boro-Uai
Bobonaro	Maliana	Tapo/Memo	Uluatin, Pip Galag 1, Pip Galag 2
	Cailaco	Goulolo	Malilia, Suri-Ubu
	Bobonaro	Colimau	Atublogo, Manunia, Tegoabe
		Lourba	Gumer, Lourba Leten, Zo-Belis
		Tapo	Oe-Po, Tapo Tas
		Ilat-Laun	Ilat-Laun, Purugoa, Tunero
Covalima	Fohorem	Fohoren	Fatuc Laran , Lo'O Hali, Fatuc Bitic Laran
	Maucatar	Holpilat	Hatu, Leogore, Manulor
		Ogues	Ogues, Orun, Soga
	Zumalai	Lepo	Aisal Leuc, Baulolo, Biatuma
Dili	Atauro	Vila Maumeta	Eclae, Ileticaraquia, Ilimanu
		Maquili	Fatulela, Macelihu, Mau-Meta
	Cristo Rei	Balibar	Fatuloda, Lacoto, Lorico
Ermera	Railaco	Railaco Leten	Manuponihei, Colhuinamo, Tuileso
	Ermera	Riheu	Sasoher, Gomhei, Raebliri
	Letefoho	Lauana	Grotu, Hatugeo, Raebou/Soi
	Atsabe	Leimea Leten	Buibaro, Olacata, Orbeto
	Hatulia	Manusae	Hatete, Cuccara, Lugulaulau
		Urahou	Hatlailete, Dosmagar, Raimean
		Mau-Ubo	Grotu, Leburema, Caisoru
Lautem	Lospalos	Lore I	Maluro, Otcho-Tchau, Vailana
		Souro	Nairete, Soru-Lua, Tchaivatcha
	Iliomar	Tirilolo	Tirilolo, Etevata , Tatalalarin
	Tutuala	Mehara	Loiquero, Porlamano, Poros

Municipality	Subdistrict	Suco	Aldeia
Liquiça	Bazartete	Motaulun	Mota Icun, Classo, Mau-Luto
		Maumeta	Maumetalau, Caimegohou, Nartutu
	Liquiça	Loidahar	Cotalara, Soatala, Manucol-Hata
		Leotela	Tolema, Hatumasi, Manati
	Maubara	Vaviquinia	Vila, Morae, Darulara
Manatuto	Soibada	Fatumaquerec	Lesuata Sasahi
		Manlala	Daunloroc, Manlala
	Laclubar	Sananain	Fatu-Uc, Tanusa, Waidarec
Manufahi	Same	Holarua	Fahiluhan, Hatu-Rae, Orema
	Fatuberliu	Bubussuso	Aituha, Bubulora, Lihu Lau
		Fatukahi	Cledic, Fatubessi, Fatuboe
Oe-cusse	Pante Macasar	Nipane	Bausiu, Sacato
		Taiboco	Hauboni, Maquelab, Ulas
	Nitibe	Suniufe	Cabana, Fuabano, Oelnanoe
		Lelaufe	Bebo, Cuatenes, Queno
	Oesilo	Usitasae	Buqui, Pune, Sifin
Viqueque	Uatucarbau	Irabin De Cima	Caida Ho O, Tetumori, Uatubita
		Afaloicai	Cai Uailita, Daralari, Lequiuala
	Ossu	Uabubo	Buanurac, Dauborobaha, Ossogori
	Watulari	Afaloicai	Cailaque, Caitau, Uato Ita
		Babulo	Aha bu'u, Daralari, Roma

Appendix II: Building of the "agricultural assets indicator"

The "agricultural assets indicator" was created in order to summarize into a single value all the information collected about agricultural assets owned by the households (from land to agricultural equipment/tools and livestock).

Methodology

The methodology followed is very simple. For each category of assets, a rank was given to each choices according to its "economic value". For example, for agricultural equipment, a hoe was given the rank 1 and a drum was given the rank 4.
Secondly, each category/type of assets were given a weight, also according to their economic value. For example, "agricultural equipment" was given a weight 1, while the "are cultivated" was given a weight 3. Ranks and weights used are presented in Table 43.

Table 43. Variables used in the agricultural wealth indicator – weights and ranks

Category of assets	Possible choices	% of total sample / average # owned	Rank	Weight
Agricultural equipment	Hoe	81 % / 1.8	1	1
	Shovel	79% / 1.6	1	
	Axe	58% / 1.1	1	
	Water can	26% / 1.4	2	
	Wheelbarrow / pushcart	21% / 1.1	3	
	Drum	48% / 2	4	
	Hand-operated sprayer	4% / 1.1	4	
	Silo	7% / 1.4	5	
	Hand tractor	2% / 1	6	
	Ox cart	0.4% / 3.3	6	
	Rice thresher	1% / 1	7	
	Rice hulling machine/husker	0.7% / 1	7	
	Big tractor	0.1% / 1	8	
Livestock	Chicken	85% / 6	1	2
	Pig	90% / 3	2	
	Cow	41% / 5	3	
	Goat	40% / 3	4	
	Sheep	2% / 4	4	
	Horse	21% / 4	5	
	Buffalo	16% / 2	6	
Land ownership	No	4%	0	2
	Yes, some	4%	1	
	Yes, all	92%	2	
Area cultivated	1 to 1499 m^2	7%	1	3
	1500 to 2999 m^2	11%	2	
	3000 to 9999 m^2	30%	3	
	10000 to 19999 m^2	28%	4	
	20000 to 29999 m^2	12%	5	
	30000 to 49999 m^2	10%	6	
	50000 m2 or more	2%	7	

Finally, for each respondent, the above data was computed into one single data, the "agricultural assets score", by summing the result of multiplication of ranks by weights for each category of assets. For example, if a respondent owns one hoe, two shovels, one drum, one ox cart, ten chickens, two pigs, that the land he cultivates is his own and is about 2ha, the score obtained for the agricultural wealth indicator will be: (1*1 + 2*1 + 1*4 + 1*6)*1 + (10*1 + 2*2)*2 + 2*2 + 5*3 = 60.

Across the EoPS sample, agricultural assets scores range from 5 to 720 with an average of 92. The higher the score, the more expensive assets owns the family, so in other terms, the more oriented/active is the family in agriculture.

Note that this indicator wasn't designed to reflect the situation of this sample within the country or even within sampled sucos. Its use should be limited to comparing groups of respondents among them and within this sample only.

Assessing the validity of the indicator

In order to check if the ranking obtained through this methodology was realistic, some cross-analysis were made to see if the scores obtained are coherent with other data collected in the survey. Other comparisons were also made to see if this indicator was useful enough for the purpose of this survey.

Table 44. Assessing the validity of the agricultural assets indicator

	# of cases	Average agricultural assets score
PPI – categories of PPI scores:		
PPI score =< 28	107	81
PPI score from 29 to 34	100	98
PPI score from 35 to 39	91	81
PPI score from 40 to 43	90	84
PPI score from 44 to 49	110	99
PPI score from 50 to 56	98	101
PPI score above 57	101	99
Result Anova test		Sig = 0.321[63]
Persons involved in agriculture		
0-2 persons	259	87
1.5 to 4 persons	353	91
4.5 persons or more	86	113
Result Anova test:		Sig = 0.04
Total maize harvested in 2015		
No harvest	22	61
1-25 kg	76	68
26-50 kg	79	91
51-100 kg	119	85
101-200 kg	147	81
201-500 kg	154	105
501-1000 kg	37	149
> 1000 kg	21	180
Result Anova test		Sig = 0.000

[63] If the value "Sig" is under 0.05, the two variables tested are correlated.

	# of cases	Average agricultural assets score
Gender of HoH		
Male	652	94
Female	45	63
Result Anova test		Sig = 0.019
Growing MAF varieties		
Adopters	322	102
Non-adopters	376	83
Result Anova test		Sig = 0.004
Experiencing hunger in last 12 months		
Yes	340	77
No	188	110
Result Anova test		Sig = 0.000

The agricultural assets indicator is correlated with all the variables tested here that are related to agriculture and food security which indicates that the indicator designed here is probably realistic/coherent.
Also this indicator is not correlated with the PPI which ensures that it will provide different sort of information compared to the PPI. If they were positively correlated, the use of the agricultural assets indicator would probably not be interesting as it would have provided similar information as the PPI.
It is also correlated to the gender of the HoH which also is interesting to analyse in this report.

In conclusion, the agricultural assets indicator is definitely an interesting and valuable tool to be used in this survey.

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Farmers

Last but not least, the End of Program Survey would not have been possible without the 700 households in the 60 sucos who gave about an hour of their time to be interviewed about their experience and practices in foodcrop cultivation. We thank them for their willingness to participate in this survey.

Figure 25. EoPS team