



**To'os ba Moris Di'ak**  
**Farming for Prosperity**

# **Market Analysis of Selected Agricultural Products**

Technical Report 1  
December 2016

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International



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# Abbreviations & Acronyms

ACIAR	Australian Centre for International Agriculture Research
AusAID	Australian Agency for International Development (now in DFAT)
AVANSA	USAID's Avansa Agrikultura Project
BOSS	Business Opportunities and Support Services Project
CAP	Conservation Agriculture Programme
CCT	Cooperativa Café Timor
CRS	Catholic Relief Services
DFAT	(Australian) Department of Foreign Affairs and Trade
DPs	Development Partners
EU	European Union
FAO	Food and Agriculture Organization
FEA	Financial and Economic Analysis
GAFFSP	Global Agriculture Food Security Program
GAPs	Good Agriculture Practices
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoTL	Government of Timor-Leste
IADE	Institute for Business Support
IFAD	International Fund for Agriculture Development
JICA	Japan International Cooperation Agency
MAF	Ministry of Agriculture and Fisheries
MAFSP	MAF's Strategic Plan
MCIA	Ministry of Commerce, Industry and Environment (previously MTCI)
MDF	Market Development Facility
MECAE	Minister of State, Coordinating Minister for Economic Affairs
MoH	Ministry of Health
Mt	Metric Tonne = 1,000 kg
MTOP	MAF's Mid Term Operation Plan
MTIP	MAF's Mid Term Investment Plan
NGO	Non-Government Organization
NTT	Nusa Tenggara Timor
PSAF	Partnership for Sustainable Agroforestry
R4D	Roads for Development
RBFS	Rice-Based Farming Systems
RDP IV	Rural Development Program Phase IV – EU funded
SAPIP	Sustainable Agriculture Productivity Improvement Project
SoL	Seeds of Life
TLMSP	IFAD's Timor-Leste Maize Storage Project
TLSDP	Timor-Leste Strategic Development Plan
Market Analysis of Selected Agricultural Products	

USDA	United States Department of Agriculture
TOMAK	To'os ba Moris Diak or Farming for Prosperity program
ZEEMS	Zonas Especiais de Economia Social de Mercado de Timor-Leste

# Executive Summary

This study comprises step one of a three-step process designed to identify high-potential Value Chains (VC) where TOMAK will commence development assistance from early 2017.

The three steps are as follows:

- Step 1: Conduct of a broad market scan to assess current and potential markets for selected agriculture products that could be produced in the TOMAK target area. The results from this work will be used to identify a list of products and VCs that are assessed to have market potential, to be further assessed through steps two and three.
- Step 2: Assessment of farm-level aspects of higher-priority crop and livestock products identified through step 1, including current production practices, constraints, and opportunities for improvement, providing a basis for further refining the list of potential target VCs.
- Step 3: Conduct of detailed VC analysis for products that are assessed to have both market potential and clear opportunities for productivity improvement on-farm.

Prior to this market analysis study, TOMAK prepared indicative VC selection criteria with the main 'drivers' being that in order to achieve the level of impact desired it will be necessary to develop an early focus on VCs that have strong market potential and offer sound financial returns for farmers.

Table 1 presents a matrix of products (shaded red<sup>1</sup>) which might be considered by TOMAK, categorised by (i) the three different farm types in the target area (subsistence, small, and semi-commercial); and (ii) three key output markets (home consumption, domestic (including import replacement), and export).

**Table 1: Longlist of target products by farmer type**

Crops																			
Annual									Perennial										
Farm Type ---->	Subsistence			Small			Semi-Commercial			Farm Type ---->	Subsistence			Small			Semi-Commercial		
Market a/ ---->	HO	DIR	EX	HO	DIR	EX	HO	DIR	EX	Market a/ ---->	HO	DIR	EX	HO	DIR	EX	HO	DIR	EX
Paddy (white)										Coconut									
Paddy (red)										Candle nut									
Paddy (black)										Pepper									
Maize - consumption										Cloves									
Maize - livestock feed										Turmeric									
Sweet Corn										Timber b/									
Cassava										Fruit c/									
Sweet potato										Coffee d/									
Mungbean																			
Soybean																			
Peanut																			
Other legumes																			
Ginger																			
Onion																			
Potato																			
Vegetables c/																			
Livestock																			
Ruminant									Non-Ruminant										
Farm Type ---->	Subsistence			Small			Semi-Commercial			Farm Type ---->	Subsistence			Small			Semi-Commercial		
Market a/ ---->	HO	DIR	EX	HO	DIR	EX	HO	DIR	EX	Market a/ ---->	HO	DIR	EX	HO	DIR	EX	HO	DIR	EX
Cattle										Pigs									
Sheep/Goats										Chickens									
Buffalo										Fish - aqua.									

a/ HO = home consumption, DIR = domestic market and import replacement, EX = export market.

b/ Various species - short-, medium- and long-term; in association with EU/GIZ agroforestry project; fuelwood for HO market.

c/ AVANSA's commercial product focus, not initial TOMAK focus except for nutrition purposes; could become important TOMAK products in the longer-term.

d/ Leave the coffee sector to CCT and other DPs.

Note: this table could be municipality-specific once further planning has been completed.

<sup>1</sup> Red = TOMAK target products; Blue and green = products being covered by other programs.

This assessment is based on review of available secondary data on production volumes, domestic market volumes, import volumes, export volumes, import/ export parity prices, and net financial returns available to farmers. Review of the secondary data has been supplemented through interviews and discussions with key informants including buyers, traders, exporters, importers, relevant government institutions, and various Development Partners (DPs).

There are no 'stand-out' products which have wide-scale potential to grow exports from Timor-Leste – with the notable exceptions of coffee and a range of timber products. However, there are some good opportunities for farmers to increase incomes by growing products which are suitable for domestic and import-replacement markets.

These products have been selected on the basis of the need to: (i) have potential for impact at scale across the target area; and (ii) fit into existing farming systems – especially those practiced by poor and resource-limited farmers. These products were also repeatedly cited by large and small local traders as having good potential to increase farm incomes. Key products are further summarised below, categorised by farm type.

- **Subsistence farmers.** This target group should be assisted with a 'food first' strategy, with the objective of ensuring self-sufficiency in the main staple foods – rice and maize (depending on their farming system), cassava, sweet potato, peanuts, vegetables and legumes; plus coconut and timber in the longer-term, and fruit. The only anticipated support for current extensive livestock production systems could be improved vaccination services; and possibly improved poultry production with a focus on eggs for direct household (HH) consumption. The overriding strategy should be to introduce 'tried and tested' ways to increase staple food production, with a primary focus on: (i) improved food crop varieties; (ii) reduced post-harvest losses; (iii) wider use of conservation agriculture practices for maize production; (iv) a broadening of products grown with the dual objective of addressing malnutrition; and (v) possibly improved control of Newcastle Disease in free-range poultry. The eventual aim should be to assist these poorer HHs to graduate to the 'small farmer' category (see below).
- **Small farmers.** Depending on their geographic location within target municipalities and therefore access to local and domestic markets, this category of farmers is expected to focus on the following crops: (i) rice for subsistence needs; (ii) maize, cassava and sweet potato for subsistence and some livestock feeding; (iii) peanuts for consumption and local sale; (iv) introduced legumes (mainly mung and soybean) for consumption and domestic sale; and (v) opportunistic local collection and trading in coconut products and candle nut. Livestock production opportunities include development of improved semi-intensive production systems (back-yard feeding using surplus food crops and indigenous forages), looking to the domestic and import replacement markets. Pigs are expected to be particularly important targets as surplus quantities of staple foodcrops are grown. Note however the risks associated with unreliable vaccination services from the Ministry of Agriculture and Fisheries (MAF), as well as the difficulty of sourcing a cost-effective ration with particular respect to the protein component of the diet.
- **Semi-commercial farmers.** The products listed as being suitable for small farmers are expected to be equally relevant for emerging commercial farmers, who are also likely to be interested in additional, more risky products. For example: (i) the emerging opportunities for black and particularly red rice, and sweet corn, should be tested; (ii) maize produced under irrigated conditions could be used for non-ruminant livestock production; (iii) legumes other than soy and mung bean could be introduced; and (iv) depending on soil type and rainfall patterns, small quantities of onions and Irish potato for domestic and import replacement markets. A range of commercial tree crop products could also be targeted; including wood production. Ginger and turmeric are two emerging crops which appear to have reasonable domestic and international markets (according to the traders interviewed). Intensive livestock production could focus on all three markets as demand increases.

Other reasons for the selecting these products include: (i) recognition of products that are already being targeted by other DPs; (ii) a realistic and practical view of what is required for Timor-Leste to increase agricultural exports, taking into account the strong US\$, the impact of domestic rice subsidies, and a lack of marketing infrastructure; (iii) a broad focus on all three market categories (domestic, import replacement and export); (iv) an attempt to 'pick the low hanging fruit' that are already backed with proven technology (i.e. focus on some early and relatively easy wins such as improved pork production); and (v) acceptance that a

lack of reliable data and information means that some decisions are somewhat subjective and could therefore be incorrect.

Based on the above longlist, it is recommended that the products listed in Table 2 below be further assessed as initial target VCs for TOMAK.

**Table 1. List of high and medium market potential products**

<b>High market potential</b>	<b>Medium market potential</b>
Pigs	Maize (as animal feed)
Cattle	Cassava (as animal feed)
Mung bean	Peanuts
Soybean	Black/red rice
	Potato
	Onions

It should be emphasised that this short-list represents a starting point for TOMAK, not a complete list of all the VCs it will work with. Assessment of market opportunities and selection of additional VC development targets will be on-going throughout the course of the Program.



# Main Report

## 1. Background

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### 1.1. Introduction

TOMAK ('To'os Ba Moris Diak' or 'Farming for Prosperity') is a new A\$25 million, 5+5 year livelihoods improvement Program supported by the Australian government. The Program's goal is to ensure that selected rural households live more prosperous and sustainable lives. TOMAK is expected to achieve this objective through parallel and linked interventions which aim to: (i) establish a foundation of food security and good nutrition for targeted rural households; and (ii) build household capacity to confidently and ably engage in profitable agriculture markets.

TOMAK's primary target area comprises inland mid-altitude areas that have some irrigation capacity and therefore reasonably good agricultural potential. It includes 70-80 suku located mainly in the Maliana basin (including most of Bobonaro Municipality), the eastern mountain regions (including most of Baucau and Viqueque) as well as parts of Lautem, Manatuto and Oecusse Municipalities (Figure 1). The Program will initially be focussed in Baucau, Viqueque and Bobonaro Municipalities.

In its efforts to promote commercial agriculture and improve household (HH) incomes, TOMAK will identify and work on the development of a limited number of target value chains (VCs). The Investment Design Document (IDD) indicates TOMAK could be supporting three to five VCs in each municipality over the next five years, delivering significant improvements to the livelihoods of producers, entrepreneurs and workers. It is likely that some of these VCs will be the same across different municipalities, although probably with a different mix of development support.

This study<sup>2</sup> comprises step one of a three-step process designed to identify high-potential VCs where TOMAK will commence development assistance from early 2017. Note that the objective is not to identify all VCs where TOMAK will work, as this will need to be an ongoing process throughout the duration of the Program, but to identify initial targets.

The three steps are as follows:

- Step 1: Conduct of a broad market scan to assess current and potential markets for selected agriculture products that could be produced in the TOMAK target area. The results from this work will be used to identify a list of products and VCs that are assessed to have market potential, to be further assessed through steps two and three.
- Step 2: Assessment of farm-level aspects of higher-priority crop and livestock products identified through step 1, including current production practices, constraints, and opportunities for improvement, providing a basis for further refining the list of potential target VCs<sup>3</sup>.
- Step 3: Conduct of detailed VC analysis for products that are assessed to have both market potential, and clear opportunities for productivity improvement on-farm<sup>4</sup>.

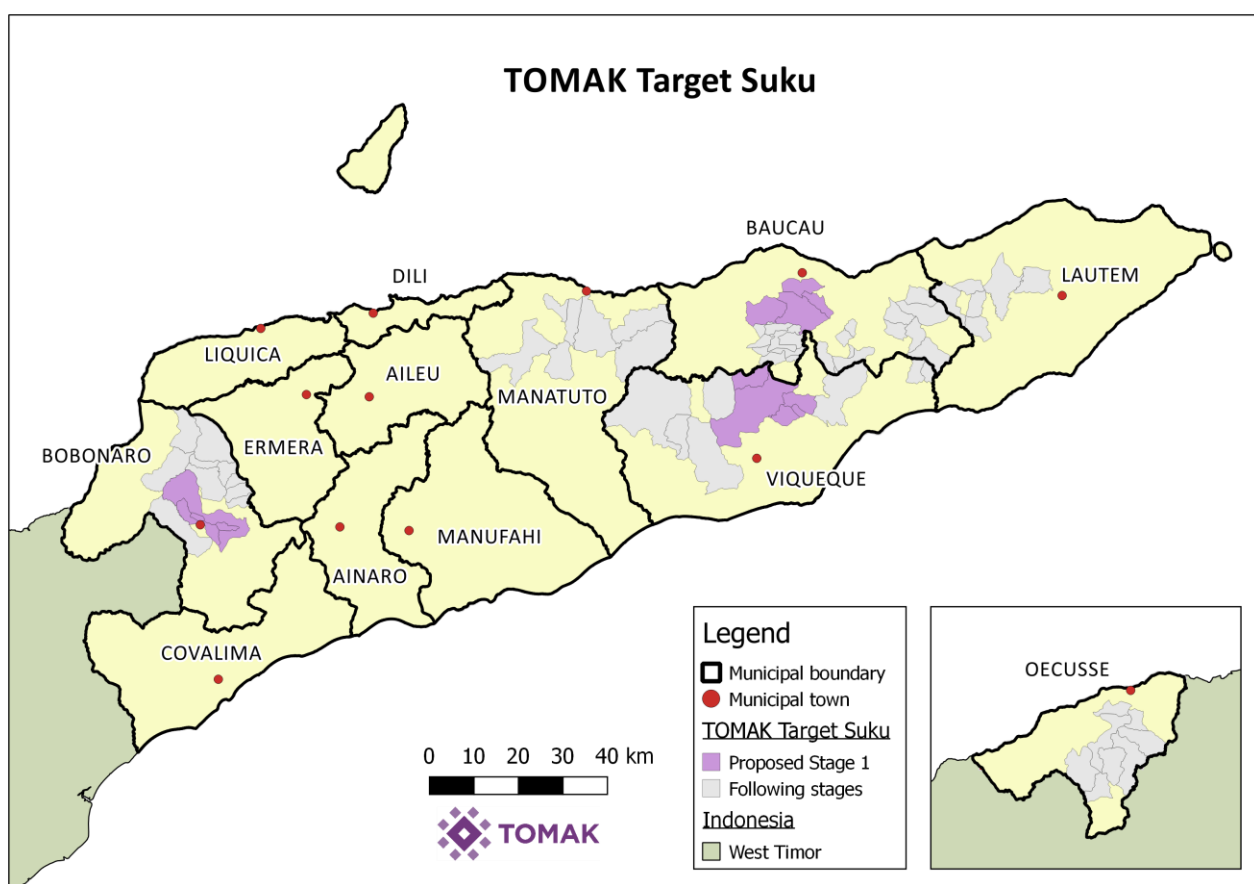
#### Figure 1: TOMAK's target municipalities and suku

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<sup>2</sup> The team comprised: (i) Mr Philip Young, Consultant Agriculture Economist (ii) Ms Jenny Ikelberg, TOMAK International VC Specialist; and (iii) Ms Joaninha Guterres, TOMAK National VC Specialist. The team would like to thank the wide range of institutions and people met during the mission for their cooperation and assistance.

<sup>3</sup> See TOMAK Technical Report #2: '*Potential for improving on-farm productivity of selected agricultural and livestock products*'. November 2016.

<sup>4</sup> See TOMAK Technical Report #3: '*Value Chain Assessments for Selected Agricultural Products*'. November 2016.



## 1.2. Value chain selection

Prior to this market analysis study, TOMAK prepared indicative VC selection criteria with the main 'driver' being that in order to achieve the level of impact desired it will be necessary to develop an early focus on VCs that have strong market potential and offer sound financial returns for farmers. Accordingly, suitable VCs are likely to include those for which:

- (i) There is already a reasonable production base in the target municipalities, i.e. where improved production systems are already reasonably known to farmers, and where production and financial impacts are likely to be widespread and inclusive rather than focused on a few select HHs and communities. This important point relates to the potential scale of impact.
- (ii) There is demonstrated strong market demand - national for domestic consumption, import replacement, or export.
- (iii) There is solid potential for growth in product demand.
- (iv) There are established and affordable trading links, or local businesses that are interested in investing in the value chain/s.
- (v) Timor-Leste has some comparative advantage in economic terms for tradeable commodities.
- (vi) Market prices translate into farm-gate returns that are sufficiently attractive to stimulate investment by farmers.
- (vii) Target products are more durable than perishable in nature, and require (at least in the early stages of value chain development) fewer rather than more steps to process raw material into final market products.

Apart from the above criteria which were pre-defined by TOMAK, this study has identified a number of additional considerations that should also be taken into account, as outlined in Section 4.1.

### 1.3. Terms of reference

Specific tasks included in the ToR for this assignment included:

- (i) Finalise the long-list of agriculture products to be assessed - together with the TOMAK and Market Development Facility (MDF) teams<sup>5</sup>;
- (ii) Estimate total production in Timor-Leste, by product and municipality - for selected products;
- (iii) Estimate the proportion of this production which is marketed;
- (iv) Derive seasonal supply profiles, with corresponding price trends;
- (v) Assess national markets and market demand over the past five to ten years, along with an assessment of likely future trends in demand;
- (vi) Analyse import statistics for the last five to ten years and identify import substitution opportunities;
- (vii) For products which are already exported or are considered to have export potential, assess current market demand (with a focus on Indonesia, particularly Nusa Tenggara Timor [NTT]) along with an assessment of likely future trend/s in export demand;
- (viii) Calculate import/export parity prices to provide an indication of Timor-Leste's comparative advantage/disadvantage for products which are either import substitutes, or potentially exportable (compared with NTT);
- (ix) Assess the extent of active private sector involvement in selected value chains, and at what level of the value chain; and,
- (x) Assess financial returns available to producers (per ha and per labour day) for the "with" and "without" project situations.

### 1.4. Sources of Data

By design, the analysis carried out as part of this study has been based on secondary data as far as possible. Where primary data have been required to verify secondary or missing data this has been collected through interviews and discussions with key informants including buyers, traders, exporters, importers, relevant government institutions, and various DPs.

All rural development projects in Timor-Leste struggle to collate reliable and up-to-date data and information on agricultural statistics – crop areas, production levels, volumes sold, etc. This situation will not improve until the Ministry of Agriculture and Fisheries (MAF) has completed an Agriculture Census and then uses this information as the basis for developing a national M&E system which has the capacity to collect, collate and analyse field-level data<sup>6</sup>. In the meantime, DPs and Programs such as TOMAK have to rely on primary sources of data from a wide range of co-operators, and informed estimates. In some cases it is possible to triangulate such data to cross-check for accuracy, but in others it is necessary to rely on anecdotal evidence and experience to judge whether data is reasonable or not. The information and data used in this report is referenced wherever possible, and where relevant supported with comments on accuracy and reliability in the form of footnotes to the tables or the text.

This report is presented in four main sections:

- Section 1 (this section) contains background information to the study.

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<sup>5</sup> Plus with advice from projects/ programs such as the USAID's Avansa Agrikultura Project (AVANSA).

<sup>6</sup> Development of an improved agricultural statistics system is expected to be supported through a World Bank grant to MAF for the Sustainable Agriculture Productivity Improvement Project (SAPIP), awarded through the Global Agriculture Food Security Program (GAFSP).

- Section 2 provides a snapshot of the current situation in relation to crop and livestock production, and notes some of the key constraints relating to development of commercial agriculture.
- Section 3 sets out the case for TOMAK's potential role in relation to assisting the diversification of rice-based farming systems (RBSF).
- Section 4 details a long-list of possible target products, the rationale for their selection, as well as a short-list of products that are assessed to be highest priority for further assessment through steps 2 and 3.
- Section 5 provides additional information for some of these products.
- Sections 6-12 review available secondary data on:
  - Total foodcrop production;
  - Market volumes;
  - Seasonal supply profiles and price trends;
  - Domestic markets;
  - Imports;
  - Export markets;
  - Import/ export parity pricing;
  - Major private sector actors in agricultural markets; and,
  - Financial viability of selected enterprises for producers.
- Section 14 makes a range of additional observations that fall outside the mandate of this study.

## 2. Overview of the agricultural sector

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Understanding the current production base is an essential precursor to identifying which products might have best development potential. The 2015 national census contained a subset of questions on Timor-Leste's agriculture sector. The full report has not been published<sup>7</sup> but preliminary figures are informative for this study and have been used to identify where TOMAK might focus initially in terms of priority sectors and products – using the percentage of HHs engaged in a particular activity as a rough guide.

Table 2 provides a summary of the 2015 agricultural statistics for TOMAK's initial three target municipalities.

Key points include:

- Around 55% of HHs grow irrigated rice, 80% maize, 70% cassava, 65% sweet potato, and 55% vegetables and beans.
- Over 80% own poultry and pigs, whereas only 30% and 17% own cattle and buffalo, respectively; and about 37% have sheep/goats.
- Numbers of livestock per HH are fairly consistent across the target areas.
- Cattle numbers have increased by nearly 40% since 2010, with poultry and pig numbers also increasing – by 23% and 20% respectively.

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<sup>7</sup> Since this report was finalised, more detailed suku-level data from the 2015 Census has been obtained and analysed. This is documented in TOMAK Technical Report #7 '[Analysis of secondary data](#)'. December 2016.

**Table 2: Summary of 2015 agricultural statistics for target municipalities**

	No of HHs	Percent of HH with:					
		Rice	Maize	Cassava	S/potato	Vegies	Beans
BAUCAU	22,976	55%	78%	66%	62%	46%	44%
BOBONARO	17,635	48%	86%	73%	61%	57%	59%
VIQUEQUE	15,297	60%	74%	76%	70%	66%	63%
TOMAK Project Area	55,908	54%	79%	71%	64%	55%	54%
		Percent of HH with:					
		Poultry	Pigs	Cattle	Buffalo	Sheep	Goats
BAUCAU	22,976	84%	83%	11%	16%	45%	
BOBONARO	17,635	78%	81%	48%	10%	33%	
VIQUEQUE	15,297	84%	81%	33%	28%	28%	
TOMAK Project Area	55,908	82%	82%	29%	17%	37%	
		Livestock Nos per HH					
		Poultry	Pigs	Cattle	Buffalo	Sheep	Goats
BAUCAU	22,976	6	2	5	5	5	
BOBONARO	17,635	6	3	4	4	3	
VIQUEQUE	15,297	7	3	6	7	4	
TOMAK Project Area	55,908						
		Percent Increase in L/stock Nos (2010 - 2015)					
		Poultry	Pigs	Cattle	Buffalo	Sheep	Goats
TOMAK Project Area		23%	20%	38%	16%	-13%	8%

Source: 2015 Census

This data serves to emphasise what TOMAK's target farmers are currently growing (crops) and raising (livestock). These existing enterprises should be the foundation for determining where support to develop improved livelihoods is (at least initially) focussed (see Section 4.1).

It needs to be emphasised that Timor-Leste's current socio-economic environment is not highly conducive to encouraging small farmers to respond to new market opportunities. Reasons include: (i) the high cost of hired labour (about \$5.00 per day, and up to \$7.00 per day for work in paddy fields, plus meals and other support costs); (ii) a disincentive for rural people to work on-farm when casual unskilled work is available in road and other construction activities; (iii) the impact of pension and social transfer payments which mean that it is more convenient for some rural HHs to purchase cheap imported rice rather than to grow this and other staple foods; (iv) the failure (to-date) of the Ministry of Commerce, Industry and Environment (MCIA) to stimulate paddy production through a local purchase scheme; and (v) continued use of traditional farming methods with limited use of mechanisation, particularly for weed control. Against this background, promoting the development of commercial agriculture will not be easy.

### 3. Rice-Based Farming Systems (RBSF)

TOMAK is designed to cover inland suku that have access to irrigation resources, including the major irrigation schemes (such as the Maliana I and II irrigation schemes in Bobonaro Municipality) as well as many other smaller river and spring-fed irrigation areas. The decision to target these areas was based on pre-design analysis of Timor-Leste's major rice-based farming systems and current trends within these areas in relation to crop production<sup>8</sup>. Most of these irrigated areas have traditionally been used for rice production, although planted area has been declining for a number of years, for a range of reasons.

It is almost impossible for locally produced rice to compete with imported product, which is being landed in Timor-Leste for around half the cost of local production. As a result of this, many of Timor-Leste's major irrigation schemes are producing negative economic rates of return<sup>9</sup>. In other words, in economic terms they are making a loss. Related issues, particularly relevant to the large irrigation schemes such as those in

<sup>8</sup> See: P M Young. Pre-Feasibility Study of Future Support for Rice-Based Farming Systems in Timor-Leste (May 2014), unpublished.

<sup>9</sup> See Public Expenditure on Infrastructure (irrigation, roads and electricity) MoF and World Bank, 2015.

Bobonaro Municipality (Maliana I and II) include: (i) high investment and therefore high operating and maintenance costs; (ii) limited water flows in the dry season and therefore low cropping intensities (maybe 1.2 maximum); (iii) reversion to traditional rice production systems (away from SRI (system of rice intensification) and ICM (integrated crop management approaches)) due to lack of domestic rice marketing opportunities (caused by high levels of rice importation and limited Government-funded public rice purchasing schemes); and (iv) to-date, no testing of options to supply supplementary irrigation water through tube-wells and small pumps to access aquifer water which underlies the main irrigated areas.

Production of rice in irrigated areas is increasingly carried out to meet HH subsistence needs, rather than to produce a surplus for sale, except for highly unpredictable and uncertain sales to Government-funded purchase schemes at highly inflated subsidised prices.

Given the lack of profitability associated with irrigated rice production, there is an important opportunity for TOMAK to identify and promote alternative cropping systems that are able to generate better returns (economic and financial) for Timor-Leste's highly constrained irrigated land resources. As an example, a single crop of low gross margin paddy could be replaced with a crop of partially irrigated maize, followed by a legume and/or a vegetable crop. There is also the possibility of using irrigated areas for the production of forage or grain for feeding to livestock. Overriding all of this, cropping systems that are more efficient in their use of the limited irrigation resource need to be identified and promoted.

Even if these production shifts are achieved, it needs to be recognised that rice is likely to remain an integral part of the cropping mix, even if just to meet consumption requirements for poorer HH, despite the fact that it is neither financially nor economically viable to grow it in Timor-Leste. Irrigated rice cannot therefore be entirely ignored by TOMAK. It needs to be viewed as a likely remaining, but increasingly less significant component of irrigated cropping systems.

Apart from facilitating a shift in irrigated cropping systems to include a greater emphasis on non-paddy crops, another option worthy of investigation, based on the fact that all of Timor-Leste's major irrigation areas are located over water-bearing aquifers, is to use tube-wells and small pumps to increase the timely supply of irrigation water as crops mature and ripen. Although SAPIP is expected to investigate the use of this currently under-utilized groundwater resource, it is recommended that TOMAK do the same in the main irrigation zones in its three target municipalities – noting that there is no over-lap between SAPIP and TOMAK in terms of target areas.

An important resource produced by Timor-Leste's irrigation zone is rice straw which can be used as the basis for a reasonable maintenance ration for ruminant livestock. Current practice is to burn crop residues in an attempt to control weeds and crop diseases. This means that a useful livestock forage is being wasted at a time when the number of large ruminants is fast increasing (see Table 3). Experience from Viet Nam indicates that as rice production increases so does the number (and productivity) of cattle and buffalo<sup>10</sup>.

Finally, once Government decides to restrain expenditure on infrastructure development, there is likely to be greater incentive to maximize food and livestock production from irrigated areas as 'hand-outs' are reduced and market incentives to maximize agricultural production slowly return. Under such a scenario it is not unrealistic to postulate that farmers will become more interested in maximizing financial returns to the two most limiting resources – water and farm labour. This is another reason why TOMAK should focus on cash crops that can be grown either in rotation with rice (such as legumes which utilize residual moisture) and/or new cropping systems that replace rice (such as intensive fodder production for ruminants and feed grain production for pigs and poultry).

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<sup>10</sup> Source: David Young (*pers com*), DFAT's (AusAID's) Quang Ngai Rural Development Project, Central Viet Nam



## 4. Product selection

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During the past five years DPs have completed many reviews and analyses of the wide range of agriculture products grown in Timor-Leste that are considered by sectoral experts to have potential for: (i) domestic consumption; (ii) domestic value-adding followed by domestic consumption; (iii) import replacement; and (possibly) (iv) export. These prior reports form the basis of many of the conclusions in this study.

More recently, and as Timor-Leste's economy continues to be driven by Government spending on infrastructure, and as social transfers and pensions enable rural people to slowly improve their standards of living<sup>11</sup>, there are strong and positive signs that local trade in agriculture commodities is increasing as demand grows, and as transport costs are reduced through improved rural road networks<sup>12</sup>. Interviews with small and larger traders during the course of this study indicated interest in every imaginable agriculture product, with some being realistic and others quite unrealistic – especially when commodities are traded in US\$ and production costs are relatively high. A quick review of market prices in Maliana and Baucau revealed that most agriculture products sold in local markets in Timor-Leste are expensive by regional standards. The long list of agriculture products to be assessed is very long indeed.

Of concern in relation to this situation is the almost blind belief that Timor-Leste can easily increase the production of a wide range of exotic (and difficult to grow) niche products followed by local processing, and domestic or export sales. Many of the traders interviewed as part of this study indicated that they could sell as much of various products as they could buy locally – into either domestic or international markets. However, few of these traders seemed to understand just what is required for farmers to grow sufficient quantities of high-quality produce to enable sizable volumes to be sold on a regular basis in order to maintain market access.

In this regard there are some good lessons from Timor-Leste's coffee industry, which has experienced stagnant exports for many years despite considerable assistance from the United States Department of Agriculture (USDA) and more recently NZAid, channelled through Cooperativa Café Timor (CCT)<sup>13</sup>. It takes years to bring about large and sustainable changes in production levels of any crop – those likely to be targeted by TOMAK will be no different. The danger of over-estimating market sizes by simply scaling-up traders' estimates cannot be ignored.

A sense of reality seems to be missing, perhaps because of the commendable success with a few products such as cloves and pepper, based on limited sales into small and very select markets. However, the reality is that development will be constrained by:

- The fact that Timor-Leste's irrigation systems are not functioning as planned and large areas of paddy land are now grazed by ruminant livestock, rather than being cropped.
- Production and productivity figures are some of the lowest in the world, and to date there has been limited success in increasing these figures on a broad scale despite substantial development efforts (see Section 12 for some details on these trends).
- MAF's extension system remains under-resourced and is not functioning as expected.
- In recent years climate change has had a significant impact, especially in 2015/16.

This scenario means that it is not possible to identify a simple list of agricultural products which, if produced in increased quantities of higher quality product, might enable Timor-Leste's agriculture sector to 'trade its way to prosperity'. Another important point to keep in mind is that Timor-Leste has a very small population with insufficient purchasing power to drive increased local demand – with the exception of some sections of the population in major urban centres.

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<sup>11</sup> The Government recently announced that poverty had fallen from over 50% to about 40%.

<sup>12</sup> See various 'Roads for Development' (R4D) reports for examples of how improved local road access is increasing trade in and out of villages.

<sup>13</sup> Despite considerable support through CCT for more than 10 years, production has not changed significantly - 14,000 Mt in 2006 and only 9,000 Mt in 2012. Source: FAOSTAT.

## 4.1. Selection criteria

Further to the general VC selection criteria outlined in Section 1.2, there is an over-riding factor that needs to be taken into account when deciding which products have the best potential in terms of market access and impact on family incomes. This is farmers' attitude to the risk associated with changes to farming systems that have been entrenched for centuries, and at a time when: (i) Government-supported marketing systems are not functioning as planned (MCIA's product purchasing strategy has not yet convinced farmers to grow more paddy<sup>14</sup>); (ii) farmers are highly conscious of the impact of the recent El Nino events following the partial failure of the 2015/16 rainy season; and (iii) a strengthening US\$ which means that Timor-Leste's potential export products are less competitive in international markets, and imports are cheaper.

The foregoing indicates the need for a phased approach to the introduction of new agricultural products and farming systems. It is therefore recommended that TOMAK start with existing farming systems and firstly increase production of current products, and to then slowly introduce new products once HHs are sufficiently confident to test new markets. This staged process should be based on 'picking the low fruit' first, i.e. using existing and proven technologies to increase production of products which are more traditional and are the foundation of current farming systems. Timor-Leste's agriculture sector is characterized by plenty of 'technology on the shelf', e.g.: (i) improved food crop varieties which can significantly increase yields (from SoL III); (ii) improved grain storage to reduce post-harvest losses<sup>15</sup>; (iii) application of the Food and Agriculture Organization's (FAO) Conservation Agriculture (CA) techniques which reduce labour inputs (mainly for weeding) and increase yields through moisture conservation; and (iv) application of RDP IV's Good Agriculture Practices (GAPs).

There is an overriding need to focus on a few products which have the best potential to increase standards of living for the majority of TOMAK's targeted rural HHs. This issue here is about the scale of impact – there is little merit in focussing on products for which demand will only ever be relatively small and which might only suit a few more progressive farmers in specific locations, rather than on products which have the potential to involve larger numbers of farmers throughout the target area.

It will also be important for TOMAK *not* to target products in specific geographic areas where other development initiatives are already underway (or planned), such as development of horticultural products and vegetables in Bobonaro Municipality, currently being supported by Avansa Agrikultura Project (AVANSA). In this example, it is logical to allow AVANSA to be the early movers and 'take the lead' on horticulture products, and to only target these products for TOMAK's farmers once AVANSA has developed and proven production systems and opened markets. Finding 'clear space' where TOMAK can operate will require ongoing close cooperation and coordination with Timor-Leste's DPs.

At least initially TOMAK has decided to focus on annual and perennial crops and livestock, and to not include agroforestry (for wood production - for sale, and for fuelwood) in the possible list of target products. This decision is reasonable in terms of the need to generate quick-wins, but it will also be important for TOMAK to be engaged with the forthcoming EU- and GIZ-funded Partnership for Sustainable Agroforestry (PSAF). This Program will initially target two of TOMAK's three priority municipalities (Baucau and Viqueque) and therefore it is logical that the two Programs work together on agroforestry production if and once financially viable HH models have been developed.

Finally, it needs to be remembered that some of the more resource-poor rural HHs in TOMAK's target area will not be self-sufficient in staple food production (rice, and/or maize, and roots and tubers). The situation with respect to staple food self-sufficiency will be better understood once TOMAK's baseline survey has been completed. In the event that there are pockets where families are not self-sufficient in staple foods, TOMAK will need to design a separate approach to providing livelihoods improvement support (and support for improved nutrition) for these families. This is because HHs in this situation are not likely to be interested in changing their production mix to engage with emerging markets.

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<sup>14</sup> As reported to TOMAK's MAT in Maliana by MAF, and the private sector, August 2016.

<sup>15</sup> From the Timor Leste Maize Storage Project (TLMSP) which showed that stored maize losses can be reduced from 30% to almost zero by storing maize in air-tight 200 litre fuel drums.



## 4.2. Preliminary long-list of target products

Based on a review of the literature together with consideration of production and market data as presented in later sections of this report, Table 4 presents a matrix of products (shaded red<sup>16</sup>) which might be considered by TOMAK, categorised by (i) the three different farm types in the target area (subsistence, small, and semi-commercial); and (ii) three key output markets (home consumption, domestic (including import replacement), and export). At this stage fruit and vegetables (shaded blue, mainly AVANSA's domain) and coffee (shaded green, supported by CCT and others) have been excluded from consideration.

**Table 3: Longlist of target products by farmer type**

Crops																					
Annual										Perennial											
Farm Type --->		Subsistence			Small			Semi-Commercial			Farm Type --->		Subsistence			Small			Semi-Commercial		
Market a/ --->		HO	DIR	EX	HO	DIR	EX	HO	DIR	EX	Market a/ --->		HO	DIR	EX	HO	DIR	EX	HO	DIR	EX
Paddy (white)											Coconut										
Paddy (red)											Candle nut										
Paddy (black)											Pepper										
Maize - consumption											Cloves										
Maize - livestock feed											Turmeric										
Sweet Corn											Timber b/										
Cassava											Fruit c/										
Sweet potato											Coffee d/										
Mungbean																					
Soybean																					
Peanut																					
Other legumes																					
Ginger																					
Onion																					
Potato																					
Vegetables c/																					
Livestock																					
Ruminant										Non-Ruminant											
Farm Type --->		Subsistence			Small			Semi-Commercial			Farm Type --->		Subsistence			Small			Semi-Commercial		
Market a/ --->		HO	DIR	EX	HO	DIR	EX	HO	DIR	EX	Market a/ --->		HO	DIR	EX	HO	DIR	EX	HO	DIR	EX
Cattle											Pigs										
Sheep/Goats											Chickens										
Buffalo											Fish - aqua										

a/ HO = home consumption, DIR = domestic market and import replacement, EX = export market.

b/ Various species - short-, medium- and long-term; in association with EU/GIZ agroforestry project; fuelwood for HO market.

c/ AVANSA's commercial product focus, not initial TOMAK focus except for nutrition purposes; could become important TOMAK products in the longer-term.

d/ Leave the coffee sector to CCT and other DPs.

Note: this table could be municipality-specific once further planning has been completed.

Before making any final decisions on which products to target, TOMAK will need to conduct further assessments in order to learn more about: (i) what target farmers are currently growing and, how much they are marketing, and where to; and (ii) where are the subsistence, small and commercial farmers geographically located in the target suku. The 2015 census has provided TOMAK with some initial guidance on the former (at district level) but more information will be required before it will be possible to finalise **Table 3** for each of the three target municipalities with any degree of accuracy, and with outcomes that reflect reality in terms of domestic and export market products.

Not surprisingly, there are no 'stand-out' products which have wide-scale potential to grow exports from Timor-Leste – with the notable exceptions of coffee and a range of timber products. However, there are some good opportunities for farmers to increase incomes by growing products which are suitable for domestic and import-replacement markets. These products have been selected on the basis of the criteria and guidelines as outlined in Sections 1.2 and 4.1 – and particularly the need to: (i) have potential for impact at scale across the three target municipalities; and (ii) fit into existing farming systems – especially those practiced by poor and resource-limited farmers. These products were also repeatedly cited by large and small local traders as having good potential to increase farm incomes – noting the warning that it is erroneous to simply scale up these estimates to derive a total demand figure.

Other reasons for the selecting these products include: (i) recognition of products that are already being targeted by other DPs; (ii) a realistic and practical view of what is required for Timor-Leste to increase

<sup>16</sup> Red = TOMAK target products; Blue and green = products being covered by other programs.

agricultural exports, taking into account the strong US\$, the impact of domestic rice subsidies, and a lack of marketing infrastructure; (iii) a broad focus on all three market categories (domestic, import replacement and export); (iv) an attempt to 'pick the low hanging fruit' that are already backed with proven technology (i.e. focus on some early and relatively easy wins such as improved pork production); and (v) acceptance that a lack of reliable data and information means that some decisions are somewhat subjective and could therefore be incorrect.

#### **4.2.1. Subsistence farmers**

This target group of farmers should be assisted with a 'food first' strategy with the objective of ensuring self-sufficiency in the main staple foods – rice and maize (depending on their farming system), cassava, sweet potato, peanuts, vegetables and legumes; plus coconut, timber in the longer-term (initially for fuelwood and then wood for sale as volumes grow), and fruit. Note that at least initially TOMAK will not support fruit and vegetable production and sale as this sector is currently targeted by AVANSA. However, over time and as AVANSA develops new markets for these products, it would be logical for TOMAK to patch into these markets.

The only anticipated support for current extensive livestock production systems could be improved vaccination services; and possibly improved poultry production with a focus on eggs for direct HH consumption.

The strategy for this category of farmers should be to introduce 'tried and tested' ways to increase staple food production, with a primary focus on: (i) improved food crop varieties (from SoL III); (ii) reduced post-harvest losses (from IFAD's Timor-Leste Maize Storage Project (TLMSP)); (iii) wider use of FAO's Conservation Agriculture Program (CAP) farming system for maize production; (iv) a broadening of products grown with the dual objective of addressing malnutrition through TOMAK's Food Security and Nutrition Component; and (v) possibly improved control of Newcastle Disease in free-range poultry. The eventual aim should be to assist these poorer HHs to graduate to the 'small farmer' category (see below).

#### **4.2.2. Small farmers**

Depending on their geographic location within target municipalities and therefore access to local and domestic markets, this category of farmers is expected to focus on the following crops: (i) rice for subsistence needs; (ii) maize, cassava and sweet potato for subsistence and some livestock feeding after value-adding with back-yard processing; (iii) peanuts for consumption and local sale; (iv) introduced legumes (mainly mung and soybean) for consumption and domestic sale; and (v) opportunistic local collection and trading in coconut products and candle nut.

Livestock production opportunities include development of improved semi-intensive production systems (back-yard feeding using surplus food crops and indigenous forages), looking to the domestic and import replacement markets. Pigs are expected to be particularly important targets as surplus quantities of staple foods are grown. Note however the risks associated with unreliable vaccination services from MAF, as well as the difficulty of sourcing a cost-effective ration with particular respect to the protein component of the diet.

#### **4.2.3. Semi-commercial farmers**

The products listed as being suitable for small farmers are expected to be equally relevant for emerging commercial farmers, who are also likely to be interested in additional, more risky products. For example: (i) the emerging opportunities for black and particularly red rice, and sweet corn, should be tested; (ii) maize produced under irrigated conditions could be used for non-ruminant livestock production; (iii) legumes other than soy and mung bean could be introduced; and (iv) depending on soil type and rainfall patterns, small quantities of onions and Irish potato for domestic and import replacement markets. Diversification of irrigated cropping systems away from rice-based farming to systems which produce a wider range of products is likely to be particularly relevant to this group.

A range of commercial tree crop products could be targeted (see RHS of Table 4). Over time it is expected that commercial wood production will also become increasingly important as the new EU/GIZ-funded agroforestry project is implemented (Phase 1 will commence in early 2017). Ginger and turmeric are two

emerging crops which appear to have reasonable domestic and international markets (according to the traders interviewed – but to be confirmed). Intensive livestock production could focus on all three markets as demand increases.

### 4.3. Short-list for further assessment

Based on the above combined with review of data presented in following sections of this report, it is recommended that the products listed below be further assessed as initial target VCs for TOMAK.

#### List of high and medium market potential products

High market potential	Medium market potential
Pigs	Maize (as animal feed)
Cattle	Cassava (as animal feed)
Mung bean	Peanuts
Soybean	Black/red rice
	Potato
	Onions

It should be emphasised that this short-list represents a starting point for TOMAK, not a complete list of all the VCs it will work with. Market assessment and selection of additional VC development targets will be on-going throughout the course of the Program.

## 5. Supplementary comments on some target products

### 5.1. White rice

As previously noted, despite the fact that white rice does not produce attractive financial returns to labour and other inputs (Section 14), domestic production cannot compete with cheap imported rice (Section 12), and total paddy production in Timor-Leste is declining (see Section 6), TOMAK should not ignore this fundamental crop. The reason is that the target area includes large numbers of poor subsistence HHs, at least some of which will be dependent on irrigated rice as their main source of staple food. Maintaining some support for paddy production could be considered as ‘an exception to the rule’ – on the one hand there are no financial or economic reasons why production of this product should be supported by TOMAK, but on the other, there are compelling social and food security reasons why the product should continue to attract attention. Paddy (white rice) has therefore been included in the long-list of potential target products.

### 5.2. Maize

#### 5.2.1. Maize for processing

An emerging opportunity that has been identified by some Timorese businesses is the growing market for processed livestock feeds, especially for intensive pig and poultry production. One Dili-based trader is at an advanced stage of business development. In addition, field work revealed that there is an increasing number of small-scale pig breeding and fattening operations that are using rations based on maize, fish-meal, rice bran – plus locally-available feedstuffs (at least in Baucau where GIZ supported the industry and MAF distributed free pigs). This trend (adding value to surplus maize by processing and then feeding to non-ruminants) is common in countries which succeed in satisfying the demand for staple food – noting in the case of Timor-Leste that this situation has arisen due to rice imports and not increased domestic food production. Demand for pork is high and current market prices are the same as for beef. This scenario indicates a growing market for processed non-ruminant livestock feeds based primarily on maize and grain legumes. This opportunity has been identified by MDF, and TOMAK should work closely with this sister project to assist with the development of this significant commercial opportunity.

### 5.2.2. Maize for processed food products

Timor Global has a contract with the Ministry of Education to supply a fortified product called Timor Boost as part of the school feeding program. In October 2016 there will be a trial with 7,000 students in 12 schools over three months. If results are acceptable (in terms of taste tests, logistics, etc.) the program will possibly be expanded to cover 360,000 students, subject to funding. Timor Boost is about 80% maize, which means Timor Global would require about 4,300 Mt of aflatoxin-free maize each year (see

Table 4). Many projects are expected to focus on helping to supply this potential market. Supplying good quality maize will require careful maize drying and storage to avoid contamination with aflatoxins. The introduction of aflatoxin tests by Timor Global with assistance from MDF is a major advance for Timor-Leste, but the real challenge will be avoiding contamination in the first place.

Timor Global also requires maize for the manufacture of Timor Vita, a fortified supplement distributed to pregnant and lactating mothers and children under five. The World Food Program (WFP) has supported Timor Global to develop and produce this product to date, but funding will cease from June 2017. Ministry of Health (MoH) is considering whether it can provide ongoing support, although nothing has been decided to date. Due to aflatoxin issues, Timor Global has had to use imported maize for manufacturing Timor Vita, rather than locally-sourced product.

**Table 4: Maize required for Timor Global's School Feeding Program**

No. of students	Years 1-3 a/	Years 4-9
360,000	120,000	240,000
kg/day (total)	0.1	0.15
kg/day (maize)	0.08	0.11
days/week	3	3
weeks/year	40	40
Total	1,152	3,162
<b>TOTAL maize (Mt/yr)</b>		<b>4,320</b>

### 5.3. Red and black rice

Some traders have indicated growing domestic and export markets for red and black rice, but as with all 'potential' products it is dangerous to sum estimates of total market size because of the likelihood of double counting. The prices quoted for these products (about \$1.20/kg for black rice and \$1.00/kg for red rice – compare with an import parity price for 25% broken white rice of \$0.67/kg) are attractive, but yields are reported to be very low (less than 1.0 Mt/ha for black paddy because it is a rainfed crop, and about 2.0 Mt/ha for red paddy). TimorOrganic indicated that the business would purchase 100-200 Mt of black rice per year (to begin with) for domestic and export markets. One issue which was not raised but is almost certainly a major problem is that of farmers continuing to use contaminated and impure seed. This means that if TOMAK decides to focus on these two crops, one of the first support initiatives will need to be the sourcing of pure seed of proven improved varieties.

### 5.4. Legume grains

Many traders interviewed during the study reported demand for local soybean, mung bean, peanut, red bean, and other legumes; and many agricultural development projects (including those assisted by Non-Government Organisations (NGOs)) are involved in promoting various legumes to increase farm incomes and HH nutrition. One emerging market which has been targeted by a commercial group of farmers near Same is the use of legumes in the School Feeding Program which has high quality and volume requirements. There are widely varying estimates of the market size for each of these products, and these need to be viewed cautiously because of the risk of 'double counting' and unreliable import figures. However, on balance it seems reasonable to conclude that there are growing domestic markets for a range of legumes; and in terms of TOMAK's objectives, the potential benefit of increased production of legumes in improving HH nutrition should also not be ignored.

The biggest problems with legume production in Timor-Leste are: (i) maintaining supplies of fresh and pure seed; (ii) managing in-crop pests and diseases, and weeds (without the use of herbicides); and (iii) very low yields by world standards<sup>17</sup>. Gross margin models prepared by Oxfam indicate very low returns from soybean and mung bean production and therefore at current levels of production these legume crops are not attractive investments. However, Timor-Leste is reported to be importing 300 Mt of soy and mung bean per annum (based on conservatively scaled-up traders' estimates) valued at about \$1.5 million. This is not a major import replacement market, but could be attractive to legume growers who have access to Dili and the major municipal markets which always stock these products.

Table 16 lists the products exported by Gajah Mada (an Indonesian trading company which has operated in Timor-Leste since the late 1990s), and includes the comment (on legumes) that the company will purchase 'as much as possible' at current offered prices. This suggests that the export market for legumes is strong – but not many farmers in Timor-Leste are prepared to accept the prices offered because of high production costs (especially hired labour) and low crop productivity. In other words, markets do exist for a range of legumes, but farmers are not able to take advantage of these opportunities because of production-related problems and constraints. This is an area which could be targeted by TOMAK (improved supply of production inputs and technical services) for selected groups of farmers who are considered to be more commercial in orientation. A combination of commercial and nutritional approaches to legume production should produce positive outcomes in terms of achieving TOMAK's objectives.

## 5.5. Pepper, ginger and cloves

The two 'niche' products mentioned most frequently by traders and projects/ programs working in the field of agricultural marketing and VC development were pepper and ginger. CCT and other DPs supporting Timor-Leste's coffee industry have been inter-planting coppiced and replanted coffee plantations with pepper (and cloves). Production is beginning to flow onto the domestic market. TimorOrganic is currently processing small quantities of powder ginger and pepper, and some NGOs are also assisting farmers to grow pepper. The current market for export pepper (which is wholesaling for \$18/kg) is estimated to be about 150 Mt per annum by TimorOrganic. There is no information on the potential market size for ginger, which TimorOrganic is currently buying for \$1.75/kg of powder. However, according to TimorOrganic, markets in Singapore and Malaysia are expanding. In summary, TimorOrganic believes that the total market for spices is about 500 Mt per annum, which seems very high.

In addition, as coffee plantation rehabilitation expands with ongoing support from CCT (with additional funding through NZAid) it is expected that the production of cloves will increase. CCT has just exported its first container of cloves to McCormicks and even though it took months to accumulate the product<sup>18</sup>, many traders interviewed as part of this study mentioned cloves as a spice with potential for Timor-Leste. Furthermore, there is already some experience with this crop but at present it is grown as part of the coffee farming system – which is not predominant in TOMAK's target area.

Without having a more detailed and accurate understanding of the altitude zones in TOMAK's target municipalities (maps are under production) it is difficult to determine whether there might be a role for pepper and ginger in mid-altitude irrigated farming systems. Further information on crop requirements in terms of soils, altitude and rainfall are required before these two products can be either added to the list of target products, or dropped.

## 5.6. Cassava and sweet potato

Cassava and sweet potato are staple crops for most rural Timorese. In times of need, and when other crops such as paddy and maize fail or yields are low, cassava becomes the 'fall-back' crop, with families relying on it during the 'hungry season'. Sweet potato tends to be treated as more of a cash crop than cassava and the purple variety is increasing in popularity due to its high vitamin A content. An increasing number of farmers are beginning to feed surplus cassava to pigs, and CCT has a high starch cassava plantation with the

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<sup>17</sup> See various Seeds of Life (SoL) publications on their web-site.

<sup>18</sup> Source: pers. com. Mr. David Boyce, CCT.



objective of stimulating production of this product. In summary, these two crops can be considered as multi-purpose crops – used for home consumption and some animal feeding, and also opportunistic marketing for domestic consumption.

It is noticeable that cassava and sweet potato chips manufactured in Indonesia are readily available in all markets in Timor-Leste. However, it is doubtful if domestic chip production could compete with cheap and voluminous imports and therefore it is not unreasonable to conclude that these two crops are likely to remain in the home consumption and domestic market categories (see Table 2). Markets will vary, depending on local production levels and therefore domestic prices. Therefore both crops could be considered as ‘opportunistic’ – farmers will either consume, sell directly to local markets, or add-value through livestock feeding, according to supply/demand conditions. Nevertheless, it will be important for TOMAK to keep these products on its target list because of this degree of market flexibility and because the products store reasonably well.

## 5.7. Onions and potatoes

Large volumes of relatively low-value onions and potatoes are being imported into Timor-Leste every year. For example, Leader imports around 9 Mt of onions and 12.5 Mt of potatoes per year; and Dili Mart imports over 330 Mt of potatoes per year. Custom’s records (Table 14) show that in 2014 the value of imported vegetables, roots and tubers was \$1.95 million, which seems low when considered against Dili Mart’s imports of potatoes alone which are valued at about \$0.70 million. If it is assumed that Dili Mart has 30% of the domestic potato market, and that the onion market is worth the same as the potato market, the total imported (wholesale) value of these two crops could be about \$4.0 million.

Given that TOMAK is operating in agro-ecological zones which can grow potatoes and onions (provided that good quality and disease-free planting materials are available<sup>19</sup>), imports are consistently large, and the products are increasingly used in western-style cooking, it seems logical that TOMAK should further investigate the technical and financial feasibility of growing potatoes and onions as import replacement products. There are good examples from Eastern Indonesia<sup>20</sup> where enterprising groups of women farmers have captured local markets for these products. There are no apparent reasons why the same could not be achieved in Timor-Leste.

## 5.8. Coconut and candle nut

These two traditional products are already produced for export markets in Timor-Leste, with Gajah Mada being one of the major players. Both products can be considered to be ‘opportunistic’ crops. Farmers tend to collect the raw products when market conditions are good enough, but do not tend to manage trees with the objective of maximizing production and profits i.e they are collected when local traders offer acceptable prices (see Section 11 for more details on candle nut).

In the past, Viqueque reportedly had 17,000 ha of coconuts and a viable copra export industry, but aging trees and very high transport costs have undermined financial viability. There are no gross margin budgets available for this crop<sup>21</sup>, but proponents need to be aware of a resurgence of coconut-related industries throughout the Pacific which can probably compete for international markets more effectively than Timor-Leste. It is therefore suggested that TOMAK treat coconut products as multi-market opportunities (see **Error! Reference source not found.**), and take the approach of assisting local traders to access produce from target farmers – perhaps with some assistance to accumulate product into marketable volumes.

The same applies for candle nut – this small industry has been operating for many years, with volumes exported and prices realised at the whim of world markets, particularly the oil price paid in Hawaii. GIZ assisted with the re-installation of an oil press in Baucau in about 2008. This machinery had been partly operational during the Indonesian occupation. At present, this fledgling industry seems to be going through a resurgence, and a number of traders interviewed during the study mentioned the potential for the export of

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<sup>19</sup> MAF has imported seed potato in the past, but there have been cold storage and disease problems.

<sup>20</sup> See SOLID Project - funded by International Fund for Agriculture Development (IFAD).

<sup>21</sup> MAF released some market information on Timor-Leste’s coconut industry during the period of the ARP programs, but this has not been updated.

candle nut (in nut and oil forms). However, there were no reports of incremental planting, but rather increased opportunistic collection of nuts through local markets.

A positive feature of these two products is that there are traders operating in Timor-Leste who have indicated that they can market increased volumes. And here-in lies the fundamental marketing problem – accumulating sufficient volumes on a regular basis in order to cover high transport and transaction costs. Based on the example of how Gajah Mada procures candle nut in Baucau, appointment of local ‘product accumulators’ could be a solution to this problem. The same could apply for coconut.

## 5.9. Sweet corn

A local product which seems to be increasing in popularity is sweet corn – for grilling and sale as a snack. Several supermarkets report increasing trade in this product. Farmers close to Dili (such as those near Maubara) are now using supplementary irrigation to produce year-round supplies. This product will always remain specialist and subject to over- and under-supply, but there could be opportunities for some farmers in TOMAK’s target area to grow sweet corn for sale in municipal markets. This product was available in the main Maliana and Baucau markets in August 2016, and is sold in the grilled fish and corn markets along the seaside in Dili.

## 5.10. Pigs

There is already some experience with small-scale pig production in Timor-Leste through: (i) the GIZ-funded Pig Production and Labour Employment Project (just completed), which did not rate highly when reviewed; (ii) the MAF-funded CDCA livestock distribution program through the former National Directorate of Extension; (iii) MAF’s (Livestock Division) Pig Production Project<sup>22</sup>; and (iv) various NGO-funded livestock distribution projects<sup>23</sup>. Some valuable lessons have been learned but are not well recorded, including: (i) buying pig food (maize, rice bran and fish meal) is expensive and most farmers prefer to use home-grown feeds; (ii) little use has been made of pig manure for intensive crop production; (iii) the importance of reliable supplies of water for stock has not been recognized; (iv) veterinary services (for vaccination against swine fever and swine cholera) are essential – but are not functioning at all well<sup>24</sup>; and (v) the standard of animal husbandry (feeding, watering, pen cleaning, weaning, etc.) is very low on some of the MAF-supported pig production projects. These lessons need to be collated by TOMAK and used as the basis for a pig production manual, if it is not possible to adapt the one prepared by GIZ. The major gap at the moment is the lack of reliable information on which to base pig gross margin models (fattening and breeding)<sup>25</sup>. The notes on pig production in Appendix 1 provide a starting point for this process.

The importance of improved vaccination services for pigs (and cattle – see below) cannot be over-emphasized. TOMAK will lose credibility if pig-raising households are assisted but are then devastated by disease epidemics. Provision of vaccination services will require close cooperation with MAF’s National Directorate of Livestock and Veterinary Services. Initial meetings on this topic were held with the Director General during this study. Improved animal health services should be the next step before commencing work on pig VCs, noting that it is MAF’s stated position that vaccination for all types of livestock will be free-of-charge until the end of 2020 (when the current Timor-Leste Strategic Development Plan (TLSDP) finishes).

There appear to be few short-term problems with marketing increased pork production as pork (and beef) are currently selling in local markets for about \$7/kg of meat<sup>26</sup>. Young weaner pigs are worth \$150 each and are often pre-sold. Heavy pigs (for ceremonial purposes) are worth well over \$500 each, with reports of some very heavy pigs realizing \$1,000 per head. Over time and as beef consumption increases and therefore beef prices rise in the face of shortages, it is expected that pork consumption will also rise (as was the case throughout

<sup>22</sup> See Appendices for notes on pig production projects that were visited during the study.

<sup>23</sup> Such as Catholic Relief Services (CRS) in Baucau - pigs and cattle in eight suku in Venelale, two in Baucau and two in Vermase.

<sup>24</sup> For example, Baucau Municipality has 42,300 pigs; and in August 2016 the Livestock Department had 400 vials of vaccine available. Interviewed pig farmers were very concerned about an outbreak of swine fever as temperatures increase.

<sup>25</sup> Neither MAF nor GIZ have any models.

<sup>26</sup> In many countries, pork is usually 50% of beef prices.

China as incomes increased). A very brief review of pig markets confirmed an almost insatiable demand for pork, which makes increased pig production highly attractive for small farmers. However, there are no gross margin budgets available for pig breeding or fattening in Timor-Leste. TOMAK will need to prepare such budgets as the cost of maize and protein supplements in fattening rations could make pig fattening enterprises less attractive than pig breeding. This exercise will then enable recommendations on which production model to use to be tailored to local situations, particularly in terms of the availability of surplus grains and protein supplements.

## 5.11. Cattle

There is now some experience with smallholder cattle production systems in Timor-Leste (mainly through the Australian Centre for International Agriculture Research (ACIAR) funded adaptive research projects on cattle feeding and management<sup>27</sup>, but to-date this has not been written up as a simple production manual. The assessment is that models for small-holder pig production are more advanced than for cattle production – notwithstanding the excellent ACIAR publication entitled '*Markets and Policy*' component of ACIAR Project LPS-2009-036 '*Enhancing smallholder beef production in East Timor*' (2012-15). This means that TOMAK will need to extract the relevant findings from this (and other ACIAR beef cattle reports from Nusa Tenggara Timor (NTT) and Eastern Indonesia) and formulate their own 'best-bet' production manuals<sup>28</sup>. This work should include fast-tracking of some of the more obvious technical options.

One somewhat surprising finding during the study was a report from MAF in Maliana that it is attempting to set the price for live cattle – and not allowing market forces to equate the supply of and demand for beef. As an example, during July 2016 the price of cattle in Maliana was set at about \$750 per animal, which is equivalent to \$2.70/kg liveweight for a 280 kg liveweight animal. TOMAK needs to make more enquiries into this situation.

The ACIAR report referred to above contains valuable information on cattle marketing and beef production. A summary is presented in the box below, with the most notable conclusion being that the annual turnoff of cattle is estimated by ACIAR to be nearly double the official figure.

Official (census) statistics record an annual turnoff of about 12,000 cattle, but calculations in this Report suggest a turnoff of about 21,000 in 2013 and 2014 (similar numbers in both years). Cattle marketing systems have emerged to service the ceremonial market (5,000 cattle), slaughtermen in the 13 districts (5,000), slaughtermen in Dili (5,000), and other higher value markets in Dili (1,000 animals to the Tibar abattoir, butchers, and CCT for Dili ceremonies). Also in this higher value market, in 2014 Timor-Leste imported 160 tonnes of beef for the Dili supermarket and restaurant trade (equivalent of approximately 1,000 cattle), while another 5,000 cattle are traded live across the border to Indonesia (although trade was disrupted from 2014 to present). Based on these figures, bovine consumption levels are low at 2kg per person per year (1.66kg beef and 0.30kg carabeef) but perhaps double this in Dili. Previous, widely-used consumption figures are highly overstated. Consumption could be expected to increase with population growth and urbanisation, which bodes well for the industry.

<sup>27</sup> Noting that this work was conducted on research stations and not directly with cattle owners.

<sup>28</sup> In addition, there are valuable lessons from Viet Nam where the numbers of ruminant livestock have increased as paddy rice production increased - by using rice straw and tree legumes as the basis of an improved ration.



## 6. Total staple food production<sup>29</sup>

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### 6.1. Paddy

#### 6.1.1. National production

Rice (paddy) remains one of the two most important staple food crops in Timor-Leste, although some experts are of the opinion that in some years (such as the 2015/16 El Nino year) roots and tubers (e.g. sweet potato and cassava) are just as important. The problem is that whilst there are some 'guesstimates'<sup>30</sup> of paddy and maize production (based in the past on FAO-supported crop cutting surveys under-taken by MAF) there are no reliable figures on the annual production of roots and tubers<sup>31</sup>.

Table 6 details how paddy production and productivity have declined over the past five years – recognizing the impact of the 2015/16 El Nino event. Nevertheless, even prior to the very dry wet season in 2015/16 there was a significant downward trend in: (i) the area planted to paddy (ha); (ii) gross production (Mt) (before allowances for post-harvest losses and seed retention); (iii) the area planted per HH (ha/hh); and (iv) production per HH (Mt /hh).

There are explanations for these trends, and Section 3 contains a summary of why Timor-Leste's paddy production is declining. These topics are beyond TOMAK's remit but readers need to be aware of what is happening in this important sub-sector, if for no reason other than it remains a key focus of Government's agriculture sector investment programming.

#### 6.1.2. Production in TOMAK's target Municipalities

Paddy production in TOMAK's three target municipalities has also declined in the same proportion as national paddy production – with the areas planted (ha), gross production (Mt), ha planted/HH, and production/HH all declining over the period 2012 to 2016 (Table 7). These dramatic and concerning declines are easier to follow when presented in graph form, as shown in Figures 3 and 4. Declines in paddy production of these levels should be sending strong messages to food policy makers that Timor-Leste's irrigated rice sector is not functioning as planned. As previously noted, this is an area where TOMAK could possibly be engaging with Government at the national policy level.

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<sup>29</sup> Sections 6-12 collate data drawn from various sources on key aspects such as total production, domestic market size, imports, exports etc for some of the products considered in the course of this study. Data for some products is simply not available.

<sup>30</sup> See highlighted cells in the following four tables - figures in red font are probably reporting errors.

<sup>31</sup> This is an "untenable" situation and one which places Timor-Leste in a very risky situation - no one really knows how much food is available in-country at any given time.

**Table 5: Paddy production in Timor-Leste (Ha, Mt, Ha/HH and Mt/HH)**

**Paddy Production Figures by Municipality**

Municipality	Total hhs a/	Paddy hhs	% Paddy hhs	Area (ha) planted					Gross Production (Mt) c/				
				2012	2013	2014	2015	2016 b/	2012	2013	2014	2015	2016 d/
Aileu	7,598	2,586	34.0%	456	630	561	398	398	1,140	2,584	1,655	1,238	1,046
Ainaro	10,601	2,734	25.8%	1,948	504	419	150	150	9,545	1,530	1,291	737	457
Baucau	22,976	12,606	54.9%	11,318	10,833	9,782	8,112	8,112	40,745	33,798	32,378	26,364	21,761
Bobonaro	17,635	8,527	48.4%	4,411	3,185	2,920	2,516	2,409	14,556	11,163	8,935	8,881	6,927
Covalima	12,564	4,099	32.6%	4,771	3,826	4,332	970	970	14,313	10,139	12,130	3,395	2,284
Dili	42,485	3,013	7.1%	80	88	80	30	30	264	264	274	116	85
Ermera	20,671	4,659	22.5%	1,420	1,928	1,905	833	833	4,544	6,055	6,248	2,924	2,341
Lautem	12,050	3,487	28.9%	1,972	977	906	680	370	7,099	2,559	3,434	2,530	1,070
Liquica	11,885	1,734	14.6%	399	275	250	254	254	1,277	1,001	760	823	677
Manatuto	7,467	3,026	40.5%	3,858	1,548	1,427	1,302	1,302	13,503	4,875	6,065	5,273	3,891
Manufahi	9,023	2,661	29.5%	1,152	727	224	122	800	3,802	1,853	571	326	1,723
Oecusse e/	14,345	13,294	92.7%	3,315	455	2,453	2,450	2,450	10,277	729	4,366	5,635	4,790
Viqueque	15,297	9,115	59.6%	6,787	3,741	3,255	2,976	3,825	22,397	11,710	10,839	8,273	10,430
<b>Total</b>	<b>204,597</b>	<b>71,541</b>	<b>35.0%</b>	<b>41,887</b>	<b>28,717</b>	<b>28,514</b>	<b>20,793</b>	<b>21,903</b>	<b>#####</b>	<b>88,260</b>	<b>88,947</b>	<b>66,514</b>	<b>57,482</b>

a/ From 2015 National Census - preliminary figures only

Figures in **red font and yellow highlighting** = apparent error in figure report

b/ Based on estimates included in FSBTL, Issue No. 14 Jan-Mar 2016.

Figures in **blue font** are FAO and TOMAK estimates.

c/ Before allowance for retained seed and post-harvest losses.

d/ based on 85% of 2011 - 2015 yield averages, to reflect impact of 2015/16 El Nino.

e/ Now that Oecusse is an autonomous zone, it does not report crop production figures.

**Paddy Production Figures by Municipality**

Municipality	Total hhs a/	Paddy hhs	% Paddy hhs	Ha planted per hh c/					Mt per hh c/				
				2012	2013	2014	2015	2016 d/	2012	2013	2014	2015	2016 d/
Aileu	7,598	2,586	34.0%	0.18	0.24	0.22	0.15	0.15	0.44	1.00	0.64	0.48	0.40
Ainaro	10,601	2,734	25.8%	0.71	0.18	0.15	0.05	0.05	3.49	0.56	0.47	0.27	0.17
Baucau	22,976	12,606	54.9%	0.90	0.86	0.78	0.64	0.64	3.23	2.68	2.57	2.09	1.73
Bobonaro	17,635	8,527	48.4%	0.52	0.37	0.34	0.30	0.28	1.71	1.31	1.05	1.04	0.81
Covalima	12,564	4,099	32.6%	1.16	0.93	1.06	0.24	0.24	3.49	2.47	2.96	0.83	0.56
Dili	42,485	3,013	7.1%	0.03	0.03	0.03	0.01	0.01	0.09	0.09	0.09	0.04	0.03
Ermera	20,671	4,659	22.5%	0.30	0.41	0.41	0.18	0.18	0.98	1.30	1.34	0.63	0.50
Lautem	12,050	3,487	28.9%	0.57	0.28	0.26	0.20	0.11	2.04	0.73	0.98	0.73	0.31
Liquica	11,885	1,734	14.6%	0.23	0.16	0.14	0.15	0.15	0.74	0.58	0.44	0.47	0.39
Manatuto	7,467	3,026	40.5%	1.27	0.51	0.47	0.43	0.43	4.46	1.61	2.00	1.74	1.29
Manufahi	9,023	2,661	29.5%	0.43	0.27	0.08	0.05	0.30	1.43	0.70	0.21	0.12	0.65
Oecusse e/	14,345	13,294	92.7%	0.25	0.03	0.18	0.18	0.18	0.77	0.05	0.33	0.42	0.36
Viqueque	15,297	9,115	59.6%	0.74	0.41	0.36	0.33	0.42	2.46	1.28	1.19	0.91	1.14
<b>Total</b>	<b>204,597</b>	<b>71,541</b>	<b>35.0%</b>	<b>0.59</b>	<b>0.40</b>	<b>0.40</b>	<b>0.29</b>	<b>0.31</b>	<b>2.01</b>	<b>1.23</b>	<b>1.24</b>	<b>0.93</b>	<b>0.80</b>

a/ From 2015 National Census - preliminary figures only

b/ Based on estimates included in FSBTL, Issue No. 14 Jan-Mar 2016.

c/ Before allowance for retained seed and post-harvest losses.

d/ based on 85% of 2011 - 2015 yield averages, to reflect impact of 2015/16 El Nino.

**Table 6: Paddy production in TOMAK's target Municipalities - (Ha, Mt, Ha/HH and Mt/HH)**

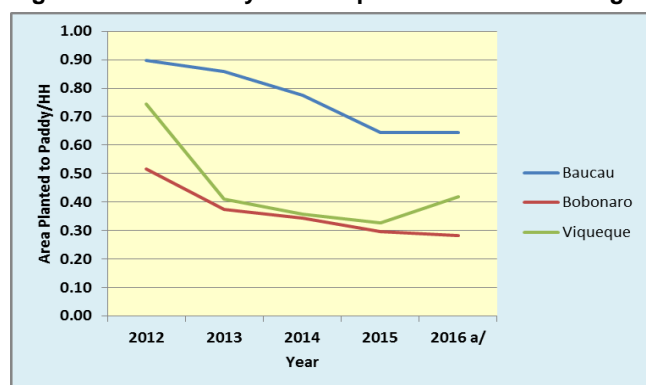
TOMAK Municipality	Total hhs a/	Paddy hhs	% Paddy	Area (ha) planted					Gross Production (Mt) c/				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Baucau	22,976	12,606	54.9%	11,318	10,833	9,782	8,112	8,112	40,745	33,798	32,378	26,364	21,761
Bobonaro	17,635	8,527	48.4%	4,411	3,185	2,920	2,516	2,409	14,556	11,163	8,935	8,881	6,927
Viqueque	15,297	9,115	59.6%	6,787	3,741	3,255	2,976	3,825	22,397	11,710	10,839	8,273	10,430
<b>Total</b>	<b>55,908</b>	<b>30,248</b>	<b>54.1%</b>	<b>24,528</b>	<b>19,772</b>	<b>17,971</b>	<b>15,619</b>	<b>14,346</b>	<b>79,710</b>	<b>58,684</b>	<b>54,167</b>	<b>45,534</b>	<b>39,118</b>

a/ From 2015 National Census - preliminary figures only

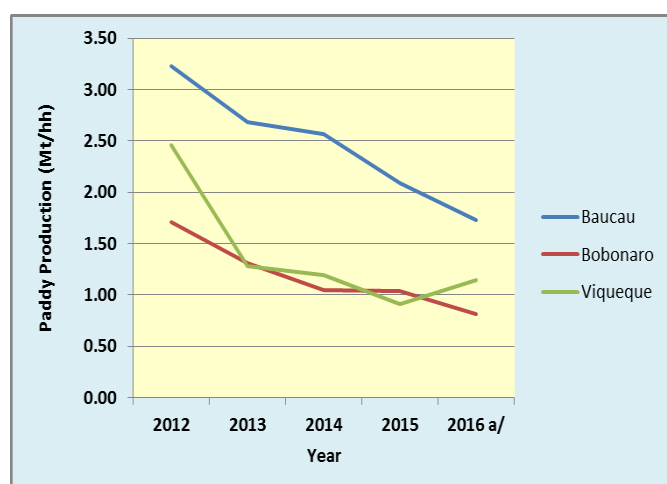
TOMAK Municipality	Total hhs a/	Paddy hhs	% Paddy	Ha planted per hh					Mt per hh				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Baucau	22,976	12,606	54.9%	0.90	0.86	0.78	0.64	0.64	3.23	2.68	2.57	2.09	1.73
Bobonaro	17,635	8,527	48.4%	0.52	0.37	0.34	0.30	0.28	1.71	1.31	1.05	1.04	0.81
Viqueque	15,297	9,115	59.6%	0.74	0.41	0.36	0.33	0.42	2.46	1.28	1.19	0.91	1.14
<b>Total</b>	<b>55,908</b>	<b>30,248</b>	<b>54.1%</b>	<b>0.81</b>	<b>0.65</b>	<b>0.59</b>	<b>0.52</b>	<b>0.47</b>	<b>2.64</b>	<b>1.94</b>	<b>1.79</b>	<b>1.51</b>	<b>1.29</b>

a/ From 2015 National Census - preliminary figures only

**Figure 1: Ha of Paddy Planted per HH - TOMAK's Target Municipalities**



**Figure 2: Production of paddy (Mt/HH) - TOMAK's target Municipalities**



## 6.2. Maize production

### 6.2.1. National production

Maize production in Timor-Leste has also declined from about 95,000 Mt in 2012 and 103,000 Mt in 2013, to only about 39,000 Mt in 2016 – with the latter figure being strongly influenced by the 2015/16 El Nino event, particularly along the north coast (Table 8). Nevertheless there is a strong downward trend in total maize production as staple food consumption patterns change away from the traditional maize-based diet to one based more on rice. This trend has probably impacted on the nutritional status of the population, and importantly means that if maize production is to continue, other uses of the staple will need to be identified and promoted. In this regard the most obvious alternative use for maize is as a non-ruminant livestock feed<sup>32</sup>.

**Table 7: Maize Production in Timor-Leste (Ha, Mt, Ha/HH and Mt/HH)**

**Maize Production Figures**

Municipality	Total hhs a/	Maize hhs	% Maize hhs	Area (ha) planted					Gross Production (Mt) c/				
				2012	2013	2014	2015	2016 b/	2012	2013	2014	2015 d/	2016 e/
Aileu	7,598	7,039	92.6%	3,651	1,410	1,655	1,617	1,617	8,397	2,665	3,525	2,426	1,889
Ainaro	10,601	9,476	89.4%	4,058	1,185	647	332	332	8,116	2,874	1,398	531	502
Baucau	22,976	17,904	77.9%	2,483	2,547	2,237	2,422	2,422	6,207	6,723	7,583	3,391	3,710
Bobonaro	17,635	15,128	85.8%	4,179	1,795	2,987	2,489	2,489	10,448	3,052	6,750	5,725	3,572
Covalima	12,564	10,335	82.3%	5,043	4,782	6,352	6,138	6,138	9,077	9,516	8,385	16,573	7,657
Dili	42,485	7,999	18.8%	2,061	1,672	1,008	1,000	215	3,092	6,538	2,328	2,100	355
Ermera	20,671	17,271	83.6%	632	4,463	1,813	1,895	1,895	632	6,337	5,185	3,222	2,077
Lautem	12,050	10,196	84.6%	4,163	8,725	992	4,283	4,283	4,996	30,625	3,819	11,136	8,758
Líquica	11,885	9,652	81.2%	4,992	2,747	1,876	1,985	1,985	12,978	8,405	4,878	6,948	3,846
Manatuto	7,467	4,607	61.7%	1,051	996	1,119	1,021	1,021	2,732	3,514	3,760	1,940	1,777
Manufahi	9,023	8,018	88.9%	729	1,323	1,336	1,099	1,099	1,677	3,864	5,050	2,638	1,988
Oecusse f/	14,345	13,393	93.4%	8,216	9,345	7,761	8,441	1,093	18,075	13,923	21,110	12,662	1,217
Viqueque	15,297	11,343	74.2%	3,940	1,831	1,677	1,093	984	8,274	5,127	4,880	2,708	1,633
<b>Total</b>	<b>204,597</b>	<b>142,361</b>	<b>69.6%</b>	<b>45,197</b>	<b>42,820</b>	<b>31,460</b>	<b>33,815</b>	<b>25,573</b>	<b>94,700</b>	<b>103,163</b>	<b>78,651</b>	<b>71,997</b>	<b>38,983</b>

a/ From 2015 National Census - preliminary figures only

Figures in **red font and yellow highlighting** = apparent error.

b/ Based on estimates included in FSBTL, Issue No. 14 Jan-Mar 2016. Figures in **blue font** are FAO and TOMAK estimates.

c/ Before allowance for retained seed and post-harvest losses.

d/ Production estimates for Oecusse and Viqueque based on historical averages

e/ based on 67% of 2011 - 2015 yield averages, to reflect impact of 2015/16 El Nino.

f/ Now that Oecusse is an autonomous zone, it does not report crop production figures.

<sup>32</sup> Noting too the possible increase use of maize in the school feeding program using maize-based fortified biscuits.

#### Maize Production Figures

Municipality	Total hhs a/	Maize hhs	% Maize hhs	Ha planted per hh					Mt per hh				
				2012	2013	2014	2015	2016 a/	2012	2013	2014	2015	2016 a/
Aileu	7,598	7,039	92.6%	0.52	0.20	0.24	0.23	0.23	1.19	0.38	0.50	0.34	0.27
Ainaro	10,601	9,476	89.4%	0.43	0.13	0.07	0.04	0.04	0.86	0.30	0.15	0.06	0.05
Baucau	22,976	17,904	77.9%	0.14	0.14	0.12	0.14	0.14	0.35	0.38	0.42	0.19	0.21
Bobonaro	17,635	15,128	85.8%	0.28	0.12	0.20	0.16	0.16	0.69	0.20	0.45	0.38	0.24
Covalima	12,564	10,335	82.3%	0.49	0.46	0.61	0.59	0.59	0.88	0.92	0.81	1.60	0.74
Dili	42,485	7,999	18.8%	0.26	0.21	0.13	0.13	0.03	0.39	0.82	0.29	0.26	0.04
Ermera	20,671	17,271	83.6%	0.04	0.26	0.10	0.11	0.11	0.04	0.37	0.30	0.19	0.12
Lautem	12,050	10,196	84.6%	0.41	0.86	0.10	0.42	0.42	0.49	3.00	0.37	1.09	0.86
Liquica	11,885	9,652	81.2%	0.52	0.28	0.19	0.21	0.21	1.34	0.87	0.51	0.72	0.40
Manatuto	7,467	4,607	61.7%	0.23	0.22	0.24	0.22	0.22	0.59	0.76	0.82	0.42	0.39
Manufahi	9,023	8,018	88.9%	0.09	0.17	0.17	0.14	0.14	0.21	0.48	0.63	0.33	0.25
Oecusse f/	14,345	13,393	93.4%	0.61	0.70	0.58	0.63	0.08	1.35	1.04	1.58	0.95	0.09
Viqueque	15,297	11,343	74.2%	0.35	0.16	0.15	0.10	0.09	0.73	0.45	0.43	0.24	0.14
<b>Total</b>	<b>204,597</b>	<b>142,361</b>	<b>69.6%</b>	<b>0.32</b>	<b>0.30</b>	<b>0.22</b>	<b>0.24</b>	<b>0.18</b>	<b>0.67</b>	<b>0.72</b>	<b>0.55</b>	<b>0.51</b>	<b>0.27</b>

a/ From 2015 National Census - preliminary figures only

b/ Based on estimates included in FSBTL, Issue No. 14 Jan-Mar 2016.

c/ Before allowance for retained seed and post-harvest losses.

d/ Production estimates for Oecusse and Viqueque based on historical averages

e/ based on 67% of 2011 - 2015 yield averages, to reflect impact of 2015/16 El Nino.

f/ Now that Oecusse is an autonomous zone, it does not report crop production figures.

#### 6.2.2. Production in TOMAK's target Municipalities

Maize production in TOMAK's three target municipalities has also declined – as shown in Table 9, and Figures 5 and 6.

**Table 8: Maize production in TOMAK's target Municipalities - (Ha, Mt, Ha/HH and Mt/HH)**

#### Maize Production Figures

TOMAK Municipality	Total hhs a/	Maize hhs	% Maize hhs	Area (ha) planted					Gross Production (Mt) c/				
				2012	2013	2014	2015	2016 b/	2012	2013	2014	2015	2016 d/
Baucau	22,976	17,904	77.9%	2,483	2,547	2,237	2,422	2,422	6,207	6,723	7,583	3,391	3,710
Bobonaro	17,635	15,128	85.8%	4,179	1,795	2,987	2,489	2,489	10,448	3,052	6,750	5,725	3,572
Viqueque	15,297	11,343	74.2%	3,940	1,831	1,677	1,093	984	8,274	5,127	4,880	2,708	1,633
<b>Total</b>	<b>55,908</b>	<b>44,375</b>	<b>79.4%</b>	<b>12,614</b>	<b>8,186</b>	<b>8,915</b>	<b>8,019</b>	<b>5,895</b>	<b>26,940</b>	<b>16,914</b>	<b>21,227</b>	<b>13,839</b>	<b>8,915</b>

a/ From 2015 National Census - preliminary figures (Figures in red font and yellow highlighting = apparent error).

#### Maize Production Figures

TOMAK Municipality	Total hhs a/	Maize hhs	% Maize hhs	Ha planted per hh					Mt per hh				
				2012	2013	2014	2015	2016	2012	2013	2014	2015	2016
Baucau	22,976	17,904	77.9%	0.14	0.14	0.12	0.14	0.14	0.35	0.38	0.42	0.19	0.21
Bobonaro	17,635	15,128	85.8%	0.28	0.12	0.20	0.16	0.16	0.69	0.20	0.45	0.38	0.24
Viqueque	15,297	11,343	74.2%	0.35	0.16	0.15	0.10	0.09	0.73	0.45	0.43	0.24	0.14
<b>Total</b>	<b>55,908</b>	<b>44,375</b>	<b>79.4%</b>	<b>0.28</b>	<b>0.18</b>	<b>0.20</b>	<b>0.18</b>	<b>0.13</b>	<b>0.61</b>	<b>0.38</b>	<b>0.48</b>	<b>0.31</b>	<b>0.20</b>

a/ From 2015 National Census - preliminary figures only

Figure 3: Ha of maize planted per HH - TOMAK's target Municipalities

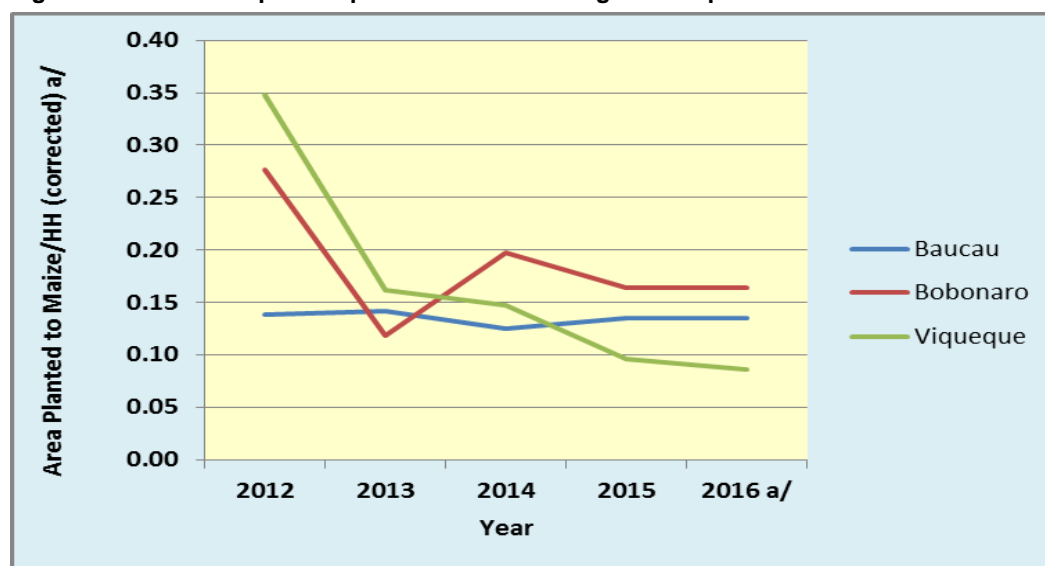
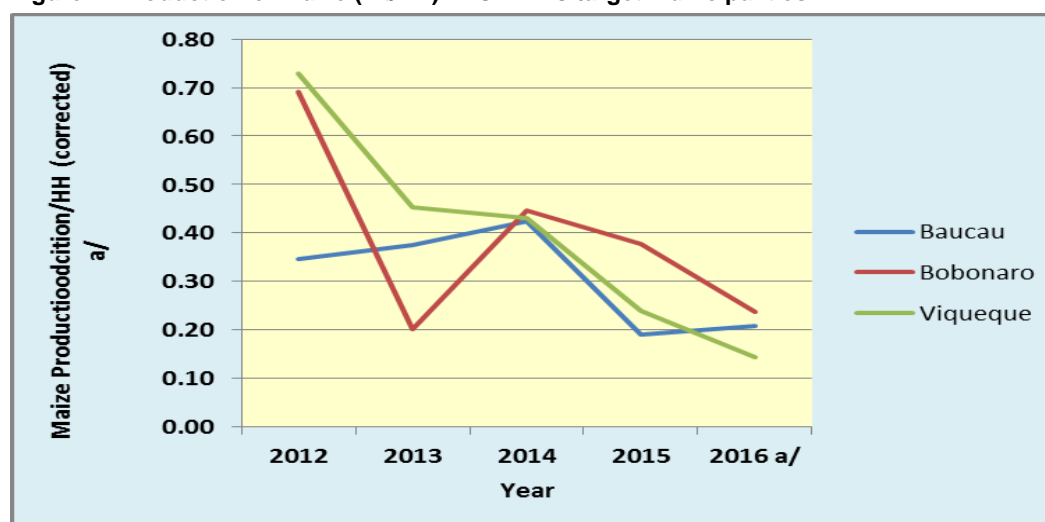


Figure 4: Production of maize (Mt/HH) - TOMAK's target Municipalities



## 6.3. Other food crop production in TOMAK's Target Municipalities

MAF does not publish production figures for non-grain foods, although the MAF Strategic Development Plan contains estimates for 2013. In addition, MDF has collated production figures for the non-grain crops. These and MAF's estimates are shown in Table 10. In summary, the main non-grain crops are cassava and sweet potato with small tonnages of Irish potato, soybean, peanut, mung bean, green gram; and larger volumes of fruit and vegetables.

**Table 9: Total market for fresh food in Timor-Leste – estimate**

Source/Product -->	Cassava	Sweet Pot.	Potato	Soybean	Peanut	Mung	Gr Gram	Vegies	Fruit	Meat c/	Total d/	Total e/
<b>MDF (Mt) Current Prod'n a/</b>	37,000	12,000	2,000	2,000	4,300	2,200	1,200	15,500	14,000	15,000	<b>105,200</b>	<b>56,200</b>
<b>MAF (Mt) Current Prod'n b/</b>	30,700	9,300	1,500	1,100	3,100	1,800	1,200	6,540	14,000	15,000	<b>84,240</b>	<b>44,240</b>
<b>Average (fresh food)</b>											<b>50,220</b>	
<b>Deficit (Mt) - Dili f/</b>											<b>35,000</b>	
<b>Deficit (MT) non-Dili g/</b>											<b>115,000</b>	
<b>Total Deficit (Mt)</b>											<b>150,000</b>	
<b>Total Market (Mt) h/</b>											<b>200,220</b>	

a/ From MDF Sector Assessment Strategy (July, 2013) - various production tables.

b/ From MAF's Strategic Development Plan, Table 4 (2013)

c/ Source: FAOSTAT (2013) inflated to 2016 estimates and adjusted to reflect ACIAR's 2015 beef production estimates.

d/ Based on other source estimates if numbers are not available.

e/ Total of fresh fruit, vegetables and meat, as defined as Fresh Foods by MDF, excludes cassava and sweet potato.

Nos in blue font are missing and therefore have been assumed to be the same as nos available.

f/ See Figure 7 for source.

g/ See Figure 8 for source.

h/ The size of the total market for Fresh Foods is the current deficit (150,000 Mt) plus current production (50,000 Mt) = about 200,000 Mt.

## 7. Proportion of production marketed

MAF does not collect figures on the proportion of food and livestock production which is marketed, but a publication by Monash University<sup>33</sup> is informative. Table 11 shows that relatively little of the core staples (maize, rice, cassava and sweet potato) enters formal markets – 7%, 7%, 12%, and 9%, of total production, respectively. However, other crops such as vegetables, peanuts, fruit and mung bean are more actively traded – see red font in Table 11.

Despite these small figures it is apparent that small volumes of many types of agricultural products are being traded across all of Timor-Leste (usually in in 4 Mt trucks). The largest of these is obviously rice (most of which is imported) but observations and meetings during the study confirmed that the volume of some goods being traded is increasing. For example, irrigated areas close to Dili order small trucks to collect fresh vegetables late at night for delivery the next morning.

**Table 10: Proportion of food production sold by Timor-Leste's farmers**

Crop -->	Maize	Cassava	Pumpkin	Banana	S Potato	Taro	Vegies	Coconut
% of harvest sold -->	7%	12%	15%	33%	9%	8%	57%	7%
Crop -->	Peanut	Rice	Fruit	Kidney Bean	Soy Bean	Mung Bean	Potato	Coffee
% of harvest sold -->	33%	7%	60%	46%	27%	36%	11%	83%

Source: Monash University Report on Poverty and Agriculture (2014)

## 8. Seasonal supply profiles and price trends

### 8.1. Supply profiles

There is no 'hard' information available on seasonal supply profiles for Timor-Leste's main agriculture products. However, it is well known that some commodities are in relative short supply at certain times of the year, for example: (i) fresh vegetables especially at the end of the wet season; (ii) maize in the 'hungry season' (when prices increase by about 50%<sup>34</sup>); (iii) fruits which are out of season (e.g. citrus, mango, avocado, etc.); and (iv) local pigs and poultry after waves of diseases kill large numbers of animals. These shortages are covered by increased imports at prices which are a disincentive for producers to supply product

<sup>33</sup> 'Poverty and the Agriculture Household in Timor-Leste: Some Patterns and Puzzles', Inder, Brown and Datt, 2014.

<sup>34</sup> As reported by the IFAD-funded Timor-Leste Maize Storage Project (TLMSP), see TLMSP PCR (2015).

out-of-season. The one product which is in constant supply year-round is imported (and sometimes subsidized) rice.

Another aspect of the food supply scenario in Timor-Leste is the obvious over-supply of some commodities (particularly green vegetables) during certain times of the year – to the extent that large volumes are wasted or fed to pigs. For example, a bucket of tomatoes can be worth from \$10 to \$2, and cabbages from \$2 to \$0.50. There is no coordinated production planning for the more perishable food products. Use of electronic media to inform farmers of production and price trends would assist in this regard.

## 8.2. Price trends

MAF's Agribusiness National Directorate supposedly collects weekly market price information in the main markets in Dili, and the municipal centres. This information is meant to be collated centrally in Dili but the team was informed that (at least for Maliana) this data is held by individual MAF officers and not sent to Dili. It is recommended that TOMAK engage with MAF's Agribusiness National Directorate with the objective of accessing this important information on a regular basis. One of the most important uses of this price trend data is that it can/could indicate emerging market opportunities for TOMAK's target farmers. In the meantime, Tables 12 and 13 are examples of some of the commodity price information collected by MAF on a weekly basis – at least from the Maliana market in July 2016. The figures in red font are for commodities which might be targeted by TOMAK after completing further VC assessment.

**Table 11: Example of price information collected by MAF for crops, livestock, fisheries and forestry products**

Commodity	Price/kg		
	Weight (kg)	Price (\$)	\$/kg
Local rice	1.00	0.60	<b>0.60</b>
Imported rice Globus	30.00	16.00	0.53
Imported rice Globus	25.00	13.00	0.52
Maize	1.00	0.35	<b>0.35</b>
Peanuts (without skin)	1.00	1.50	<b>1.50</b>
Soy bean	1.00	1.50	<b>1.50</b>
Mung bean	1.00	1.50	<b>1.50</b>
Red bean	1.00	2.25	<b>2.25</b>
Rice husk	37.00	10.00	0.27
Taro	1.16	1.00	<b>0.86</b>
Sweet potato	1.25	1.00	<b>0.80</b>
Cassava	2.38	1.00	<b>0.42</b>
Coffee	1.00	1.50	1.50
Areca nut	0.80	3.00	3.75
Bettle vine	0.24	0.75	3.13
Local chicken	0.50	10.00	<b>20.00</b>
Local Egg	1.00	0.25	0.25
Beef	1.00	7.00	<b>7.00</b>
Pork	0.35	3.00	<b>8.57</b>
Imported Chicken	0.80	3.50	4.38
Fresh fish	0.30	2.00	<b>6.67</b>
Dried fish (small)	1.00	4.00	4.00
Local salt	1.00	0.75	0.75
Honey	0.60	5.00	8.33
Firewood	1 gerobak	8.00	0.50

Note: **red font** indicates TOMAK target products.

Source: Maliana market, 16th July, 2016.



**Table 12: Example of price information collected by MAF vegetables**

Commodity	Weight (kg)	Price (\$)	\$/kg
Carrot (small)	0.32	0.50	1.54
Carrot (big)	0.69	1.00	1.46
Potato (small)	0.35	1.00	<b>2.87</b>
Potato (big)	0.98	2.00	<b>2.05</b>
Tomato	12.00	8.00	0.67
Onion	0.33	1.50	<b>4.56</b>
Garlic	12.00	10.00	0.83
Eggplant	0.33	0.50	1.54
Long bean	0.13	1.00	7.94
Bitter gourd	0.32	0.50	1.58
Onion leaf	0.29	0.50	1.71
Ginger	0.17	0.50	<b>2.99</b>
Cucumber	0.13	1.00	7.87
Chili	0.80	2.00	2.50
Banana (Fatuk)	16.00	4.00	0.25
Banana (Singapura)	15.00	3.00	0.20
Small papaya	0.92	0.50	0.55
Papaya	3.82	2.00	0.52

Note: **red font** indicates TOMAK target products.

Source: Maliana market, 16th July, 2016.

## 9. Domestic demand

The most recent estimates of the total demand for all types of food products in Timor-Leste were completed by MDF in mid-2013. The results are summarized in Figure 7 (for the Dili population) and Figure 8 (for the non-Dili population). The data reported should be regarded as 'proxies' for potential domestic markets, particularly for fresh food (meat, fruit and vegetables). Interpretation of the numbers in Figures 7 and 8 requires care as the food deficits shown in these graphs are not the differences between the supply of and demand for food, but the differences between the current low levels of consumption and the levels of consumption required if the population of Timor-Leste was consuming adequate and balanced diets. In other words, the potential total market for fresh food (defined by MDF as all types of meat, fruit and vegetables) is about 200,000 Mt, of which about 50,000 Mt is currently supplied - see right hand side of Table 10.

As the population expands at about 2% per annum and (some) incomes grow, the demand (and product mix) for fresh food will change. However, the MDF analysis indicates that the 'theoretical' market size for the range of products likely to be targeted by TOMAK is sizeable, and therefore should be attractive if local products can compete with imported products.

Figure 5: Food requirement and consumption gap - Dili population

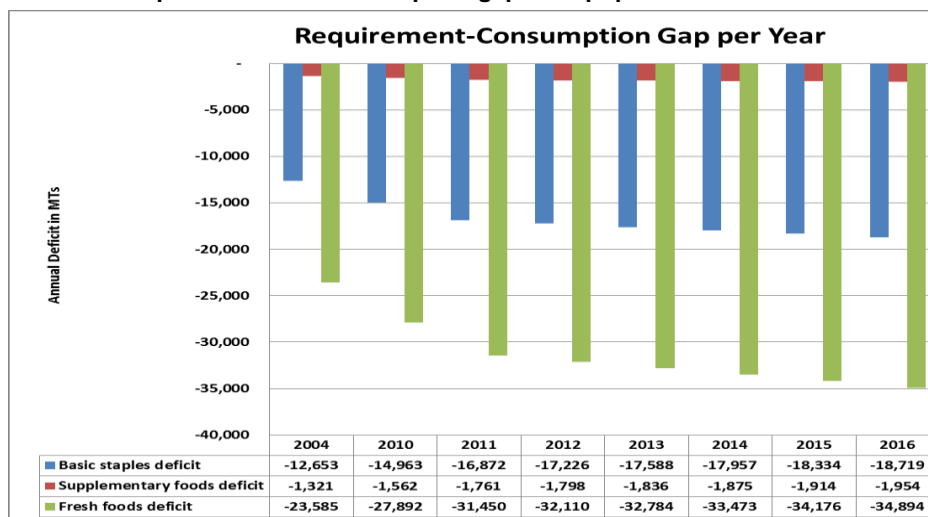
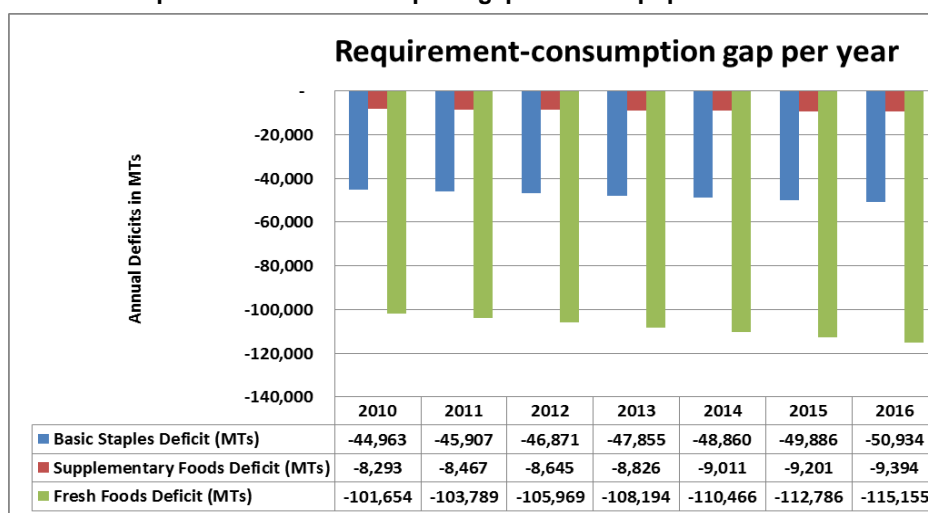


Figure 6: Food requirement and consumption gap - non-Dili population



## 10. Imports

Table 14 lists Timor-Leste's main food imports for the period 2010 to 2014; the 2015 figures are under review by the Directorate General of Statistics. Key points include:

- Rice imports are valued at nearly \$110 million over five years. Note that this figure is much higher (\$226 million) when an adjusted figure of \$100 million is used for 2010<sup>35</sup>.
- The value of imported fish products has increased by 180% over this time period.
- The equivalent figures for food oil, and sugar and confectionary, are 145% and 112%, respectively.
- Overall (and ignoring the rice import aberration in 2010) food imports into Timor-Leste have increased in value from about \$43.5 million to \$76.1 million over four years, an increase of about 75%.

<sup>35</sup> When 376,100 Mt were imported.

**Table 13: Timor-Leste: Imported agriculture commodities**

Item	Description of Imported Food Items	Year					Total	Gth (%) b/
		2010	2011	2012	2013	2014		
2 a/	Meat and edible meat offal	\$5,116	\$2,042	\$2,600	\$7,594	\$8,120	\$25,472	59%
3	Fish, crustacea and molluscs, etc.	\$662	\$153	\$402	\$1,125	\$1,853	\$4,195	180%
4	Dairy products, eggs, honey, other	\$3,320	\$853	\$1,192	\$3,881	\$4,398	\$13,644	32%
7	Vegetables, roots and tubers	\$1,284	\$591	\$336	\$1,299	\$1,954	\$5,464	52%
8	Fruit and nuts	\$811	\$299	\$418	\$695	\$982	\$3,205	21%
9	Coffee and spices	\$873	\$431	\$598	\$1,484	\$1,148	\$4,534	32%
10	Cereals c/	\$14,123	\$9,182	\$31,006	\$22,525	\$32,215	\$109,051	128%
11	Products of milling industry, malt and starch, etc.	\$1,870	\$1,368	\$2,455	\$3,224	\$2,151	\$11,068	15%
15	Animal or vegetable fats, oils and waxes d/	\$200	\$1,743	\$2,515	\$4,012	\$4,267	\$12,737	145%
16	Meat, fish, crustacea, molluscs, etc. e/	\$1,255	\$1,128	\$1,316	\$1,890	\$2,455	\$8,044	96%
17	Sugars and sugar confectionary	\$2,079	\$1,831	\$3,121	\$4,026	\$4,399	\$15,456	112%
19	Prepared cereals, flour, starch, etc.	\$4,694	\$3,156	\$5,854	\$5,423	\$6,377	\$25,504	36%
20	Prepared vegetables, fruit and nuts f/	\$1,174	\$3,287	\$5,987	\$9,088	\$1,617	\$21,153	38%
21	Miscellaneous edible	\$4,066	\$859	\$1,401	\$1,727	\$2,137	\$10,190	-47%
<b>Total</b>		<b>\$43,537</b>	<b>\$28,934</b>	<b>\$61,213</b>	<b>\$70,006</b>	<b>\$76,087</b>	<b>\$269,717</b>	75%
<b>Total - Potential TOMAK import replacement products.</b>		<b>\$7,211</b>	<b>\$2,932</b>	<b>\$3,354</b>	<b>\$9,588</b>	<b>\$11,056</b>	<b>\$34,141</b>	<b>53%</b>
<b>Total - Potential TOMAK import replacement products (average per year over five years)</b>							<b>\$6,828</b>	<b>-5%</b>

Source: External Trade Statistics Annual Report, 2014. General Directorate of Statistics.

a/ Rows in purple identify products which TOMAK's farmers could potentially produce.

b/ from 2010 to 2014.

c/ Rice (grain). [These numbers do not match those for detailed rice imports - error in 2010 figure.](#)

d/ Percent increase based on 2011 base, not 2010. Apparent error in figure for 2010.

e/ Possible duplicate of item number 3.

f/ Processed - not fresh.

In theory, imports of this value (and volume) should indicate opportunities for import replacement if and when surpluses become available in Timor-Leste (see the purple highlighted rows in Table 14). However as Timor-Leste is a free and open market with very low import duties (about 5%) domestic commodities have to be price-competitive with imported goods if the former are to replace the latter in domestic markets. A good example is imported soybean (reported to be about 2,000 Mt/year if trader estimates are scaled up conservatively). Information collected during the study indicated that increased volumes of tofu and tempeh were being sold in local markets, with women traders in Maliana and Baucau travelling regularly to Dili to buy imported soybean. In addition the larger traders such as Timor Global and Leader reported that they are prepared to purchase local soybean at competitive prices. So - in theory, there is an opportunity to grow soybean to replace imports.

Back to the issue of scale of impact and incremental benefits for the majority of TOMAK's target rural households. If the soybean market is about 2,000 Mt, this could be met by about 4,000 farmers each growing 0.5 ha of the crop at a yield of 1.0 Mt/ha. TOMAK is targeting about 45,000 households in three municipalities, or about 11 times the number of farmers who could (in theory) meet the domestic demand for soybean. And, at the current very low yields (less than 0.5 Mt/ha) locally-grown soybean cannot compete with the imported product - see Figure 10 which indicates an import parity price of \$740/Mt, compared with an export parity price of \$2,400/Mt.

Importantly, even if the issue of price competitiveness is ignored, the overall size of TOMAK's potential import replacement market (see the bottom purple highlighted rows in Table 14) is not large - estimated to be about \$6.8 million per year. Once fully engaged with 45,000 farmers, this equates to only about \$150 per farming household per year - a figure which is too low to have any real impact on rural livelihoods.

## 11. Exports

### 11.1. Current Exports

Table 15 lists the main agriculture commodities which are currently exported from Timor-Leste. It shows that apart from coffee (valued at \$15.2 million in 2015) there are no other commodities which are currently exported in any significant volume<sup>36</sup> or value. However, it should be noted that not all exports from Timor-Leste are recorded, particularly those products which enter into NTT across the border. In addition, Gajah Mada reports that they are exporting quite a wide range of products in small volumes such as coconut and copra. This indicates that the official figures in Table 15 could be incomplete and that 'informal' exports through small Indonesian ports in West Timor are not recorded.

**Table 14: Timor-Leste's exports of agriculture commodities**

Description a/	2010 \$'000	2011 \$'000	2012 \$'000	2013 \$'000	2014 \$'000	2015 \$'000
Meat and edible meat offal; salted, in brine, dried or smoked; edible flours and meals of meat or meal						
Fish; fresh or chilled (excluding fish fillets and other fish meat of heading no. 0304)				\$50		
Fish; dried, salted or in brine, smoked fish, whether or not cooked before or during the smoking process	\$25					
Crustaceans, in shell or not, live, fresh, chilled, frozen, dried, salted or in brine; crustaceans, in shell, cooked				\$8		
Guts, bladders and stomachs of animals (other than fish); whole and pieces thereof, fresh, chilled, frozen						
Skins and other parts of birds with feathers, down; feathers, down and parts thereof; not further worked						
Nuts, edible; coconuts, Brazil nuts and cashew nuts, fresh or dried, whether or not shelled or peeled						\$41
Nuts (excluding coconuts, Brazils and cashew nuts); fresh or dried, whether or not shelled or peeled						\$2
Citrus fruit; fresh or dried						
Coffee, whether or not roasted or decaffeinated; husks and skins; coffee substitutes containing coffee	\$15,987	\$11,923	\$18,813	\$15,795	\$13,646	\$15,155
Tea				\$2	\$5	
Oil seeds and oleaginous fruits, others n.e.s. in chapter 12; whether or not broken						\$18
Plants and parts of plants (including seeds and fruits), used primarily in perfumery, pharmacy; for insecticides			\$168			
Locust beans, seaweeds and other algae, sugar beet, sugar cane, fresh, chilled, frozen or dried, whether or not refined		\$15	\$24			
Ground nut oil and its fractions; whether or not refined, but not chemically modified						\$91
Oils and their fractions n.e.s. in chapter 15, obtained solely from olives, whether or not refined, but not chemically modified				\$77	\$84	
Coconut (copra), palm kernel or babassu oil and their fractions; whether or not refined but not chemically modified					\$0	
Fixed vegetable fats and oils (including jojoba oil) and their fractions, whether or not refined; but not of animal origin		\$40	\$125	\$66	\$77	
Margarine; edible mixtures or preparations of animal or vegetable fats or oils or of fractions of different vegetable fats or oils	\$60					
Sugars, including lactose, maltose, glucose or fructose in solid form; sugar syrups without added flavours						\$8
Chocolate and other food preparations containing cocoa		\$12				
Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of oil						
Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of oil						
<b>Total</b>	<b>\$16,072</b>	<b>\$11,990</b>	<b>\$19,130</b>	<b>\$15,998</b>	<b>\$13,812</b>	<b>\$15,315</b>

a/ Full statistical descriptions have been shortened to fit in the table.

Source: derived from Directorate General for Statistics Annual Reports.

Discussions with traders conducted during the course of this study indicated that there are small volumes of a wide range of products being exported that are unlikely to be captured in the above statistics. For example, Gajah Mada is now trading in copra from Viqueque and candlenut from Baucau and Viqueque; and aims to increase trade in pepper and cloves. These products are usually back-loaded on trucks which deliver Indonesian food products into Timor-Leste at the rate of up to five 10 Mt trucks per week. Note however that Gajah Mada reported that export volumes had declined. Nevertheless, some of the export tonnages being reported are reasonable and promising - such as 800 Mt of copra and 200-300 Mt of candle nut in 2015. Comments on other export products confirm the difficulties traders are experiencing when attempting to accumulate product in Timor-Leste – noting that Gajah Mada is one of the longest-serving traders in the country.

### 11.2. Potential Exports

The potential for the export of agricultural products from Timor-Leste is discussed in Section 12, noting that success in this area will depend on whether the agriculture sector is competitive with neighbouring countries in the region. In addition, this study reviewed imports into Timor-Leste's nearest neighbour with the objective of identifying potential export markets. Details are summarized in Table 16 and show that in terms of agriculture products, by far the largest import into NTT is grains (mainly rice valued at \$31.7 million in 2012),

<sup>36</sup> Volume figures are available.

with very small volumes of dairy products, eggs, and fruit; and coffee tea and spices. This analysis indicates that the market for any of Timor-Leste's agricultural products in West Timor appears to be very small and has little immediate potential.

**Table 15: Imports (volume and value) into West Timor**

No a/	Types of goods	2012		2013	
		Volume (Kg)	Value (US \$) b/	Volume (Kg)	Value (US \$)
4	Milk, Butter, Eggs	6,835	\$56,000	0	\$0
8	Fruits	13,381	\$1,957	13,600	\$1,992
9	Coffee, Tea, Spices	558,545	\$122,013	236,402	\$52,640
<b>10</b>	<b>Gandum-gandum/ Grains</b>	<b>34,731,800</b>	<b>\$31,708,750</b>	<b>0</b>	<b>\$0</b>
25	Garam, Belerang, Kapur/Salt, sulfur,	57,535,590	\$9,599,091	45,999,000	\$2,671,809
27	Mineral fuels	9,416,559	\$7,022,836	16,878,301	\$11,564,927
84	Mesin-mesin / Pesawat Mekanik -aircraft	2,249,430	\$9,884,764	0	\$0
85	Mesin / Peralatan Listik	718,363	\$3,582,205	9,645	\$18,275
88	Kapal Terbang dan Bagiannya	96,000	\$9,072,136	0	\$0
<b>Total</b>		<b>105,326,503</b>	<b>\$71,049,752</b>	<b>63,136,948</b>	<b>\$14,309,643</b>

a/ Empty rows removed.

b/ Products valued at US\$1.0 million or more - for non-agriculture products.

An important point from the many interviews held with current small and large traders in Timor-Leste is that they are all very bullish about prospects for increased exports. However, there is little evidence of any thorough market analysis – just questionable estimates of ‘unlimited’ potential ‘if only the farmers would grow more...then we could sell more’. An exception to this situation is that reported by Gajah Mada which is currently exporting unknown tonnages of copra, candlenut and mung bean, but noting traded volumes are reported to be declining. This situation is understandable in a country whose agricultural sector has recorded limited growth since independence, but it is dangerous in terms of building unrealistic expectations that can lead to misguided public sector expenditure on infrastructure and assets which are subsequently under-utilized. There are many valuable lessons from Pacific Island Countries in this regard, and TOMAK would benefit from reviewing the outcomes from related projects in this area.

A report prepared for Oxfam Australia in early 2016<sup>37</sup> is informative in terms of the potential to develop agricultural exports from Timor-Leste. This report concludes: *“there is little domestic interest in agricultural commodities among Timor-Leste’s business community at present. Lack of reliability, dispersed supply, and poor quality have led the few large buyers such as Timor Global and WFP to source products such as mungbean from international sources (MDF, 2013) (Japan International Cooperation Agency - JICA, 2011) (Timor Global, personal communication) (Oxfam Australia, 2015). This situation is compounded by the falling value of the Indonesian Rupiah which, along with increased policing of Timor- Leste’s international border, has all but shut down informal cross border trade and significantly reduced the profit margin for formal exports.*

### 11.3. Current export markets, and future trends

Starbucks (buying from CCT) and Ecom AGROÍNDUSTRIÁL (from Timor Global) are currently the main buyers of Timor-Leste's only major agricultural export – coffee. However, over the past few years entrepreneurs have released a range of speciality coffees from different geographic areas onto the domestic market, and for niche international markets. Volumes remain small and prices are high because transactions are in US\$. However, following a period of stagnation (see Table 15), the coffee sector is currently experiencing some growth as a result of programs to encourage farmers to replant and to prune<sup>38</sup>. It is therefore not unreasonable to predict that the volume of coffee exported from Timor-Leste will increase over the next five years. Note however that coffee exports are subject to highly variable international prices and currency exchange rates.

<sup>37</sup> See: Freach (2016). *‘Hafora Project Value Chain Assessment - Final Report’*.

<sup>38</sup> Source: Mr. David Boyce, Coffee Advisor, CCT (August 2016).

Future trends in agricultural commodity exports are difficult to predict because of the current situation in Timor-Leste's agriculture sector where there remains confusion around: (i) subsidized rice prices and Government purchases of paddy; (ii) the use of subsidies and free hand-outs; (iii) the practical use of agriculture inputs (e.g. small-scale mechanization, weedicides, and inorganic fertilizer) to increase production and production factor productivity; (iv) heavy Government investment in the irrigation sector with comparatively little attention paid to upland farming systems; (v) increasing imposition of 'unofficial' taxes and charges on the transport of agricultural produce (now up to \$100 per truck per trip<sup>39</sup>); and (vi) the ongoing impact on the sector of all forms of social transfer payments which now total about \$125 million per year – meaning that recipients have sufficient funds to buy rather than grow staple foods.

However, despite this somewhat gloomy scenario, it is apparent that an increasing number of small and opportunistic traders (including the better established international traders) are interested in buying and selling a wide range of products for which they claim to have access to markets. Such products include novelty fruits and vegetables, spices (including cloves, pepper, vanilla, etc.), turmeric, ginger, chilli, etc. Note however that there appears to be a fundamental flaw in the estimated size of the markets for these types of products. This is because most traders interviewed during the study reported potential tonnages which they envisaged could be sold into international and domestic markets in a monopolistic situation, not when in competition with other traders.

In summary (and when the export parity prices outlined in the next section are taken into account) it is difficult to envisage any major changes (growth in volumes and values) in Timor-Leste's agriculture commodity export markets over the next five to 10 years; with coffee being the exception. No doubt this conclusion will be challenged by some who consider that Timor-Leste can competitively export niche agriculture products, and perhaps they will be proven correct. But TOMAK aims to achieve impact at scale, and to improve the livelihoods of substantial numbers of poor rural HHs. Such an outcome is not likely to be achieved through the export of small volumes of niche products into fickle and inconsistent markets – hence the focus in the analysis on more 'traditional' products which: (i) can be used as subsistence foods; (ii) can be sold into domestic markets – perhaps as import replacements; and (iii) can be value-added through local processing and/or feeding to livestock.

## 12. Import/export parity prices

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MAF and some DPs are confident that Timor-Leste's agricultural sector can contribute to export earnings despite having to: (i) trade in US\$<sup>40</sup>; (ii) compete with low regional labour costs (and opportunity costs) which are much less than in Timor-Leste<sup>41,42</sup>; and (iii) operate in a low productivity situation (e.g. low yields per ha and low labour productivity). At present, the only agriculture commodity which is exported in any volume or value is coffee (see Table 15). There are also small exports (volume and value) of a various niche products for which local traders have identified specialist markets.

### 12.1. Import and export parity price ratios

The real test is: can Timor-Leste be competitive in international markets for its current main and possible future agriculture products, such as rice, maize, soybean, beef, lamb, pork and chicken. As part of a review of *Zonas Especiais de Economia Social de Mercado de Timor-Leste* (ZEEMS) completed by the World Bank in 2015/16, import and export parity prices for these products were estimated to determine if agriculture products from the ZEEMS Zone (the autonomous municipality of Oecusse) could compete on international markets<sup>43</sup>. These models should be considered as indicative only as they do not reflect specific conditions in TOMAK's target municipalities, and do not cover the full range of potential products outlined in Table 4. However, they do provide a very useful example of prevailing conditions for a range of agricultural products of broadly similar

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<sup>39</sup> Reported by a private trader to the MAT (August 2016).

<sup>40</sup> This situation does not allow currency depreciation, and hence increased international competitiveness.

<sup>41</sup> <http://www.wageindicator.org/main/salary/minimum-wage/vietnam>

<sup>42</sup> About US\$110 per month - for 12 and not 13 months (as in East Timor)

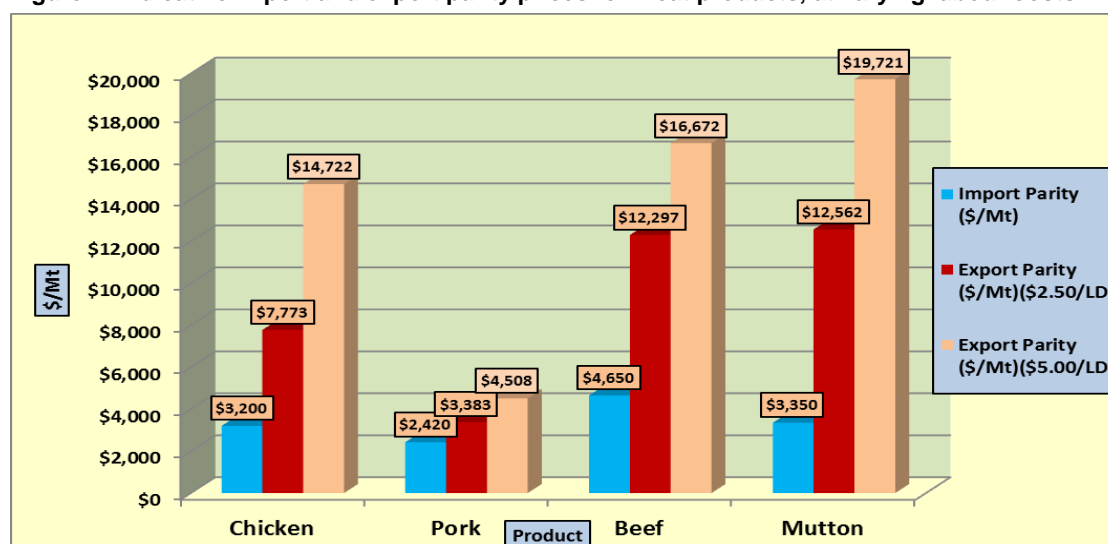
<sup>43</sup> The figures in this section have been updated from an unpublished report on ZEEMS' Agriculture Potential, World Bank (2015)



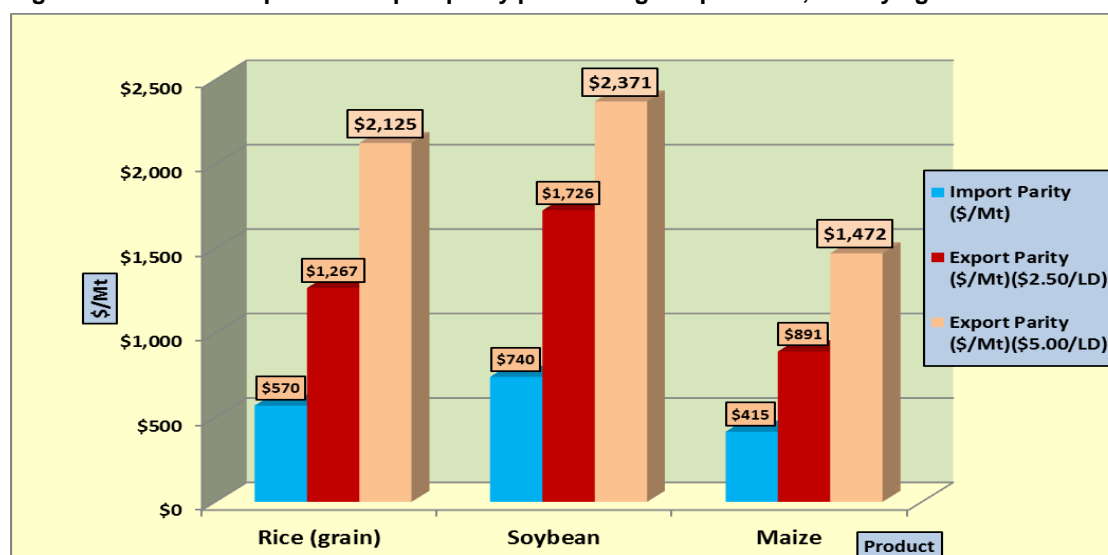
nature. The overall conclusions regarding competitiveness and the underlying imperative for productivity improvement are unlikely to be significantly different for the subsectors and products that are targeted by TOMAK.

Results presented in Figures 9 and 10 show that at present Timor-Leste's main agriculture commodities cannot compete on world markets. For example, pork can be landed in Dili for about \$2,400/Mt, while Timor-Leste's export parity price for this product is about \$3,380/Mt if labour is costed at \$2.50 per labour-day (LD) and about \$4,500/Mt if labour is costed at \$5.00 per LD (see Figure 9). The corresponding figures for rice (grain) are \$570/Mt and \$2,100/Mt (at \$5.00 per LD) (see Figure 10).

**Figure 7: Indicative import and export parity prices for meat products, at varying labour costs**



**Figure 8: Indicative import and export parity prices for grain products, at varying labour costs**



The import/export parity prices in Figures 9 and 10 are based on current levels of productivity (Mt/ha, meat production per animal, etc.). It is informative to determine the productivity increases required if Timor-Leste's main agriculture products are to be competitive on international markets (with labour costed at \$5.00 per day). The results of this analysis are shown in Table 17 and indicate that an average productivity increase of about three times would be required if this export objective is to be achieved. Such an increase is a huge figure by world standards. It is very doubtful if any of Timor-Leste's major agriculture products (excluding coffee and

possibly other high value tree crop and horticulture products for niche markets) could be exported competitively.

The corollary of low import prices is that domestic producers struggle to compete in import replacement markets, particularly when labour, water and production inputs are lower, and costs are priced in US\$.s.

**Table 16: Productivity increases required for international competitiveness**

Product	Productivity Increase for Competitiveness a/	
Chicken	4.3	times
Pork	2.5	times
Beef	2.7	times
Mutton	5.4	times
Rice (grain)	3.0	times
Soybean	2.0	times
Maize	2.0	times
<b>Crude Average</b>	<b>3.1</b>	<b>times</b>
a/ Labour costed at \$5.00 per day.		

### 13. Private sector involvement in selected value chains

Various projects such as the International Labour Organization (ILO)-implemented Business Opportunities and Support Services Project (BOSS<sup>44</sup>), various NGOs working in the sector, and MDF have collated a list of private sector actors currently operating in the emerging market sector for agriculture products (Table 18). Although it is not possible to compare the current situation with that a few years ago, there is sufficient evidence that the number of actors in Timor-Leste's emerging commercial agriculture sector is gradually increasing as opportunities arise – including contract purchasing of paddy for MCIA.

Observations of this study in the main markets in Maliana and Baucau indicate that the volume of trade has increased compared with several years ago<sup>45</sup>, as has the number of opportunistic traders who take advantage of opportunities to earn small margins (often less than 10%) to move products from one point of sale to another. For example, small retail traders in the Maliana market are accumulating product directly from farmers, paying for local transport, and then selling in the main market. Another example of increased local trade is the regular delivery of imported soybean from wholesalers in Dili to retailers in local municipal markets, noting that soybean is just one of many food products which are now traded in small volumes by traders all over the country.

The team's conclusion is that there has been an increase in the number of small traders operating in agricultural product markets in the past five years. Most of these traders are probably not registered as businesses<sup>46</sup>, but are reacting to opportunities to trade in small volumes of locally-consumed products, as well as in some of the smaller niche markets for products such as turmeric and vanilla. However, this increase is from a very small base and the current levels of trading are still far lower than during the period of Indonesian occupation. In addition, this situation does not necessarily mean that there are opportunities for TOMAK's target farmers to participate in these markets because of the difficulties associated with accumulation of critical volumes of product (a common complaint by small traders), and the stated objective for TOMAK to generate impact at scale.

<sup>44</sup> BOSS supports the Institute for Business Support (IADE).

<sup>45</sup> As observed by this study (August 2016) compared with previous visits to the same markets in 2013 and 2014.

<sup>46</sup> A check with the "one-stop-shop" SERVE in MCIA would confirm this conclusion.



**Table 17: Supermarkets, private sector investors, input suppliers and traders in Timor-Leste**

Supermarkets	Other P/sector	Input supply	Traders
<b>Dili</b>			
Kmanek	Josephina Farm	Kmanek	Kmanek
Dili Mart	Farm Pro	Agi Agricultura	Dili Mart
Jacinto	Gracia Farm	Serafim	Gagamara
W4		Boaventura	W4
Pateo		Gracia	Globus
Timor Organic			Creative Furak
Timor Global			Lisun
Lita/Leader			
Landmark			
Lisun			
Metromart			
<b>Baucau</b>			
Fidbama	Azelda	Sr. Thomas	Azelda
Nagarzo	Dr. Philip	Agi Agricultura Baucau	Nagarzo
Loja Mateus			Lisun
Padaria			
Lisun			
Sumber Laris			
<b>Viqueque</b>			
Borala		Life A Long	Borala
Palapa		Uma Tolu	Palapa
Sinar Harapan			Sinar Harapan
<b>Maliana</b>			
Kmanek		Gunilabe	Kmanek
Haleluya			Haleluya
Rizky			Lisun
Lisun			

## 14. Financial returns available to producers

Over the past 10 years, agricultural development projects have estimated the financial returns available to Timorese farmers who adopt improved agricultural production practices. This is a standard feature of appraising most investment projects, and, for example was an important part of the financial and economic analysis (FEA) during the design (and post program evaluation) of both SoL III and IFAD's TLMSP. The most recent agricultural investment project analysis completed by a Development Partner was the financial and economic appraisal conducted for SAPIP. This section of the report is based on the crop and livestock whole farm models prepared as part of the SAPIP appraisal process.

SAPIP's physical and financial food production models are summarized in the tables below. The first (Table 19) details indicative financial and economic gross margin farm models, the second (Table 20) covers food production and incremental food production, and the third (Table 21) outlines the estimated composition of incremental food production - staple, nutritious and animal/fish. The standout results in these tables are the low returns to family labour, which vary from \$3.78 to \$6.23 per family labour day. These returns are low for two reasons: (i) even though the 'with project' models are based on improved technology packages, incremental production is still low by international standards; and (ii) the high cost of hired labour (at least \$5.00 per day) and the high opportunity cost of family labour (about \$2.50 per day).

Regardless, the models indicate that rural HHs can increase gross farm incomes from about \$1,200 per year (for both dryland and irrigated models) to between \$1,700-2,000 for improved dryland models, and \$1,950-3,550 for improved irrigated models, respectively (Table 19). Food production can be increased from 1.2 Mt/hh to 2.3 Mt/hh (Table 20). Importantly, the production of nutritious food can also be increased (Table 21).

It needs to be emphasised that these models are only indicative and will need to be updated and adjusted as more information on the cropping systems and patterns in TOMAK's target municipalities (and suku) becomes available.

**Table 18: Indicative Financial and Economic Gross Margin Farm Models**

FINANCIAL AND ECONOMIC GROSS MARGINS - WITH AND WITHOUT FARM MODELS										
Gross Margins			Financial				Economic			
Model and Crop/Livestock Product a/			Farm GM a/	Hired Labour	Net	\$/Fam L/Day	Farm GM b/	Hired Labour	OC Fam. Lab c/	Inc.Net Ben
		ha								
<b>WOP1: TM,TV,TNR,TR (dryland)</b>										
Paddy	Traditional (S 1)								285	
Maize	Traditional (S 1)	1.00	\$280	\$5.00			\$269	\$2.50	\$2.50	
Vegetables	Traditional (S 1)	0.10	\$190				\$181			
Non-ruminant	Traditional		\$407				\$387			
Ruminant	Traditional		\$355				\$337			
<b>Farm Gross Margin</b>			<b>1.10</b>	<b>\$1,232</b>	<b>\$1,232</b>	<b>\$4.32</b>	<b>\$1,174</b>		<b>\$713</b>	<b>\$462 na</b>
<b>WOP2: TP,TM,TV,TNR,TR (irriga</b>										
Paddy	Traditional (S 1)	1.00	\$245				\$226	18	324	
Maize	Traditional (S 1)	0.10	\$28	\$5.00			\$27	\$2.50	\$2.50	
Vegetables	Traditional (S 1)	0.10	\$190				\$181			
Non-ruminant	Traditional		\$407				\$387			
Ruminant	Traditional		\$355				\$337			
<b>Farm Gross Margin</b>			<b>\$1,225</b>		<b>\$1,225</b>	<b>\$3.78</b>	<b>\$1,158</b>	<b>\$45</b>	<b>\$810</b>	<b>\$303 na</b>
<b>WP1: IM, IL, TNR, TR, CT (dryland)</b>			<b>ha</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>Net</b>	<b>\$/Fam L/Day</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>OC Fam. Lab</b>
Maize	Improved (S 1)	0.50	\$286				\$252		320	
Legumes	Improved (S 2)	0.50	\$334	\$5.00			\$303	\$2.50	\$2.50	
Cash trees	Improved Mixed	0.50	\$292				\$265			
Non-ruminant	Traditional		\$407				\$387			
Ruminant	Traditional		\$355				\$337			
<b>Farm Gross Margin</b>			<b>\$1,674</b>		<b>\$1,674</b>	<b>\$5.23</b>	<b>\$1,544</b>		<b>\$800</b>	<b>\$744 \$282</b>
<b>WP2: IM, IL, TNR, TR, TT (dryland)</b>			<b>ha</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>Net</b>	<b>\$/Fam L/Day</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>OC Fam. Lab</b>
Maize	Improved (S 1)	0.50	\$286				\$252		320	
Legumes	Improved (S 2)	0.50	\$334	\$5.00			\$303	\$2.50	\$2.50	
Timber trees	Improved Mixed	0.50	\$613				\$525			
Non-ruminant	Traditional		\$407				\$387			
Ruminant	Traditional		\$355				\$337			
<b>Farm Gross Margin</b>			<b>\$1,995</b>		<b>\$1,995</b>	<b>\$6.23</b>	<b>\$1,804</b>		<b>\$800</b>	<b>\$1,004 \$543</b>
<b>WP3: IP, IM, IV, TNR, TR (irrig'n)</b>			<b>ha</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>Net</b>	<b>\$/Fam L/Day</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>OC Fam. Lab</b>
<b>Paddy</b>										
Paddy	Improved (S 1)	1.00	\$281	112			\$164	112	454	
Maize	Improved (S 2)	0.50	\$286	\$5.00			\$252	\$2.50	\$2.50	
Legumes	Improved (S 2)	0.50	\$334				\$303			
Vegetables	Improved (S 3)	0.20	\$278				\$266			
Non-ruminant	Traditional		\$407				\$387			
Ruminant	Traditional		\$355				\$337			
<b>Farm Gross Margin</b>			<b>\$1,941</b>	<b>\$560</b>	<b>\$1,381</b>	<b>\$3.04</b>	<b>\$1,709</b>	<b>\$280</b>	<b>\$1,135</b>	<b>\$294 -\$9</b>
<b>WP4: IP, IM, IL, IV,FP, INR, IR (irr</b>			<b>ha</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>Net</b>	<b>\$/Fam L/Day</b>	<b>Farm GM</b>	<b>Hired Labour</b>	<b>OC Fam. Lab</b>
<b>Paddy</b>										
Paddy	Improved (S 1)	1.00	\$281	216			\$164	216	585	
Maize	Improved (S 2)	0.50	\$286	\$5.00			\$252	\$2.50	\$2.50	
Legumes	Improved (S 2)	0.50	\$334				\$303			
Vegetables	Improved (S 2)	0.25	\$348				\$332			
Fish pond	Improved		\$344				\$326			
Non-ruminant	Improved		\$1,034				\$982			
Ruminant	Improved		\$920				\$874			
<b>Farm Gross Margin</b>			<b>\$3,546</b>	<b>\$1,080</b>	<b>\$2,466</b>	<b>\$4.22</b>	<b>\$3,233</b>	<b>\$540</b>	<b>\$1,463</b>	<b>\$1,231 \$928</b>

a/ Product codes: T = Traditional and I = Improved. M = maize, V = vegetables, NR = non-ruminants, R = ruminants, L = legumes

CT = cash trees, TT = timber trees, FP = fish pond

b/ Farm Gross Margin or simple profit = gross margin per ha or livestock unit, multiplied by the no. of ha or livestock units.

c/ Opportunity cost of farm and hired labour.

**Table 19: Indicative Food Production and Incremental Food Production**

Food Production (from 1.0 ha)----->			Net	Food (kg)	Inc. Food (kg)
WOP: TP,TM,TV,TNR,TR (dryland) a/		ha/unit	(kg/ha)		
Paddy	Traditional (S 1)				
Maize	Traditional (S 1)	1.00	800	800	
Vegetables	Traditional (S 1)	0.10	1,600	160	
Non-ruminant	Traditional	kg		205	
Ruminant	Traditional	kg		44	
<b>Total Food per farm (kg)</b>				<b>1,209</b>	
<b>Staple</b>				<b>800</b>	
<b>Nutritious</b>				<b>160</b>	
<b>Animal</b>				<b>249</b>	
Food Production (from 1.0 ha)----->			Net	Food (kg)	Inc. Food (kg)
WOP: TP,TM,TV,TNR,TR (irrigation)		ha/unit	(kg/ha)		
Paddy	Traditional (S 1)	1.00	1,360	748	
Maize	Traditional (S 1)	0.10	800	80	
Vegetables	Traditional (S 1)	0.10	1,600	160	
Non-ruminant	Traditional	kg		205	
Ruminant	Traditional	kg		44	
<b>Total Food per farm (kg)</b>				<b>1,237</b>	<b>28</b>
<b>Staple</b>				<b>828</b>	<b>28</b>
<b>Nutritious</b>				<b>160</b>	
<b>Animal</b>				<b>249</b>	
WP1: IM, IL, TNR, TR, CT (dryland)		ha/unit	Net	Food (kg)	Inc. Food (kg)
			(kg/ha)		
Paddy	Improved (S 1)	0.50	1,728	475.2	
Maize	Improved (S 2)	0.50	1,224	612	
Legumes	Improved (S 2)	0.50	720	198	
Vegetables	Traditional (S3)		1,600		
Non-ruminant	Traditional	kg		205	
Ruminant	Traditional	kg		44	
<b>Total Food per farm (kg)</b>				<b>1,534</b>	<b>297</b>
<b>Staple</b>				<b>1,087</b>	<b>287</b>
<b>Nutritious</b>				<b>198</b>	<b>38</b>
<b>Animal</b>				<b>249</b>	
WP2: IM, IL, TNR, TR, TT (dryland)		ha/unit	Net	Food (kg)	Inc. Food (kg)
			(kg/ha)		
Paddy	Improved (S 1)	0.50	1,728	475	
Maize	Improved (S 2)	0.50	1,224	612	
Legumes	Improved (S 2)	0.50	720	360	
Vegetables	Improved (S 2)		1,920		
Fish pond	Improved	kg		350	
Non-ruminant	Improved	kg		410	
Ruminant	Improved	kg		134	
<b>Total Food per farm (kg)</b>				<b>2,341</b>	<b>1,104</b>
<b>Staple</b>				<b>1,087</b>	<b>287</b>
<b>Nutritious</b>				<b>360</b>	<b>200</b>
<b>Animal/ fish</b>				<b>894</b>	<b>645</b>

a/ Product codes: T = Traditional and I = Improved. M = maize, V = vegetables,

NR = non-ruminants, R = ruminants, L = legumes, CT = cash trees

TT = timber trees, FP = fish pond

**Table 20: Indicative composition of incremental food production**

Model/ Food Prod'n ----->	Food (kg)	% of Total a/	Inc. Food (kg)	Percent Inc.
<b>WOP: TP,TM,TV,TNR,TR (dryland) a/</b>				
Staple	800	65%		
Nutritious	160	13%		
Animal/ fish	249	20%		
<b>Total Food (kg) - base</b>	<b>1,209</b>			
<b>WOP: TP,TM,TV,TNR,TR (irrigation)</b>				
Staple	828	67%	28	4%
Nutritious	160	13%	nil	
Animal/ fish	249	20%	nil	
<b>Total Food (kg)</b>	<b>1,237</b>		<b>28</b>	<b>2%</b>
<b>WP1: IM, IL, TNR, TR, CT (dryland)</b>				
Staple	1,087	71%	287	36%
Nutritious	198	13%	38	24%
Animal/ fish	249	16%	nil	nil
<b>Total Food (kg)</b>	<b>1,534</b>		<b>325</b>	<b>27%</b>
<b>WP2: IM, IL, TNR, TR, TT (dryland)</b>				
Staple	1,087	46%	287	36%
Nutritious	360	15%	200	125%
Animal/ fish	894	38%	645	259%
<b>Total Food (kg)</b>	<b>2,341</b>		<b>1,132</b>	<b>94%</b>

a/ Product codes: T = Traditional and I = Improved. M = maize, V = vegetables,

NR = non-ruminants, R = ruminants, L = legumes, CT = cash trees

TT = timber trees, FP = fish pond

While the analysis does not cover all of the crops that TOMAK will become involved in supporting, it does serve to provide a broad indication of the financial viability of a range of possible crop and livestock development options. Importantly, these assessments are presented as HH models as well as enterprise models, enabling an approximate indication of the likely impact of modelled interventions on individual HHs, both in terms of income and food security. Further forecasts of the financial viability of improving production of specific products have been separately undertaken by TOMAK<sup>47</sup>. As more information on TOMAK's target HHs is collated these financial models will be further updated using actual rather than estimated production parameters.

## 15. Concluding comments

A number of other relevant ideas, options and points of interest were obtained during the course of the study. Whilst these are outside the set terms of reference, they are noted here as relevant to TOMAK's considerations TOMAK during remainder of the Inception Phase.

### 15.1. Missing market links

It became apparent during the visit to Maliana (and also from discussions in Baucau) that one of the possible reasons why products are not entering existing markets is due to a lack of 'product accumulators', i.e. there seems to be a missing link in the VC for some products. As an example of how this could be facilitated, some paddy farmers in the Maliana I irrigation scheme (20 groups with 10 members each) were unable to sell their paddy until they had joined a 'cooperative' formed by a local trader and businessman. The latter: (i) supplies

<sup>47</sup> See TOMAK Technical Report #2: '*Potential for improving on-farm productivity of selected agricultural and livestock products*'. November 2016.

crop production inputs, some technical advice and mechanization in return for a share of the paddy grown; and (ii) provides a product aggregation service whereby farmers pool their paddy for (hopefully) eventual sale to MCIA. This marketing process would not have been possible without support from the 'product accumulator', who has enabled paddy producers to access one of the few markets for their product.

This approach to product marketing warrants further investigation by TOMAK. Product accumulators could eventually charge for at least some of their services and therefore progressively replace MAF's 'free' agricultural extension services – which are generally not delivered as required and have now been further downgraded from a National Directorate to Divisional level within MAF's organization.

## **15.2. Maintaining market flexibility**

Expectations in terms of Timor-Leste's potential to 'export its way to prosperity'<sup>48</sup> are high and considered by some to be unrealistic<sup>49</sup>. It will be important for TOMAK to consider a range of markets for selected products, in order to maintain market flexibility and manage risk. For example, if a particular area has the potential to increase maize production, it will be important for TOMAK to identify more than one market for this product. Options might include: (i) increased sales for human consumption, particularly if maize can be stored and sold into higher-priced markets later in the year; (ii) local (aldeia-level) processing for small-scale pig and poultry feeding; (iii) sale to Timor Global (if free from aflatoxins) for use as the basis for the school feeding program; and (iv) sale to emerging commercial feed mills which are aiming to supply Timor-Leste's growing market for intensively-fed poultry and pigs. This approach can be described as adopting a degree of market flexibility and therefore sound risk management.

## **15.3. Transforming the rice-based farming system**

As outlined in Section 3, TOMAK faces a major challenge in areas (such as the Maliana I irrigation system in Bobonaro) which have traditionally relied on irrigation for the production of one crop of low-yielding paddy per year, possibly followed by small areas of vegetable production. The current cropping pattern fails to maximize the return to investment in such schemes (US\$6.60 million in 2012 alone for rehabilitation works for the 1,050 ha Maliana I scheme). Over time TOMAK should aim to assist its target farmers in these areas to change their production mix to include more profitable enterprises that can make better economic use of the limited irrigation resource. Possible options include supplementary irrigation for maize production (for commercial sale and processing followed by pig production) rather than paddy production, increased areas of high-value legumes such as mung and soybean, production of specialist grazing forages for fattening livestock, and aquaculture.

At present, this suggestion conflicts with national policy, which is to maximize paddy production irrespective of the cost of production. Therefore, before commencing on a program of support for changed cropping patterns for Timor-Leste's irrigated areas, it will be necessary for TOMAK to engage with MAF, Minister of State, Coordinating Minister for Economic Affairs (MECAE) and Government to open a dialogue related to the issue of inadequate rates of return from investment by Government and Japanese aid (JICA) in irrigation rehabilitation<sup>50</sup>. This study accepts that this topic is outside of TOMAK's mandate, but as it has decided to target the mid-altitude irrigated areas, this policy issue cannot and should not be ignored.

## **15.4. Periodic updates of Municipal profiles**

The Australian Department of Foreign Affairs and Trade (DFAT) prepared current situation reports on five possible target municipalities as part of the TOMAK pre-design process. These documents contain a wealth of reliable and valuable information on not just the agricultural sector but also health and education. They are an excellent source of up-to-date and relevant data and statistics for Viqueque, Baucau and Bobonaro

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<sup>48</sup> With the exception of petroleum products.

<sup>49</sup> Particularly in view of the dollarized Timor-Leste economy and a depreciating Indonesian Rupiah against the US dollar.

<sup>50</sup> See Public Expenditure on Infrastructure (irrigation, roads and electricity) MoF and World Bank, 2015.

Municipalities. TOMAK should endeavour to update these important background papers on an annual basis. An important addition to these documents could be a section providing reliable agricultural statistics, including progressive collation of information on agricultural markets.

## 15.5. Micro-credit and/or savings & loan activities

A welcome feature of the TOMAK design is that it will not perpetuate the past culture of providing free handouts to farmers, despite the fact that MAF still distributes limited quantities of free seed and fertilizer<sup>51</sup>. This situation is one in which there is confusion between policy and practice – on the one hand agriculture inputs are supposedly subsidized, whilst on the other, MAF's annual budget is insufficient and can only meet a small percentage of the total demand for production inputs. Suffice to say that very few farmers will be 100% subsidized in the future, but expected to fund the operating and capital investments on their farms. Regardless, the expectations of free 'handouts' remains strong. This new approach means that farmers will need to source funds, other than their own, from one of two possible sources: (i) through the use of micro-credit and/or local savings and loans schemes; or (ii) from 'product accumulators' (see Section 15.1). This situation will require careful consideration by TOMAK before engaging with target farmers, as expectations in terms of ongoing subsidies from bilateral DPs are high. To many farmers, TOMAK will be regarded as an extension of SoL III which had a policy of providing inputs free-of-charge.

## 15.6. Mapping of development activities in target areas

There are considerable bilateral- and direct MAF-funded development activities in TOMAK's initial target municipalities. The current Development Partner activity table which is maintained with the objective of avoiding overlap and duplication does not provide the level of detail required for TOMAK to extract a good understanding of 'who is doing what' in these areas. This should be one of the first tasks for the soon-to-be appointed TOMAK Regional Managers, with the multiple objectives of identifying potential local partners, avoiding duplication, and learning local lessons. A good example is the now-completed FAO-funded Rural Development Project in the Seical Valley in Baucau. This three-year project handed out pigs and poultry in 23 aldeias, but there are no records on results or sustainability. TOMAK should follow-up this project as no doubt there are valuable lessons to be learned.

Timor-Leste's rural sector is well-served with many DP-funded projects and programs. Recent initiatives by DFAT and the European Union (EU) have improved activity coordination and therefore improved cooperation and efficient aid delivery. However at the outset of a Program as large and diverse as TOMAK it is important to: (i) understand what other DPs are aiming to achieve and what they are doing where - objectives, strategies, geographic and product focus, etc. for the current projects and programs; (ii) learn from past experiences - particularly from longer-term development projects such as the EU-funded and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)-implemented Rural Development Program (Phase IV) (RDP IV), AVANSA's initial experience with its focus on horticulture and vegetable crops and value chains, SoL III, and MDF; and (iii) gather together the large number of analytical reports on Timor-Leste's agriculture sector which have been prepared by the World Bank and DFAT, amongst others.

In addition some DPs have completed market and VC analyses with the objective of identifying products with potential for export and/or import replacement. For example, FAO's report on post-harvest management practices of maize and cowpea in Timor-Leste contains a section on value chains. Perhaps the most important of these reports is the '*Inclusive analysis of growth, poverty and gender at sector level and sector growth strategy for poverty reduction and women's economic empowerment*', published by the DFAT-funded MDF. There are many sources of secondary information on market opportunities and associated VCs.

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<sup>51</sup> MCIA's purchase price for paddy has declined from \$0.75 per kg to \$0.40 per kg now that MAF is (supposedly) not supplying free inputs.

## **15.7. A possible marketing partner for TOMAK**

It became apparent during the study that one option for TOMAK might be to form 'marketing partnerships' with one or more selected traders who are currently active in 'small volume and wide product range' markets in target municipalities. One such option is Gajah Mada, which regularly ships a few Mt of Timor-Leste-sourced products out through the NTT port of Atambua. This includes pepper, candle nut, coffee, mung bean and copra. The attraction of such an arrangement is that Gajah Mada already has an extensive network of local product accumulators in place (for example, a small trader in Triloka buys candle nut from farmers for \$0.75/kg and onward sells to Gajah Mada in Dili for \$0.80/kg. The small margin covers the cost of back-loading trucks from Dili). This suggestion could provide a starting point in terms of opening up small markets for a range of products.

## **15.8. Delivery partners**

TOMAK has the flexibility to decide how and who will deliver farmer services and inputs, including the use of direct-hire technical staff, contracted NGO's and/or some arrangement with MAF's extension services. In this context one of the main conclusions from field work completed as part of this study is that identifying agricultural products with potential is just the start of a transformation process, the success of which will be determined by the rate and extent to which target farmers can be encouraged to change their current production practices and slowly move into more commercial agriculture. Achieving the latter will require the delivery of extension services and production inputs to farmers, and at present there is strong evidence from the field (and from staff themselves) that MAF is not able to fill this role. Therefore, as a matter of priority and before the final choice of target products is made, it will be important for TOMAK to make a key decision in terms of extension service delivery. This is because to some extent the final choice of target products will be related to how associated services are to be delivered.



