TOMAK

To'os ba Moris Di'ak

Farming for Prosperity

Market System & Value Chains Assessment

Technical Report 3

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Adam Smith International

MERCY CORPS

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Abbreviations & Acronyms

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
ASI	Adam Smith International Pty Ltd
AVANSA	Avansa Agricultura Project (USAID funded)
BNCTL	Banco Nacional Comersial Timor-Leste
CDE	Centre for Enterprise Development
DFAT	Australian Department of Foreign Affairs and Trade
fob	Free on Board
g	Gram
GDP	Gross Domestic Product
GM	Gross Margin
GoTL	Government of Timor-Leste
Ha	Hectare
IADE	Institute for Business Support
IDR	Indonesian Rupiah
IPPC	International Plant Protection Convention
Kg	Kilogram
M4P	Making Markets Work for the Poor
MAF	Ministry of Agriculture and Fisheries
MCIE	Ministry of Commerce, Industry and Environment
MDF	Market Development Facility (Australian Aid-funded)
MECAE	Minister of State, Coordinating Minister for Economic Affairs
MoF	Ministry of Finance
MFI	Micro-Finance Institution
NGO	Non-government organisation
NTB	Non-Tariff Barrier
OIE	Office International des Epizooties
PNDS	National Program for Village Development Support (GoTL executed, Australian TA support)
R4D	Roads for Development Program (GoTL executed, Australian TA support)
RoI	Return on Investment
SDP	Strategic Development Plan
SEM	Secretariat of State for the Socio-Economic Support of Women
SEO	Suku Extension Officer (MAF)
SOL	Seeds of Life Program (ACIAR-funded)
SPS	Sanitary and Phytosanitary
TBT	Technical Barrier to Trade
TOMAK	To'os Ba Moris Diak
ToR	Terms of Reference
USD	United States Dollar
VAT	Value0-dded Tax
VC	Value Chain
VLW	Village Livestock Worker
WEAMS	Women's Empowerment & Market Systems Framework

WEE	Women's Economic Empowerment
WFP	World Food Program
WTO	World Trade Organisation
$	United States Dollar

Executive Summary

To'os Ba Moris Diak (TOMAK) aims to build the capacity of rural households to confidently and ably engage in profitable agricultural markets. The objectives of this Market System & Value Chains Assessment are to map the value chains for cattle, groundnut, mung bean, red rice and shallots; analyse market systems; and, identify constraints and root causes of underperformance. Development opportunities and plausible intervention areas for TOMAK are then developed based on the priority constraints identified. The assessment was undertaken using a gendered value chain and Making Markets Work for the Poor (M4P) Approach. The agriculture sector in Timor-Leste is overwhelmingly subsistence-based, with smallholders consuming most of the food they produce. Coffee is the only significant agricultural export and a large proportion of the food consumed in Dili, the main consumption centre, is imported.

The transition towards farmers producing for market (i.e. commercialisation of the agriculture sector) is impeded by several factors. Farmers are reluctant to increase production without assured markets and market systems have not developed due to low production, a chicken-and-egg dilemma. There is evidence agricultural output has even decreased in recent years, due to an out-migration of youth from rural areas as traditional agriculture offers low incomes, with the older population having access to welfare transfers to buy food rather than produce it themselves. Some irrigation schemes have fallen into disrepair and have been abandoned as they were designed for operation and maintenance by Government, not as farmer-managed schemes, and the import of cheap rice has made local production unviable on a commercial basis.

Gender mapping confirmed that women farmers in Timor-Leste carry out a larger range of agricultural and market functions than men, yet still their contribution remains systematically undervalued and under-resourced. Gender blind analysis, resourcing and investments have resulted in missed opportunities to improve agriculture production and profit. Addressing inequalities in access to services and resources and strengthening the capacity of rural women to perform their productive roles more effectively will have a major impact on household economies and food security.

Capacity within Government institutions is still evolving and although policy is supportive of commercial agriculture, strategies to achieve policy objectives remain weak and under-resourced. As such, the regulatory environment still offers some obstacles to private sector investment in commercial agriculture. For example, Timor-Leste ranks 189th out of 189 countries in the World Bank 'Doing Business Report' for registering property and enforcing contracts. Non-Tariff Barriers to Trade are also high due to a lack of quality standards and accredited Sanitary and Phyto-Sanitary facilities.

Furthermore, use of the United States Dollar makes food imports relatively cheap and exports to neighbouring Asian countries more expensive. Costs of production are also greater as most inputs, such as seed, fertiliser and sprays, must be imported, and labour costs are the highest in the region.

'Supporting functions' required for a commercial agriculture sector have yet to emerge. Farmers are reliant on male-dominated public extension services, which are in general unable to offer expert advice required by commercial farmers. Limited finance is available but requires collateral most farmers don't have. Post-harvest handling facilities and knowledge are poor resulting in high losses, low quality and reduced income.

Supply chain coordination is the biggest constraint to commercialising agriculture production. There is no horizontal coordination between smallholders to aggregate volumes of produce to attract traders at the farm-gate, resulting in high transport costs and speculative selling on local market days. There is also no vertical coordination between farmers and traders. Farmers sell small amounts of produce on an *ad-hoc* basis when they require cash, resulting in low prices and traders receiving unknown quantities of poor quality.

Value chain analysis was carried out on the five selected products and concluded little could be done to improve cattle and shallot value chains at present. The commercialisation of cattle will prove difficult as long as farmers consider them a store of wealth, selling only when cash is required, rather than producing for market with a target slaughter weight and age. For shallot, domestic production cannot compete with imports which are cheaper and better quality. Gross margin analysis also concluded cattle and shallot provided the lowest 'returns on investment' for farmers, traders and market vendors.

Specific recommendations to improve the groundnut, mung bean and red rice value chains include increasing yields; mechanising land preparation to increase area planted; improving drying and storage to reduce aflatoxin in groundnut, grain fracturing during red rice milling and bruchid infestation in mung bean; mechanising threshing (mung bean) and shelling (groundnut) to reduce labour costs; and strengthening market linkages with millers (red rice) and exporters (groundnut and mung bean).

The transition from subsistence farming to commercial agriculture will require mechanisation to increase area planted and finance for additional investment requirements. As domestic demand is largely satisfied for groundnut, mung bean and red rice consumption, links with export markets must be made, otherwise farmers will be unable to sell their produce. If products from Timor-Leste are to compete on international markets, costs of production must be reduced, quality improved and supply chains established.

Commercialising agriculture poses significant challenges and risks. It is recommended TOMAK improves the 'rules and regulations' of the agricultural marketing systems as follows:

- **Gendered and inclusive approaches to market system development**

The commodities analysed in this mapping are predominantly female commodities in that women are involved in every aspect of the value chain where men may not be. Some commodities are mostly led by women such as shallot, mung bean and groundnut. Some are jointly managed such as red rice. In cattle women play an equal but differing role to men. When the different needs of women and men are considered equally and collectively in the development of value chain solutions, then the probability of success rises significantly.

There will be a need to better understand and address the gender imbalance and discrimination that exists inherently in the agriculture sector in order to develop sustainable market solutions. Land ownership defines this divide initially and it flows onto assets, use of resources, agriculture services, regulations, household labour, market systems and family and farm decision-making. There is a need to explore and invest in 'push-pull' investments to address gender and inclusion disparity. *Push* strategies help women or vulnerable producers overcome persistent gender-based discrimination with specific reference to finance, mobility, literacy, market linkages, confidence and trust. Push strategies are utilised in each case to lay the groundwork that would eventually enable the *pull* of women into markets using more commercially-based incentives.

The TOMAK Gender and Social Inclusion Analysis (GESIA)[1] and the Women's Empowerment and Market Systems (WEAMS) framework (adopted by M4P) are key references in developing gendered market system approaches and targets.

- **Standards and contract farming law**

Two important aspects of the regulatory environment are product standards to improve quality and a contract farming law to protect investors.

If groundnut, mung bean and red rice are to be exported, product quality must be improved and one way to achieve this is by introducing industry standards. International standards, such as CODEX or ISO, already exist. It is recommended farmers, traders/exporters and Ministry of Agriculture and Fisheries (MAF) Quarantine Services (who provide export permits) are trained on how to achieve these standards and how to measure them. Grades based on the standards are then introduced, with premiums paid to encourage farmers to improve quality.

Contract farming is one means of attracting private sector investment to commercialise smallholder agriculture. As such, those investments must be protected for all stakeholders and the promulgation of a 'contract farming law' can provide assurance to all parties involved. The law must be enforceable which usually requires a third party to mediate and resolve disputes amongst stakeholders.

Commercial agriculture requires far more 'supporting functions' than subsistence agriculture. It is not TOMAK's mandate to provide these functions, but to facilitate others to provide them on a sustainable basis. As such, proposed interventions to improve 'supporting functions' include:

[1] See TOMAK Technical Report #8: '*Gender and Social Inclusion Analysis'*. December 2016.

- **Trader linkages and supply chain coordination**

Starting at the production base, smallholders should be clustered and collection centres established to aggregate produce into large enough volumes to attract traders to the farm-gate and reduce transport costs. Based on production clusters, farmers can make supply agreements with traders providing surety of market access for farmers and known supply volumes for traders. Clustering also provides an entry point for contract farming. As the smallholder sellers are generally women, it is important that they are empowered to build the skills required to mobilise as clusters and engage with traders effectively.

- **Groundwater irrigation**

Ensuring irrigation for crops is a major means of reducing risk for farmers who are investing in agriculture on a commercial basis. This becomes increasingly germane with the threat of climate change. Considering the high cost and management requirements of maintaining large surface-water fed irrigation schemes, the introduction of tube wells to exploit ground water aquifers may be more appropriate for farmer-managed irrigation systems.

- **Specialised technical support**

Public extension services are not expert enough for commercial agriculture. Either farmers need to be trained themselves on specific technical issues or private extension services introduced. Technical support can be provided by input suppliers or private technical experts employed by farmer clusters. The extension worker could also provide fertiliser and spraying services to farmer clusters. The introduction of new technology and provision of technical support are often part of a contract farming package. As groundnut, mung bean and shallot production and marketing functions are currently mainly undertaken by women, there is a need to plan for this within the technical support activities.

- **Finance**

Access to finance is important for both farmers investing in farm inputs at the beginning of the season and for traders buying in bulk at harvest. Financing for ‘farm service providers’ to purchase tractors and post-harvest handling machinery will also be required. As farmers (particularly women) and small businesses are often not eligible for financing from the formal banking sector, it is recommended other innovative value chain financing instruments are introduced such as ‘trade receivables financing’, ‘warehouse receipts financing’ and ‘lease-purchase agreements’.

- **Post-harvest handling**

Increasing quality for export markets requires improved drying and storage facilities, and processing costs must be reduced through the introduction of labour saving machinery. Post-harvest services can be provided by an individual business on a ‘service fee’ basis, a trader linked into the value chain who wishes to ensure quality control, or collectively by farmer clusters using shared equipment. For example, a post-harvest handling business could be established by a farmer cluster to operate the equipment, which farmers then pay to use. Specific post-harvest handling improvements could include: introducing moisture content meters, use of electric dryers, bruchid fumigation (mung bean storage), introducing mechanical shellers (groundnut) and threshers (mung bean). As many of the post-harvest functions are currently undertaken by women, often involving considerable work burden, it is advised the focus be on supporting women-led trials of labour saving approaches.

- **Tractor services**

Reducing labour costs and increasing mechanisation are key to making commercial agriculture viable in Timor-Leste. Tractor services, be it two-wheel or four-wheel, are essential for expanding agricultural production. MAF is currently providing subsidised tractor services for land preparation. Women, men and extension workers reported that women have limited or no access these services. Stereotypes seem to prevail that men prepare the land and women are unable to utilise large farming equipment. The risk here is that the needs of female-headed farming households are not met. Private sector tractor services do exist and must be supported to ensure sustainability.

- **Business management support**

Commercial agriculture will stimulate the emergence of farm support services including tractor services; contract spraying / fertilising; and post-harvest threshing/shelling/drying and storage. Often these service providers will have no previous business management experience and will have taken out loans to start their business. It is recommended on-going business management support is provided to these enterprises to ensure their viability and sustainability, and also to progressive farmers who want to expand their businesses.

- **Market research**

No market research is currently carried out in Timor-Leste by either the public or private sector. Commercialising agriculture will require establishing linkages with new export markets, which needs market research. It is recommended TOMAK commissions several rapid market research studies to identify new export markets and buyers and additional products for which Timor-Leste has a comparative and competitive advantage.

The M4P (including WEAMS) approach prescribes a facilitative role to bring about more effective and sustainable systemic change to the market system. Considering the opportunities to improve agricultural market systems in Timor-Leste described above, it is recommended a 'smallholder inclusive business model' strategy be prepared to bring about the systemic changes.

Contract farming is one example of a smallholder inclusive business model. Contract farming is an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices. The arrangement also invariably involves the purchaser in providing some of the 'supporting functions' described above, such as the supply of inputs and the provision of technical advice.

In other countries, contract farming has proven to be a successful means of integrating smallholders into commercial supply chains. Market access is provided for farmers and product supply is assured for traders, allowing the development of an agricultural market system. TOMAK's role could therefore be to facilitate the establishment of various smallholder inclusive business models and contract farming arrangements between value chain stakeholders such as groundnut farmers and commodity traders/West Timor importers, mung bean farmers and West Timor importers, red rice farmers and millers.

Main Report

1. Introduction and Background

To'os Ba Moris Diak Program (TOMAK) is an A$25 million, 5+5 year agricultural livelihoods program funded by the Australian government in Timor-Leste. Its goal is to ensure rural households live more prosperous and sustainable lives. TOMAK will achieve this through parallel and linked interventions that aim to:

- Establish a foundation of food security and good nutrition for targeted rural households.
- Build their capacity to confidently and ably engage in profitable agricultural markets.

Gender equality and women's empowerment is systematically incorporated into the design, implementation and monitoring of all interventions across both components.

The primary target area comprises inland mid-altitude areas that have some irrigation capacity. This zone includes around 70-80 suku, located mainly in the Maliana basin (including most of Bobonaro); the eastern mountain regions (including large parts of Baucau and Viqueque) as well as parts of Lautem and Manatuto; and Oecussi. The program will initially focus its activities in Baucau, Viqueque and Bobonaro Municipalities.

TOMAK will develop an early focus on target value chains that have the strongest market potential and offer the best economic returns.

This study[2] comprises step three of a three-step process designed to identify and assess high-potential value chains where TOMAK will provide development assistance from early 2017. The three steps are as follows:

- Step 1: Conduct of a broad market scan to identify commodities with best market potential. The results from this work identified a list of products that were assessed to have market potential, to be further assessed through steps 2 and 3[3].
- Step 2: Assessment of farm-level aspects of selected crop and livestock production systems, including current production practices, constraints, and opportunities for improvement, providing a basis for an informed initial selection of value chains for more detailed analysis[4].
- Step 3: Conduct of detailed analysis of value chains that are assessed to have both market potential, and clear opportunities for productivity improvement on-farm.

1.1. Approach and methodology

The objectives of the Market System Assessment are to map the value chains for cattle, groundnut, mung bean, red rice and shallots; analyse their market systems; and identify constraints and root causes of underperformance. Development opportunities and plausible intervention areas for TOMAK are then developed based on the priority constraints identified. The assessment was undertaken using a gendered value chain and Making Markets Work for the Poor Approach (M4P).

The underlying rationale for the M4P approach stems from an appreciation of the importance and role of market systems in reducing poverty. M4P is an approach to developing market systems so that they function more effectively, sustainably and beneficially for poor women and men, building their capacities and offering them the opportunity to enhance their lives. By bringing about change in the market systems within which people live and work it is possible to effect substantial and lasting change that can impact on many, and sustainably, rather than a few, temporarily.

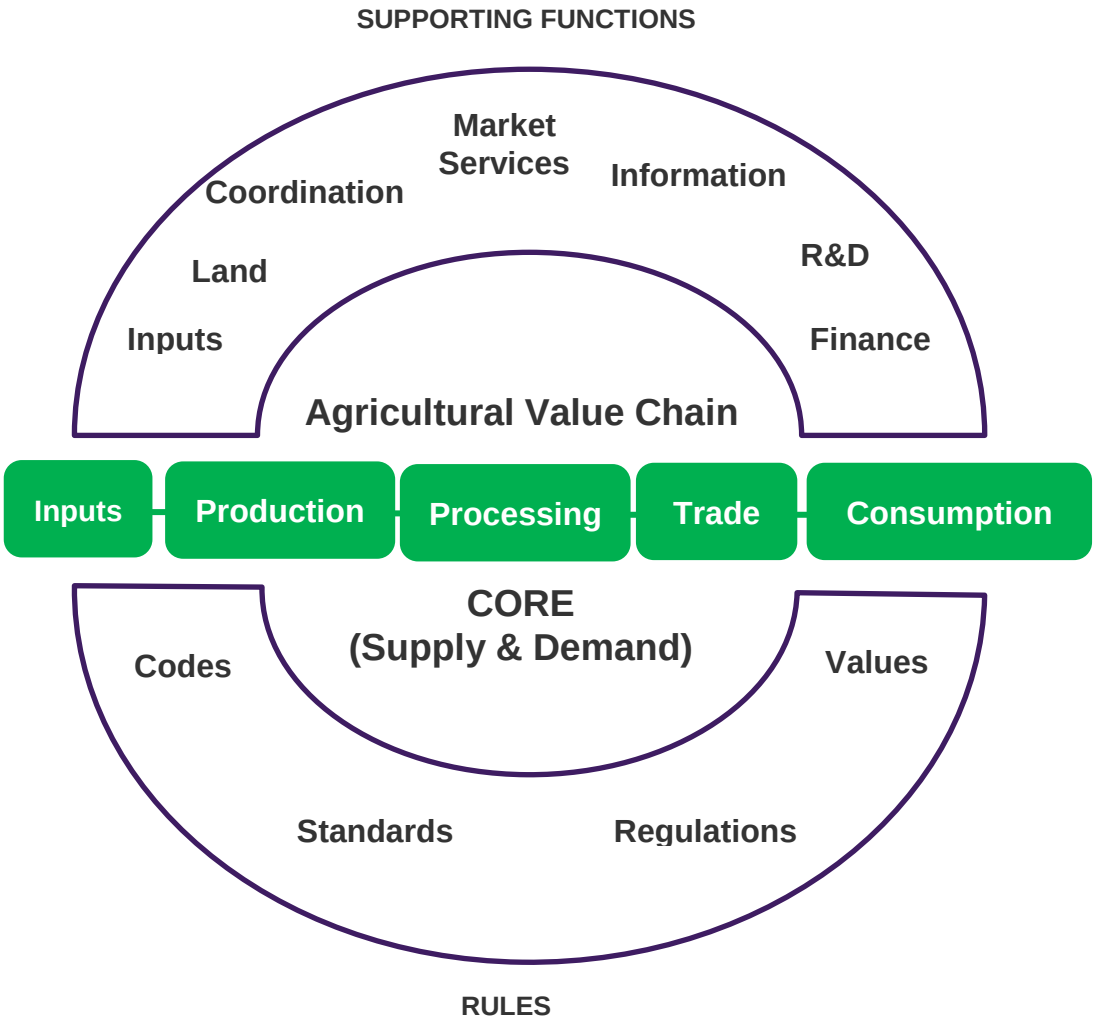
[2] The team comprised: Adam Sendall (Value Chain Consultant), Jenny Ikelberg (TOMAK Value Chain Specialist), Joaninha Guterres (TOMAK Value Chain Specialist), Inga Mepham (TOMAK Gender Specialist), and various participants from the Market Development Facility (MDF). The team would like to thank the wide range of institutions and people met during the mission for their cooperation and assistance.

[3] See TOMAK Technical Report #1: '*Market Analysis of Selected Agricultural Products'*. October 2016.

[4] See TOMAK Technical Report #2: '*Potential for improving on-farm productivity of selected agricultural and livestock products*'. November 2016.

M4P's value-add stems from developing a transparent view of a market system and of the functions (core transactions, rules and supporting functions) and players within it. Interventions are then built based on a detailed understanding of markets and the poor within those markets. Figure 1 shows a simplified view of the agriculture system, using the M4P market system construct.

Figure 1: Schematic of the Agriculture Market System



Source: Springfield Centre (2008) *Perspectives on the M4P Approach,* DFID/SDC.

The core function in any market system is to provide a space for transactions of a good or service based on supply and demand. However, the nature and efficiency of the core is shaped by formal and informal rules and a range of supporting functions. These determine behaviour and practices, shape relationships, and provide information, knowledge and incentives. Within this environment, a diverse range of public and private, formal and informal players may be active. It is this multi-function, multiple-player arrangement that M4P refers to as a market system.

Specific to the agriculture sector, important supporting functions include input markets and how they can be made more accessible to the poor; land ownership; improved coordination and business linkages amongst smallholders; strengthened private-sector led market services; and how the flow of technology, ideas and knowledge for agriculture can be improved. Rules include standards and regulations, which are commonly provided by Government to shape market outcomes and govern participation and behaviour in markets.

By addressing underlying causes, rather than symptoms of weak performance, M4P aims to unleash large-scale change. Interventions may be small in themselves, but should continually strive to leverage the actions of key market players to bring about extensive and deep-seated systemic change.

Sustainability is a prime concern of M4P. This means considering not just the existing alignment of key market functions and players but how they can work more effectively in the future, based on the incentives and capacities of players (government, private sector, associations etc.) to play different roles. As external players M4P projects seek to catalyse others in the market system, while not becoming part of it themselves. Finally, M4P requires that gender constraints be considered at all stages and that agencies and governments play a facilitating role in addressing these.

As noted above, prior to this assessment two precursor studies were carried out to appraise the market and on-farm potential of several value chains. The studies identified cattle, groundnut, mung bean, red rice and shallots as value chains that could offer the best economic returns for farmers in the short-term. Selection criteria included crops for which: (i) productivity could be improved through proven production techniques and showed the highest financial returns per labour day, (ii) are already widely grown, (iii) have a strong market demand and potential for further growth, and (iv) possess established trading linkages.

TOMAK targets suku in the 'mid-altitude irrigable' zone, which are defined as non-coastal suku where more than 35% of households grow rice, often have access to irrigation and grow a diverse number of crops and livestock. For this assessment, field research covered a sample of twenty suku in Baucau, Bobonaro and Viqueque municipalities (See Table 1).

Table 1: Suku included in the field research

Municipality	Baucau	Bobonaro	Viqueque
Suku	Uailaha Fatulia Uaioli Vemase Uatu Lari Venilale Gariuai	Atuaben Saburai Lahomea Ritabou Manapa	Ossu rua Ossu decima Bahalarawain Uma Ana Tolu Buikarin Builale Uaigia Uabubu

The purpose of the field research was to fill in information gaps from the two previous studies so detailed value chain analysis could be carried out.

The Consultant carried out the field research with a small team of TOMAK staff and representatives from the Market Development Facility (MDF). Persons interviewed in the municipalities and suku included Ministry of MAF district officers, farmers (individuals & groups), traders, market vendors, national non-government organizations (NGOs) and international NGOs in each municipality.

At national level, interviews were held with MAF National Directors for agriculture and livestock, commodity exporters and a major supermarket. A market survey was also carried out in Taibessi fresh produce market. A list of persons met and documents reviewed are found in Appendices 1 and 2, respectively.

Finally, a 'National Validation' workshop was held in Dili including 37 participants (10 women and 27 men) including key Government officials, private sector players and donors to present a summary of the main findings from all three municipalities.

1.2. Agriculture sector performance

The economy of Timor-Leste is driven by offshore petroleum revenues and Government infrastructure contracts, which has concentrated economic growth in Dili. Petroleum revenues are set to decline over the next 25 years and over 70% of the population remain reliant on the agriculture sector for employment. Widespread poverty, particularly in rural areas, persists with 42% of the population living below the poverty

line[5] and 27% of the population consuming below the minimum level of dietary energy consumption (ADB, 2014). As few other economic opportunities exist, the pathway out of poverty for most of Timor-Leste's population will be through agriculture.

The agriculture sector in Timor-Leste accounted for 19% of GDP, or just over $253 million in 2013. The 'industry' and 'services' sectors accounted for 63% and 18% respectively (World Bank). Although agriculture sector contributions to GDP are declining in favour of the services sector, over 70% of families rely on some form of farming activity for their survival. Coffee is the only significant non-oil agricultural export and in 2014, coffee exports, mainly to Germany and USA, were valued at USD14 million. However, there is a considerable net deficit in agricultural trade as agricultural imports in 2014 were valued at approximately $60 million. Major imports included rice, sugar, meat (chicken, beef, pork), vegetable oil, fish, milk and vegetables (potato, onion)[6].

In rural communities 57.5% of women and 60% of men are actively involved in agriculture[7]. Agricultural production is carried out by 154,000 smallholder households, cultivating an average of 1.2 ha per household, mainly on a subsistence basis. Most smallholdings are mixed rainfed farms growing maize, cassava, red kidney beans, sweet potato, rice, groundnut and vegetables. Coffee, coconut and candlenut are the most common tree crops.

Livestock, such as poultry, pigs, cattle, buffalo, goats and sheep are raised on a small-scale and extensive basis. Intensive pig and poultry production has not developed in Timor-Leste due to the high cost of imported concentrate feeds and cheap imported pork and chicken meat.

Artisanal capture fishing provides over 85% (6,065 tonnes) of fish consumed in Timor-Leste. Most of the sea fishing is carried out using small traditional boats, gill nets and long lines. Only 21% of boats are motorized. Mariculture and inland aquaculture have only recently been introduced on a small-scale. Commercial offshore fishing is carried out by foreign fleets under license. There are indications of over-fishing and sustainability of wild fish stocks is a major concern.[8]

About 52% of the country is covered by light and dense forest. Forest trees include teak, sandalwood, rosewood and mahogany. Most forest is degraded and very little is exploited on a commercial basis.

Overall, agricultural productivity is low. Steep topography coupled with unsustainable farming practices such as 'slash and burn' contribute towards degradation of the resource base. Crop yields remain low due to the use of traditional, low risk and low cost production methods and there has been limited adoption of yield-increasing technologies such as irrigation, mechanisation, improved varieties and fertilisers.

Low levels of agricultural output means farmers consume most of the food they produce themselves and agribusiness has not developed. Unsurprisingly, market systems remain rudimentary and access to services that support a commercialisation process such as finance, extension, traders and market information are extremely limited.

[5] GDS (2014) *Poverty in Timor-Leste,* MoF
[6] GDS (2014) *External Trade Statistics,* MoF
[7] Government of Timor-Leste (SEPFOPE and General Directorate of Statistics). 2015. Timor-Leste Labour Force Survey 2013
[8] Sendall, Gusmão & Comon (2016) *LEO Aquaculture Feasibility Study,* ACDI/VOCA/USAID, Timor-Leste

2. The Agricultural Market System

1.3. Rules & regulations

1.3.1. Institutions

Ministry of Agriculture & Fisheries (MAF)

The Ministry of Agriculture & Fisheries is the main institution for the agricultural sector, with a budget of $22.34 million (2016). By Government mandate, MAF is responsible for creating technical assistance centres for farmers; managing technical and agricultural education; raising agrarian investigation; controlling land use for agricultural and livestock purposes; fostering and verifying animal health; promoting agro-industries; fostering and overseeing food production, including seed production; ensuring Quarantine Services; implementing a cooperative system for the production and trading of agricultural products; performing feasibility studies for the installation of irrigation systems, water storage and associated facilities; managing forest resources and watersheds; fostering the development of industrial plants, namely coffee; managing water resources for agricultural purposes; controlling and overseeing fisheries and fish farming sectors; and managing National Parks and Protected Areas.

At the national level MAF has Technical Directorates for agriculture (crops, horticulture, extension, irrigation); livestock and veterinary; forestry, coffee and industrial plants; fisheries; agricultural education; quarantine and bio-security; research and statistics; and, agribusiness. MAF has Regional Offices in Baucau (east), Ermera (west) and Manufahi (central) that carry out a coordinating role between the national MAF office in Dili and the municipalities.

In each Municipality, the Municipal Agricultural Offices have Officers for each of the main disciplines i.e. agriculture, irrigation, livestock, forestry, fisheries and agribusiness. In addition, at Administrative Post level there are 65 Extension Coordinators responsible for supervising the Suku Extension Officers (SEO) in their respective Administrative Posts. There is a total of 442 SEOs, nominally one for each suku, providing general agriculture advice to farmers. The percentage of women SEOs varies in each municipality. In Viqueque it is 7%, in Bacau 12%. The total percentage of women in MAF is currently at 18% of which only 5% hold senior management roles[9]. This is considerably lower than the Government's minimum target of 33% women in the public service[10].

Ministry of Commerce, Industry and Environment

The Ministry of Commerce, Industry and Environment (MCIE) is the main institution for developing commerce, with a budget of $12.70 million (2016). By Government mandate it is responsible for designing, executing and assessing policies on commerce, industry and environment; improving national and international competitiveness; appraising and licensing industrial and commercial ventures; managing company information and documentation; promoting development of the co-operative sector, especially in rural areas and regarding agriculture, in coordination with MAF; promoting micro and small enterprises, organising and administering registration of industrial property; promoting international standardisation, metrology, and quality control; implementing environmental policy; performing strategic environmental assessments of policies, plans, programs and legislation; and ensuring the adoption and supervision of pollution prevention and control measures by the relevant facilities.

Instituto de Apoio ao Desenvolvimento Empresarial

The *Instituto de Apoio ao Desenvolvimento Empresarial* (IADE) is the main institution for providing business development services, with a budget of $1.28 million (2016). IADE is an autonomous institution under the tutelage of the Minister of State, Coordinating Minister for Economic Affairs (MECAE). IADE is charged with providing assistance to new and developing businesses by providing practical training, counselling and business support services. IADE has offices, training rooms and fully trained staff in 12 municipalities, offering

[9] GoTL (2015) Human resources data across 6 ministries
[10] GOTL (2011) Timor-Leste Strategic Development Plan 2011-2030

business services throughout Timor-Leste. A key target of IADE has been women's producer and processing groups established and supported by Secretariat of State for the Socio-Economic Support of Women (SEM) and local and international NGOs.

As a relatively new independent country, institutional capacity is still evolving. With limited resources, MAF focuses on food security and MCIE focuses upon non-agricultural commerce. Although policy is supportive of commercial agriculture, strategies and the regulatory framework to achieve policy objectives remain weak.

1.3.2. Government policies & strategies

The Strategic Development Plan 2011-2030 (SDP) articulates the Government's over-arching economic development agenda and emphasises the importance of a thriving agricultural sector for food and nutritional security, poverty reduction, and economic growth for the nation as a whole. Rural development, agriculture and gender equity are key components for economic development.

Rural development objectives are to support private sector development in rural areas, to increase incomes and provide rural employment opportunities. Strategies to achieve this include promoting the establishment of cooperatives and providing business development services through the Business Development Centres (IADE) in the municipalities. Agribusiness is also specifically encouraged.

Goals for the agriculture sector are to improve national food security; reduce rural poverty; support the transition from subsistence farming to commercial farming of crops, livestock and fisheries; and promote environmental sustainability and the conservation of Timor-Leste's natural resources. Strategies to achieve this include rehabilitating and extending irrigation systems, introducing high-yielding varieties and new crop production techniques, and improving on-farm storage. Rice, maize, fruit and vegetables, and cash crops (coffee, candlenut, coconut) are specifically identified as crops with high potential.

Strategies for livestock rely upon increasing livestock numbers through improved health (vaccination campaigns) and nutrition. Cattle are specifically targeted as having potential for import substitution and export. The strategy for fisheries focusses mainly on the development of inland aquaculture for food security, and commercial aquaculture for export. For forestry, the focus is on reforestation and the promotion of sustainable forest management practices. In line with the SDP, the MAF Strategic Plan (2014-2020) focusses on five strategic objectives:

- Increase (on a sustainable basis) production and productivity of selected crops, livestock species, fisheries and forestry;
- Enhance and improve market access and market value addition (develop safety and quality standards, facilitate access to high quality inputs, support diversification into high-value products and value-addition through processing, provide rural marketing infrastructure, promote collective marketing through farmer groups and associations, and promote private sector engagement for the provision of marketing services);
- Improve the enabling environment (legislation, policies, institutions, and infrastructure);
- Ensure MAF and related agencies are strengthened and appropriately configured and equipped to deliver the MAF Strategic Plan and the Government's SDP; and
- Enhance sustainable resource conservation, management and utilization.

Government is still developing policies and strategies and the policy framework for the agriculture sector remains weak, especially with respect to commercial agriculture. Although sub-sector policies or laws have been developed for agricultural extension, forestry, fisheries, food security, gender equality and quarantine; policies for water and irrigation, seed and fertiliser use, land use and management, livestock production and agro-chemicals have yet to be completed.

The most recent Government policy that has had largest impact upon the agriculture sector is the provision of welfare transfers by the Ministry of Social Solidarity, such as old-age pensions, veteran recognition payments and disability allowances. Whilst socially justifiable, the welfare transfers coupled with an out-migration of young people from rural areas may have led to reduced agricultural output, as older people remaining in rural areas choose to buy food with the welfare transfers rather than produce it themselves.

1.3.3. Regulatory environment

There is limited private sector investment in the agriculture sector. The World Bank '*Doing Business Report*' (2016) ranked Timor-Leste 173rd out of 189 countries for ease of doing business. Although Timor-Leste ranked 189th for registering property and enforcing contracts, it ranked better at 92nd for trading across borders. Corporate tax is comparatively low at 10% and tax-free holidays are available to new investors. Other important features of the regulatory environment are described below.

Land tenure

A Land Law is currently with Parliament for review and approval. Secure land tenure is crucial for private sector involvement in agriculture to fund investments such as irrigation and processing plants. Timor-Leste faces three areas where land reform poses a challenge: farmland currently under customary practices; urban land in need of zoning and clear property rights; and Government land that can be used for public and private investment. Legally recognised land ownership is also necessary for farmers to obtain loans from banks, as often it is the only tangible physical asset they could provide as collateral.

Trade agreements

Currently, Timor-Leste has no formal trade agreements and is not a member of the World Trade Organisation (WTO). Most importantly, Timor-Leste only has 'observer' status within the Association of South East Asian Nations (ASEAN), so cannot benefit from the ASEAN Free Trade Area.

Customs procedures and import/ export taxes

All commercial businesses in Timor-Leste must be registered with SERVE (one-stop-shop for business registration and licensing) to receive an operating license, and with the Ministry of Finance (MoF) to receive a Tax Identification Number. To export agricultural produce from Timor-Leste, businesses must receive a Certificate of Origin from MCIE, an Export Permit from MAF and a Customs Declaration from MoF. Export Permits and Customs Declarations are issued in Dili with physical inspections carried out at the main international border points (Batu Gede terrestrial border with Indonesia, Nicolau Lobato international airport and Dili Port).

Although exports incur a Customs Brokerage charge, agricultural exports from Timor-Leste are free from export tax. Customs procedures in Timor-Leste have been improved and simplified over recent years and are not considered an impediment for the export of non-perishable goods.

If goods are exported overland to Indonesia, most agricultural imports incur a 5% import tax but no Value-Added Tax (VAT) is paid on unprocessed commodities. However, processed goods such as roast and ground coffee of shelled groundnut (kernel) incur a 10% VAT charge.[11]

Non-Tariff Barriers to Trade

Technical barriers to trade, such as Sanitary and Phyto-Sanitary (SPS) requirements of importing countries, can be problematic for exporters of agricultural produce. Although Timor-Leste has promulgated a 'Decree Law No. 21/2003 on Quarantine and Sanitary Control on Goods Imported and Exported' and 'Decree Law No. 1/2006 on General Regulations on Quarantine', it does not comply with internationally recognised SPS measures established by the World Organisation for Animal Health (OIE), Codex Alimentarius, and the International Plant Protection Convention.

Agricultural crops can be exported from Timor-Leste into Indonesia with an Export Permit provided by MAF quarantine services. However, Indonesia has banned the import of cattle from Timor-Leste due to bio-security concerns regarding endemic brucellosis in the Timorese herd. Nonetheless, the Government is committed to addressing this issue through establishing and implementing an OIE standard 'Terrestrial Animal Health Code', which could take several years to complete.

[11] Sendall & Associates (2006) *West Timor Market Study,* GTZ

Currency Exchange Rate

Timor-Leste uses the United States Dollar (USD) as its official currency. The Indonesian Rupiah (IDR)/USD exchange rate has fallen from IDR 9,000 in 2011 to IDR 13,000 in 2016, a 44% decrease. As the US economy recovers from the global financial crises, all Asian currencies have weakened against the USD. The IDR is currently at an 18-year low against the USD because of a wide current account deficit. Even though Indonesia is introducing several measures to reduce the current account deficit, exchange rates are not likely to improve significantly in the near future.

Indonesia would be an ideal export market for the small volume of potential agricultural exports from Timor-Leste. Produce could trickle over the land border into West Timor and feed into the supply chains providing for the huge Indonesian market. However, the comparatively high costs of production (imported inputs and high labour costs) make Timorese products less cost competitive than Indonesian products and once IDR has been exchanged back into USD, prices are less attractive to farmers and traders in Timor-Leste.

Use of the USD has also made imports comparatively cheaper than locally produced goods. One notable example is the import of rice from Vietnam, which costs $350/Mt fob (Free on Board) Hanoi[12] or approximately $425/Mt landed in Dili, and retails for $0.50/kg. It is estimated the Vietnamese rice farmer receives $0.20/kg for paddy at farm-gate, whilst Timorese rice farmers currently receive $0.40/kg for paddy at farm-gate.

1.4. Supporting functions

1.4.1. Infrastructure

Roads

Timor-Leste has 1,427km of National Roads, 812km of Municipal Roads, 716km of Urban Roads and 4,702km of Rural Roads. Up to 57% of rural roads are judged to be in poor or bad condition and 43% are in fair or good condition.

The Rural Road Five-Year Investment Plan (2016-20) has a budget of $118.6 million for the rehabilitation of 1,465km of poor or bad roads; the periodic maintenance of 393km of roads in fair condition and the routine maintenance of 117km of roads in good condition. Roads for rehabilitation have been prioritised based on the population served and engineering costs.[13]

Although road conditions are improving, access continues to be a major challenge for many areas during the rainy season. The aggregation and transport of produce from remote areas of production to areas of consumption is time consuming and costly for traders. Oftentimes Dili-based traders and retailers find it easier to import produce, rather than source domestically.

Irrigation schemes

Prior to independence approximately 72,000ha of land was irrigated, with operation and maintenance carried out by Government. After independence, the area of working irrigation schemes fell to 34,000ha. Over 60% of the schemes are traditional systems with 98% using gravity-flow surface water. The majority of schemes provide supplemental water only during the rainy season, and only 20% of schemes can produce a second crop.

The transition to community-based management for irrigation schemes has not been successful and many more schemes have fallen into disrepair. This, coupled with the reduction in irrigated rice production due to the provision of welfare payments and the import of cheap rice, as mentioned above, has led to more schemes being abandoned.

Irrigation is important for increasing agricultural production. However, it is now evident low crop productivity coupled with the maintenance requirements of gravity-flow surface water schemes makes them unviable in most instances. Other irrigation technologies need to be explored.

[12] World Bank Pink Sheet, October 2016
[13] MPWTC (2015) *Rural Roads Master Plan,* GoTL

Utilities

Timor-Leste is in the final phase of a nation-wide electrification program designed to connect every suku to the national grid. Urban water supplies are being improved in all district capitals, and there is widespread mobile phone coverage provided by three service providers: Timor Telecom, Telkomcel and Telemor. As such, the availability of utilities has considerably improved over recent years and should not be an impediment to commercial agriculture and agribusiness.

Market Places

There are no wholesale markets in Timor-Leste. Traditional fresh produce markets are the venue for traders to sell to market vendors and the market vendors to sell to consumers. Dili's main fresh produce market is located at Taibessi, where full-time market vendors sell their products. Each municipality capital has similar daily markets and some Administrative Posts hold weekly markets. Rural producers, particularly women, travel to these markets from home, sometimes in groups but usually as individual sellers. They often sleep overnight in the market place for one-five nights.

Typically, dry goods are imported from Indonesia; rice is imported from Vietnam; potato, onion and garlic are imported from China; and vegetables and beans are produced locally. Although meat and fish are sold in Dili markets, very little is sold in municipality and administrative post markets. There are no fees for market stalls but *ad-hoc* contributions are common. For instance, in Maliana retailers provide a $2 donation to the church on national holidays. The only exception is for meat retailers in the Dili/Taibessi market, who pay $30/month to use allocated market facilities. Sanitation and food safety conditions are poor. Safety of women and children in the market has not been analysed in detail, but during fieldwork female traders reported that they had seen or experienced incidents of intimidation, domestic violence, sexual harassment and conflict between vendors.

1.4.2. Services

Technical advice

Although there are three Agricultural High Schools in Timor-Leste, a survey carried out by the Seeds of Life Program (SoL) in 2012 found that 78% of farmers had only received primary school education, and few students returned to farming after graduation. The introduction of improved technologies is reliant on public extension services and development projects.

The national extension service is described under Section 2.1.1. Although each suku is provided with a SEO, they are generalists and cannot be expected to provide expert technical advice on every crop. In order to get access to free inputs from Government (seed, tools, hand tractors), training, or visits by the extension worker, farmers have to belong to a group. This means that SEO's do not provide extensive coverage to all farmers in a suku. A recent report from SoL found that only 30% of farming households were part of an agricultural group. Of these 30%, 65% were men and 35% were women[14]. Few women hold leadership roles within agricultural groups. The same report also found women members of the households had significantly lower access to extension services than men, with only 23% of women reporting they knew the SEO. SEO's can be aware of the differing roles, disparity and support needs of male and female producers, but don't necessarily have the skills to meet them.

Commercial agriculture requires specialised technical support, which is usually provided by private extension services through contract farming arrangements, or by farmers attending short duration training courses, often supported by projects.

Business advice

IADE has offices in every municipality (Business Development Centres) and provides training in how to: (i) identify your business; ii) start your business; iii) improve your business; and (iv) expand your business. Training is provided that specifically targets women's producer and processing groups. IADE also provides a

[14] Akter.S, Erskine. W, Branc,LV, Agostinho.OF, Imron.J & Spyckerelle.L (2016) *Gender in crop production in Timor-Leste*

Business Incubation Facility, market research and business match matching services. However, the services are rarely used and it is doubtful if they are expert enough for commercial ventures.

Tractor services and other labour saving devices

MAF offers 4-wheel tractor services (disc ploughing) in the municipalities for a subsidised payment of fuel and food for the driver. Similar private sector tractor services are available for $100/ha plus fuel. Tractor and other farm mechanisation services are essential for commercial agriculture to take place and will also provide additional employment opportunities in rural areas. Women, men and extension workers reported that women have limited or no access to tractor services. Stereotypes seem to prevail that men prepare the land and women are unable to utilise large farming equipment. The risk here is that the needs of female-headed households are not met.

Veterinary services

There are fewer than ten qualified veterinarians in Timor-Leste, all of whom are based in Dili. MAF has livestock officers at Municipal level and animal technicians in most Administrative Posts, who carry out vaccination campaigns. Previously, over 400 Village Livestock Workers were trained to provide basic animal health care, however, few remain active.

Currently, MAF provides free vaccinations for cattle (Haemorrhagic Septicaemia), pigs (Swine Fever) and poultry (Newcastle Disease). However, considering the small number of vaccinators compared to livestock populations, coverage rates are low.

As with the provision of technical advice described above, commercial livestock farms usually receive veterinary services as part of contract farming arrangements, by farmers attending short duration training courses covering basic procedures, or by contracting private veterinarians for more complicated procedures.

During fieldwork, women farmers reported having limited or no relationship with veterinary services. Men are generally responsible for contacting these services. Women's preference is to vaccinate livestock on a regular schedule, whereas men's practice is to vaccinate if livestock starting to die in their area. Women respondents expressed a willingness to pay for vaccination. This difference in livestock management creates tension in the household. Evidence suggests that an intensive focus on improving women's access to livestock health services and expertise in livestock health management to the same levels as men would greatly improve animal health outcomes.

1.4.3. Research & development

The Directorate of Statistics and Research under MAF currently focuses on identifying, introducing and multiplying improved seed varieties, based on work previously carried out by the SoL Program. Adaptive research on improved production technologies, based on improved technologies adopted in other countries, is not considered to be a major constraint. The main constraint for commercialising agriculture at this point of time is 'market' research, and developing linkages with those markets. The Directorate of Statistics and Research has very limited involvement in the conduct of socio-economic research.

1.4.4. Farm inputs

There are at least three farm input stores in Dili selling seeds, sprays, fertilisers, animal feeds and medicines, and farm tools and equipment. Farm inputs in most demand are seeds and sprays for the horticulture sector.

Most of the products originate from Indonesia. As the market in Timor is still small, none of the farm input stores can become official distributors yet, which requires sales over $0.5 million. Therefore, farm input stores in Dili buy from second and third tier distributors in Indonesia and import themselves. Few problems are experienced during import, apart from bio-security concerns regarding blood and bone meal content of animal feeds.

Mercy Corps has supported eleven suppliers and retailers of farm inputs (branded as Loja Agrikultura) across four rural municipalities and urban Dili, focusing on inputs for horticulture, animal medicines and the safe use of agrochemicals. Mercy Corps has facilitated training for storeowners in business management, soil pH

testing, animal medicine and safe use of agro-chemicals, enabling them to provide useful technical advice to farmers. Demand for farm inputs is growing and farm input suppliers are a possible source of technical advice.

1.4.5. Finance

Timor-Leste has three foreign banks - *Bank Mandiri* (Indonesia), ANZ (Australia), *Banco Nacional de Ultramarino* (Portugal) and one national bank, the *Banco Nacional Comersial Timor-Leste* (BNCTL). BNCTL has branches in all municipalities and provides agriculture / agribusiness loans. Loans available from BNCTL are summarised in Table 2.

Table 2: BNCTL Loans

Loan Type	Maximum Amount ($)	Repayment Period	Interest Rate (%)	Requirements
Women's Group	1,000	6 months	14	Cash flow forecast
Agriculture	2,000 for coffee production. 1,000 for other crops	9 months	16	Salary guarantee, land certificate, vehicle registration
Multipurpose	50% of salary	5 years	16	For salaried employees
Business	No limit	3 years	10-16	Collateral worth 120% of loan value
Market Vendor	1,000	6 months	14	Business plan

Source: BNCTL

Loans are available for persons with salaries or collateral. Interest rates are high at 14-16% and loans for small businesses are limited to $1,000. Whilst traders are generally able to fulfil the borrowing requirements from formal financing institutions, farmers cannot and usually borrow from family and friends, or receive credit advances from traders as down payments on crops prior to harvest.

There are two Micro-Finance Institutions (MFIs) operating in Timor-Leste, *Moris Rasik* and *Tuba Rai Metin* (TRM). These two institutions hold customer guarantee savings of over $500,000, and as such fall under the BCTL 'ODTI Licensing and Supervision Regulations' introduced in 2010. *Moris Rasik* is strongly influenced by the principles of the Grameen Bank, and group lending dominates its loan portfolio. It has faced problems of declining portfolio quality and a high client dropout rate, and has undergone internal restructuring. Although smaller than *Moris Rasik*, TRM is expanding and now has branches in each municipality.

In addition to savings and loans groups established by NGOs, Credit Unions provide financing to members at a slightly higher interest rate of 20%, which also requires collateral guarantees. However, most Credit Union loans are for short-term personal purposes, rather than agriculture or business.

Apart from long-term loans for capital investment, farmers' most common financing requirements are medium term loans to cover cashflow gaps between planting and harvest. The urgent need for cash at harvest often forces farmers to sell most of their produce when prices are lowest.

Traders and exporters also require large amounts of cash to buy in bulk so that they can quickly accumulate tradeable volumes of produce. Without financing, indigenous wholesale and export-oriented supply chains will be slow to emerge.

1.4.6. Market information

Most farmers are production-oriented and sell whatever surpluses remain after home consumption. They have limited knowledge and awareness of value chains, marketing issues and how incomes can be increased through marketing strategy. There are no public market information services. Most farmers receive their price information from traders and the market place.

Field investigation provided examples of men and women working together to use the small amount of market information they have. Examples of this were women receiving market information at the market place (e.g. that the price of shallots, pigs or tomatoes is high in a specific market e.g. Dili). On their return, they pass the information on to their group or family, which then decides how to act on it. Generally, though the market

places remain underutilised. The establishment of 'one stop shop' information stands in marketplaces could be a way of quickly changing this dynamic.

Most households have access to communication tools that could be used for disseminating market information, such as mobile phones (49% ownership), radio (22% ownership) and TV (10% ownership).[15]

3. Production and Consumption (Supply & Demand)

1.5. Municipal profiles

1.5.1. Baucau

Baucau is located 122km east of Dili. It is Timor's second largest municipality by population with 124,061 inhabitants. The urban population (17,545 persons) lives mainly in Baucau town[16]. The municipality district has 474km of rural roads, 56% of which are in poor or bad condition and 159km of rural roads will be improved between 2016-20[17].

Baucau is one of the leading municipalities for groundnut production, mainly in Garuai sub-district, and the third largest producing district for shallot, mainly in Venilale Administrative Post. Red rice is grown in Vemase and Laga Administrative Posts. Baucau is not a major cattle producing area, with very few animals traded out of the municipality. Very little, if any, mung bean is grown. Most of the mung bean sold in the municipality market is sourced from Viqueque. Cattle numbers and crop production areas are presented in Table 3.

Table 3: Cattle Numbers and crop production areas in Baucau Municipality

Commodity	Cattle (head)	Groundnut (ha)	Mung Bean (ha)	Red Rice (ha)	Shallot (ha)
No.	11,593	421	0	n/a	200

Source: cattle = MoF 2015 census; groundnut, mung bean and shallot = Baucau em Números 2013

1.5.2. Bobonaro

Maliana, the capital of Bobonaro municipality, is located 149km south-west of Dili. The western perimeter of Bobonaro district forms the international border with Indonesia. Batu Gede is the international border crossing. The close proximity to the Indonesian border provides Bobonaro with a comparative advantage for overland export to the Indonesian market. Bobonaro is Timor's fourth largest municipality by population with 98,932 inhabitants. The urban population (12,220 persons) lives mainly in Maliana town[18].

Bobonaro has 485km of rural roads, 40% of which are considered to be in poor or bad condition. Between 2016-20, 103km of rural roads will be improved[19].

The Maliana I irrigation scheme covers 1,050ha, mainly planted with rice for home consumption. Approximately 700ha can be planted with a second crop, usually vegetables, for income generation. The areas that cannot be irrigated for a second crop are left fallow for cattle to graze. Plots are individually owned and a Water-User Association has been established. However, the association is not functional and no fees are collected to finance maintenance costs.

Bobonaro is the leading municipality for cattle production and a major producer of groundnut (mainly in Bobonaro sub-district) and mung bean (Balibo sub-district). Small amounts of shallot are grown in Bobonaro sub-district. Red rice production is minimal.

Cattle numbers and crop production areas are presented in Table 4.

[15] Seeds of Life survey, 2012
[16] GDS (2015) *Population and Housing Census,* MoF
[17] MPWTC (2015) *Rural Roads Master Plan,* GoTL
[18] GDS (2015) *Population and Housing Census,* MoF
[19] MPWTC (2015) *Rural Roads Master Plan,* GoTL

Table 4: Cattle numbers and crop production areas in Bobonaro Municipality

Commodity	Cattle (head)	Groundnut (ha)	Mung Bean (ha)	Red Rice (ha)	Shallot (ha)
No.	37,052	520	475	n/a	85

Source: cattle = MoF 2015 census; groundnut, mung bean and shallot = Bobonaro em Números 2014

1.5.3. Viqueque

Viqueque is located 183km south-east of Dili. Viqueque is Timor's fifth largest municipality by population with 77,545 inhabitants. The urban population (8,850 persons) lives mainly in Viqueque town[20].

Viqueque has 219km of rural roads, 46% of which are considered to be in poor or bad condition. Between 2016-20, 94km of rural roads will be improved[21].

Viqueque has a bi-modal rainy season with rainfall peaking in both December and May, allowing double cropping. Typically maize or rice is planted as the main season crop, followed by a second maize crop or legumes and pulses such as mung bean, soybean and red bean. Viqueque is the third largest cattle producing municipality but very few are traded outside of the area. Red rice is grown in Uatu Lari and Uatu Cerbau Administrative Posts and mung bean is grown along the coastal plains. Although small amounts of groundnut and shallot are grown for home consumption, most sold in the market originates from Baucau. Cattle numbers and crop production areas are presented in Table 5.

Table 5: Cattle numbers and crop production areas in Viqueque Municipality

Commodity	Cattle (head)	Groundnut (ha)	Mung Bean (ha)	Red Rice (ha)	Shallot (ha)
No.	31,224	61	61	n/a	15

Source: cattle = MoF 2015 census; groundnut and mung bean = MAF 2015; shallot = Viqueque em Números 2013

1.6. Production

1.6.1. Cattle (*Bos banteng*)

Timor-Leste's national cattle herd is 221,767 head (2015 census). Cattle are concentrated in two main production areas: Bobonaro and Covalima (32% of herd) and Lautem and Viqueque (26% of herd). Cattle are raised extensively by both men and women, grazing freely on rough pasture. Productivity is low, with an estimated calving rate of 50%, weaning age of 10 months, calf mortality of 20%, and daily live-weight gains of 0.2kg/animal/day. The size of the national herd is above the grazing capacity of existing natural pasture and very little supplemental feeding is carried out. Incidences of brucellosis and haemorrhagic septicaemia are high. Although MAF provides free vaccination for haemorrhagic septicaemia, coverage rates are only 30%. Furthermore, infestations of internal parasites such as liver fluke go untreated [22].

The purpose of cattle production in Timor-Leste is as a 'store of wealth' rather than commercial. Cattle are maintained at minimal levels and only sold when cash is required, or slaughtered for home consumption during ceremonies. Cattle can take four years to reach a minimum slaughter weight of 250kg live-weight. Decisions to sell cattle are made mostly by men in consultation with their wives and extended family.

Much could be done to improve productivity across all fronts. Stall-feeding / finishing cattle is widely practised in West Timor using the 'Amarasi' system, whereby forage legumes (e.g. *sesbania, leucaena, gliricidia, kaliandra)* and grasses (e.g. *napier*) are integrated into farming systems specifically for feeding cattle. Although the Amarasi system is practised on a small-scale in Oecusse, it has not been adopted in the rest of Timor-Leste.

[20] GDS (2015) *Population and Housing Census,* MoF
[21] MPWTC (2015) *Rural Roads Master Plan,* GoTL
[22] Waldron et al (2016) *Sub-Sector Analysis of the Timor-Leste Beef Industry*, ACIAR

Research suggests 683 forage trees in the wet season and 1,076 forage trees in the dry season are needed to fatten a bull for 3 to 4 months, requiring a significant amount of cut and carry labour[23]. As the farmer's motivation for cattle production is primarily as a store of wealth based on a low-input low-output system, it is unlikely increased productivity or commercialisation of the cattle sector will take place in the short-term.

1.6.2. Groundnut (*Arachis hypogaea*)

Approximately 1,065ha of groundnut is planted in Timor-Leste annually, producing 1,876 tonnes, with average yields of 1.76 Mt/ha (MAF, 2012). The main production areas are Baucau and Bobonaro municipalities. Groundnut is produced by both men and women farmers who have distinct roles in production. Women tend dominate this value chain as producers, traders, processors and consumers.

Groundnut is grown as a main rainy season crop between December and April. On average, 136 labour days are required to cultivate one hectare of groundnut, mainly for weeding, harvesting and shelling. Farmers don't use inputs and prefer the local seed variety they produce themselves. Women groundnut farmers who don't own land need to negotiate use-rights (which may include profit-sharing agreements).

Research carried out by SoL concluded that only 12% of households who grow groundnut sold some of the harvest for income generation. On average, these households sold 83kg and consumed a similar amount domestically.

Productivity can be increased by planting the higher yielding *Utamua* variety, applying P fertilisers and using shelling machines to reduce labour costs. *Utamua* may be suitable if the groundnut is sold for processing, however, consumers prefer the local variety for direct consumption as a snack.

1.6.3. Mung bean (*Vigna radiata*)

Approximately 2,186ha of mung bean is planted, producing 2,034 tonnes annually, with average yields of 0.93 Mt/ha (MAF, 2012). The majority of mung bean is planted in Covalima, with Manatutu, Bobonaro and Viqueque municipalities also producing significant volumes. Mungbean is produced by both men and women farmers who have distinct roles in production. Women tend to dominate this value chain as producers, traders and consumers.

Mung bean is a drought resistant crop, often grown as a second crop after rice or maize in the bi-modal rainfall zone. It is planted in May/June and harvested in September/October. Individual farmers usually plant small areas only (e.g. <1,000m^2), producing a harvest of only 80kg for sale in local markets. Other than seed, no inputs are used. On average 76 labour days are required to cultivate one hectare, mainly related to weeding, harvest and cleaning. Women mung bean farmers who don't own land need to negotiate use-rights (which may include profit-sharing agreements). Such agreements are usually just for the period required to grow the crop.

Traditionally, one crop of mung bean requires harvesting three times which is labour intensive. However, new varieties are available with synchronised flowering and maturity, allowing a single harvest. Mechanised threshing would also reduce labour requirements. Productivity can also be increased by using higher yielding varieties and P fertiliser. High post-harvest losses due to Bruchid (bean weevil) infestation can be reduced through improved storage hygiene and the use of phosphine fumigation. A combination of these improvements would have a significant impact on net returns.

1.6.4. Red rice (*Oryza indica)*

The area used for production of red rice grown is unknown, but total production is estimated at approximately 12 Mt/year. Most red rice is planted in Baucau and Viqueque Municipalities. Several red rice varieties have been identified but the nomenclature has yet to be classified. All varieties are non-glutinous and aromatic but some varieties only have a red skin (bran), whilst others also have a red grain.

[23] Halliday et al (2014) *Biomass Measurements of Forage Tree Legume Diets in Eastern Indonesia,* ACIAR

Traditionally, red rice is eaten during sickness, post-partum and ceremonies rather than as a staple food, hence production levels are minor compared to white rice. Red rice is grown in the main rainy season in Baucau Municipality, and as a second crop in Viqueque.

Other than seed, no inputs are used and on average 130 labour days are required to cultivate one hectare. Average yields are 1.2 Mt/ha, which could be increased on irrigated areas by using fertiliser and labour saving herbicides. Little is known about the gender roles and responsibilities of red rice farmers simply because it is a niche crop grown. Anecdotal evidence from farmers suggests it is a joint commodity where men and women both produce and sell the crop.

1.6.5. Shallot (*Allium cepa*)

Approximately 357ha of shallot is planted, producing 1,161 Mt annually, with average yields of 3.25 Mt/ha (MAF, 2012). Main production areas are the higher elevation areas of Aileu, Ainaro and Baucau municipalities. Shallot is the commodity that comes closest being women-led. Production is almost entirely undertaken by women, with men playing small support roles at key times such as transporting or fixing the fences.

Shallot is mainly grown as a dry season crop, with planting in April/May and harvesting in July/August. It requires a high level of inputs such as irrigation, fertilisers and fungicides, and is estimated to require 183 days labour to cultivate one hectare. Most labour is related to planting, irrigating, weeding and harvest. Due to the high labour and investment requirements, farmers tend to only plant small areas, typically 30m² in individual plots.

Shallots grown in Timor-Leste are much smaller than those grown in neighbouring West Timor and quality is generally worse, even though local shallot fetches high prices and provides an important source of income for farmers able to grow it. Quality could be improved through use of better planting material, better irrigation and the use of fungicides.

1.7. Processing

The value-added through processing is summarised figuratively in Section 4.1 with calculations presented in the Gross Margin Analysis in Section 4.3.

Beef

Beyond slaughter and butchering into joints, very little meat processing is undertaken. Transforming a live bull into beef increases its value from $600 to $875, or by 46%.

Traditional slaughter slabs, where most cattle are slaughtered, are basic and unregulated. MAF has established slaughterhouses in the district capitals and Dili, however, only the Dili slaughterhouse at Tibar is operational.

The slaughterhouse at Tibar is equipped with facilities such as a killing box, stun gun, boning room and overhead rails, but no electricity to power the cold store. It is operated by a private sector operator who charges a $30 service fee for each head slaughtered. Pre- and post-mortem inspections are carried out by MAF. The operator then pays MAF a commission of $7.50/head slaughtered for using the facilities. Up to 50 head of cattle are slaughtered a month which provides beef for the two butcher shops in Dili.

The Tibar slaughterhouse has capacity to slaughter 50 cattle a day, so is currently under-utilised and financially unviable. Despite decree laws being promulgated for ‘Slaughterhouse permits’ and ‘Hygiene and sanitary conditions in the preparation, transportation and sale of meat and meat products’, these are not enforced. As such, most slaughtering continues to take place at the unregulated slaughter slabs, rather than through the slaughterhouse.

Electrification to rural areas provided opportunities to increase the amount of smaller quantities of pre-cut beef available in markets or kiosks. The cold chain is more reliable and there is an increasing demand for smaller quantities of meat available closer to home for household consumption.

Groundnut

Groundnut in Timor-Leste is shelled by hand, mostly by women, and is very time consuming. Simple mechanised shellers are available which would significantly reduce the labour involved and increase profit for effort of women. Shelling groundnut increases its value by $0.13/kg, or 17%. Some 'cottage industry' level of processing into peanut butter is undertaken; otherwise, groundnut is generally roasted and eaten as a daily snack daily as well as at ceremonies.

Rice

Paddy is milled into rice, which can then be cooked for consumption. Transforming paddy into rice increases its value by $1.13/kg, or 226%.

For some red rice varieties, it is the skin or bran that is coloured red, not the grain. As such, paddy should only be milled to remove the husk and not polished. Satisfactory milling rates of 75% are achieved by ACELDA, a major red rice processor; however, the proportion of broken rice remains high. This is attributed to farmers over-drying rice to as low as 11% moisture content, which causes fracturing during milling. The ideal moisture content for milling rice is 14%.

Mung bean & shallot

After cleaning and drying, no further processing of mung bean or shallot is undertaken, although mung bean can be processed into bean sprouts through germinating the seed.

1.8. Storage

Groundnut, mung bean and rice can be stored for up to year under the correct conditions. Groundnut is particularly susceptible to aflatoxin contamination due to inadequate drying. Groundnut is best stored in-shell at 10% moisture content, however, farmers often sell groundnut at 20% moisture content. Mung bean and rice are best stored at 14% moisture content. Shallots have a shorter shelf life of two months.

Meat, if unrefrigerated, can only be stored for a few hours. Refrigerated meat can be stored for up to five days. However, only the butcher shops in Dili have chill rooms and refrigerated display counters.

Traders exporting candlenut and copra to Indonesia store produce in basic large sheds with the main purpose of keeping the produce dry. Very little is done to prevent contamination from insects, rodents or birds. Traders may carry out some drying, cleaning and bagging of produce until quantities are sufficient to fill a truck. This can take up to two months.

Smaller inter-municipality traders and market vendors supplying groundnut, mung bean and rice generally buy enough produce to last for up to two months. As volumes are small, there are no specific storage facilities and produce is kept at home.

Although farmers sell most of their produce at harvest, larger farmers or farmers without trader connections can store produce for up to seven months. Post-harvest storage losses are highest at farm level due to inadequate drying and pest infestation. Mung bean storage losses can be as high as 80% from bruchid infestation.

Changes in seasonal prices allows for some value to be added through storage. Based on the seasonal price figures in Section 4.1, mung bean and groundnut prices increase by $0.50/kg over nine and seven months respectively. If a loan is taken out at 14%/year interest, instead of selling at the lowest price, the loan service costs would be $0.05/kg for mung bean and $0.06/kg for groundnut, providing a significant break-even margin for storage. For example, for mung bean, storage costs (including losses) could amount to 0.45/kg and the farmer would still break-even.

1.9. Transport

The most common means of transporting bulk agricultural produce, including live cattle, is by hiring four-tonne trucks. Hire costs from Maliana and Viqueque towns to Dili are $250/trip and from Baucau town to Dili $200/trip. Hire costs from the Administrative Posts to Municipal capitals average $50/trip. Bulk transport is estimated to cost roughly $0.04 cents/kg per kilometre.

When farmers transport their produce individually for sale in local markets, the transport price increases considerably. For example, when using the local bus, transport costs can rise to $0.30/kg per kilometre, as the passenger transport costs are also included. Therefore, significant savings can be made from bulk transport, which costs less than 1% of transporting individually.

Further analysis is needed to look for efficiencies in transportation from a farmer's fields to the farmer's home. Significant time and effort is required by some producers. An example being a female farmer who transports her mung bean crop by hand to the edge of her field then loads a horse and then loads her mung bean onto a truck that travelled intra-suku from Bibileo to Ossu De Cima. She then unloads it and stores it at her house. Finally, she brings small quantities (4 kg at a time) by foot to the weekly market.

1.10. Population & consumption

Timor-Leste is classified as a lower middle-income country. It is a small economy with a Gross Domestic Product (GDP) of $1.4 billion and a population of 1,167,242 persons. Average annual population growth between 2010 and 2015 was 1.81% and average household size is 5.7 persons[24]. GDP growth has slowed in recent years to 4.3% in 2015. Gross National Income per capita has also been falling since 2012 and is currently at $1,920 (World Bank). Mean household income is estimated at $378/month, with urban households ($674/month) earning more than twice that of rural households ($292/month)[25].

Urban dwellers are net consumers of food. Dili city is by far the largest market with the urban population (222,323 persons) accounting for 19% of the total population of Timor-Leste (urban and rural).

Timor-Leste has a terrestrial border with Indonesia. West Timor is only 120km away from Dili, which could provide access to the huge Indonesian market. Main towns in West Timor include Atambua (population 72,373) and Kupang (population 349,344). Atapupu port in Atambua and Tenau port in Kupang provide shipping linkages to the rest of Indonesia. Indonesian wholesalers in Surabaya are reluctant to import directly from Timor-Leste due to the high transaction costs for a relatively small amount of produce, preferring to buy from importers in Atambua who are familiar with the import procedures.

Although the agriculture sector is recovering in Timor-Leste, considerable amounts of food continue to be imported, as shown in Table 6.

Table 6: Main food imports by value

Product	Value ($)	Origin
Rice	32,215,000	Vietnam
Meat	8,120,000	New Zealand (Beef) Brazil (Chicken)
Sugar	4,399,000	Thailand, Malaysia
Dairy products	4,398,000	Australia
Vegetables	1,954,000	China (potatoes, garlic, onions)
Fish & seafood	1,853,000	Vietnam (prawn, tilapia, milkfish) Portugal (octopus, squid, sardine)

Source: GDS (2014) *External Trade Statistics,* MoF

Although the above food imports may offer some opportunity for substitution, Timor-Leste is at a comparative and competitive disadvantage for the production of most products.

Beef consumption in Timor-Leste is estimated at 1.66kg/capita/year. This is based on a demand of 5,000 head/year slaughtered for home consumption / ceremonies, 5,000 head/year slaughtered for sale in district markets and 6,000 head/year slaughtered for sale in Dili[26]. It is estimated a further 5,000 head are exported

[24] GDS (2015) *Population and Housing Census 2015,* MoF
[25] GDS (2011) *Timor-Leste Household Income and Expenditure Survey*, MoF
[26] Waldron et al (2016) *Sub-Sector Analysis of the Timor-Leste Beef Industry*, ACIAR

illegally over the border to West Timor / Indonesia and 287 tons of beef (equivalent to 2,000 head) are imported[27].

The domestic demand for beef is largely met by local production, with a small amount of quality beef imported for the high-end Dili market. Although the imported beef could be substituted with domestic beef through the Tibar slaughterhouse and butcher shops, farmers prefer to raise cattle as a store of wealth, rather than produce quality beef for market on a commercial basis.

A resumption of the legal export of live cattle to West Timor is unlikely to take place until the endemic disease Brucellosis is brought under control and Timor-Leste can comply with the OIE Terrestrial Animal Health Code. This is likely to take at least several years.

Groundnut consumption in Timor-Leste is estimated at just under 2,000 Mt/year. Demand is largely satisfied by domestic production, however, there may be opportunities for export. Indonesia is one of the world's largest importers of groundnut, importing 194,430 tons in 2015, mainly from India (ITC). West Timor plants 4,315ha of groundnut, mainly in Kupang and Timor Tengah Selaten regencies. This is four times the area of groundnut planted in Timor-Leste[28]. Current retail price in Atambua is IDR 25,000/kg ($1.92/kg) for kernel, which is similar to retail prices in district markets in Timor-Leste.

Mung bean consumption in Timor-Leste is estimated at 2,000 Mt/year, which is largely satisfied by domestic production. However, there may be opportunities for export to West Timor, which has to buy mung bean from Surabaya in the off-season, originating from Myanmar. West Timor plants 1,963ha of mung bean, a similar area to Timor-Leste. The main production area is in Belu regency. The current retail price in Atambua is IDR 25,000/kg ($1.92/kg), similar to the retail price in Dili.

Red rice consumption in Timor-Leste is estimated at 15 Mt/year. Although consumption is small, interest is growing, as it is considered a healthy alternative to polished white rice. Domestic production (12 Mt/year) is not enough to meet domestic demand, with small amounts of 'Red Cargo' rice being imported from Thailand.

Apart from minor import substitution, there may also be export opportunities, due to the growing international demand for high quality traditional fragrant rice varieties such as 'Thai Hom Mali' (Thai Jasmin rice). Organic certification may also add-value. However, improving product quality is the priority.

Shallot consumption in Timor-Leste exceeds domestic production and most of the shallots found in markets are imported from China and Indonesia. West Timor / Indonesia plants 844ha of shallot, mainly in Kupang regency, compared with 357ha planted in Timor-Leste[29]. Indonesian shallot retails for IDR 25,000/kg ($1.92/kg) in Atambua compared with $2/kg in Dili.

Locally produced shallot is mostly sold in municipal and sub-municipal markets. Although the quality is much poorer than imported shallot, prices can be twice as much, therefore shallot does not offer any opportunity for import substitution or export.

To summarise, Timor-Leste has a small urban population that are net consumers of food, rather than producers. The domestic demand for beef, groundnut and mung bean is largely satisfied by domestic production, therefore if production is to increase, export markets must be explored.

There is some unsatisfied domestic demand for red rice but if production were to increase by more than 3 Mt/year export markets would also have to be considered. The domestic production of shallot is not competitive as an import substitute or for export.

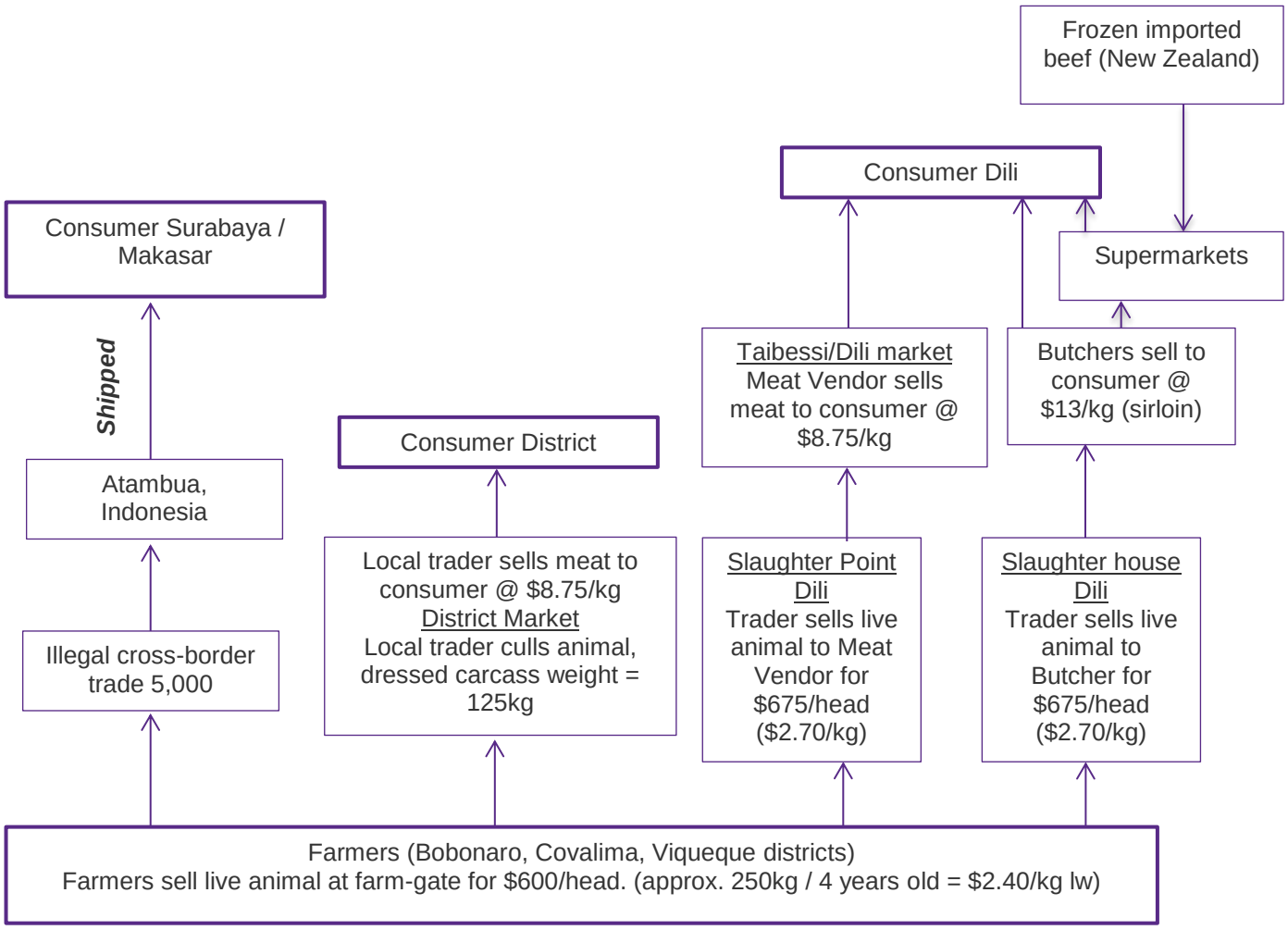
[27] ITC, 2015
[28] Badan Pusat Statistik, NTT, 2015
[29] Badan Pusat Statistik, NTT

4. Value Chain Analysis

1.11. Institutional commodity flows

Institutional commodity flows for selected value chains in the three municipalities are presented in Appendix 3, based on market surveys carried out in September and October 2016. The institutional commodity flows presented in this section are representative of national value chains.

1.11.1. Cattle



Apart from the illegal cross-border trade in live cattle, there are two main market channels for beef. In the municipalities, local traders (mostly men) buy directly from farmers (mostly men). They slaughter the cattle and retail the meat direct to consumers. There is also some inter-municipality trade in cattle, for example, between Bobonaro and Ermera, which has very few cattle. This municipality channel accounts for 5,000 head or 24% of cattle traded. In Dili, traders travel to the municipalities to buy from farmers, then sell the live animal onto meat vendors who carry out the slaughter and retail the meat direct to consumers. This Dili market channel accounts for around 6,000 head or 29% of cattle traded. Cattle used for home consumption or ceremonial purposes are sourced from a farmer's own herd or are direct transfers between farmers and don't enter the supply chain.

Sourcing cattle is problematic for traders, as enough animals have to be purchased to fill one truck so as to reduce transport costs. As farmers only sell one animal at a time, one truck load of ten cattle will need to be sourced from several farmers. Traders will often have to care for several head of cattle for several days before transporting to Dili for sale.

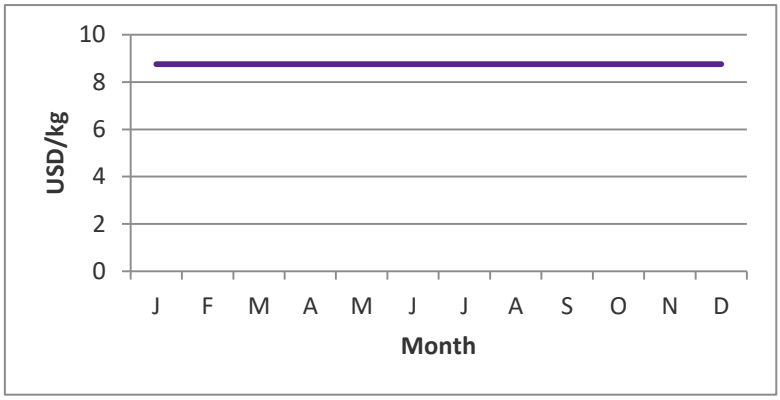
Sourcing quality cattle is a problem, particularly for the butcher shops i.e. cattle that are not too old but have good conformation. One butcher shop owner is considering 'finishing' cattle himself, as he cannot source the quality of cattle he wants from farmers or traders.

Most beef in the municipalities is sold fresh in local wet markets. However, in Dili, approximately 10% of local beef is sold through the butcher shops and 25% of beef consumed is imported frozen and sold through supermarkets.

The cattle supply chain could be improved by 'finishing' cattle to market standards and coordinating sales with traders. However, current payment systems do not reward farmers for producing quality cattle and farmers' main motivation for cattle production is as a store of wealth, not for profit.

The price of beef is the same in Dili as in the district markets, therefore increased distance from the consumption area increases transport costs and reduces trader profits. Figure 2 shows seasonal prices for beef, which remains constant throughout the year.

Figure 2: Seasonal Prices for Beef

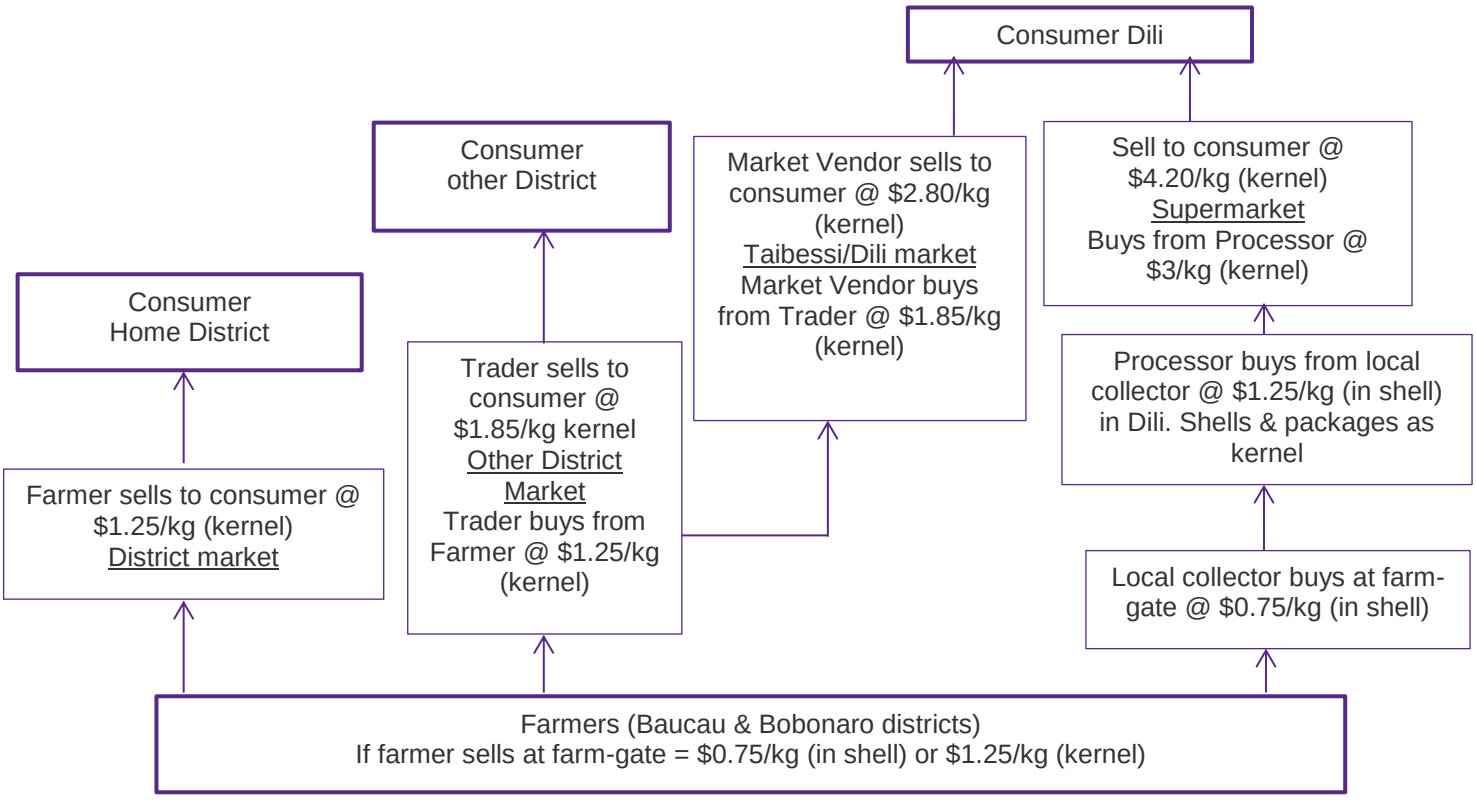


Women and men's involvement in the cattle value chain is about equal. With women engaged more in cattle care such as feeding, health, breeding and processing, men are more involved in managing a herd, transportation and sales. Potential for women's economic empowerment from cattle is limited to the extent to which women can negotiate the use of income from the sale of cattle at the household level. Cattle investments would therefore need to be paired with improving joint household decision making. Below is the Women's Economic Empowerment (WEE) potential score for cattle as a value chain (see Appendix 4 for further details). Baucau ranks lower overall because cattle are not reared as much in Baucau as the other municipalities and are used more for cultural exchange than for sale.

Women's Economic Empowerment potential score for beef by municipality (out of 100)

Bobonaro	Viqueque	Baucau
44	46	36

1.11.2. Groundnut

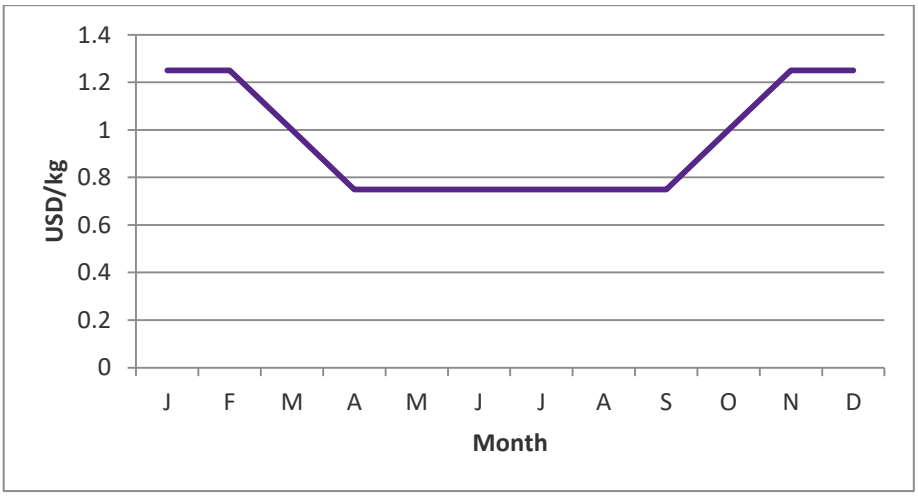


Farmers, mainly women, typically shell the groundnut and sell directly to consumers in local markets or to traders from other municipalities and Dili. A small amount of groundnut is sold through supermarkets which retail for 50% more than in fresh produce markets due to improved quality and packaging.

Local groundnut traders are small-scale, buying from farmers and retailing to consumers themselves or selling onto market vendors, mainly women, in other municipalities. Although there may be export opportunities for groundnut, large traders/exporters with the capacity to do so are unable to aggregate enough volume to fill a container on a regular basis.

Figure 3 shows seasonal prices for groundnut. At harvest, prices fall to $0.75/kg but increase again seven months later to $1.25/kg, a 67% increase, offering opportunity to increase income from storage.

Figure 3: Seasonal Prices for Groundnut

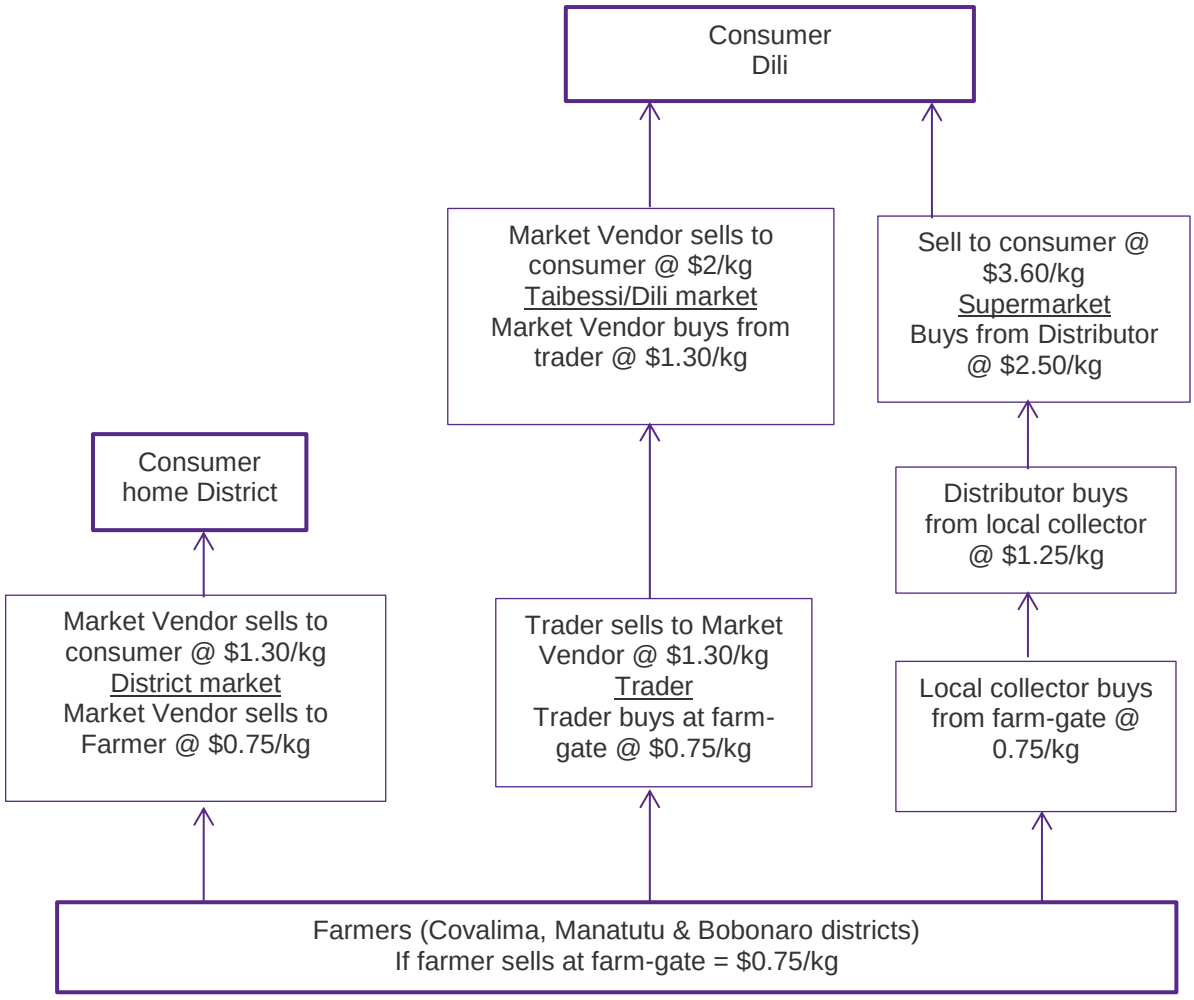


Women and men are both involved in the groundnut value chain with women doing approximately 75% of the work. Men are involved in preparing the land, fencing, some aspects of harvesting and transporting. Women are involved in every stage of the value chain from land preparation through to processing and sale. They also have more control over the use of income than for other value chains, but utilisation of income is in consultation with men. The potential for women's economic empowerment from the groundnut value chain is high. Improvements in labour saving devices and processing options as well as market information, promotion of aggregators and safe market places would improve WEE outcomes. Below is the WEE potential score for groundnut as a value chain (see Appendix 4 for further details). Viqueque is ranked lower because peanuts were not widely grown in Viqueque compared to the other municipalities and thus there was no evidence of women entrepreneurs.

Women's Economic Empowerment potential score for groundnut by municipality for (out of 100)

Bobonaro	Viqueque	Baucau
64	36	62

1.11.3. Mung Bean

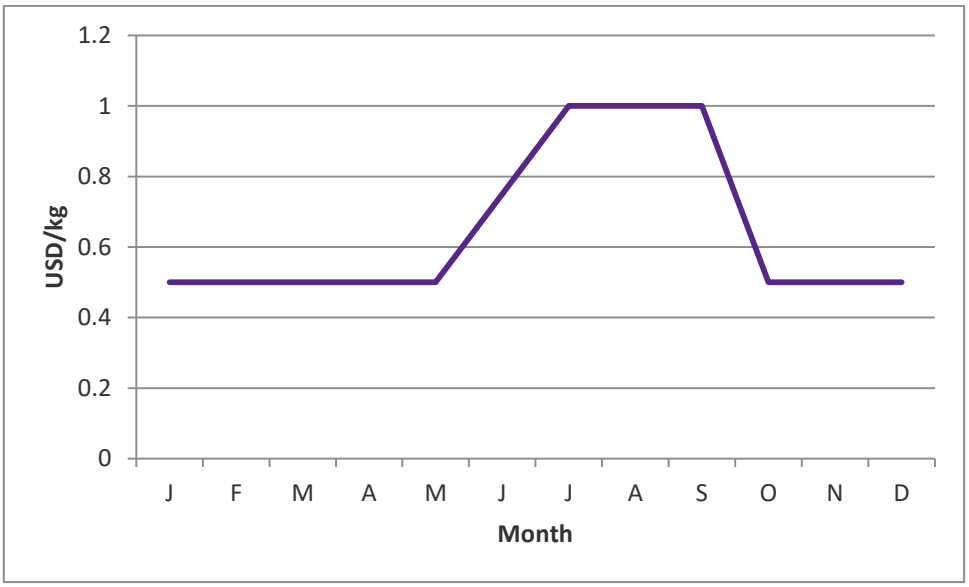


Most mung bean is sold in fresh produce markets. Farmers typically sell the mung bean directly to consumers in local markets or to traders from other municipalities and Dili. A small amount of mung bean is sold through supermarkets which retails for 80% more than in fresh produce markets due to better quality and packaging.

Local mung bean traders are small-scale, buying from farmers and retailing to consumers themselves or selling onto market vendors in other districts municipalities. In the past mung bean has been imported and exported to Atambua in West Timor. Trading networks are already established with Indonesian buyers for other products such as candlenut and copra.

Figure 4 shows seasonal prices for mung bean. At harvest, prices fall to $0.50/kg but increase again nine months later to $1.00/kg, a 100% increase, offering opportunity to increase income from storage.

Figure 4: Seasonal Prices for Mung Bean



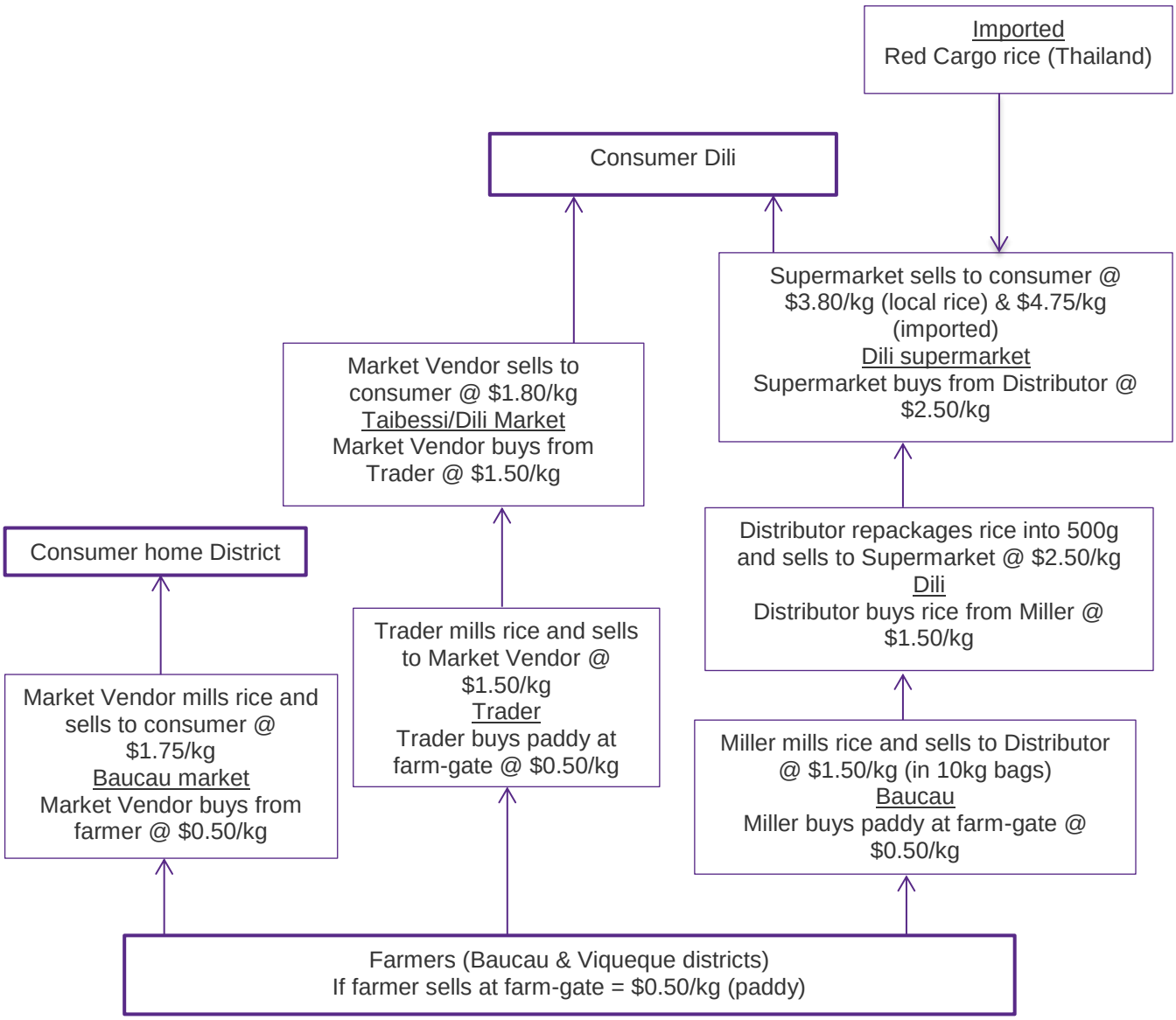
Mung bean and groundnut value chains are very similar in terms of WEE. The key difference is that groundnut has more income potential from value-adding and processing than mung bean. Women and men are both involved in the mung bean value chain with women doing approximately 70% of the work. Men are involved in preparing the land, planting, fencing, harvesting and transporting. Women are involved in every stage of the value chain from land preparation through to sale. They also have more control over the use of income than other value chains but utilisation of income is in consultation with men. Land utilisation may need to be negotiated with men as mung bean is usually grown on prime land. This would normally involve profit-share agreements.

The potential for women's economic empowerment from the mung bean value chain is high. Improvements in labour saving devices and processing options as well as market information, promotion of aggregators, land utilisation models and safe market places would improve WEE outcomes. Below is the WEE potential score for mung bean as a value chain (see Appendix 4 for further details). Bobonaro has the most potential for WEE. There was evidence of women's groups negotiating use of land for production and coming together to produce as a group with strong understanding of the market compared to Viqueque, which lacked these elements. In Baucau mung bean is not grown as much, thus the involvement of women as producers and entrepreneurs brings the score down.

Women Economic Empowerment potential score for mung bean by municipality (out of 100)

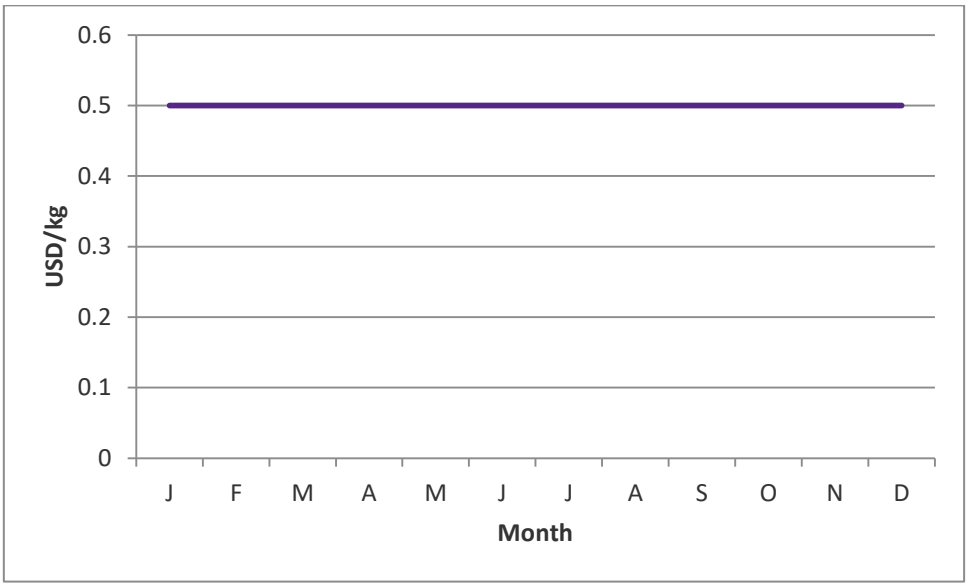
Bobonaro	Viqueque	Baucau
62	54	44

1.11.4. Red Rice



Market vendors and traders, mainly women, buy paddy from farmers and mill the rice before selling it on in local markets. However, most of the red rice is bought by one of two commercial millers who mill and package the rice for sale in supermarkets, where it retails for twice as much as the local white rice markets. Figure 5 shows seasonal prices for red rice, which remain constant throughout the year. When local supplies deplete, red rice is imported, which stabilises the price.

Figure 5: Seasonal Prices for Red Rice

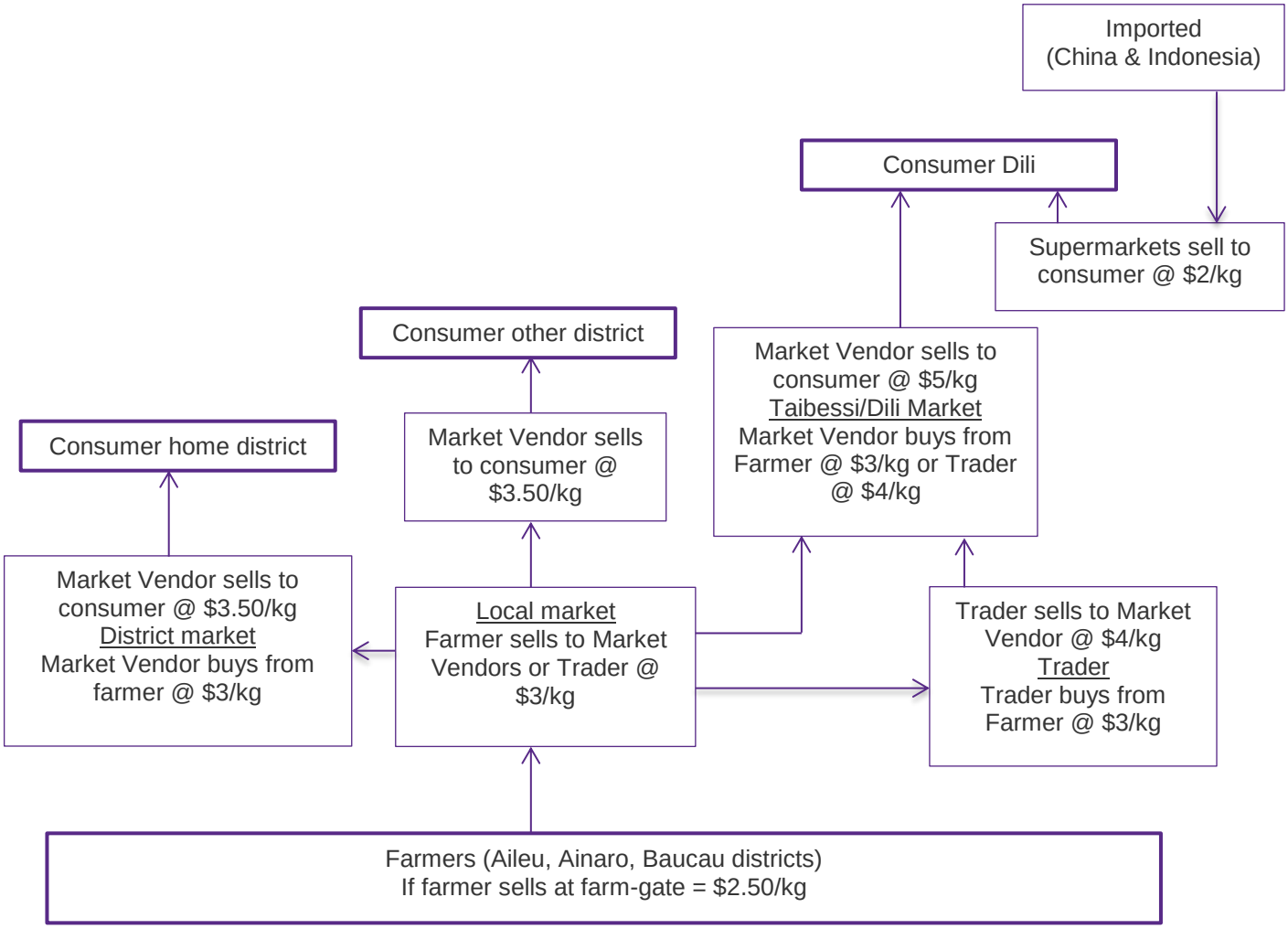


As red rice is more of a niche crop, less information was able to be verified about the gender division of labour and use of income in this value chain compared to the others. Some report gender divisions in production that mirrors white rice but others suggest it is closer to mung bean. Either way it suggests that women are involved in the value chain at least as much as men. The red rice value chain seems to have good potential across all three municipalities. Below is the WEE potential score for red rice as a value chain (see Appendix 4 for further details).The slightly lower score for Bobonaro is because it is undertaken less, thus less women are involved. While control of income needs to be further verified, the involvement of women as red rice sellers in the markets suggest they would have higher control than, for instance, cattle if not as much as mung bean. Understanding the gender roles in the value chain better would allow recommendations for improvements in WEE outcomes to be more targeted.

Women Economic Empowerment potential score for red rice by municipality (out of 100)

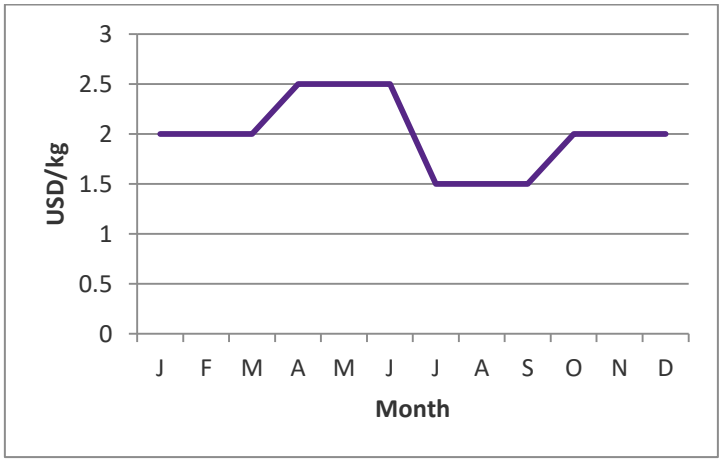
Bobonaro	Viqueque	Baucau
50	56	56

1.11.5. Shallot



Local shallot production is small-scale and most are sold in district and sub-district markets where cheaper imported shallots have yet to penetrate. Figure 5 shows seasonal prices for shallot. At harvest, prices fall to $1.50/kg but increase again nine months later to $2.50/kg, a 67% increase.

Figure 5: Seasonal Prices for Shallot



The shallot value chain was most closely analysed, and could be considered a woman-led value chain at 90%. Women dominate this value chain at every stage. Men help but they don't consider themselves to be shallot farmers. Helping is usual limited to fencing and transporting. Women have more control over the use of income as it is often seen as small. This might change if larger quantities were traded. Improvements in labour saving devices, seed saving, pest management and market information would increase WEE outcomes. Below is the WEE potential score for shallots as a value chain (see Appendix 4 for further details). The score in Viqueque is very low as no evidence of production was found and traders in the Viqueque markets were buying from Baucau.

Women Economic Empowerment potential score for shallots by municipality (out of 100)

Bobonaro	Viqueque	Baucau
60	12	60

In the local markets, all the above crops are sold by volume (different size of cans, sacks, buckets and bunches) and not on a weight-kilo based system. The assessment team had therefore to weight the various volume-based measures used by vendors, and convert to kilo. For farmers, traders and consumers, the current volume-based system makes it very difficult to compare prices and it allows for cheating.

1.12. Stakeholder analysis

1.12.1. Farmers

Sixty percent of farms in the mid-altitude irrigable areas are between 0.30ha and 1.99ha with average farm size of 1.34ha. Crops grown include rice, maize, mung bean, groundnut, vegetables and red bean. Approximately 90% of households raise poultry (8 head) and pigs (3 head); and 37% raise cattle (4 head).

Approximately 89% of households receive income from agriculture. Up to 70% of households receive income from livestock, 50% from crops, and 20% from plantation crops (candlenut, copra, coffee). The most common crops sold are vegetables (59% of households), maize (38% of households) and groundnut (12% of households)[30].

Farmers sell most of their crop at harvest as they need the cash. Incomes are low with 24% of people in the mid-altitude irrigable areas living on less than $1.25/day.

Most cattle farmers sell one animal at a time when cash is required and most groundnut, mung bean, red rice and shallot farmers plant areas less than 1,000m² each. Typical volumes harvested by farming household are 80kg of mung bean and 160kg of groundnut. As such, most individual farmers don't produce enough to attract traders at the farm-gate. As a result, they need to take their produce to the local market where they sell direct to consumers, to local market vendors or inter-district traders.

1.12.2. Traders

Traders buy produce from farmers in producing municipalities and transport it for sale to market vendors in other municipalities and Dili. To achieve this, they must aggregate enough produce to fill a truck and reduce transport costs. Traders will buy at the farmgate of larger producers, otherwise they will buy from farmers at local markets on market days.

Traders specialise in product lines such as grains and pulses, but will also carry out other business based around transport. For example, traders may sell construction materials or imported consumer goods (rice, noodles, soap etc.) to shops in the municipalities and fill their trucks for the return journey with agricultural produce for sale in Dili.

[30] Seeds of Life End of Project Survey, 2015

There are only three traders based in Dili with the capacity to export to Indonesia. Exporting not only requires the financial resources to buy in bulk, but also knowledge of export procedures and contacts with buyers in Atambua. Other larger coffee exporters have the capacity to export but face difficulties sourcing sufficient product to fill a container, which is required for exporting via sea freight.

1.12.3. Market vendors

Market vendors specialise in product lines. Meat vendors, mostly male, will sell only beef or pork. Grain and pulse vendors, mostly women, will sell only rice, mung bean, soybean, red beans and ground nut. Fresh vegetable vendors, mostly women will sell shallot plus other seasonal vegetables.

Local markets have many small scale vendors. Almost all of these are women except for meat sellers. They often sell the same produce, indicating high levels of competition. For example, in Taibessi market in Dili there are 42 (mainly women) vendors selling groundnut, mung bean and red rice; 53 vendors (women & men equally) selling shallot; and 16 vendors (all men) selling meat.

Typical market vendors don't have the cashflow or storage facilities to buy in bulk. Dry produce such as groundnut, mung bean and red rice is purchased every two months, whilst shallots are purchased weekly. In one week, a typical market vendor in Dili or the municipality markets will sell 10kg of groundnut, 40kg of mung bean, 12kg of red rice and 20kg of shallot.

Market vendors source from the farmgate, from traders in producing municipalities or from traders bringing produce to the market where the vendor is located. Market vendors may carry out some additional drying, cleaning and grading of produce before sale, otherwise no value-addition is carried out.

1.12.4. Inter-firm coordination

There is very little inter-firm coordination within agricultural supply chains. Production is largely subsistence based with many farmers producing small amounts mainly for their own consumption. Surpluses are sold in local markets when cash is required.

As such, the aggregation of produce into marketable volumes to supply consumers in urban centres or export is a major constraint.

Horizontal coordination

Although farmer groups have been established by MAF, NGOs and development projects to receive training and inputs, there are no known farmer groups that carry out group marketing or even coordinate the aggregation of produce at one collection point to attract traders to buy at the farm-gate. Local NGO's, particularly women's NGO's, who are already providing group formation support to farmer and processing groups were positive about this possibility, and would support trialling the aggregation of produce in the three municipalities.

Vertical coordination

There are very few formal or informal buying agreements between traders and farmers or market vendors and traders. An exception are supermarkets in Dili buying vegetables directly from farmers. Occasionally traders make advance payment to farmers for standing crops on the understanding the farmer will sell all the crop at time of harvest to the trader. However, in most cases, farmers sell to traders on an *ad-hoc* basis either at the farmgate or at local markets. Similarly, market vendors do not have formal buying agreements with traders. Vendors will buy from whichever trader has the best price on the day.

The absence of inter-firm coordination is a major impediment towards the development of efficient supply chains and market systems. Farmers receive low prices and traders receive inadequate quantities of low quality produce. Furthermore, farmers are reluctant to expand production without a sure market and traders are unable to gain access to markets without larger production volumes.

1.13. Gross margins & value-added

The following analysis shows basic gross margins and value added for main value chain stakeholders. Return on Investment (RoI) is calculated as an indicator of profitability.[31] Profit as a percentage of final retail price is also calculated as an indication of how the value added is shared amongst value chain stakeholders. Profit calculations are based on easily divisible units such as hectares and tonnes.

1.13.1. Cattle

Farmer (1 animal)	Trader (1 animal)	Market Vendor (1 animal)
Income: 1 bull @ $600 (4 year old) Expenditure: 1 calf @ $250 (10 month old)	Income: 1 bull @ $675 Expenditure: 1 bull @ $600 Transport @ $25 *Sub-total = $625*	Income: 125kg meat @ $8.75/kg = $1,094 Expenditure: 1 bull @ $675 Slaughter fee @ $30 *Sub-total = $705*
Profit: $350/head or $1.40/kg live-weight	***Profit: $50/head or $0.20/kg live-weight***	***Profit: $389/head or $3.11/kg meat***
Notes: Bull weighs 250kg live-weight. Low input – low output system extends production period. Income per month equivalent = $9.21 RoI = 140% Profit as % of final retail price = 16%	Notes: Transport from district to Dili RoI = 8% Profit as % of final retail price = 2%	Notes: Dressed carcass weight = 50% of live-weight RoI = 55% Profit as % of final retail price = 36%

The above GM analysis shows that whilst farmer income appears high for each cattle sold, income over time is low, due to the traditional low input – low output production system. The RoI is also low, considering the high risk of losing the initial investment (calf) due to high mortality rates.

Trader margins are lower per head but traders buy and sell several cattle on a weekly basis. The trader requires considerable capital to trade and also carries a high level of risk, if for example an animal dies in transit.

Market vendor income appears high based on profit per animal or per kilogramme, which explains why traders in the municipalities also retail the meat to consumers.

[31] RoI = profit /investment costs x 100%

1.13.2. Groundnut


Farmer (1ha)	Trader (1 Mt)	Market Vendor (1 Mt)
Income: 1,350kg kernel @ $1.25/kg = $1,688 Expenditure: Seed & tractor hire @ $223	Income: 1,000kg @ $1.85/kg = $1,850 Expenditure: 1,000kg @ $1.25/kg = $1,250 Transport @ $50 *Sub-total = $1,300*	Income: 900kg @ $2.80/kg = $2,520 Expenditure: 1,000kg @ $1.85/kg = $1,850
Profit: $1,465/ha or $1.08/kg	***Profit: $550/MT\t or $0.55/kg***	***Profit: $670/Mt or $0.67/kg***
Notes: 1,500kg harvest in shell. Farmer carries out shelling (70%). 136 labour days. Profit per labour day = $ 10.77 RoI = 657% Profit as % of final retail price = 39%	Notes: Transport from district to Dili RoI = 42% Profit as % of final retail price = 20%	Notes: 10% cleaning losses RoI = 36% Profit as % of final retail price = 24%

The above GM analysis shows a high RoI and profit as percentage of final retail price for groundnut farmers. Farmers add most value due to carrying out the shelling on-farm. Nonetheless, groundnut also provides rewarding returns for traders and market vendors. In short, groundnut is a financially viable value chain for all stakeholders.

1.13.3. Mung Bean


Farmer (1ha)	Trader (1 Mt)	Market Vendor (1 Mt)
Income: 800kg @ $0.75/kg = $600 Expenditure: Seed & tractor hire @ $148	Income: 1,000kg @ $1.30/kg = $1,300 Expenditure: 1,000kg @ $0.75/kg = $750 Transport @ $63 *Sub-total = $813*	Income: 900kg @ $2/kg = $1,800 Expenditure: 1,000kg @ $1.30/kg = $1,300
Profit: $452/ha or $0.57/kg	***Profit: $487/Mt or $0.49/kg***	***Profit: $500/Mt or $0.50/kg***
Notes: 76 labour days. Profit per labour day = $ 5.95 RoI = 305% Profit as % of final retail price = 29%	Notes: RoI = 60% Profit as % of final retail price = 25%	Notes: 10% losses during cleaning/ sorting. RoI = 38% Profit as % of final retail price = 25%

The above GM analysis shows a high RoI and profit as percentage of final retail price for mung bean farmers. The value added is also shared equally amongst traders and market vendors. In short, mung bean is a financially viable value chain for all stakeholders.

1.13.4. Red Rice

Farmer (1 ha paddy)	Trader (1 Mt paddy/rice)	Market Vendor (1 Mt rice)
Income: 1,750kg paddy @ $0.50/kg = $875 Expenditure: Tractor hire & threshing = $175	Income: 660kg rice @ $1.50/kg = $990 Expenditure: 1,000kg paddy @ $0.50/kg = $500 Milling @ $28 Transport @ $50 *Sub-total = $578*	Income: 900kg rice @ $1.80/kg = $1,620 Expenditure: 1,000kg rice @ $1.50/kg = $1,500
Profit: $700 or $0.40/kg paddy	***Profit: $412/Mt or $0.41/kg rice***	***Profit: $120/Mt or $0.12/kg rice***
Notes: Farmers sell as paddy at farm-gate 121 labour days Profit per labour day = $ 5.79 RoI = 400% Profit as % of final retail price = 33%	Notes: Milling ratio = 66% RoI = 71% Profit as % of final retail price = 23%	Notes: 10% loss during cleaning/sorting RoI = 8% Profit as % of final retail price = 7%

The above GM analysis shows a high RoI and profit as percentage of final retail price for red rice farmers. Millers/traders also receive acceptable RoI and percentage of final retail price but market vendors receive considerably less. However, most red rice is sold through supermarkets at higher prices than by market vendors in local markets.

1.13.5. Shallot

Farmer (1ha)	Trader (1 Mt)	Market Vendor (1 Mt)
Income: 2,500kg @ $2.50/kg = $4,745 Expenditure: Seed & fertiliser = $1,665	Income: 900kg shallot @ $4/kg = $3,600 Expenditure: 1,000kg shallot @ $3/kg = $3,000	Income: 800kg shallot @ $5/kg = $4,000 Expenditure: 900kg shallot @ $4/kg = $3,600
Profit: $3,079/ha or $1.62/kg	***Profit: $600/Mt or $0.60/kg***	***Profit: $400/Mt or $0.40/kg***
Notes: 182 labour days Profit per labour day = $ 16.92 RoI = 185% Profit as % of final retail price = 32%	Notes: 10% loss during cleaning/sorting RoI = 20% Profit as % of final retail price = 12%	Notes: 20% loss during cleaning/sorting RoI = 11% Profit as % of final retail price = 8%

Although profit appears high for shallot production, there are also correspondingly high investment costs, resulting in a lower RoI than other products.

Based on GM analysis alone, groundnut and mung bean and red rice offer the best financial returns not only for farmers but also for traders and market vendors/supermarkets. Cattle and shallot provide low RoI for farmers, traders and market vendors.

5. Conclusions and Recommendations

1.14. Key constraints (symptoms and causes analysis)

Key constraints to improving agricultural market systems are presented in Table 7. Each constraint is first described as a 'symptom'. The 'initial causes' and 'underlying causes' are then identified for each symptom. It is these symptoms that need to be addressed to improve the agricultural market system.

Table 7: Key Constraints to Improving Agricultural Market Systems

Symptoms	Initial Cause	Underlying Cause
RULES		
• Lack of private sector investment in agriculture sector	• Insecure land tenure for both men and women but particularly women • Weak judicial system to enforce contracts and protect investments	• Newly independent country with evolving Government institutions • Cultural norms re: inheritance and land ownership
• Decreasing agricultural output	• Welfare transfers • Out-migration of young people from rural areas	• Traditional agriculture offers little financial reward
• Weak policy & regulatory framework to support commercial agriculture e.g. land law	• Limited capacity/experience of commercial agriculture within Government and donor partners	• Newly independent country with evolving Government institutions
• No trade agreements	• Apart from oil and a small amount of coffee, Timor-Leste doesn't produce export commodities that make trade agreements worthwhile	• Subsistence-based agriculture sector
• Difficulty exporting agriculture goods due to NTBs (Non-Tariff Barrier)	• No accredited SPS facilities • No agricultural standards for MAF to use when issuing Export Permits	• Volume of exports does not justify investment in SPS facilities
• Social norms that accept & perpetuate gender disparity and discrimination in agriculture and markets. At all levels.	• Cultural inheritance practices- patriarchal and matriarchal • Cultural marriage exchange including patrilocality • Discriminatory institutions • Lack of recognition of Women's rights, contribution, value and roles such as 'Women are Farmers'	• The unequal treatment or perception of individuals based on their gender • Arises from socially constructed norms and practices that restrict women and girls
SUPPORTING FUNCTIONS		
• Uncoordinated (*ad hoc*) supply chains	• Fragmented production base (many small farmers producing small amounts of produce) • No supply agreements between farmers, traders and market vendors • No wholesale or aggregation system	• Trading is speculative, no long term investment due to unsure production and markets
• Poor rural roads	• High maintenance costs	• Difficult terrain
• Abandoned irrigation schemes	• Schemes not repaired or maintained • Rice no longer planted	• Schemes were originally designed to be operated and maintained by Government, not farmers • Imported rice is cheaper • Welfare transfers • Out-migration of young people

Symptoms	Initial Cause	Underlying Cause
• No technical advice for commercial farmers	• SEO's are generalists, not specialists • Farmers unwilling to pay for private extension services • Lack of SEO reach to female and male farmers	• Current production income does not justify expenditure on private extension services
• No market or marketing information	• Lack of demand for market information	• Farmers are subsistence-oriented, not commercial
• Limited agricultural finance available for farmers wishing to commercialise	• Farmers don't have collateral for loans • Farmers unwilling to borrow large amounts of capital	• Land cannot be used as collateral under customary tenure • Farming is high risk
CORE SUPPLY & DEMAND		
• Low volumes of production	• Subsistence-based farming systems with few commercially oriented farmers • Farmers stopping farming • Imported food (e.g. rice) cheaper than domestically produced food	• Unsure markets • Traditional agriculture offers little financial reward for youth • Welfare transfers for pensioners & veterans • High costs of production
• Poor quality	• Produce grown for home consumption, not market • Farmers lack post-harvest handling skills (drying, storage)	• Subsistence based farming systems
• Limited processing to add value	• Lack of processors and markets for existing products	• Selected products don't offer much opportunity for processing • Low knowledge / lack of exposure to processed products
• No storage to add value	• Farmers require cash at harvest • High risk of storage losses	• Cash flow problems • Poor storage facilities and techniques
• High transport costs	• Farmers market produce individually	• No farmer coordination • Bad road conditions
• Limited domestic demand	• Small population with limited purchasing power • Main consumption centre limited to Dili (222,323 urban population)	• N/A
• Difficult to compete with imports	• Easier for large Dili retailers to import than source locally • Imports are cheaper	• Fragmented local supply chains • High cost of domestic production
• Few export market linkages	• Difficult to aggregate quantities to fill a container	• Low volumes of production • Fragmented local supply chains

Commercial agriculture has not developed in Timor-Leste for several reasons. Firstly, the enabling environment factors have not encouraged private sector investment due to a weak policy and regulatory framework. Agricultural output has also decreased due to young people leaving rural areas as traditional agriculture offers little financial reward. Outputs haven't been maximised because investment in women farmers has been neglected. Agriculture service providers are unconsciously perpetuating rather than challenging gender norms by focusing biased land and asset ownership.

The agriculture sector is subsistence-based and those farmers wishing to start producing for market on a commercial basis face several constraints. Rural roads, providing physical access to markets, are in a poor condition and transport costs are high. There is no specialist technical advice or market information available. Some financing is available but farmers are either unable to meet the collateral requirements or are wary of borrowing due to the risky nature of agricultural production.

Agriculture market systems necessary for commercial agriculture have not developed and supply chains are fragmented and uncoordinated. This is due to low volumes of production and stagnation within a subsistence-based agricultural economy. Farmers haven't specialised in producing for market due to the lack of market linkages and market linkages haven't emerged due to the lack of production.

If the agricultural sector were to commercialise, not only would supply chains need to be improved but also new export markets sought. There is limited domestic demand for the selected products, which is already largely satisfied. Trading on export markets would require agricultural production in Timor-Leste to become internationally competitive.

1.15. Development opportunities

The development opportunities described below are interventions specific to TOMAK's agenda and how TOMAK could achieve its objectives. Each development opportunity is linked to a constraint, symptom or cause described above.

1.15.1. Product selection

Of the five products selected for value chain analysis, it is recommended that cattle be discarded. The commercialisation of cattle will prove difficult as long as farmers consider them as a store of wealth for sale only when cash is required, rather than producing for market with a target slaughter weight and age. Shallots remain as a potential VC in a year or two as it requires some additional assessment to ensure that domestic production can compete with imports in terms of price and quality.

Specific recommendations for commercialising the three remaining value chains are provided in Table 8.

Table 8: Product Specific Interventions-Advanced and Emerging

Advanced Product	Target Municipalities	Product Specific Interventions	Gender and WEE specific interventions
Groundnut	Baucau & Bobonaro	Increase yields, mechanised land preparation, improved drying and storage (aflatoxin reduction), mechanised shelling, market linkages with West Timor importers and other export markets	Ways for women to negotiate land usage, labour saving technology, group formation for aggregation, new markets, safe marketplaces and investment in food processing technologies and practices.
Mung Bean	Bobonaro & Viqueque	Increase yields, mechanised land preparation, improved storage (bruchid control), mechanised threshing, market linkages with West Timor importers	Ways for women to negotiate land usage, labour saving technology, group formation for aggregation, new markets, safe marketplaces
Red Rice	Baucau & Viqueque	Increase yields, mechanised land preparation, improved drying (reduce fracturing during milling), organic certification, market linkages with millers, import substitution and export	Ways for women to negotiate land usage, group formation, joint gender, labour saving technology, new markets (possibly fair trade), women producer angle niche product and safe market places

1.15.2. Rules

Rules provide an enabling environment for the transition towards a commercial agriculture sector. As such, TOMAK could provide Technical Assistance to support MAF prepare policies, regulations and strategies during this transition. Although constraints such as SPS, trade agreements and other-sector policies are outside TOMAK's agenda, TOMAK could focus on developing and implementing standards and preparing a contract farming law.

Standards and quality

If the above crops are to be exported, product quality must be improved and one way to achieve this is through industry standards. Although Timor-Leste does not have accredited SPS facilities, SPS certification will take place in third countries or at the country of destination, so meeting International Plant Protection Convention (IPPC) standards remains important.

International standards, such as CODEX or ISO, already exist. It is recommended farmers, traders/exporters and MAF Quarantine Services are trained on how to achieve and measure them. Grades based on the standards are then introduced, with premiums paid to encourage farmers to improve quality. Aflatoxin in groundnut is one example where testing can be carried out but more importantly training be provided on correct drying and storage to avoid contamination in the first place.

Contract farming law

Contract farming is one means of attracting private sector investment and commercialising smallholder agriculture. As such, those investments must be protected for all stakeholders. The promulgation of a 'contract farming law' can provide assurance to all parties involved. The law must be enforceable which usually requires a third party to mediate and resolve disputes amongst stakeholders.

1.15.3. Supporting functions

Commercial agriculture requires far more supporting functions than subsistence agriculture. It is not TOMAK's mandate to provide these functions but to facilitate others to provide them on a sustainable basis. As such, specific interventions to improve supporting functions are recommended below. Strategies to achieve this systemic change are described under Section 5.2.4.

Trader linkages and supply chain coordination

Starting at the production base, smallholders are clustered and collection centres established to aggregate produce into large enough volumes to attract traders to the farmgate and reduce transport costs. Based on production clusters, farmers can make supply agreements with traders providing surety of market access for farmers and known supply volumes for traders. Clustering also provides an entry point for contract farming.

Groundwater irrigation

Ensuring irrigation for crops is a major means of reducing risk for farmers who are investing in agriculture on a commercial basis. This becomes more pertinent with the threat of climate change. Considering the high cost and management requirements of maintaining large surface-water fed irrigation schemes, the introduction of tube wells to exploit ground water aquifers may be more appropriate for farmer-managed irrigation systems.

Specialised technical support

Public extension services are not expert enough for commercial agriculture. Either farmers need to be trained on specific technical issues, or private extension services introduced. Technical support can be provided by input suppliers or private technical experts employed by farmer clusters. The extension worker could also provide fertiliser and spraying services to farmer clusters. The introduction of new technology and provision of technical support are often part of a contract farming package.

Finance

Access to finance is important for both farmers investing in farm inputs at the beginning of the season and for traders buying in bulk at harvest. Often the investment is only for a few months but is for a comparatively high amount and falls between an overdraft (short-term borrowing of small amounts) and a loan (long-term borrowing of large amounts). Beyond borrowing from the formal banking sector, contract farming often provides inputs on credit.

Other innovative value chain financing instruments include 'Trade receivables financing' where a bank or financier advances working capital to a trader or producer against confirmed orders. For this to take place there must be improved supply chain coordination. Similarly, 'Warehouse receipts financing' provide farmers or other value chain enterprises with a receipt from a certified warehouse that can be used as collateral to access a loan from third party financial institutions against the security of goods in an independently controlled

warehouse. Such systems ensure quality of inventory, and enable sellers to retain outputs and the opportunity to sell for a higher price during the off-season or other later date.

Financing for farm service providers to purchase tractors and post-harvest handling machinery is often carried out through 'Lease-purchase agreements'. A 'Lease-purchase agreement' is a purchase on credit which is designed as a lease with an agreement of sale and ownership transfer once full payment is made (usually in instalments with interest). The financier maintains ownership of the subject assets until payment is made in full, making it easy to recover goods if payment is not made. The arrangement also allows agribusinesses and farmers to use and purchase machinery, vehicles and other large ticket items without requiring the collateral otherwise needed for such a purchase.

Post-harvest handling

Increasing quality for export markets requires improved drying and storage. Processing costs must also be reduced with the introduction of labour saving machinery. Post-harvest services can be provided by an individual business on a fee-for-service basis, a trader linked into the value chain who wishes to carry out quality control, or through equipment collectively owned by farmer clusters. For example, a post-harvest handling business could be established by a farmer cluster to operate the equipment, which farmers then pay to use. Specific post-harvest handling improvements include: introducing moisture content meters, use of electric dryers, bruchid fumigation (for mung bean storage), introducing mechanical shellers (for groundnut) and threshers (for mung bean).

Tractor services

Reducing labour costs and increasing mechanisation are key to making commercial agriculture viable in Timor-Leste. Tractor services, be it two-wheel or four-wheel, are essential for expanding agricultural production. Whilst MAF is currently providing subsidised tractor services for land preparation, private sector tractor services must also be supported to ensure sustainability.

Business management support

Commercial agriculture will instigate the emergence of farm support services including tractor services; contract spraying / fertilising; post-harvest threshing/shelling/drying; and storage. Often these service providers will have no previous business management experience and will have taken out loans to start their business. It is recommended TOMAK provides on-going business management support to these enterprises to ensure their viability and sustainability.

Market research

No market research is currently being carried out by either the public or private sector in Timor-Leste. Commercialising agriculture will require establishing linkages with new export markets, which needs market research. It is recommended TOMAK commissions several rapid market research studies to identify new export markets and buyers and additional products for which Timor-Leste has a comparative and competitive advantage on international markets.

1.15.4. Implementation strategy

The M4P approach provides a facilitative role to bring about more effective and sustainable systemic change to the market system. Considering the opportunities to improve the agricultural market system in Timor-Leste described above, it is recommended a 'smallholder inclusive business model' strategy is prepared to bring about the systemic changes. Inclusive business models can be described as:

- providing a living wage for vulnerable groups, such as smallholder groups, small enterprises, women- and youth-run enterprises, while also enabling buyers to profit;
- using flexible trading arrangements that make it easier for smallholders to supply a buyer, such as cash on delivery, accepting small consignments, providing reliable and regular orders;
- supporting farmers and small enterprises to establish a stronger negotiation position through skills development, collective bargaining and access to market information and financial services;

- building on the skills and expertise of existing market players, including traders and processors, and promoting value chain collaboration, transparency in pricing mechanisms, and risk sharing;
- being scalable in the medium-term so that the numbers of small actors involved can be increased and/or the type of business model can be replicated in other value chains or parts of the sector;
- allowing for diversified income streams in the long term to enable the dissemination of upgraded skills to the rest of the sector, avoiding overdependence on any single buyer or market outlet.

Contract farming is one example of a smallholder inclusive business model and can be described as an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices. The arrangement also invariably involves the purchaser in providing a degree of production support through, for example, the supply of inputs and the provision of technical advice. The basis of such arrangements is a commitment on the part of the farmer to provide a specific commodity in quantities and at quality standards determined by the purchaser and a commitment on the part of the company to support the farmer's production and to purchase the commodity.

The intensity of the contractual arrangement varies according to the depth and complexity of the provisions in each of the following three areas:

- Market provision: The grower and buyer agree to terms and conditions for the future sale and purchase of a crop or livestock product;
- Resource provision: In conjunction with the marketing arrangements, the buyer agrees to supply selected inputs, including on occasions land preparation and technical advice;
- Management specifications: The grower agrees to follow recommended production methods, input regimes, and cultivation and harvesting specifications.

In other countries, contract farming has proved a successful means of integrating smallholders into commercial supply chains. Market access is provided for farmers and product supply is assured for traders, allowing the development of an agricultural market system. TOMAK's role is to facilitate the establishment of various smallholder inclusive business models and contract farming arrangements between value chain stakeholders such as groundnut farmers and commodity traders/West Timor importers, mung bean farmers and West Timor importers, red rice farmers and millers.

Appendices

6. Appendix 1: Persons Met

Name	Designation	Place
Government		
Antonio do Karmo	National Director for Livestock & Veterinary Services, MAF	Dili
Claudino Nabais	National Director for Statistics & Research, MAF	Dili
Amaro Ximenes	National Director for Agriculture, Horticulture & Extension, MAF	Dili
Staff	Quarantine Services, MAF	Dili
Julmira da Silva	Extension worker, Uailaha	Baucau
Sebastião Bernadino da Silva	Extension worker, Fatulia	Baucau
Cansio Guterres	Extension worker, Uaioli	Baucau
District Agricultural Officers	MAF Baucau	Baucau
Ana Maria da Costa Marques	IADE	Baucau
Domingas Soares Nunes	SEM	Baucau
District Agriculture Officers	MAF Bobonaro, Maliana	Bobonaro
Director	Agriculture High School, Maliana	Bobonaro
Staff	Quarantine Services, Maliana	Bobonaro
Antonio Soares	SEM	Bobonaro
Francisco Gusmao	IADE	Bobonaro
Veronica Belo	Women's Association	Viqueque
Grigorio Henrique	District Administrator	Viqueque
Antonio Soares	Director for Crop, MAF Viqueque	Viqueque
Fernando Joaquim	Director for Livestock, MAF Viqueque	Viqueque
Esmenia Nunes	Extension worker, Ossurua	Viqueque
Domingos Pinto	Extension worker, Ossu de Cima	Viqueque
Leandro	Extension worker, Bahalarawain	Viqueque
Antonio Almeida	IADE	Viqueque
Antonito do Rosario	IADE	Viqueque
Salvador	SEM	Viqueque
Donors / Projects		
Wahyu Nogroho	Acting Country Director, Mercy Corps	Dili
Shariful Islam	Senior Market Development Advisor, MDF	Dili
Syeda Samira Saif	Market Development Specialist, MDF	Dili
Mark Henderson	Director, Office of Economic Growth, USAID	Dili
Luisa Freitas Tilman	HAFOTI staff	Baucau
Junilda Vila Nova	Officer in Charge, World Vision	Baucau
Georgina Ximenes de Reis	Alola	Baucau
Ronni Lopes	M&E, AVANSA	Bobonaro
Abel Pereira Mauricio	Director, Local NGO HADEER	Bobonaro
Rinci Nipu	Director, Organization Haburas Moris (OHM)	Bobonaro
Joao Pinto	CDC Director	Bobonaro
Sebastião Amaral	Colega da Paz field staff	Viqueque
Diana Rita	CARE International Field staff	Viqueque
Dortia Kese	HAFOTI Director	Viqueque
Luciana Guterres	Alola	Viqueque
Celeste Guterres	Vice President, Viqueque Women's Association	Viqueque
Producers		
Farmers (red rice)	Vemase	Baucau
Farmers (groundnut)	Uatu Lari	Baucau
Farmers Group (shallot)	Venilale, Uailaha	Baucau
Farmers Group (red rice)	Venilale, Fatulia	Baucau
Farmers (shallot)	Aisabe Ladies Group, Atuaben, Bobonaro	Bobonaro

Farmer Group (groundnut)	Cossal I, Saburai, Maliana	Bobonaro
Farmers Young Group (shallot)	Galumaun Group, Galu Sapulu, Lahomea Maliana	Bobonaro
OHM Farmers (red rice)	Maliana, Ritabou	Bobonaro
OHM Farmers (Mungbean)	Manapa	Bobonaro
HAFOTI Farmers (cattle)	Maliana	Bobonaro
HAFOTI Farmers (Peanuts)	Ossurua	Viqueque
Farmers (mung bean)	Dilor-Uma Tolu, Lacluta	Viqueque
Farmers (mung bean)	Buikarin	Viqueque
Traders,		
Rudy Djuang	CEO, Tuscany	Dili
Clarence Lim	CEO, Kmanek Trading	Dili
Milton	Agri-Agricultura (Input supplier)	Dili
CJ Sequeira	Talho Moris butcher	Dili
Bobby Lay	Director, Timor Global	Dili
Michael Francis	President, Global Industries Group	Dili
Staff	Gajah Mada	Dili
Chaitanya Varma	Director, Outspan Agro Timor	Dili
David Boyce	Advisor, CCT	Dili
Joanita (Uatulari)	Trader and local market vendor (red rice)	Baucau
Deolinda Perreira (Uatulari)	Trader and local market vendor (red rice)	Baucau
Local market vendors	Baucau market	Baucau
Higino da Costa Freitas	Director, ACELDA Unipessol LDA	Baucau
Angelo Freitas	Veterinary, (Input supplier)	Baucau
Agustinho Martins	Loja do Povo	Bobonaro
Local market vendors	Maliana market	Bobonaro
Silvino da Cruz	Agricultura Gunilabe, Maliana	Bobonaro
Fransisco	Beef trader, Maliana	Bobonaro
Vidal	Beef trader, Maliana	Bobonaro
Manuel Lopes	Red rice trader, Uatu Lari	Viqueque
Store Manager	Loja de Povo	Viqueque
Local market vendors	Viqueque market	Viqueque
Store Manager	Loja do Povo	Viqueque
Local market vendors	Ossu market	Viqueque
Borala Kios	Borala Kios	Viqueque
Venancio	Mung bean Trader	Viqueque

7. Appendix 2: Documents Reviewed

Amaral et al (2016) *Farm-level aspects of selected crop and livestock production systems, including current production practices, constraints, and opportunities for improvement,* TOMAK

DFAT (2015) *TOMAK Investment Design Document*

GDS (2014) *External Trade Statistics,* MoF

GDS (2015) *Population and Housing Census,* MoF

GDS (2014) *Poverty in Timor-Leste,* MoF

GDS (2011) *Timor-Leste Household Income and Expenditure Survey,* MoF

Godinho et al (2015) *Beyond Agricultural Inputs: A Learning Assessment Report,* Mercy Corps

Jones (2016) *The WEAMS Framework Women's Empowerment and Market Systems,* BEAM Exchange

Market Share Associates (2016) *Policy Brief: The Social Norms Factor,* BEAM Exchange

MDF (2013) *Inclusive Analysis of Growth, Poverty and Gender at Sector Level and Sector Growth Strategy for Poverty Reduction and Women's Economic Empowerment,* Australian Aid

MED (2012) *Value Chain Analysis of the Cattle Sector in Bobonaro and Lautem Districts,* GoTL

MPWTC (2015) *Rural Roads Master Plan,* GoTL

NDFA (2011) *Fish and Animal Protein Consumption and Availability in Timor-Leste,* MAF

NDPP (2012) *MAF Strategic Plan 2014-2020,* RDTL

RDTL (2010) *Timor-Leste Strategic Development Plan 2011-2030*

Sendall & Gusmão (2015) *LEO Timor-Leste Candlenut Market Assessment,* ACDI/VOCA/USAID

Sendall, Gusmão & Comon (2016) *LEO Aquaculture Feasibility Study,* ACDI/VOCA/USAID, Timor-Leste

Sendall & Yayasan Timor Membangun (2006) *West Timor Market Study,* GTZ, Timor-Leste

Springfield Centre (2008) *A Synthesis of the M4P Approach,* DFID/SDC

Springfield Centre (2008) *Perspectives on the M4P Approach,* DFID/SDC

Springfield Centre (2015) *The Operational Guide for the M4P Approach,* DFID/SDC

Waldron et al (2016) *Economic Analysis of Cattle Fattening Systems based on Forage Tree Legume Diets in Eastern Indonesia,* ACIAR

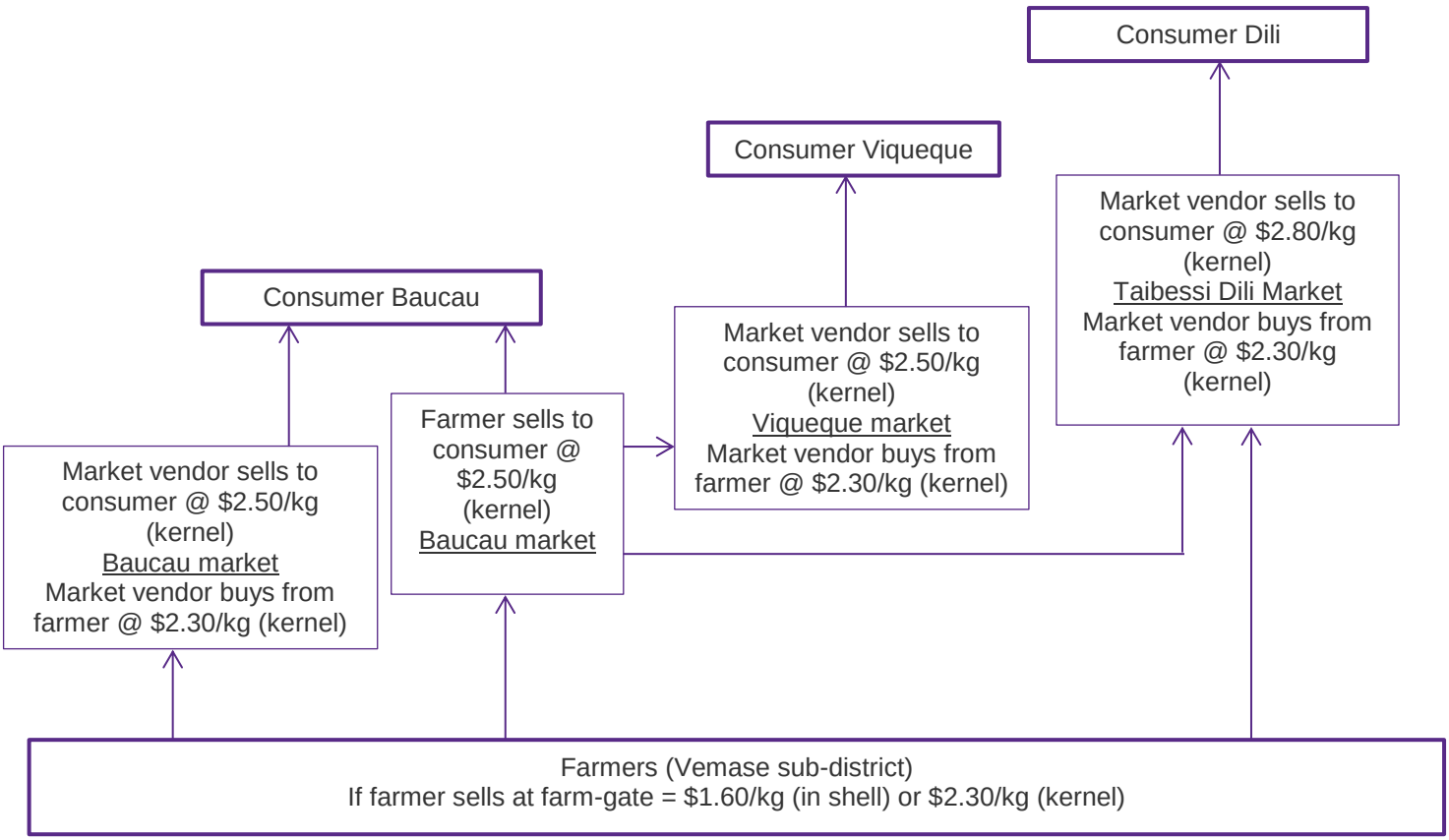
Waldron et al (2016) *Sub-Sector Analysis of the Timor-Leste Beef Industry*, ACIAR

Young (2016) *Market Analysis of Selected Agricultural Products,* TOMAK

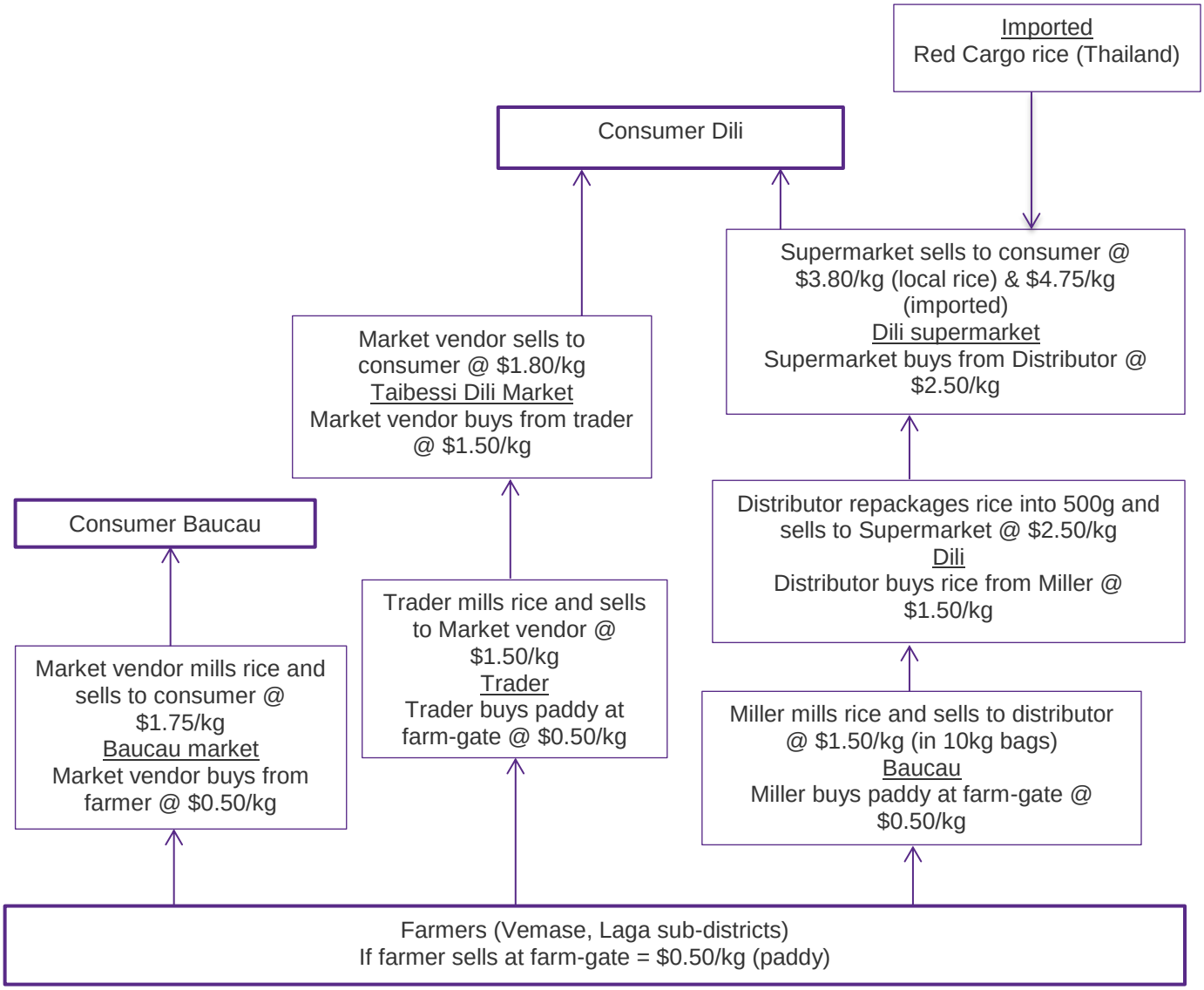
8. Appendix 3: District Value Chain Maps

BAUCAU

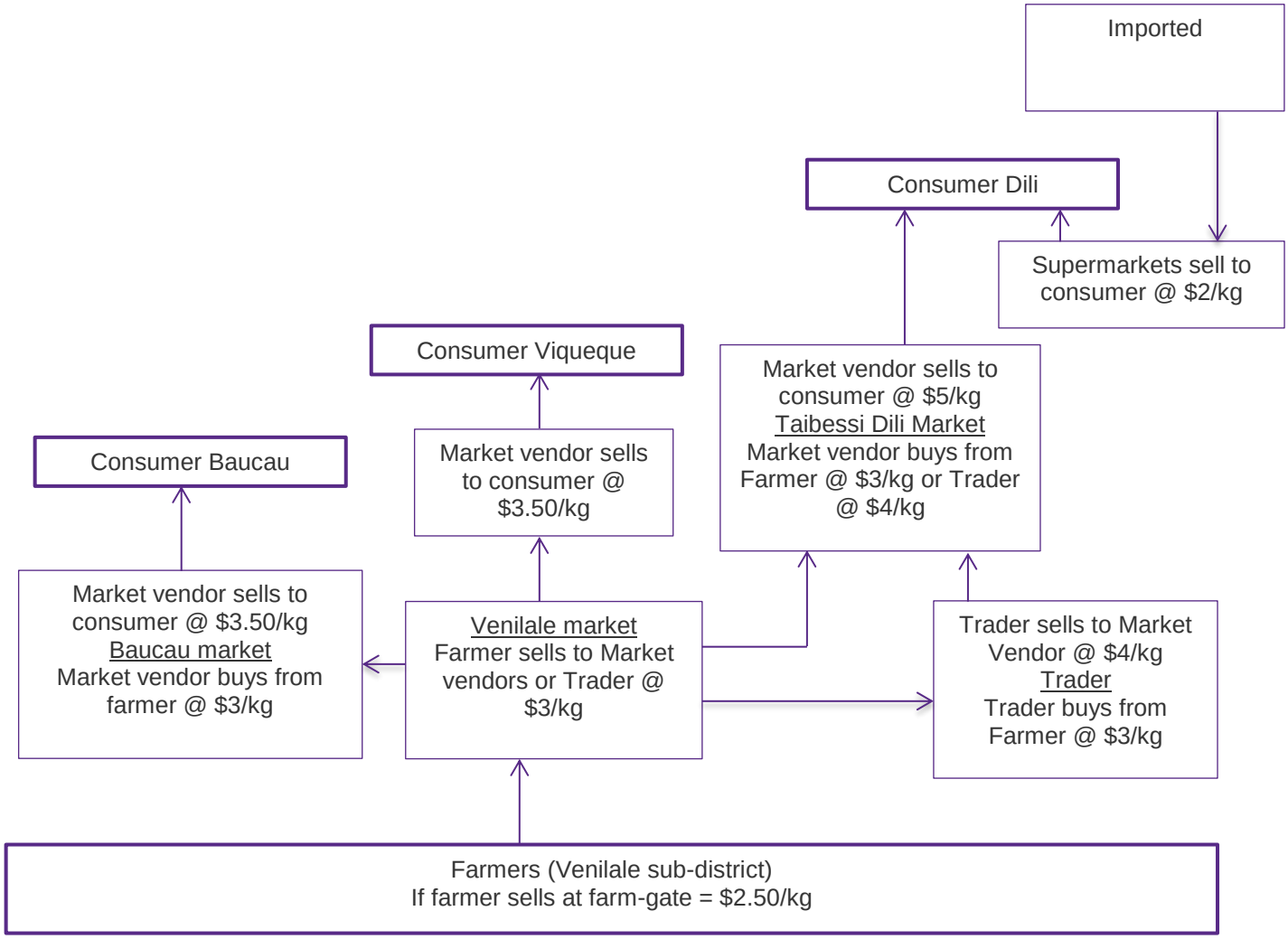
Groundnut



Red Rice

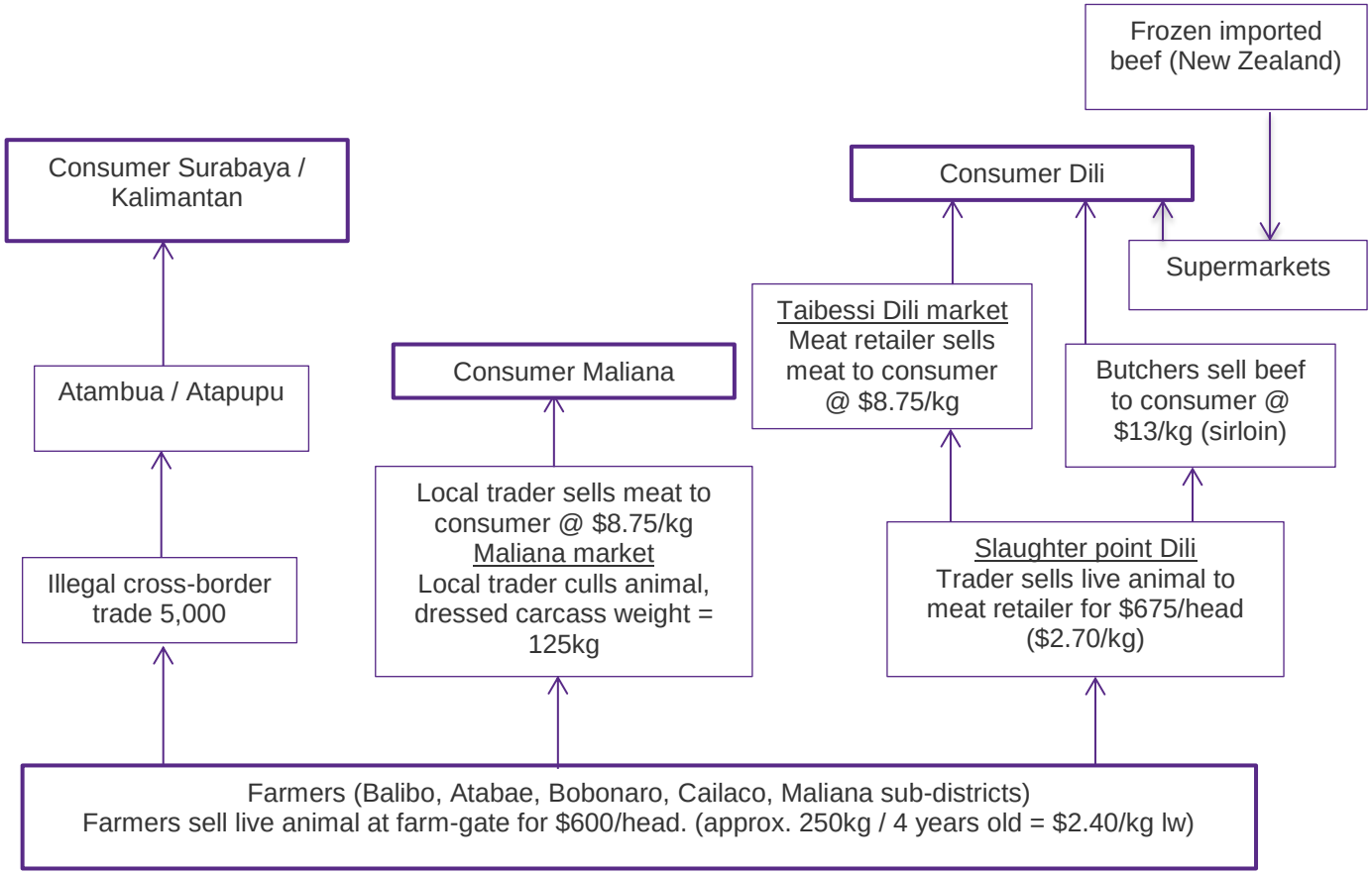

Imported
Red Cargo rice (Thailand)
Consumer Dili
Supermarket sells to consumer @ $3.80/kg (local rice) & $4.75/kg (imported)
Dili supermarket
Supermarket buys from Distributor @ $2.50/kg
Market vendor sells to consumer @ $1.80/kg
Taibessi Dili Market
Market vendor buys from trader @ $1.50/kg
Distributor repackages rice into 500g and sells to Supermarket @ $2.50/kg
Dili
Distributor buys rice from Miller @ $1.50/kg
Consumer Baucau
Trader mills rice and sells to Market vendor @ $1.50/kg
Trader
Trader buys paddy at farm-gate @ $0.50/kg
Market vendor mills rice and sells to consumer @ $1.75/kg
Baucau market
Market vendor buys from farmer @ $0.50/kg
Miller mills rice and sells to distributor @ $1.50/kg (in 10kg bags)
Baucau
Miller buys paddy at farm-gate @ $0.50/kg
Farmers (Vemase, Laga sub-districts)
If farmer sells at farm-gate = $0.50/kg (paddy)

Shallot

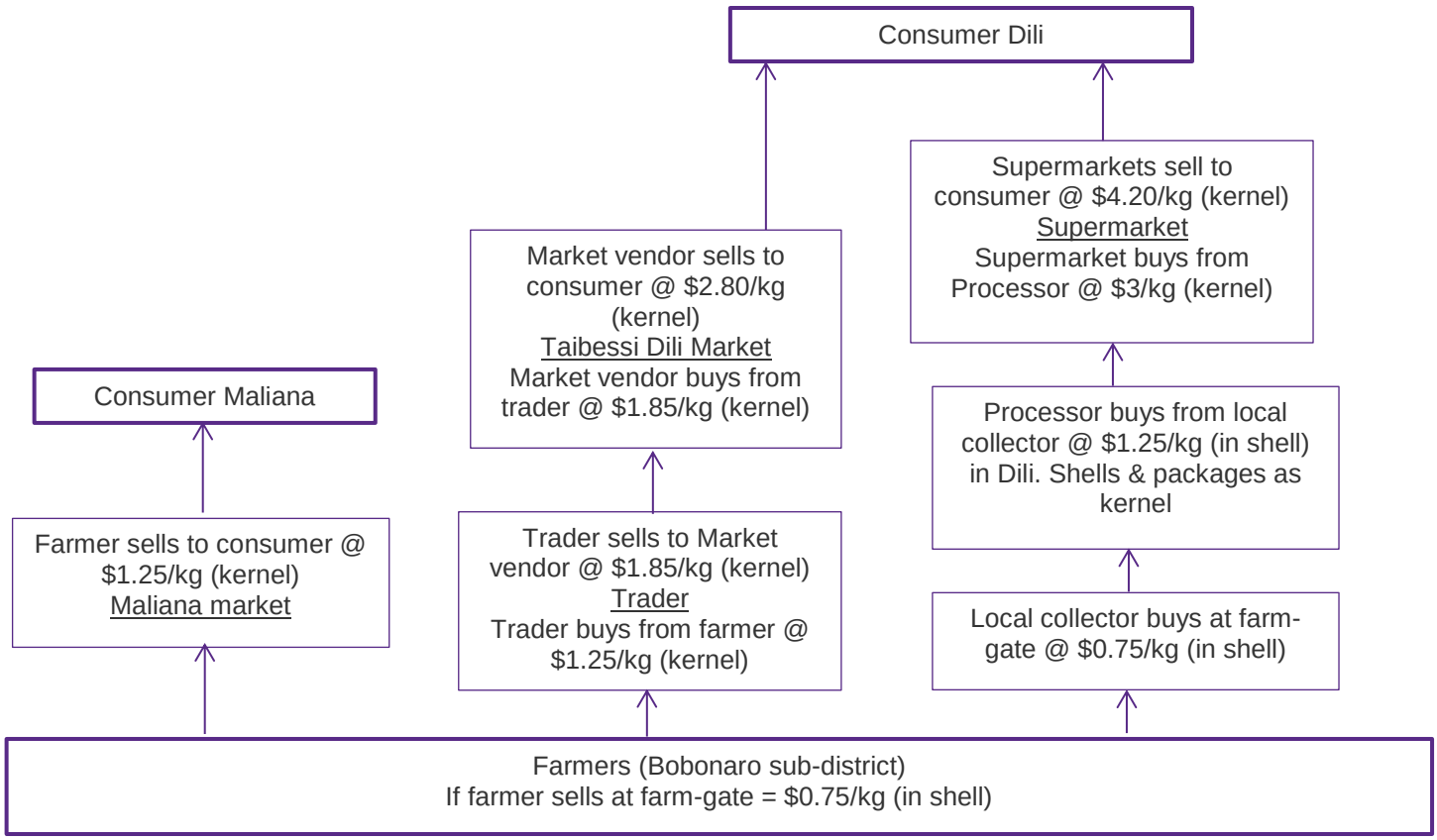

Imported
Consumer Dili
Supermarkets sell to consumer @ $2/kg
Consumer Viqueque
Market vendor sells to consumer @ $5/kg
Taibessi Dili Market
Market vendor buys from Farmer @ $3/kg or Trader @ $4/kg
Consumer Baucau
Market vendor sells to consumer @ $3.50/kg
Market vendor sells to consumer @ $3.50/kg
Baucau market
Market vendor buys from farmer @ $3/kg
Venilale market
Farmer sells to Market vendors or Trader @ $3/kg
Trader sells to Market Vendor @ $4/kg
Trader
Trader buys from Farmer @ $3/kg
Farmers (Venilale sub-district)
If farmer sells at farm-gate = $2.50/kg

BOBONARO

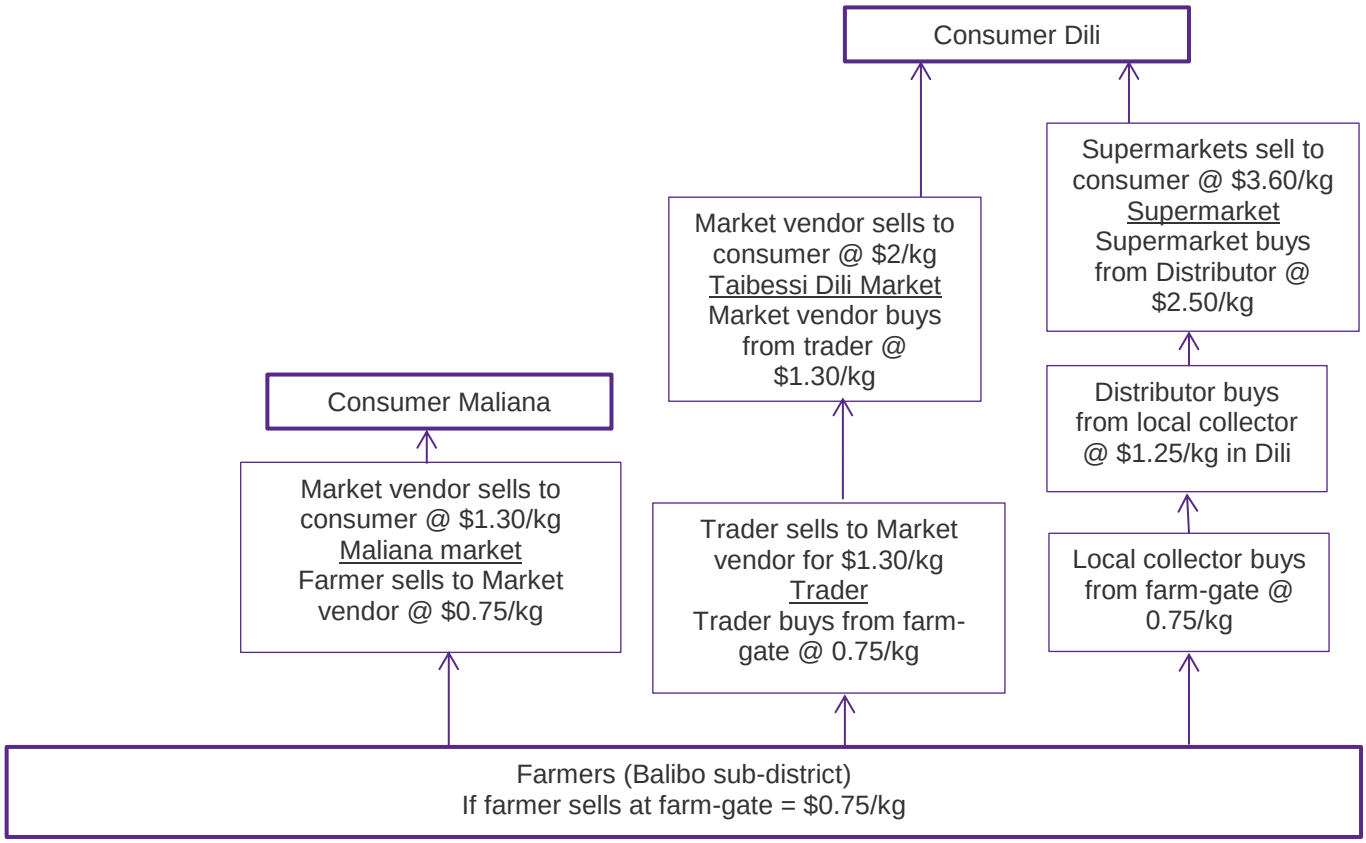
Cattle



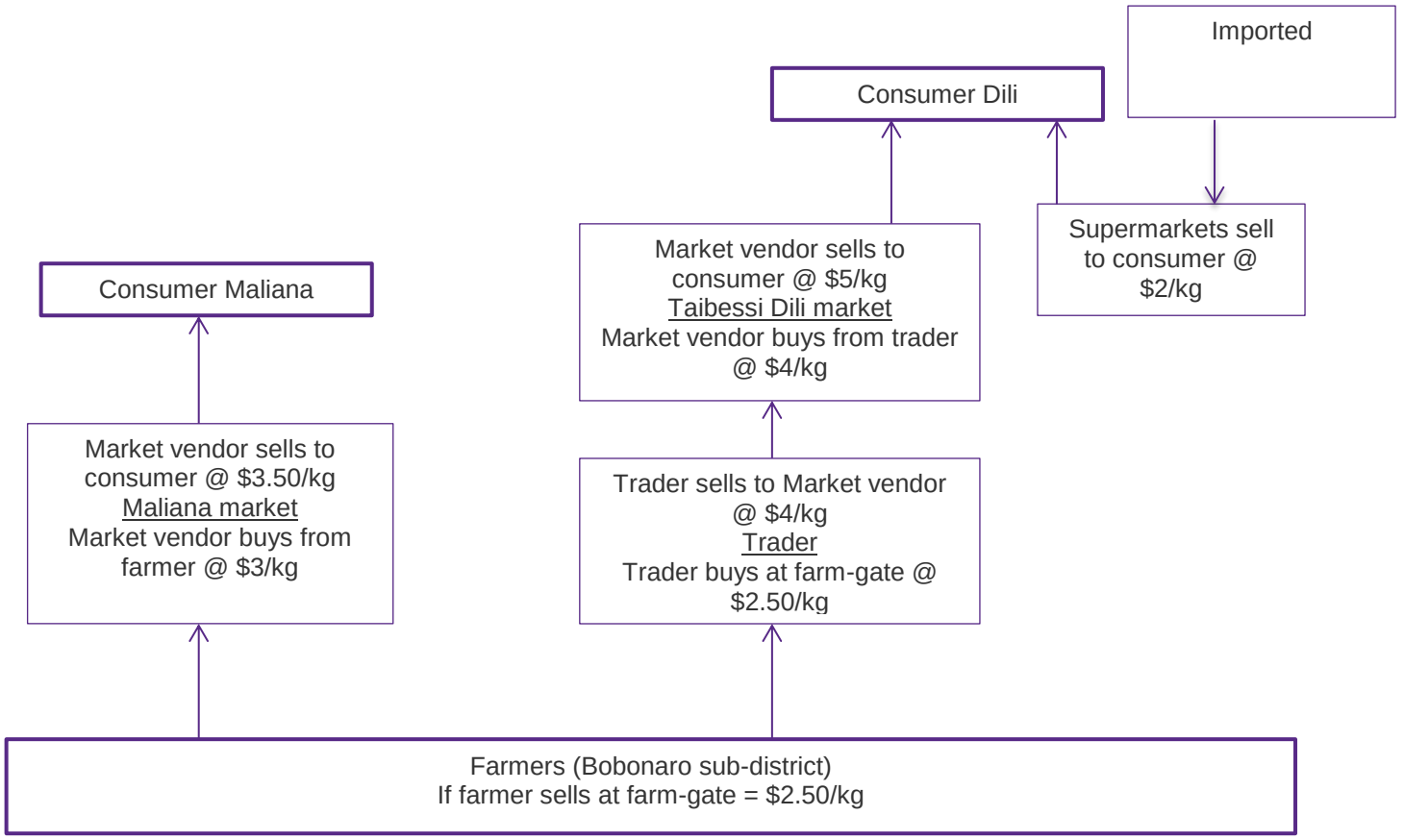
Groundnut


Consumer Dili
Supermarkets sell to consumer @ $4.20/kg (kernel)
Supermarket
Supermarket buys from Processor @ $3/kg (kernel)
Market vendor sells to consumer @ $2.80/kg (kernel)
Taibessi Dili Market
Market vendor buys from trader @ $1.85/kg (kernel)
Consumer Maliana
Processor buys from local collector @ $1.25/kg (in shell) in Dili. Shells & packages as kernel
Farmer sells to consumer @ $1.25/kg (kernel)
Maliana market
Trader sells to Market vendor @ $1.85/kg (kernel)
Trader
Trader buys from farmer @ $1.25/kg (kernel)
Local collector buys at farm-gate @ $0.75/kg (in shell)
Farmers (Bobonaro sub-district)
If farmer sells at farm-gate = $0.75/kg (in shell)

Mung Bean

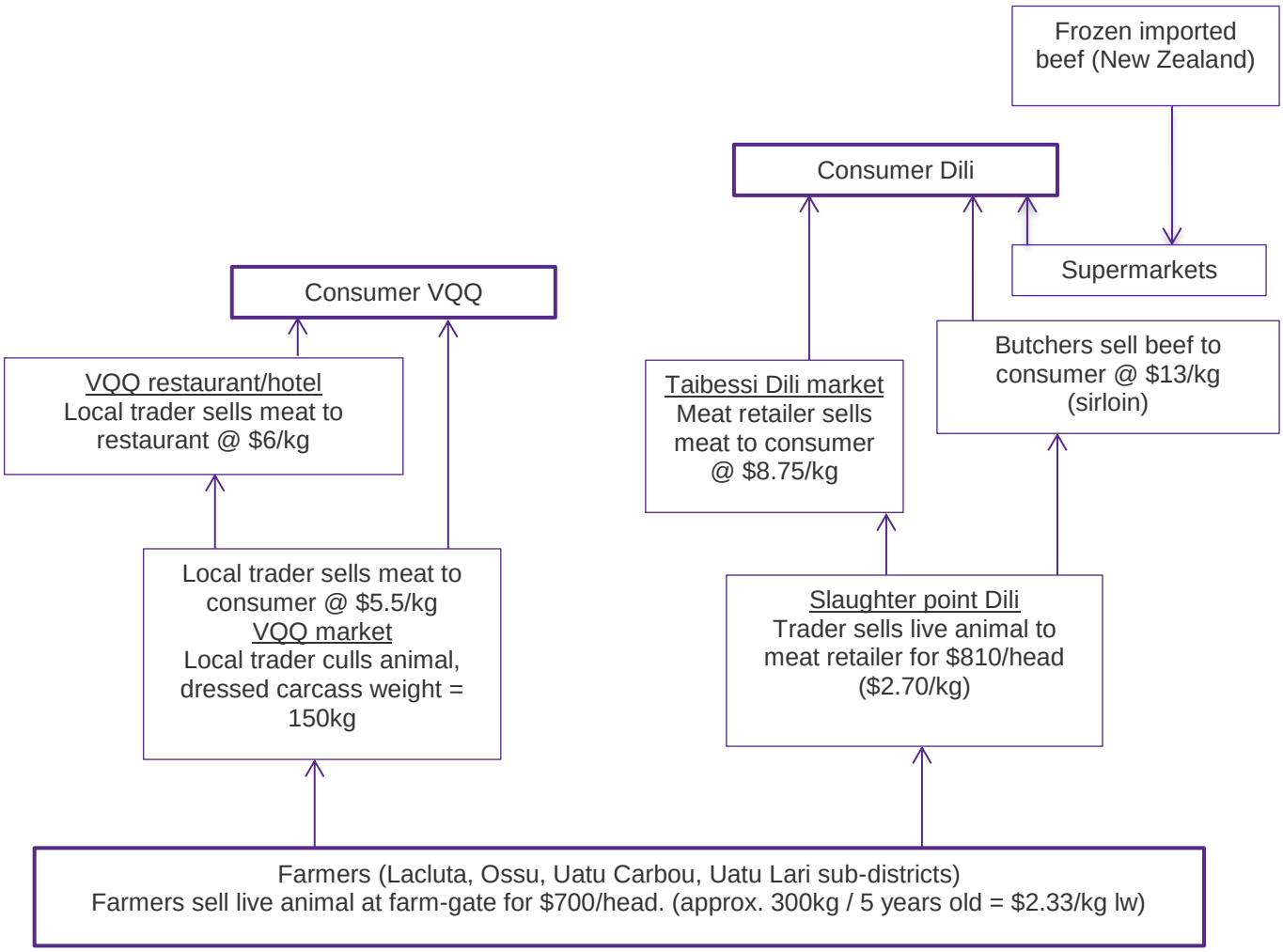

Consumer Dili
Supermarkets sell to consumer @ $3.60/kg
Supermarket
Supermarket buys from Distributor @ $2.50/kg
Market vendor sells to consumer @ $2/kg
Taibessi Dili Market
Market vendor buys from trader @ $1.30/kg
Distributor buys from local collector @ $1.25/kg in Dili
Consumer Maliana
Market vendor sells to consumer @ $1.30/kg
Maliana market
Farmer sells to Market vendor @ $0.75/kg
Trader sells to Market vendor for $1.30/kg
Trader
Trader buys from farm-gate @ 0.75/kg
Local collector buys from farm-gate @ 0.75/kg
Farmers (Balibo sub-district)
If farmer sells at farm-gate = $0.75/kg

Shallot

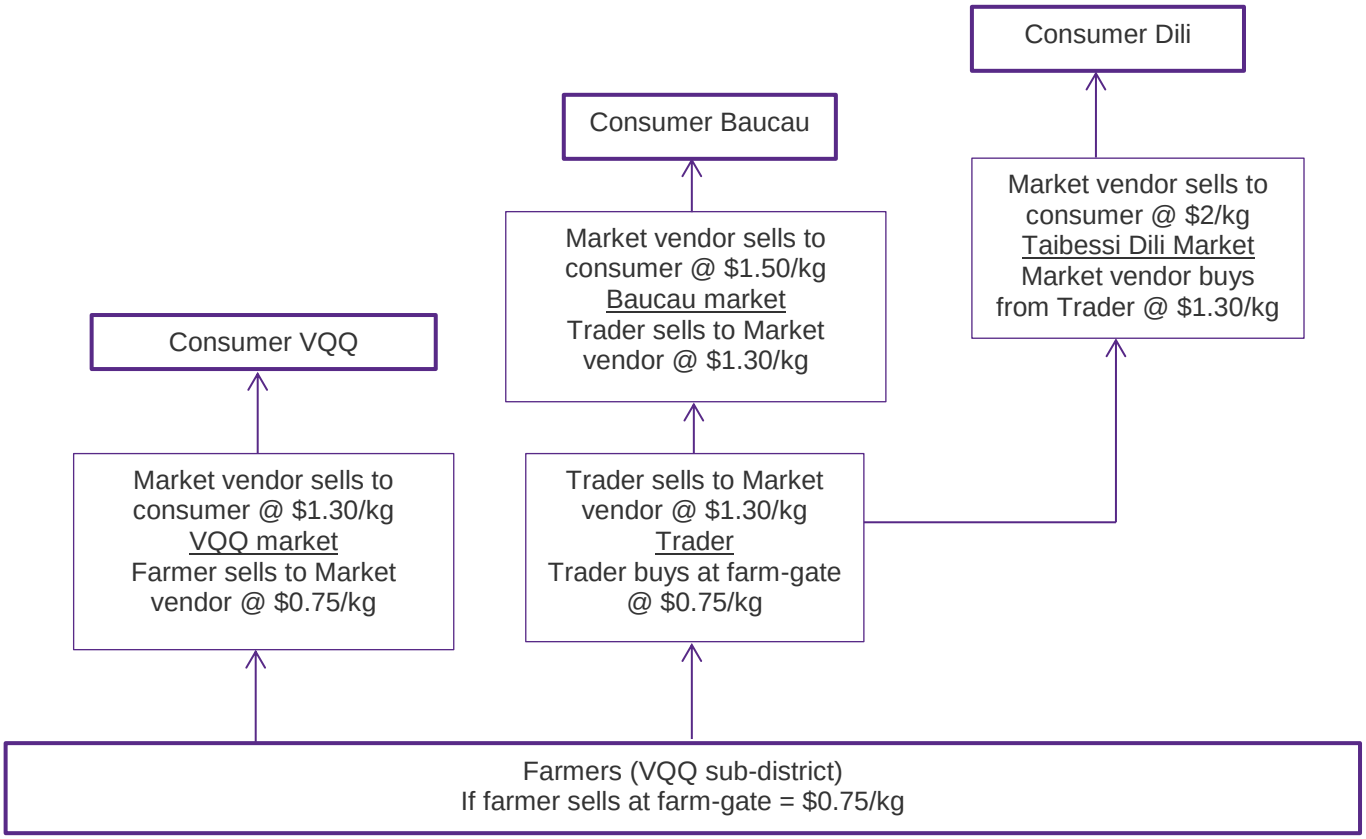

Imported
Consumer Dili
Supermarkets sell to consumer @ $2/kg
Market vendor sells to consumer @ $5/kg
Taibessi Dili market
Market vendor buys from trader @ $4/kg
Consumer Maliana
Market vendor sells to consumer @ $3.50/kg
Maliana market
Market vendor buys from farmer @ $3/kg
Trader sells to Market vendor @ $4/kg
Trader
Trader buys at farm-gate @ $2.50/kg
Farmers (Bobonaro sub-district)
If farmer sells at farm-gate = $2.50/kg

VIQUEQUE

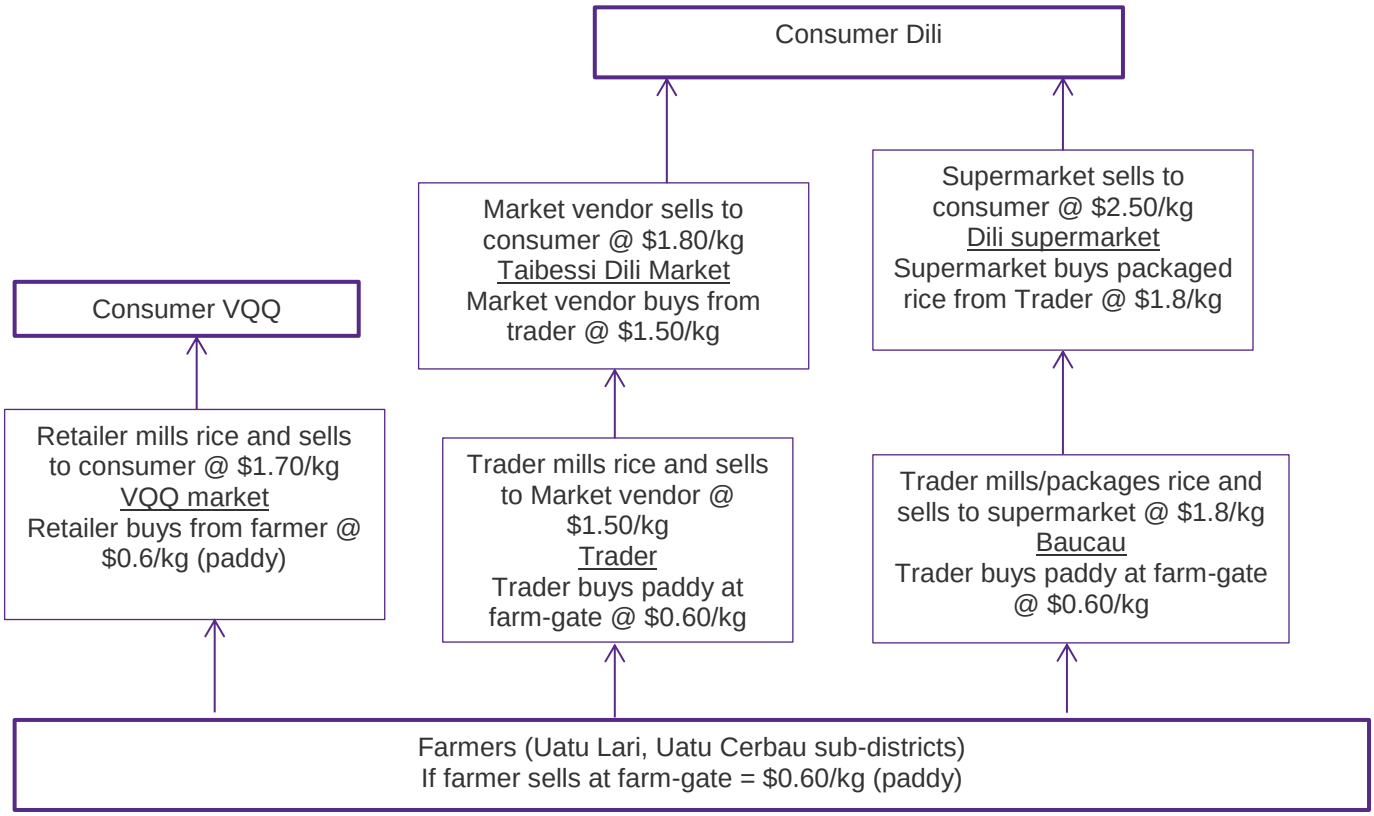
Cattle



Mung Bean


Consumer Dili
Consumer Baucau
Market vendor sells to consumer @ $2/kg
Taibessi Dili Market
Market vendor buys from Trader @ $1.30/kg
Market vendor sells to consumer @ $1.50/kg
Baucau market
Trader sells to Market vendor @ $1.30/kg
Consumer VQQ
Market vendor sells to consumer @ $1.30/kg
VQQ market
Farmer sells to Market vendor @ $0.75/kg
Trader sells to Market vendor @ $1.30/kg
Trader
Trader buys at farm-gate @ $0.75/kg
Farmers (VQQ sub-district)
If farmer sells at farm-gate = $0.75/kg

Red Rice


Consumer Dili
Consumer VQQ
Market vendor sells to consumer @ $1.80/kg
Taibessi Dili Market
Market vendor buys from trader @ $1.50/kg
Supermarket sells to consumer @ $2.50/kg
Dili supermarket
Supermarket buys packaged rice from Trader @ $1.8/kg
Retailer mills rice and sells to consumer @ $1.70/kg
VQQ market
Retailer buys from farmer @ $0.6/kg (paddy)
Trader mills rice and sells to Market vendor @ $1.50/kg
Trader
Trader buys paddy at farm-gate @ $0.60/kg
Trader mills/packages rice and sells to supermarket @ $1.8/kg
Baucau
Trader buys paddy at farm-gate @ $0.60/kg
Farmers (Uatu Lari, Uatu Cerbau sub-districts)
If farmer sells at farm-gate = $0.60/kg (paddy)

9. Appendix 4: Assessing Value Chain Potential for Women's Empowerment and Gender

TOMAK- Assessing value chains potential for women's empowerment and gender- Bobonaro

Table 1: Overall gender and Women's empowerment score potential for each value chain

		Cattle	Mung bean	Groundnut	Red Rice	Shallot	Pigs (WEE only)
1	Is the share of women producers in the value chain relatively high	6	8	8	6	8	8
2	Are there many female entrepreneurs in the value chain?	0	4	4	2	2	0
3	Do women control equipment and assets?	4	4	4	4	4	6
4	Do women have (or can they acquire) the skills needed for interesting value addition through processing or product diversification?	4	6	6	4	4	6
5	Do women control the sales income and the enterprise?	2	8	8	6	8	6
6	Can the work take place close to home?	6	6	6	6	6	10
7	Is this a value chain with low barriers to enter for poor entrepreneurs (small scale of production, low start-up costs, not requiring major capital investment, using low tech skills).	4	6	6	6	6	6
8	Is this a value chain with low barriers to enter for women (time and mobility, access to technology and assets, cultural constraints)?	4	6	6	6	8	8
9	Does this value chain offer new or increased opportunities for women	6	6	8	6	6	6
10	Is the activity in the value chain in line with livelihood conditions (year-round income, using family labour, rapid returns, contributing to food security, keeping the environment intact, not reducing availability of clean water)?	8	8	8	4	8	10
	Overall total for gender potential out of 100	**44**	**62**	**64**	**50**	**60**	66

0: (no/very low/not at all) to 10 (yes/very high/very important).

Assessing value chains potential for women's empowerment and gender- Viqueque

Table 2: Overall gender and Women's empowerment score potential for each value chains

		Cattle	Mung bean	Groundnut	Red Rice	Shallot	Pigs (WEE only)
1	Is the share of women producers in the value chain relatively high	6	6	2	6	0	8
2	Are there many female entrepreneurs in the value chain?	2	2	2	6	0	2
3	Do women control equipment and assets?	4	4	4	4	0	4
4	Do women have (or can they acquire) the skills needed for interesting value addition through processing or product diversification?	6	6	4	6	0	6
5	Do women control the sales income and the enterprise?	2	6	4	6	0	6
6	Can the work take place close to home?	4	4	4	6	2	10
7	Is this a value chain with low barriers to enter for poor entrepreneurs (small scale of production, low start-up costs, not requiring major capital investment, using low tech skills).	4	6	4	6	2	6
8	Is this a value chain with low barriers to enter for women (time and mobility, access to technology and assets, cultural constraints)?	4	6	4	4	2	6
9	Does this value chain offer new or increased opportunities for women	6	6	4	4	2	8
10	Is the activity in the value chain in line with livelihood conditions (year-round income, using family labour, rapid returns, contributing to food security, keeping the environment intact, not reducing availability of clean water)?	8	8	4	8	4	8
	Overall total for gender potential out of 100	**46**	**54**	**36**	**56**	**12**	**64**

0: (no/very low/not at all) to 10 (yes/very high/very important).

Assessing value chains potential for women's empowerment and gender - Baucau

Table 3: Overall gender and Women's empowerment score potential for each value chains

		Cattle	Mung bean	Groundnut	Red Rice	Shallot	Pigs (WEE only)
1	Is the share of women producers in the value chain relatively high	4	4	8	6	6	8
2	Are there many female entrepreneurs in the value chain?	2	2	4	4	6	4
3	Do women control equipment and assets?	2	4	6	4	6	4
4	Do women have (or can they acquire) the skills needed for interesting value addition through processing or product diversification?	6	4	6	6	6	6
5	Do women control the sales income and the enterprise?	4	6	6	6	6	6
6	Can the work take place close to home?	2	4	4	6	6	10
7	Is this a value chain with low barriers to enter for poor entrepreneurs (small scale of production, low start-up costs, not requiring major capital investment, using low tech skills).	4	4	6	6	6	6
8	Is this a value chain with low barriers to enter for women (time and mobility, access to technology and assets, cultural constraints)?	4	6	6	6	6	6
9	Does this value chain offer new or increased opportunities for women	4	6	8	4	6	6
10	Is the activity in the value chain in line with livelihood conditions (year-round income, using family labour, rapid returns, contributing to food security, keeping the environment intact, not reducing availability of clean water)?	4	4	8	8	8	8
	Overall total for gender potential out of 100	**36**	**44**	**62**	**56**	**62**	**64**

0: (no/very low/not at all) to 10 (yes/very high/very important

WEE recommendation for supporting gender equality & WEE improvements in the value chains-across the 3 districts

Commodity	Recommendations
Cattle	• Increase number of women and men entrepreneurs for cattle – room for women to be entrepreneurs in cattle processing • Strengthen joint production activities between men and women and negotiate land usage for cattle to be raised by women and men who do not have land ownership. • Target and improve the specific skill set of women within cattle raising in areas of reproduction, feeding, disease control & health • Target women for information on vaccination schedules, costs and services and encouraged to build a relationship with any service providers. More discussion on this between men and women. • Encourage women to take up village vet training or roles when they are offered • Increase gendered joint family decision making over income of cattle (Not negotiable if cattle commodity is taken up by TOMAK)
Mung bean	• Promote women as value chain leaders, aggregators, middle people developing their business plans- possible access to finance-encourage traders to come to them-involve girls in this • Improve market information, trading, production & better market place services and safety • Some opportunity for processing eg mung bean tempeh and toge/bean sprout • Negotiation of land use that may belong to a male family member -Extended family joint decision making of land and resources • Explore better storage facilities and equipment options (labour saving) • Explore road access and improvements – in the past may not have been prioritised for road upgrades small differences -paths being widened
Groundnut	• Promote women as value chain leaders, aggregators, middle people developing their business plans- possible access to finance- encourage traders to come to them- involve girls • Improve market information, trading, production & better market place services and safety • Some opportunity for processing eg snack foods, peanut butter, sauces, guri giz (peanut snack food) has links to adat usages -high energy and protein • Negotiation of land use that may belong to a male family member -Extended family joint decision making of land and resources • Explore better storage facilities and equipment options (labour saving)-shelling, harvesting and processing • Explore road access and improvements- in the past may not have been prioritised for road upgrades
Red Rice	• Undertake market survey-explore opportunities for women and men as relatively new interest in it being a commercial crop • Understand better cultural and nutritional practices of using red rice (by gender)- who eats it now? Is there room to change demand levels domestically? • Increase knowledge of red rice nutritional value • Document the business plans and movement of women selling this commodity
Shallots	• Maintain and expand women's leadership of this value chain. It is totally women led now and there are big profits in it • Document the business plans and movement of women selling this commodity • Promote women as aggregators, middle people developing their business plans- possible access to finance- encourage traders to come to them- involve girls • Improve market information, trading, production & better market place services and safety • Limited know about processing potential -possible pre fried shallots packets, within chutneys • Negotiation of land use that may belong to a male family member -Extended family joint decision making of land and resources

	• Explore better storage facilities and equipment options (labour saving) • Explore road access and improvements- in the past may not have been prioritised for road upgrades