AGRICULTURAL VALUE CHAINS ANALYSIS IN OÉ-CUSSE, TIMOR-LESTE

Regional Secretariat of Agriculture and Rural Development in Oé-Cusse

November, 2018

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Lead writers:
Frederic Lavoie and Laura Fiorotto

Principal Writers and Researchers
Frederic Lavoie, Joni Dos Santos, Aderito Prunef, Jose Sanai,
Laura Fiorotto, Jochem Jonkman, Laurelle Neugabauer.

Regional Secretariat of Agriculture and Rural Development in Oé-Cusse
Regio Da Cruz Salu

Editor
Shuo Li Liu

Layout and Design
Shift Brand Design

Pictures on page 1, 29, 84 by Irene Gavieiro

Finalized: November 2018.

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Executive summary

This document was developed by the Regional Secretariat of Agriculture and Rural Development in Oé-Cusse and UNDP Timor Leste. The objective of the document is to contribute to a better understanding of the status of the local production in the region, the challenges and opportunities, and to guide the design of potential investments from the government to support local farmers. The analysis concentrated on the value chains of the following commodities:

1. Rice
2. Coffee
3. Mandarin
4. Pineapple
5. Candlenut
6. Sea fish
7. Cattle

The analysis validates the contribution to the Regional Secretariat of Agriculture and Rural Development's strategic development objectives. It also describes, for each commodity, the value chain structure and its different functions. In addition, the analysis discusses four key considerations: production, processing, transportation and markets. Finally, the report pinpoints the main market constraints and possible interventions to improve the situation. The results serve as a base from which more detailed development strategies can be designed.

Main results are summarized for each value chain, below.

Rice Rice is the second most cultivated crop in Oé-Cusse, with more than 2,100 ha of cultivated field. It can be harvested twice per year provided there is sufficient water supply. Both the productivity and the quality of the rice paddy are low compared to Indonesia (3-4 tons of unhulled paddy or gabah/ha compared to the 2015 average of 5.3 tons/ha in Indonesia). The producers have little interest in improving quality as most of the production has been kept for household consumption. The key constraints are low yield and quality of the paddy, a lack of water supply, rudimentary processing techniques resulting in significant post-harvest losses, high competition (imported rice) and consequently, the lack of local demand. Interventions to be considered are an increase in productivity to reduce costs and consequently stimulate local demand and supporting the creation of groups for collective purchasing of inputs and marketing.

Coffee The coffee produced in Oé-Cusse is of good quality. Although the total cultivated area remains limited (36 ha), coffee is produced in all four sub-regions of Oé-Cusse and there is potential to increase the cultivation area in the region by 20-100 hectares. Productivity is lower (0.6-0.9/ha) than in Indonesia (0.9-1.09/ha), mainly due to the small size of trees, the lack of maintenance and cultivation on the steep slope of lands. Coffee is sold both in the region and to several buyers in Dili. The main constraints identified are the low productivity, inadequate farming and processing techniques, relatively high market competition and the lack of connections to buyers. Key interventions consist of increasing productivity to improve farmers' income, improving storage techniques and facilitating access to markets.

Mandarin The mandarins cultivated by Oé-Cusse farmers can be harvested from 3 years (hybrid seeds) to 4-5 years (local seeds). The fruit is not affected by pest or diseases and remains in good condition after handling. There is no processing of the fruit, except storing it in sacks for transportation. The density of plantations and the productivity achieved in the region are however much lower (150kg/tree) than in Indonesia (up to 500kg/tree).

Trees are sometimes affected by flies and ants. Competition levels are relatively low, as the producers only compete with other similar producers in the region and Indonesia producers in the neighboring region of Eban. The major constraints are the low productivity and a limited access to buyers. Possible interventions would consist of improving productivity and facilitating market linkages.

Pineapple The pineapples grown in the region can be harvested twice per year. They are not affected by pest or diseases, although good fencing is required to protect the fruits from animals. The average yield achieved by Oé-Cusse farmers (1.3 to 2 tons/ha) fares a little low compared to Indonesian farmers. There is neither processing nor storage of the fruit which reduces the risk of damage resulting from inadequate processing, although the fruit cannot be preserved for long. Competition levels are low, as the producers only compete with other similar producers in the region. The main constraints are relatively high production costs preventing producers from selling at bulk price to bigger buyers and the lack of market linkages outside of the region. Envisaged interventions are improving productivity to reduce production costs and facilitating market linkages at regional, national and possibly at international levels.

Candlenut The trees, which require three to four years to produce fruits, adapt well to a variety of conditions and typically require little maintenance. There are two varieties of candlenut in Timor-Leste: a local variety producing nuts with high oil content (suited for oil processing) and a variety from Indonesia producing whiter kernels (suited to the Indonesian spice market). The productivity of candlenut plantations is the region is low, due to aging trees and a low density of plantation. All candlenut producers in Oé-Cusse sell to brokers from Kefa, Indonesia, for the spice market. The key constraint is that there is no scope to significantly increase profitability because the price is fixed by Indonesia for relatively low and mixed quality of candlenuts, with no premium for quality. Proposed interventions consist of improving the productivity while identifying more profitable markets such as candlenut oil (e.g. ACELDA company in Baucau) and candlenut-based products.

Sea fish The high fishing season is the rainy season (December-February). In Oé-Cusse waters, fishermen can encounter several species of fish, including larger ones, such as coccus that fetch a high price. Daily fish volume per fisherman household can reach 100-150 kilos; this depends heavily on fishing equipment available. Average fish consumption per capita in Timor-Leste is much lower than other Asian nations, suggesting that marine resources are underexploited. Most fishermen only sell locally while some better off fishermen, who have the equipment to catch larger fish, also export to Dili. By far the main constraint is the low fish catch volume. Also, the more vulnerable fishermen may lack means of transportation to even sell the fish or store it properly, forcing them to rent such items when needed. Proposed interventions are the provision of better fishing equipment to small fishermen groups and facilitating market linkages for these groups.

Cattle Many households in Oé-Cusse own cattle as a store of wealth, selling a cow when in need of money. However, there is a small number of farmers which are trained and organized producing more commercially. The government supports farmer groups to raise young bulls for meat production. Feed availability and quality during the dry season is a limit to productivity. Additionally, the local infrastructure is inadequate to allow for slaughtering and processing within Oé-Cusse and there is a practice of exporting the cattle informally to Indonesia. Although farmers were trained in producing and storing feed during the rainy season for feeding in the dry season, they have not adopted this practice. Improving the feed availability, formalizing and facilitating the export of cattle, and improving the infrastructure for local meat processing are the main ways to move forward.

1. Introduction

With the support of UNDP, this value chain analysis was conducted to guide the Regional Secretariat of Agriculture and Rural Development in Oé-Cusse to analyse and prioritize the agri-business interventions. The research was conducted from November 2017 to March 2018.

UNDP Timor-Leste has been supporting Oé-Cusse local economic development processes in Oé-Cusse by accompanying the region of Oé-Cusse in the definition of economic participatory development strategies, based on the endogenous potentialities and resources as well as on exogenous opportunity factors. The aim is to endow the region with local capacities, and to generate decent productive opportunities and social equality, hence securing the welfare of the population.

The analysis targeted the following seven value chains:

1. Rice 2. Coffee 3. Mandarin 4. Pineapple 5. Candlenut 6. Sea fish 7. Cattle

Following a presentation of the research methodology, the report summarizes key background information on agricultural and rural development in Oé-Cusse. More specifically, the "Background" section briefly discusses the farming systems in the region before providing details on the main commercial agriculture activities in Oé-Cusse, which are the main staples, fruits, livestock, forestry, and fisheries.

The subsequent value chain analysis chapters are organized in four parts. The report first validates the selection of each value chain based on its contribution to the Regional Secretariat of Agriculture and Rural Development's (SRADR) strategic development objectives. These objectives include agri-business and value chain development interventions dedicated to the betterment of the agricultural sector, the growth of economy, the development of private sector (namely the generation of employment), and the reduction of poverty and food insecurity in the rural areas of Oé-Cusse.

Second, the section of "value chain structure and function" presents an overview of each value chain, indicating which market actors play a role at each stage of the value chain: inputs and services, production, processing, and marketing. It is useful to look at the degree to which the small producers participate in different stages of the value chain (for instance, they may get involved at all stages, which suggests the lack of adequate processing facilities, for instance) and the presence or absence of major demand drivers, namely large buyers; they contribute to the market demand stabilization that motivates the investments by other market participants.

Third, the "analysis" section discusses four key considerations for each value chain – production, processing, transportation, and sales – all of which provide the necessary context to assess market bottlenecks and consider possible solutions to solve these.

The fourth section aims to highlight the main *market constraints* to small producers and overall value chain efficiency while considering *possible interventions* to help solve or reduce the effect of identified constraints. Additionally, diagrams summarizing key information on each of the value chain (see *Analysis* section) can be found in the appendices section.

1.1 Methodology

General Considerations

This value chain analysis concentrated on the following aspects of the value chain: production, processing, transportation and markets. In doing so, the team attempted to provide details on each stage of the value chain, from

production to end markets, whenever information could be obtained within the scope of the research. The information collected is focused on understanding the opportunities and constraints that local farmers in Oé-Cusse face; therefore, the information collected and systematized in this document is mainly focused on the farmer's participation in the value chain.

The research targeted Oé-Cusse based producers and was carried out in all sub-districts (Costa, Nitibe, Passabe and Oesilo) and several sucos (depending on the production areas concerned by the targeted commodities).

Table 1 lists the sub-districts and sucos where fieldwork was conducted, and the map shows the location of Oé-Cusse districts.

Table 1: Locations where fieldwork was conducted

Sub-region	Suco
Costa	Costa
	Lifau
	Naimeco
	Lalisuc
	Taiboco
	Nipane
Oesilo	Bobometo
	Usi-Taqueno
Nitibe	Beneufe
	Usitaco
Passabe	Abani

Figure 1: Map of the sucos Oé-Cusse

Research process

Before the research was initiated, the target commodities to for conducting research was selected through a series of meetings, which gather the research team members and the agricultural specialists of the Regional Secretariat of Agriculture and Rural Development in Oé-Cusse, Ambeno.

Subsequently, a methodology for collecting the information has been developed with the aim to ensure the proper process of data collecting for each value chain. The methodology developed involves key informant interviews (with extentionists[1], Suco leaders, suppliers, potential buyers), interviews with senior decision-makers, focus group meeting, and workshops with all farmers. The method ensured the implementation of a collaborative process during the analyses of the value chains by promoting the active involvement of all farmers. The following tools have been created for collaborative value chain analysis:

- Form 1: Value chain analysis extensive information collection
- Form 2: Graphic of the value chain structure including current situation and main challenges.
- 2 workshops activities to ensure participative analysis of problems and development of solutions.

1 Government agricultural employees stationed in the sucos

Prior to fieldwork, the field research team conducted desk research on the target commodities. Fieldwork was conducted by a team of three researchers from November 2017 to March 2018. Responsibility over information gathering and report writing for each commodity was distributed among research team members. Example fieldworks included regular writing and debriefs with the entire team.

Value Chain Analysis Activities

1. Desk research: The review of both secondary and primary data was conducted simultaneously until the completion of the report, so the different sources of data or information could be tapped into to triangulate information. For the desk review, the team consulted relevant literature on the target commodities and the focused region (Oé-Cusse), as well as the statistical databases on production and trade.

2. Interviews: The team interviewed a diverse set of stakeholders for each of the targeted value chains. The list of interviewees included value chain actors (individual small- and medium-scale producers, producer associations, processors, retailers, traders, and the regional government) and other key informants such as local agriculture specialists.

3. Workshops: Two workshops were implemented to ensure active participation of the farmers in the situation analysis of the commodities. Farmers, staff from Regional Secretariat of Agriculture and Rural Development, and NGOs were invited. The first workshop (January 2018) focused on achieving two results: 1) collecting data on the current productivity, the number of farmers and the amount of production, and 2) determine constraints and challenges in each value chain. Farmers were taught about the current global situation of the value chain in the region; they have also provided key information that is presently included in this document. Participants of the workshop were encouraged to develop critical analysis about the challenges they face when producing and selling their products. A second workshop (February 2018) was conducted to validate the consolidation of the problems and to determine possible solutions.

4. Data and information analysis: The team members synthesized the interview notes to 1) assess economic, production, and demand data (e.g. pricing at each stage of the value chain, productivity, local sales and exports), and 2) pinpoint key constraints (e.g. limited seed quality, high production costs, and limited access to buyers), and 3) propose interventions for each commodity (e.g. provide agricultural training to improve farmers' practices, facilitate market linkages with buyers).

5. Selection of commodities and research debriefs: the selection process for the commodities to be focused on this chain analysis was conducted and completed by the agriculture specialists of the Regional Secretariat of Agriculture and Rural Development in Oé-Cusse and the UNDP staff conducting the research. Personnel from both institutions participated in regular debriefs and the preparation and validation of the information collected.

1.2 Background on Agriculture in Oé-Cusse

On June 8th 2014, the national government of Timor-Leste passed a law that established the Special Zone of Social Market Economy (ZEESM TL) that would cover the enclave of Oé-Cusse and Atauro Island, and created the Special Administrative Region of Oé-Cusse (RAEOA). One month later, the President of the Republic of Timor-Leste formally appointed Dr. Mari Alkatiri as the President of ZEESM TL.

With this law providing the legal framework, the territory of Oé-Cusse was elevated to a Special Administrative Region in relation to its administrative, financial and patrimonial autonomy, legal framework and governance bodies.

Article 38 of the Law No. 3/2014 defines 'social market economy' as an inclusive and participatory model consisting of socio-economical and environmentally sustainable development initiatives that diversify the economy in the respective administratively and physically adjacent areas. The model of social market economy focuses on social components in generating sustained economic growth, aiming to simultaneously invest in the development of education, health and economic sectors, and other key areas. It offers an inclusive model for growth that is people-centered and calls for human and social development to be at the core of all plans and processes[2].

The region is expected to become a pilot for regional development, production, services and trade in goods and services. Rural development and investment are among its key priorities considering Oé-Cusse's mainly agricultural population.

1.2.1 Social Market Economy in Oé-Cusse

The vision for a Social Market Economy in Oé-Cusse is based on the ability to involve everyone irrespective of their social position and capabilities; hence everyone feels part of the development process. It represents an economic model that places the people in the center, as an end and as an enabler for change, and guarantees social justice and equality.

The Special Administrative Region represent an innovative new policy instrument to enable effective governance, poverty reduction and economic and social well-being in Oé-Cusse. It is an instrument that will make the Social Market Economy into fruition. RAEOA seek to promote an agile, streamlined and technology-enabled regional governance structure that focuses on policy innovation and service delivery (electricity, transportation, health, education, among others) for social economic development.

The regional government recognizes the importance of small producers as they account for the biggest portion of the local population and they provide food for all families. On its first few years of action, the government has focused on building basic infrastructure for communication (roads, port, airport and bridges), electricity (new power plant that is covering 95% of the population), health (new hospital and health clinic) and education (new schools and libraries).

Investment in road transportation is particularly valued. It benefits agricultural development and improves accessibility to and from the borders with Indonesia, which is crucial to enable the free mobilization of human resources, products, and the access to services such as health and education. Other investments in infrastructure such as irrigation, covering hundreds of hectares are enabling farmers to be buffered from the uncertainties of a changing climate and move towards to a more integrated and effective approach to agricultural production.

The regional government expects these improvements to reduce inequalities and unite the urban and rural areas.

1.2.2 Agriculture in Oé-Cusse

One of the main barriers in terms of agricultural and rural development consists of the prevalent subsistence farming system, which is characterized by low agricultural productivity. This leads to a low income and food insecurity, as there is little marketable surplus of cash crops. The lack of surplus in agricultural production has also prevented the development of small and medium agro-enterprises. Finally, relative political instability and the

2 United Nations Development Programme (2017), Special Administrative Region of Oé-Cusse Ambeno: An Alternative Development Model for Timor-Leste.Dili, Timor-Leste.

lack of adequate infrastructure (although construction is ongoing) have resulted in limited private sector investment and underdevelopment of the agri-business sector[3].

Agriculture and rural development related facts[4]:

- Very young population with 52% of inhabitants aged below twenty years old;
- Over 80% of the inhabitants of Oé-Cusse have farming as their main occupation;
- Nearly all farmers practice subsistence agriculture, with no more than 1% of households producing primarily for selling in the market (see table below).

Table 2: Levels of agricultural activity per administrative post

Administrative Post, Suco	Private Households	Level of Agricultural Activity		
		Only minor agriculture activity (backyard)	Producing mainly for home consumption with some sales	Producing mainly for sale with some home consumption
(1)	(2)	(3)	(4)	(5)
TOTAL	14,345	6,252	7,859	92
%		44%	55%	1%
Nitibe	2,705	663	2,022	9
Oesilo	2,538	913	1,608	9
Pante Macassar	7,285	3,767	3,351	61
Passabe	1,817	909	878	13

Source: TL Population and Housing Census 2015.

Farming systems

As mentioned above, subsistence agriculture remains prevalent in the region, with the majority of rural households in Oé-Cusse cultivating less than one hectare (refer to the table below). On the one hand, mechanization and the utilization of yield enhancing mechanisms (improved seeds, fertilizers and crop protection) are mostly limited to the production of irrigated rice. On the other hand, shifting cultivation, often based on "slash and burn" techniques, is widespread. Inter-cropping of rain-fed maize and cassava is practiced on steep slopes of the hills. Cowpeas, pigeon peas, mung beans, soya beans, groundnuts and sweet potatoes are also cultivated at the onset of rains in November. Crop varieties are selected primarily with the aim to reduce post-harvest losses rather than an increase in yield. Similarly, the crops are selected based on their potential to maintain the household's food security (or to reduce relative food insecurity), rather than maximizing production of one or more specific crops.

3 Adam Sendall (2016), Oé-Cusse Rural Development Strategy (2016 – 2020).

4 The rest of the *Background* section heavily relies on: UNDP-ZEESM (2017) Agri-business development programme Oé-Cusse: Building local capacity for agri-business development in Oé-Cusse, and General Directorate of Statistics (2015) Timor-Leste Population and Housing Census, Volume 3 "Social and economic characteristics", Ministry of Planning and Finance.

Table 3: Cultivated areas by household by urban/rural location and Administrative Post

Urban/rural location, Administrative Post	Total Private Households	Cultivated Area				Not Reported
		< 1 Ha	1-5 Ha	> 5 Ha	No Land	
TOTAL	14 345	11 076	2 607	123	223	316
Urban	2 244	1 517	467	13	92	155
Rural	12 101	9 559	2 140	110	131	161
Nitibe	2 705	1 988	599	48	16	54
Oesilo	2 538	1 988	513	8	19	10
Pante Macassar	7 285	5 583	1 273	62	136	231
Passabe	1 817	1 517	222	5	52	21

Source: TL Population and Housing Census 2015.

Main staples

Two main staple crops in Oé-Cusse are maize and rice paddy. Maize remains the most widely grown crop by number of households (92% of rural households); however, it is typically cultivated for home consumption, with very small amounts being sold on the market. According to the farmers, pests (insects and rodents) may affect up to 20% of maize production, pre-harvest and post-harvest. There are also reports of weevils destroying up to 40% of traditionally-stored maize. Rice is grown by 88% of rural households, mostly under upland (dry) conditions. Pre- and post-harvest crop losses are high. Pests and diseases alone can affect more than 20% of rice paddy production, as indicated by the farmers. Estimates from the Ministry of Agriculture, Forestry and Fisheries (MAF) suggest that many farmers lose up to 33% of their production before and after harvest. In addition to these losses, rice dehulling is very inefficient as less than 50% of paddy grains remain unbroken following the dehulling process, compared to a maximum of 70% for improved rice dehullers or dehuskers[5].

5 FAO Rice post-harvest e-mail conference, http://www.fao.org/docrep/x5427e/x5427e0h.htm, note that the dehulling or dehusking of rice is often also referred to as polishing or as milling. This could however lead to confusion with regards to the production of rice flour.

Table 4: Crop production in the main and second season per urban/rural location and administrative post

Urban/rural location, Administrative Post	Total Private Households	Private households involved in crop production	Crop production (main season)		Crop production (second season)	
			Yes	No	Yes	No
TOTAL	14 345	14 029	14 024	321	13 939	406
Urban	2 244	2 089	2 088	156	2 047	197
Rural	12 101	11 940	11 936	165	11 892	209
Nitibe	2 705	2 651	2 650	55	2 643	62
Oesilo	2 538	2 528	2 528	10	2 526	12
Pante Macassar	7 285	7 054	7 051	234	6 987	298
Passabe	1 817	1 796	1 795	22	1 783	34

Source: TL Population and Housing Census 2015.

Table 5: Main crops produced per household by urban/rural location and administrative post

Urban/rural location, Administrative Post	Total Private Households	Private households involved in crop production	Type of crop produced						
			Rice	Maize	Cassava	Sweet potato	Vegetables	Beans	Coffee
TOTAL	14 345	14 029	13 294	13 393	11 596	8 802	10 528	9 807	5 253
Urban	2 244	2 089	1 705	1 810	1 600	1 212	1 559	1 245	926
Rural	12 101	11 940	11 589	11 583	9 996	7 590	8 969	8 562	4 327
Nitibe	2 705	2 651	2 588	2 588	2 263	1 932	1 951	2 087	764
Oesilo	2 538	2 528	2 492	2 509	2 184	1 399	1 875	1 948	749
Pante Macassar	7 285	7 054	6 507	6 540	5 429	3 886	5 003	4 285	2 858
Passabe	1 817	1 796	1 707	1 756	1 720	1 585	1 699	1 487	882

Source: TL Population and Housing Census 2015.

Fruits

Fruit trees (mango, banana, papaya, avocado, mandarin, guava, custard apple, pineapple, citrus, cashew) and vegetables (tomato, kale, cabbage, amaranth, bitter-gourd, Chinese lettuce) are grown on a small-scale, mainly for home consumption. Small areas of coffee have been planted in the Costa sub-region and coconut is grown in the lowland areas.

Table 6: Fruit production per household by urban/rural location and administrative post

Urban/rural location, Administrative Post	Total Private Households	Fruit (permanent)	Fruit (temporary)
TOTAL	14 345	9 123	8 613
Urban	2 244	1 394	1 403
Rural	12 101	7 729	7 210
Nitibe	2 705	1 202	1 189
Oesilo	2 538	1 587	1 370
Pante Macassar	7 285	4 931	4 685
Passabe	1 817	1 403	1 369

Source: TL Population and Housing Census 2015.

Livestock

Livestock in Oé-Cusse is mostly raised traditionally and overall productivity remains low. In most cases, livestock is kept as a store of wealth and only sold if there is an urgent need for cash. This said there are more than 60 cattle producers (especially in Nibin, Abani, Bobometo and Lifau) that are organized and have received technical training in both Timor-Leste and Indonesia and own a higher number of cattle than the majority of producers (from three in mountainous areas to 100 in low lands). The livestock is informally exported to Indonesia, especially when the value of the US dollar decreases, making Timorese exports cheaper for Indonesian buyers. Four to five-year old cattle can be sold $600-800 on the Indonesian market. Pigs and chickens scavenge for food around the village, supplemented with kitchen waste. Cattle, buffalo and goats graze freely or are tethered during the cropping season. The production of bovine meat, goat, and poultry is larger than the local demand for these products (de Paulo Correia et al., 2017)

Livestock mortality and morbidity also remains high. Most common diseases are Newcastle Disease (poultry), Swine Fever (pigs) and Hemorrhagic Septicemia and Brucellosis (buffalo and cattle). Anthelmintic are rarely used with corresponding low daily live-weight gains due to infestations of internal parasites in addition to poor feed quality. Although the Livestock Department in Oé-Cusse does not have a qualified veterinary doctor, a free vaccination service is provided by veterinary workers funded by MAF. The Livestock Department has previously distributed improved cattle and goat genetic stock for breeding and provided extension advice on improved feeding.

Table 7: Livestock rearing (all livestock types) and the number of cattle/cow heads by urban/rural location and Administrative Post

Urban/rural location, Administrative Post	Total Private Households	Livestock rearing (own use)		Livestock rearing (to sell)		Cattle/Cows	
		Yes	No	Yes	No	Private Households	Number Cattles/ Cows
TOTAL	14 345	13 661	684	13 498	847	3 719	11 004
Urban	2 244	2 005	239	1 926	318	364	1 169
Rural	12 101	11 656	445	11 572	529	3 355	9 835
Nitibe	2 705	2 665	40	2 642	63	657	2 390
Oesilo	2 538	2 465	73	2 453	85	729	2 060
Pante Macassar	7 285	6 830	455	6 722	563	1 446	4 523
Passabe	1 817	1 701	116	1 681	136	887	2 031

Source: TL Population and Housing Census 2015.

Forestry

High quality forest trees grown in Oé-Cusse include sandalwood, teak, mahogany and candlenut. Other species include eucalyptus, Thailand Shower (Cassia siamea), Albizia falcataria, and gmelina. Sugar palm (Borassus flabellifer) is tapped for sugar and alcohol; Gebang Palm (Corypha utan) leaves are used for roofing. The trunk can also be processed into sago for pig feed. Non-timber forest products include tamarind, beetle-nut, candlenut, bamboo, rattan and honey.

Table 8: Timber tree production per urban/rural location and administrative post

Urban/rural location, Administrative Post	Total Private Households	Timber trees
TOTAL	14 345	7 185
Urban	2 244	1 215
Rural	12 101	5 970
Nitibe	2 705	949
Oesilo	2 538	1 143
Pante Macassar	7 285	3 968
Passabe	1 817	1 125

Source: TL Population and Housing Census 2015.

Although most of the forest resources are depleted, approximately 95% of Oé-Cusse households still use firewood for cooking, which further exacerbates the problem. The remaining resources, though being very little, is still exploited for commercial purposes. In recent years the Forest Department has initiated a reforestation initiative to protect the remaining forest. Seedlings propagated in a central nursery are distributed to communities to plant on their own land. Forest management is however constrained by land tenure related issues. Nearly 25% of landowners in Oé-Cusse do not have any registration number of certificate (see table 9 below). The lack of clarity on land tenure hampers progress in controlling deforestation and in conducting reforestation programs, which are critical to alleviate the effects of soil erosion and landslides.

Table 9: Land tenure modalities of households per urban/rural location and administrative post

Urban/rural location, Administrative Post	Total Private Households	Land Tenure							
		Rent and share product	Lease/ rent for fixed value	Rent free	Owned without número referénsia or certificate	Owned with número referén-sia	Owned, certificate Portugese	Owned, certificate Indonesia	Commu-nal land
SAR OECUSSE	14 345	1 344	1 188	4 770	3 479	2 585	1 157	2 268	2 479
Urban	2 244	128	155	628	339	739	397	653	267
Rural	12 101	1 216	1 033	4 142	3 140	1 846	760	1 615	2 212
Nitibe	2 705	243	216	1 134	727	210	76	251	555
Oesilo	2 538	93	68	927	403	103	28	79	636
Pante Macassar	7 285	938	790	2 227	1 947	1 962	969	1 606	819
Passabe	1 817	70	114	482	402	310	84	332	469

Source: TL Population and Housing Census 2015.

Fisheries

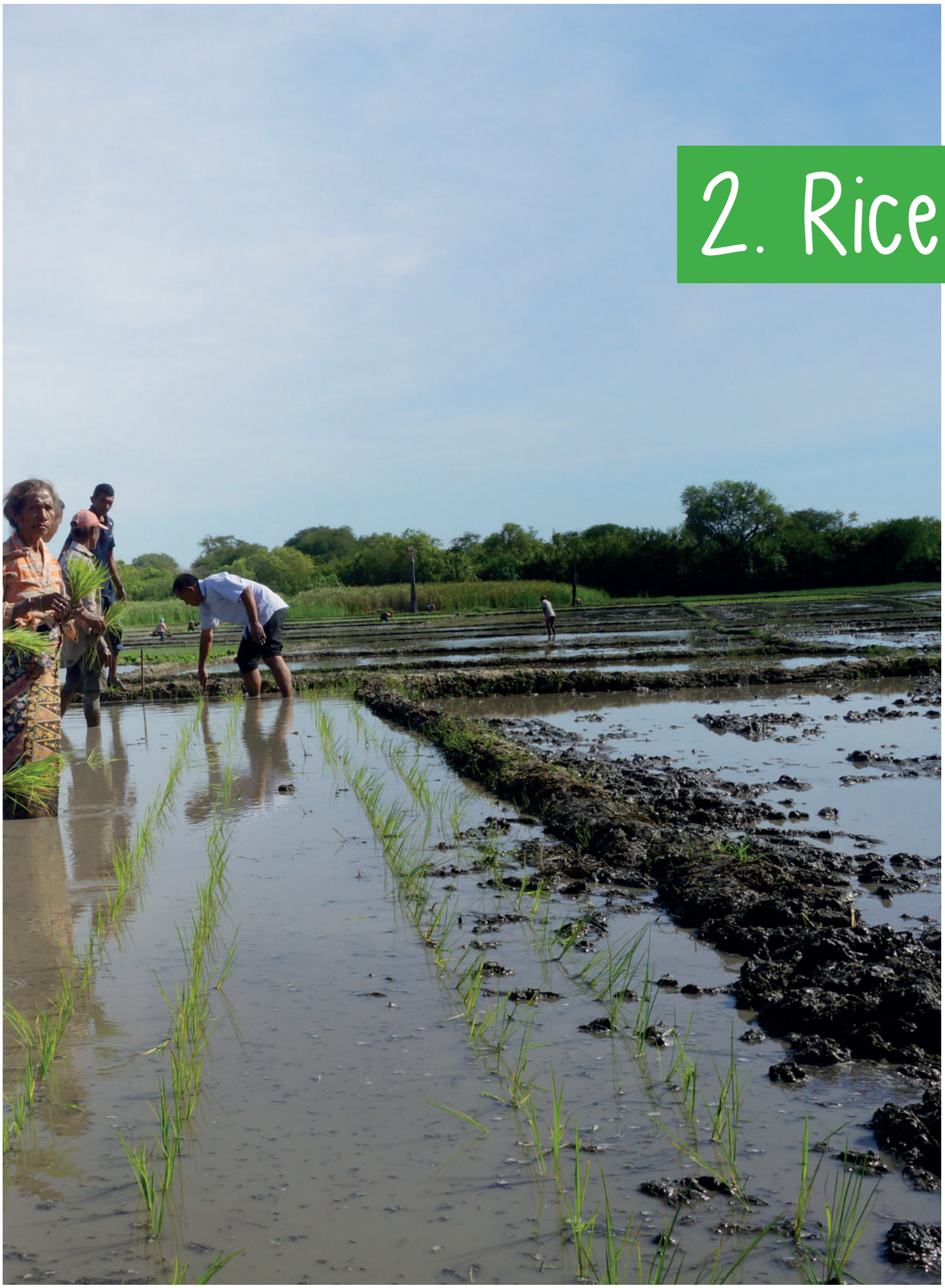
Interestingly, there is a much higher number of households practicing aquaculture (47%) compared to fishing (5%) (see table 10 below). Nonetheless, Oé-Cusse has a 67-kilometer coastline extending from Citrana to Sakato. Common marine fish and seafood of commercial value include bream, barracuda, mackerel, flounder, snapper, trevally, grouper, turbot, dolphin fish, tuna, sailfish, marlin, herring, wrasse, sea-perch, mullet, sardine, squid, crabs and lobster. However, the low per capita fish consumption rate in Timor-Leste suggests that marine resources remain underexploited[6]. Of the 319 households estimated to own fishing boats, fewer than 20 may still own an outboard engine and much fewer own an appropriate fishing boat to reach deeper seas. As a result, most fishermen fish in-shore and resort to small canoes and traditional nets.

Table 10: Households involved in fisheries activities by Administrative Post and urban/rural

Urban/rural location, Administrative Post	Total Private Households	Fisheries Activities			
		Aquaculture		Fishing	
		Yes	No	Yes	No
TOTAL	14 345	5 321	9 024	764	13 581
Urban	2 244	773	1 471	183	2 061
Rural	12 101	4 548	7 553	581	11 520
Nitibe	2 705	967	1 738	186	2 519
Oesilo	2 538	444	2 094	33	2 505
Pante Macassar	7 285	3 044	4 241	523	6 762
Passabe	1 817	866	951	22	1 795

Source: TL Population and Housing Census 2015.

6 Food and Agriculture Organization (2007), FAO Yearbook, Fishery and Aquaculture Statistic, 2007, http://www.fao.org/fishery/publications/yearbooks See also JICA 2009: Interim report of study on project for promotion of agribusiness in Timor-Leste.



2. Rice

2. Rice

2.1 Relevance to SRADR objectives

Rice production is key for Oé-Cusse, not only because it is grown by 88% of rural households but also because it directly affects food security in a region where malnutrition is very high. Pre- and post-harvest rice losses are high. Pests and diseases alone can affect more than 20% of rice paddy production. For all these reasons, SRADR has prioritised rice in the process of rural specialization in Oe-Cusse.

Figure 2: Unirrigated rice fields in the dry season

Figure 3: Irrigated rice fields in the dry season

The production cost of rice is currently very high ($0,76/kg) and it is sold for $1/kg, leaving a very low profit to the producers. For this reason, producers cannot compete with the imported rice (sold for $0,50/kg) without product differentiation. Possible intervention could focus on reducing the production cost by improving productivity (new seeds, better irrigation) with the objective of increasing production from 1,5 tons/ha to 3 tons/ha of dehulled rice. To improve access to the market, producers should be organised in one regional association or cooperate in order to collectively sell to Dili brokers once their price becomes more competitive. By increasing production and market access producers will increase their income thus reducing poverty as the explanation below demonstrates.

2.2 Value chain structure and functions [7]

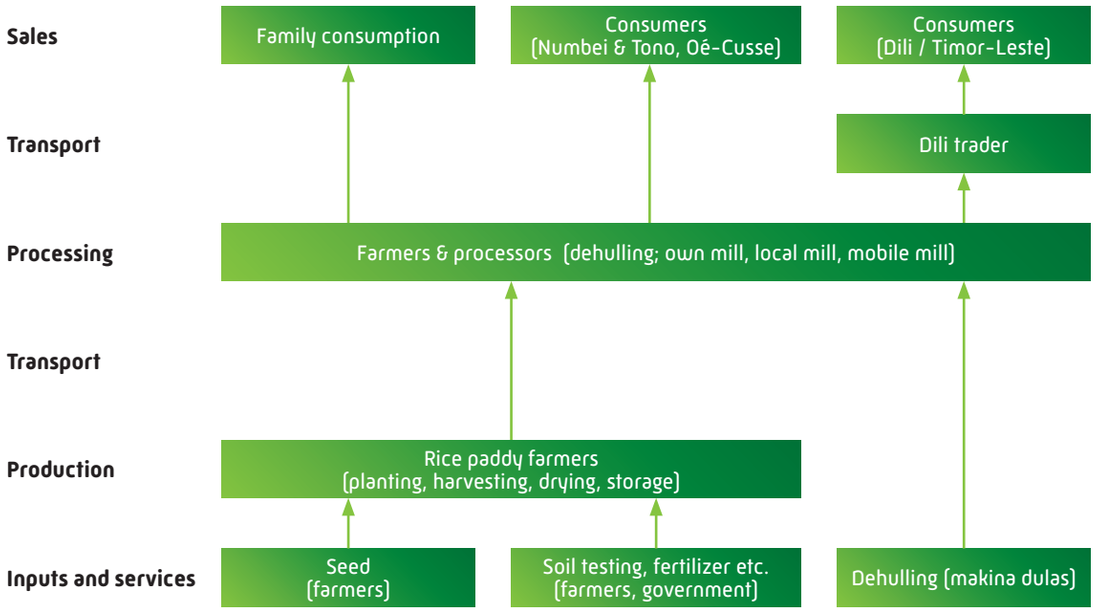


Figure 4: Rice value chain structure and main actors

2.3 Value chain dimensions

Production

The total cultivated area for rice paddy is 1,717 ha on flat land and 400 ha on hillsides, in the mountainous areas of Oé-Cusse. There is a potential to increase the total cultivated area to 2,500 ha[8]. Although the precise data is difficult to acquire, it could be estimated from the total cultivated area that there are roughly 1,500 rice paddy producing households in the region. The paddy is typically harvested once per year, although in irrigated areas, it can be harvested twice per year, from January to May and then from June to November. The key rice paddy production areas are Kolamsina, Barasantu, Roti, Citrana and Betbenae.

Unfortunately, the yield and quality of the paddy is very low (e.g. inadequate shape and color, too many empty grains). This is caused by a number of factors including: 1) the low quality and mixing of seeds, 2) the inappropriate use of chemical fertilizers, 3) inefficient irrigation systems (which result in excess or insufficient watering), 4) deficient soil nutrition, 5) inadequate disease and pest management practices, 6) inadequate post-harvest grain

7 In most of the cases, rice is being sold in Oé-Cusse. In very few cases, local farmers sell production to Dili. This is because they can't compete in price with imported rice.

8 Information provided by the Regional Secretary of Agriculture.

separation and selection, and 7) lack of incentives for the producers to improve quality, as most of the production is kept for household consumption, it cannot be sold in the market.

Figure 5: Rice producing areas in Oé-Cusse

There is a common disease which affects leaves and grains of the rice paddy fields in Oé-Cusse, thereby contributing to further lower yield. To this day, the producers do not know what causes the disease and how it should be managed. Oé-Cusse lacks rice specialists to provide orientation on production (i.e. disease and pest management, sowing methods and fertilizer use).

In terms of agricultural inputs, the producers previously had access to high-quality *Mamberamo* seeds provided either by international NGOs[9] or the government. This was a significant step forward as *Mamberamo* seeds were hard to find on local markets until recently. However, since the programme stopped, the producers have been using their own seeds, which causes decreasing quality of the grain year after year. The producers also use fertilizer (5 bags for planting and after 30 days), mixing TSP and UREA fertilizers, which are sold for $60 per 50kg bag in Indonesia. They also use one litre of pesticides, either Killtop or Icon, both sold for $10/L. However, these can be detrimental to health, especially they are often applied improperly. In addition, labour costs($3/day wage + $0.50/day meals) are paid for a series of activities such as preparing the land, cleaning of the paddy, and harvesting.

9 For example Caritas Australia

PRODUCTION COST CALCULATION FOR 1 Ha:
1. after the tractor is used, level the land (7 workers x one day x $3.5 = $24.50);
2. weed the field (20 workers x 2 days x $3.5 = $140.00);
3. harvest the rice paddy (10 workers x 6 days x $3.5 = $210.00);
4. tie the harvested paddy together into bunches (5 workers x one day x $3.5 = $17.50).

Table 11: Number of households producing rice and hectares.

Region: Oé-Cusse Sub Region: Pante Macassar			
No	Suco	Households	Hectare
1	Costa	530	161.1
	Lalisuk	1789	476.8
	Lifau	803	272.2
	Cunha	774	196.5
	Naimeco	456	133.7
	Bobocasse	202	40.9
	Taiboco	359	78
	Nipane	0	0
	Sub Totoal	**4913**	**1359.2**
Sub Region: Nitibe			
No	Suco	Households	Hectare
2	Bene Ufe	998	282.2
	Lela Ufe	3429	64
	Usitaco	98	24
	Ban Afi	80	15
	Sub Total	**4605**	**385.2**
Sub Region: Oésilo			
No	Suco	Households	Hectare
3	Bobometo	485	112.4
	Usitasae	382	76.2
	Usitaqueno	0	0
	Sub Total	**867**	**188.6**
Sub Region: Passabe			
No	Suco	Households	Hectare
4	Abani	74	56
	Malelat	64	28.9
	Sub Total	**138**	**84.9**
5	**Grand Total**	**10523**	**2017.9**

Machinery and equipment: rice production in Oé-Cusse is manual and farmers use traditional equipment (shovels, billhooks and hoes) they can find in the local market. In addition, they rent the following machinery per hectare per season:

1. a hand tractor to prepare the land ($50-60 per hectare)
2. a machine to separate rice paddy from the stem, at harvest ($50 per hectare)

The average yield obtained by Oé-Cusse farmers is quite low, at 1.5-2 tons[10] per ha of dehulled rice, or 3-4 ton of rice paddy[11]. For reference, the world average in 2018 was about 4.6 ton/ha[12], and the Indonesian average in 2015 was about 5.3 ton/ha[13]. Indonesia recently even increased rice productivity from 7 ton/ha to 9.8 tons/ha of gabah kering panen (harvested dry rice with hulls) in the region Desa Gegesik[14]. Indonesia also has a significantly better quality of paddy due to better seed quality, makes better use of technology and its paddy producers are more organized and skilled in production techniques.

Figure 6: Rice stalks with grains

10 Information collected from local farmers and SRADR's staff.
11 A recent field study showed a conventional yield of rice paddy in Lifao of 3.46 ton/ha.
12 FAO Rice Market Monitor, April 2018, Volume XXI Issue No. 1
13 FAO Rice Market Monitor, July 2015, Volume XVIII Issue No. 2
14 https://ekonomi.kompas.com/read/2011/09/10/15072971/Produktivitas.Padi.Tembus.9.8.Ton.Per.Hektar

Figure 7: Rice harvesting

Processing

Farmers use a billhook to cut off and gather the paddy before putting it in a *sokan* (traditional palm leave basket with cover). The paddy is then poured into a machine which takes off the stalks. However, many low-quality grains are not discarded in the process. The grains are then dried in the sun.

For storage, the producers resort to the traditional system, which consists of putting the dried seeds into rice sacks. In many instances, the grains are stored even before the paddy is fully dry. Since the processing is very rudimentary, the quality of the paddy is often further degraded (inadequate moisture levels). Most farmers store the grains either at home or in traditional warehouses, neither of which are appropriate for paddy storage.

To remove the hull or husk from the paddy grains, the farmers typically hire the services of a local mobile de-husking machine operator, called *Makina dulas*. In some cases, the producers have their own dehulling machine. The operator charges $0.50 for 10kg of processed rice and keeps the separated hull and bran. It is common that these operators modify the machine to also scrape the inner skin of the paddy grain, increasing the quantity of bran separated (sold as pig feed). However, this modification of the dehulling machine and the fact that farmers hand in wet (or still partially wet) paddy increase significantly the amount of broken grains. Besides these mobile dehulling machines, which started to be commonly used only a few years ago, there are conventional rice dehullers, for instance in Lifau and Padiae; however, these have lost several clients to the more practical mobile dehulling machine operators. Out of each kilogram of rice paddy, a producer will obtain roughly 0.5-0.6kg of dehulled rice per kg paddy, while in theory 0.67-0.7kg is possible[15]. The world's average in 2018 was at 0.66 kg dehulled rice per kg paddy and the Indonesian average was 0.63 kg/kg[16].

15 FAO Rice post-harvest e-mail conference, Grain losses in rice processing
16 FAO Rice Market Monitor, April 2018, Volume XXI Issue No. 1

2. Rice

Figure 8: Traditional way of separating rice grains from thestalks, nowadays mostly done by machines

Transport

Most producers sell surpluses in local markets, in small quantities at a time. They typically bring up to 50kg of dehulled rice to local markets using public transport (mini-van). The average cost ranges from $2-6 for the farmer (round trip) and $1 for the rice (estimated total of $5 per trip).

If the rice paddy is purchased by a Dili trader, the trader will either use his/her own truck to pick up the rice sacks from the farmer's field or rent space on a truck to Pante-Makassar ($80-$100 per ton for those farmers living furthest away) and then ship it to Dili ($50-100/ton). In any cases, the trader will cover transportation costs.

Sales

Rice from Oé-Cusse is primarily used for household consumption. However, when there are surpluses, producers sell primarily on the local markets (at $1.00/kg). In a few cases, they can also sell to Dili traders.

The key competition in this market consists of rice imports from Indonesia, Thailand and Vietnam, as these locations offer prices that are much lower than domestic market prices: while local rice is sold at $1.00/kg in Oé-Cusse, imported rice is sold as low as $0.48/kg (for a 30kg sack) or $0.50/kg (for a 25kg sack). As a result of this situation, local farmers can't compete with imported rice and prefer to produce less to only cover family consumption.

Producers organization

A few rice producer groups have been created in the past, but they are now inactive. There is however one association (Asociasaun Kooperativa Agrikultores Tono Amasat), located in Lalisuc, that was created in 2017. Overall, however, the rice producers in Oé-Cusse are not organized in associations or cooperatives, they are not engaged in any collective marketing scheme and do not currently have the skills to organize sales or production.

Calculations
The suggested costs and profitability are estimated based on the financial data gathered during the fieldwork. These may vary between locations.

Estimated gross income per ha (assuming producers sell all their production):

((1500kg x 0.8 ha (20% post-harvest losses) = 1200kg) x $1.00) = $1200/ha

Estimated local transportation costs (for dehulled rice):

(1200kg paddy x 0.6 = 720kg dehulled rice = 14.4 sacks) x $5 transport/sack = $75 per ha

Estimated production (and processing) costs per hectare, including transportation:

Labor ($392), fertilizer ($300), pesticide ($10), machinery ($110), dehulling ($0.05/kg x 720kg), transport ($75) = $923/ha

Estimated profitability:

$1200 (total revenue) - $923 (total costs) = $277 per ha per year
(or up to $554 per ha per year in irrigated areas, allowing for 2 harvest)

As we can see, the profit margin per year is very low ($23/month), even for households that produce twice per year ($46/month). This shows that it does not make financial sense for the majority of producers, with an average land size of 1 hectare, to sell their production rather than consuming it.

If productivity was increased 3-fold and post-harvest losses were halved through better seeds use, pest control, storage and maintenance, the resulting profit could be:

((4500kg x 0.9 ha x $1.00 = $4050/ha) – (($813 x 3) + $110 machinery)
= $1,501/ha per harvest ($3,002/ha if 2 harvests per year)

2.4 Major constraints and proposed solutions

The constraints faced by rice paddy producers are many. These include low yield and a generally low quality of the paddy, the lack of water supply, rudimentary processing techniques resulting in post-harvest losses and a reduced quality, the lack of producer organizations, difficult physical access to markets due to bad roads (or a lack of roads) and a lack of means of transportation, and finally the lack of market competitiveness and consequently the lack of demand for locally-produced paddy.

Proposed intervention
The cost of production of 1kg of rice in Oé-Cusse is approximately $0,76 and it sells for $1. This high cost of production determines the low competitiveness of local producers with the imported rice (that is being sold for $0,50/kg). A possible intervention should be focused on *reducing the cost of production by improving productivity* (new seeds, implementation of best practices of rice production, improved storage and maintenance, and better irrigation) with the objective of increasing production from 1,5 tons/ha to 3 tons/ha at least in the first 2 years

Figure 9: Mobile makina dulas

of investment. To improve the access to the market, *producers should be organised in one regional association or cooperative* in order to collectively sell to Dili or local brokers once their price is more competitive. The organization of producers will also allow the knowledge sharing among farmers and quality control to ensure the implementation of best practices.

Table 12: Key constraints and proposed interventions

Major constraints	Proposed solutions
Production	
Inadequate farming techniques	Agricultural training (e.g. organic pesticides for pest management)
Low productivity	Increase productivity per ha and production areas
Low quality	Old seeds with low productivity. Increase productivity per ha and production areas (e.g. new seeds)
Lack of water supply	Build irrigation infrastructure, strengthen water management groups
Processing	
Inefficient grain selection	Technical training on grain selection
Inadequate drying of paddy	Technical training on drying techniques
Inadequate storage of paddy	Technical training on storage techniques
Inadequate storage facilities	Build adequate warehouses in targeted areas
Inefficient dehulling process	Improve access to proper dehulling facilities
Transportation	
Lack of transportation	Coordinate production and arrange collective transportation
Lack of access from fields to roads	Build connection paths (e.g. through public work schemes)
Distance to markets	Facilitate means of transportation (e.g. agreements with companies)
Bad state of rural roads	Improve rural roads
Sales	
Lack of producer groups	Support the creation one rice association for all Oé-Cusse
Low technical and soft skills levels for marketing the product	Capacity building activities
High production costs	Lower production costs, increase productivity (e.g. provide good seeds)
Low competitiveness vs imports	Increased competitiveness resulting from increased productivity and niche market approach
Low market demand	Stimulate demand by offering lower prices (via lower production costs)

3. Coffee

3. Coffee

3.1 Relevance to SRADR objectives

Coffee production covers more than 33 ha in Oé-Cusse with more than 120 families currently are involved with produciton. Presently, the productivity per coffee tree is very low (0,4kg) and there is a low density of trees per ha. The trade of coffee beans mainly depends on the international market and, therefore, the price fluctuates with little control of the producers. However, it is an interesting crop for promoting diversity in forest production and for livelihoods improvement in the most isolated areas of Oé-Cusse's mountains where other more common products do not grow well. Income generated from coffee alone will be small for the local families, but if combined with other products it alleviates poverty.

A possible intervention should be focused on increasing the density of trees planted per hectareand on increasing the productivity per tree. In addition, quality should be guaranteed to develop stable contacts with buyers and obtain a better price. Farmers can be supported to develop one association of Oé-Cusse farmers to ensure quality control and collective selling to Dili or publicizing for the local market.

Figure 10: Coffee nursery in Laukfoan

3.2 Value chain structure and functions

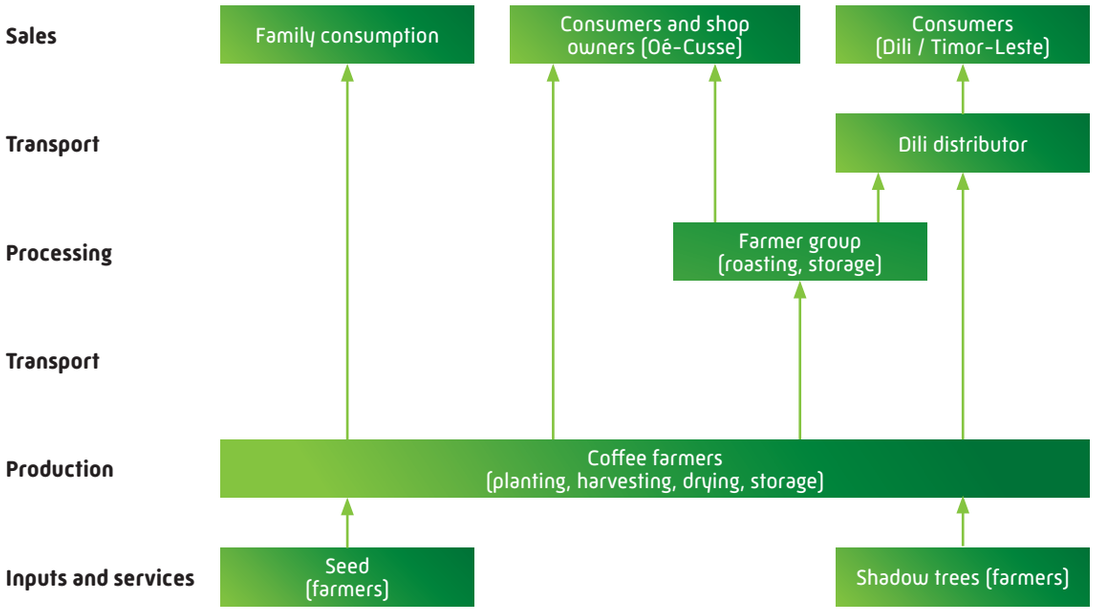


Figure 11: Coffee value chain structure and main actors

Figure 12: Coffee plantation under water and heat stress with little shadow

Figure 13: Coffee plantation in good condition and well shaded

3.3 Value chain dimensions

Production

The total cultivated area for coffee is 32-36 ha, with the potential to increase by 20-100 ha. The coffee can be harvested once per year in June and July. Although many households have a few coffee plants (>5000 according to the sensus), there are 120 coffee-producing households (HHs) in the region, covering all 4 sub-regional districts of Oé-Cusse: Pante-Makassar (Leol Batan 22 HHs, Naimeco 10 HHs, Kutete 12 HHs, and Quinat 11 HHs); Passabe (Passabe 17 HHs, Malelat 9 HHs, Naetuna 14 HHs); Nitibe (Ban Afi Bairo Kusi 7 HHs, Nitibe 2 HHs, Lamasi 2HHs); and Oesilo (Nibin 6 HHs).

Many coffee trees are under heat and water stress, reducing the quality and quantity of the coffee beans produced. Additionally, a fungal disease (Rhizoctania Sp.) affects branches of some of the trees, which also reduces the quantity and quality of the coffee beans produced. Furthermore, the trees are poorly maintained. Hence, providing shadow trees, better pruning practices, and treatment of diseases affecting the plants will improve the quality of coffee produced in Oé-Cusse.

In terms of agricultural inputs, the producers use seeds provided for free by a local NGO[17], use their own seeds, purchase seeds from other farmers at $0.50 per coffee tree, or a combination of these. They typically use organic fertilizer (from goat or cattle dung) when they plant coffee trees. Pesticide may be used, but only if plants are attacked by pests. Labor cost is set at $3.00 per worker per day. The following activities are required.

PRODUCTION COST CALCULATION FOR 1 Ha:
1. cleaning the land (2 workers x 4 days x $3.5 = $28);
2. harvesting the coffee and carrying it to the farmer's house (5 workers x 4 days x $3.5 = $70);

Concerning productivity, one hectare of flat land may hold up to 1000 trees[18]. This said most farmers cultivate coffee on land with a steep slope, which cannot hold more than 800 trees. However, local farmers hold less than this number of trees per ha, only up to 600 trees per hectare, based on observations in the field. Coffee trees in Oé-Cusse produce 0.4kg of coffee berries per year. Once the trees gain full maturity (10 years), production should reach 0.8kg-1kg per tree. Overall, coffee producers in Oé-Cusse fare lower (0.4-0.8 Tons/ha) than Indonesian producers (0.9-1.09 Tons/ha) and Ermera producers (0.8-1.5 Tons/ha).

The total area dedicated to the coffee plantation in Timor-Leste is roughly 50,000 hectares, with an annual production of 30,000 tons. In comparison, Indonesia has 1,200,000 hectares of coffee plantation with an annual production of 1,200,000 tons.

Processing

When harvesting the coffee, the workers put them in 50kg rice bags and then bring them to the farmer's house on foot. The coffee is then cleaned and dried outside in the open (wherever they have land space) on a plastic tarpaulin for 2-3 days (traditional method), as there is no specific site for drying. Once the coffee grains are dry, the producers put them back in the rice bags for storage in their traditional houses and sales. No wooden pallets are used during storage to keep the bags from contact with the ground. The coffee is mostly sold as green beans. Roasting only happens in a few cases. Only one group is selling roasted coffee in the traditional way, packages it and sells it to local shops in Oé-Cusse, at $8.00 per kg. This coffee producer association (Moris Foun) is located in Naimeco, near the villages of Laukfoan and Oben. The association owns a 5-hectare plantation.

17 Such as the local branch of Caritas and Oxfam

18 Food and Agriculture Organization (1977), Coffee, FAO Better farming series, online course, http://www.fao.org/docrep/006/AD219E/AD219E05.htm

Transport

The coffee is mostly sold in Oé-Cusse, but sometimes in Dili. The transportation cost for a round trip to the local markets, using public transportation, is $2-6 per passenger + $1 per 50Kg sack. Therefore, the cost of transportation to the local markets could be estimated to $5/50kg. The cost of transportation of one ton, one bag at a time, would be $5 x 20 bags = $100.

Transportation to Dili, which is covered by the producer, requires renting a truck (or truck space at $1-2 per bag) to Oé-Cusse port ($50 per ton), ship the production to Dili ($2 per 50kg bag) and rent a mini-truck to bring the production to the buyer's location ($0.50-1.00/ 50kg bag).

Figure 14: Oé-Cusse green beans and roasted coffee at the Festival Kafé Timor

Sales

In Oé-Cusse, the farmers usually sell coffee in the markets when they need money, rather than on a regular basis. Unroasted (green) coffee is sold to shop owners for $1.25-1.50/kg. There is no coffee distributor that would buy the local production for the region. The key competition in the coffee market consists of coffee imports from Indonesia selling at $1.50/kg and Timorese coffee from other districts of Timor (such as Ermera, Ainaro, Aileu, Manatuto and Liquiça), also sold for $1.25-1.50/kg.

There are several potential buyers in Dili which are purchasing coffee from other regions in Timor-Leste and exporting:

1. Great Castell[19]
    - Price offered: Roasted coffee: $1,75/kg
    - Dried green coffee: $0,90/Kg
2. Global Coffee
3. NCBA
4. CCT (Coperativa Cafe Timor)
5. Tunis start
6. Timor Corp or Outspan
7. Maubere Mountain Café
8. Café Letefoho
    - Price offered red berries: $1,50; dried green coffee: $1,75/kg; if of high quality

19 As of yet, only Great Castell and Letefoho have expressed interest in buying coffee from Oé-Cusse if quality can be guaranteed.

Producers organization

There are several coffee producer groups in Oé-Cusse, but they work without a formal contract, preventing them from gaining negotiating power by strategic collaboration. There is a coffee producer association (Moris Foun) located in Naimeco, near the villages of Laukfoan and Oben. The association purchases coffee from these villages, grinds it, roasts it, packages it, and sells it to the local shops in Oé-Cusse, at $8.00 per kg. There is no association that groups all producers in the region. However, there is a national association called Asosiasaun Café Timor (ACT) with the goals to improve the quantity and quality of coffee bean production in Timor-Leste, to support small coffee producers, and to promote the reputation and marketing of Timorese coffee (also at international markets). Recent contacts have been made, and the ACT has already offered support to one of the coffee producing groups.

In Dili, coffee is sold to brokers, coffee associations or cooperatives, and private companies (e.g. Gajha Madha[20], coffee associations, Cooperative Café Timor, Agro Timor, and Global Timor) at $1.25-1.50/kg for quality arabica beans. These organizations will then export the coffee to other countries.

Calculations

The suggested costs and profitability are estimated based on the financial data gathered during the fieldwork. These may vary between locations.

Estimated income per hectare:

[(600 trees/ha x 0.4kg = 240kg) x $0.90) = $216 per hectare

Estimated local transportation cost to Oé-Cusse markets:

$5/sack x 20 sacks = $100 per ton (or $32 per hectare)

Approximate production cost per hectare, including local transport, could be estimated to:

Labor ($98), pesticide ($10), transport ($32) = $140/ha

Estimated transportation cost to Dili:

$50 (truck to port) + $40 (ship) + $20 (taxi in Dili) = $110 per ton (or $35,20/ha)

Average profitability green dry coffee per hectare:

$216 (total revenue) - $250 (total costs) = - $44 per hectare

As the numbers suggest, the profitability per hectare per year is negative (-$44/month), due to the young age of trees, the low plantation density (because of land inclination), and the lack of maintenance. As a result, farmers usually prefer not to sell the production nor invest in fertilizers.

20 A representative from the company suggested that if there was sufficient coffee production in Oé-Cusse, they could consider opening a branch in the region.

If the number of trees per ha is increased (from 600 to 800) and productivity is increased to 1kg per tree through better seeds and maintenance, the profitability could reach:

([800 tres x 1kg = 800kg) x $0,9 = $720/ha) – ($215*) = $505/ha

** The calculation for increased production cost is: labour ($103), pesticide ($12), transport ($100) = $215/ha*

3.4 Major constraints and proposed solutions

The key constraints identified for coffee production are the low production levels (low density of plantations, and low productivity per tree), inadequate farming techniques, and inadequate processing methods. In terms of market access, the key barriers are relatively high market competition and the lack of knowledge of and connections to buyers.

Proposed intervention

As the profitability previous calculation shows, the coffee production offers a very limited or negative profit for the farmers. Possible intervention could be focused on increasing the density of tree planting and the productivity per tree. In addition, to have access to more stable buyers and receive a higher price, good quality of coffee should be guaranteed. Farmers can be supported to develop one association of Oé-Cusse farmers to ensure quality control and collective selling to Dili or advertising for local market.

Table 13: Key constraints and proposed interventions

Major constraints	Proposed solutions
Production	
Inefficient seed selection	Seed selection training (e.g. early harvest seed varieties)
Inadequate farming techniques	Agricultural training (planting, fertilizer, farm maintenance)
Low production levels	Increase the size and density of plantation areas
Low productivity	Agricultural training to increase productivity per tree
Processing	
Inadequate drying and storage	Technical training on drying and storage techniques
Sales	
High market competition	Improve productivity to reduce costs and selling price
	Facilitate market linkages (national and international markets)
	Support collective selling and quality control
Little knowledge and access to buyers	Develop new markets to obtain better selling prices

4. Mandarin

4. Mandarin

4.1 Relevance to SRADR objectives

More than 60 families in Oé-Cusse are producing mandarin for commercial purposes. As will be described below, mandarin production can be very profitable. There is market potential, mainly in Dili. In addition, mandarin can be produced in the same land with other products and can improve the use of land in areas where few crops grow. SRADR prioritized the fruit for investment as part of the specialization process in the region. A possible intervention in the mandarin value chain is recommended to be focused mainly on two objectives: a) promoting greater productivity per tree and improving tree quality introducing new seeds and b) improving the access of small-scale producers to new markets by organizing meetings with potential buyers in Dili or other regions.

Figure 15: Citrus producing regions in Oé-Cusse

Figure 16: Mandarin tree in Passabe

4.2 Value chain structure and functions

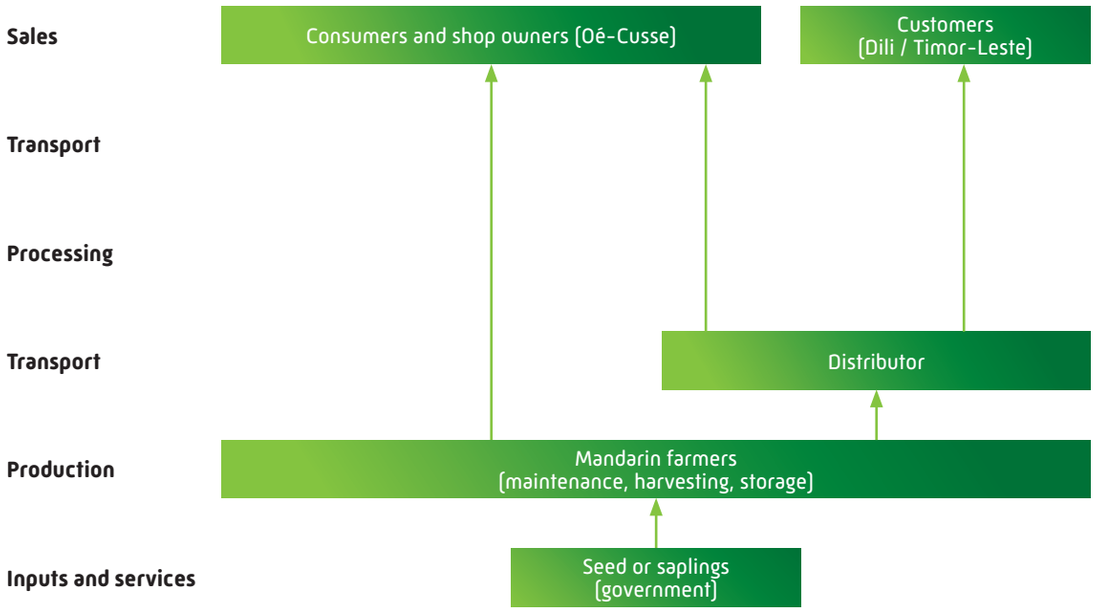


Figure 17: Mandarin value chain structure and main actors

4.3 Value chain dimensions

Production

The total cultivated area for mandarin is approximately 13 hectares across three areas (Passabe, Leolbatan and Kutete), with a potential to increase the cultivated area by 10-20 ha. There are roughly 40 mandarin producing households in Passabe (4 producer groups), with land size per household ranging from 1 to 3 hectares, and 20 in Kutete (2 producer groups). A group in Bobocase has already started planting 1,200 mandarin trees. Although there is a local initiative to increase mandarin production, support is needed. The fruit from the mandarin trees can be harvested after reaching 3-5 years of age (depending on the seed quality) and the fruits are harvested in May.

According to the Indonesian fruit classification, the fruits are of "medium to good" quality: the fruit is suboptimally sweet and large. Such suboptimality is a result of the style of organic farming which limits the usage of chemical fertilizer and insecticides -- the fruits and the trees could be destructed by flies and ants; the life cycle of the plants is affected. The quality of mandarins in Indonesia is classified to be slightly higher (by Indonesian) as they make use of more appropriate production and post-harvest technologies.

In terms of agricultural inputs, in the past, medium-quality seeds originating from Passabe were provided by government extension workers free of charge. Since the government programme has ended, the farmers have been using their own seeds. The producers use neither fertilizer nor pesticides. Labor cost is set at $3.00 per worker per day. The following activities take place.

Figure 18: Citrus tree leaf affected by insects

PRODUCTION COST CALCULATION FOR 1 Ha:

1. harvesting the fruits (6 workers x 1-2 days x $3.5 = $21-42).

Concerning productivity, mandarin trees in Oé-Cusse produce 150kg[21] of fruit per tree, which still fares low compared to Indonesian producers who can produce up to 500 kg per tree[22] (or 17-25 tons/ha). Most of the producers have 30 trees currently producing in one ha. The maximum quantity of trees per ha can vary depending on the farm production system, a medium density planting will allow to plant 380 trees in one hectare[23].

21 Information collected through inquiries and interviews with biggest producers in Oe-Cusse in January 2018: Mario Ulan and Passabe, has 30 trees and Maria Salome in Kutete, 600 trees.
22 This information is from Soe region in Indonesia.
23 Department of Primary Industries, Queensland (1997), Citrus Information Kit, Page 8.

Table 14: Tree spacing (rows spaced at 7.3 meters)

Variety	Tree spacing	Trees per hectare	Tree removal required?
Navel Valencia and Joppa oranges	3.6	380	Yes
	5.5	249	No
Imperial mandarins	1.8	760	Yes
	3.6	380	Maybe
	5.5	249	No
Ellendale mandarins	2.7	507	Yes
	3.6	380	Yes
	5.5	249	No
Murcott and other mandarins	2.7	570	Yes
	3.6	380	Maybe
	5.5	249	No
Grapefruit and lemons	3.6	380	Maybe
	5.5	249	No

Processing

There is no processing of the fruits. For storage, the fruits are simply put in 25kg buckets[24] and left in traditional storage rooms, where the quality of the fruits can be degraded due to temperature changes or humidity. The producers put the fruits into sacks when carrying them to the market or selling them to a trader.

Transport

Mandarins are typically sold in local markets in Oé-Cusse, but the fruits are sometimes sold directly to a trader coming to the producers' location in Oé-Cusse or shipped to Dili to be sold to a trader there. The transportation cost to the local markets by public transportation is $8.50 for 100-150kg (including passenger costs). In this case, the producer will also require roughly 30 plastic boxes ($10-15 for a 25kg box) to carry the mandarins to the market. This is a one-time purchase, therefore cost per year can be estimated to ($15 x 30 boxes) / 4 years. If a producer household sends its mandarin production to Dili, it will need to send it to the port in Oé-Cusse by truck ($50) and then ship it to Dili by ferry ($20 for 500-1000kg, depending on negotiation). If a trader comes to the farm, s/he will cover transport costs. Producers have no formal agreements with traders; transactions are done on a case-specific basis. Currently, plastic boxes are not yet in use.

Sales

Mandarins are sold to sellers in Oé-Cusse and Dili alike at $1.00/kg (~8 fruits) and to brokers at $30 for a 25kg bucket (or $1.20/kg).

The consumers usually pay $1 for 4 fruits in the local market or small shops in the street.

24 Currently, producers sell the product based on volume. To get this information, the team has weighed the bucket normally used to sell the mandarins without considering the weight of the bucket itself.

The key competition on this market consists of other local producers in Oé-Cusse and in the Eban area in neighbouring Indonesia, which sells cheaper at IDR 10,000 per kilo (about $0.75). There is no mandarin producer association in Oé-Cusse.

Calculations
The suggested costs, income and profitability are estimated based on the financial data gathered during the field-work. These may vary between farm locations

Distribution to the local markets (main end market):
The approximate production cost per hectare, at 30 trees per ha, if sold locally:

Labor ($42) + transport [($8.5 per 100kg x 4.5=$38) + $90 for bags) + fertilizers and others $60 = $230/ha

Total gross income for local sales would be:

(150Kg x 30 trees = 4,500kg) x $1.00/kg = $4,500 per hectare

The estimated profitability would be:

$4,500 - $260 = $4,230 per hectare/year

Although the calculated profitability for 30 trees per hectare is quite high compared to the other value chains assessed in the report, the reality is that most producers are not able to secure buyers for their production.

An intervention would focus on finding market for the production while seeking to increase the number of trees and/or the productivity per tree, so that producers tend towards the profitability levels indicated in the above formulas.

In the case we find buyers for the production and we increase production by 250Kg/tree and 30 trees/Ha:

Total gross income for local sales would be:

7,500kg x $1.00/kg = $7,500 per hectare

The estimated profitability would be:

$7,500 - $$397.75* = $7,102 per hectare ($591 per month)

*Labor ($84) + transport [($8.5 per 100kg x7.5=$63.75) + $170 for bags) + fertilizers and others $80 = $397.75/ha

4.4 Major constraints and proposed solutions

The key constraints in mandarin production are the low productivity, limited access to buyers, the lack of producer groups and skills to organize collective selling, and the lack of road access to markets.

4. Mandarin

Proposed intervention

A possible intervention in the mandarin vale chain is recommended to be focused mainly on two objectives: a) promoting greater productivity per tree and improving tree quality introducing new seeds, and b) improving the access of small producer to new markets by organizing meetings with potential buyers in Dili or other regions and promoting collective selling among all producers to increase negotiation capacity and reduce costs of transportation.

Table 15: Key constraints and proposed interventions

Major constraints	Proposed solutions
Production	
Lack of water supply	Improve irrigation infrastructure
No pest control and tree maintenance	Improve the quality of seeds and increase productivity.
Low productivity	Capacity building to improve plantation management and pest control
Processing	
Limited processing and storage	Improve storage
Transportation	
Difficult road access to markets	Improve rural road network and transportation
Sales	
Lack of producer groups to implement collective selling	Support the creation/consolidation of groups
Low technical and soft skills levels on market access and selling	Capacity building activities on marketing
Limited access to buyers	Facilitate market linkages, especially in Dili with Supermarkets and municipal fruit market

5. Pineapple

5. Pineapple

5.1 Relevance to SRADR objectives

There are pineapple producing households in the region, but only 20 currently produce surpluses that can be sold in the markets. The average yield achieved by Oé-Cusse farmers (1.3 to 2 tons/ha) fares a little low compared to Indonesian farmers and production cost are relatively high. This damages the competitiveness of the pineapple farmers to sell bulk volumes to bigger buyers with links outside of the region. An improved productivity to reduce production costs and facilitating market linkages at regional, national and possibly at international levels will increase income security for the pineapple farmers. Additionally, local processing could bring added value and create jobs, while preserving the nutrition contained in the pineapples.

5.2 Value chain structure and functions

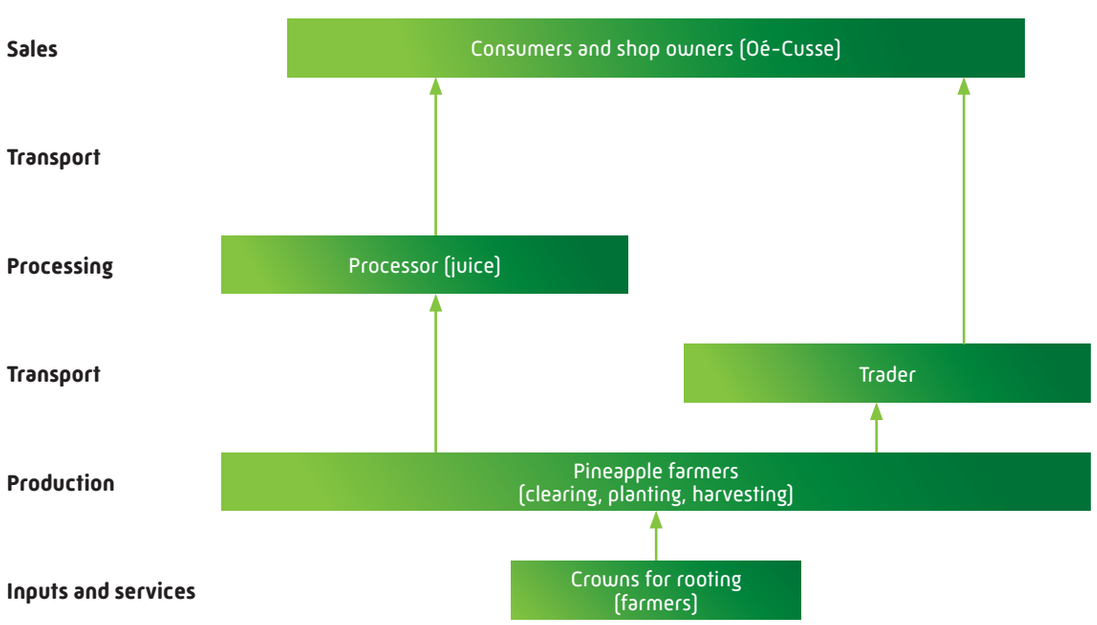


Figure 19: Pineapple value chain structure and main actors

5.3 Value chain dimensions

Production

The total cultivated area for pineapple is approximately 20 hectares, with a potential to increase the cultivated area by 20-50 ha, with appropriate access to capital and knowledge. The pineapple "crowns" (the upper part of the fruit) are planted once per year, in the rainy season (January-February) while the fruits can be harvested twice per year (June and December). However, the use of pineapple crowns for planting rather than well selected

or genetically modified seeds, limits the possibilities of scaling up production by increasing the density of plants. The key pineapple production areas in Oé-Cusse are Usi-taqueno, Bobometo, Kutete, Laukfoan and Oe-lulan.

Figure 20: Pineapple with slips usable for propagation

Figure 21: Pineapple affected by rodents

The fruits are typically sweet, coloured yellow and red, and come in different sizes. Pineapples are not affected by pest or diseases; however, fruits can be eaten by neighbouring animals (such as rodents and pigs) if the fencing is not strong enough.

Figure 22: Pineapple field with too much shade

5. Pineapple

In terms of agricultural inputs, the producers plant pineapple crowns which they mostly purchase from other producers, although they may keep some from their own fruits. Pineapple crowns for planting are sold at approximately $5 for a 50kg bag containing about 250 crowns. Therefore, the cost of crowns to plant one hectare (10,000 plants) would be $5 x 40 bags. The farmers use neither fertilizer nor pesticide. Labor cost is set at $3.00 per worker per day. The following activities are required.

PRODUCTION COST CALCULATION FOR 1 Ha:
1. fencing the area to protect it from animals (5 workers x 8 days = $120);
2. cleaning the land prior to planting (5 workers x 5 days = $75);
3. preparing holes for planting (10 workers x 5 days = $150);
4. planting pineapple crowns (5 workers x 10 days = $150).

Depending on the distance between plants, one hectare can hold more than 77,000 plants[25]. The number of plants per hectare in Oé-Cusse only reaches up to 10,000-15,000 plants per hectare[26]. Assuming that 40% of the plants produce fruit suitable for sales at the market, 4,000-6,000 fruits can be produced per hectare, for a total weight of 1.3-2 tons (1kg is about 3 pineapples) per hectare. Each kilo being sold for $1.00, the pineapple producers can expect total sales of $1,300-2,000 per hectare per season. This productivity rate fares a low compared to the Indonesian average at 2-4 tons/ha.

Processing
There is no processing or storage of the fruits, except for the removal of the pineapple crown for planting. Currently, the fruits can be kept for 2-4 days. The farmers do not know how to preserve the fruits for a longer duration. Therefore, they only harvest the pineapple when they are ready to bring them to the local market or to sell to a distributor.

Transport
The fruits are only sold in the local region. The producers often bring their production to the local markets themselves to sell it there. There are also some brokers that purchase from the producers for distribution in Oé-cusse. It costs $2-6 per passenger (round trip) and $1.00/10kg of pineapple, using public transportation; therefore, as the producers typically bring 20kg (up to 25kg) of pineapple at a time to the markets, the transport cost can be estimated to $5 for 20kg. The producers also require plastic boxes to temporarily store the pineapple at home prior to carrying them to the market. A producer may purchase 20 boxes at $5 each (containing about 20 fruits each) once and reuse them, incurring an estimated cost of $25/year independent of land size ($100/4-year depreciation). However, boxes are not yet used by the farmers. To transport the pineapple to the market, the farmers use 50kg sacks which they already have at home and can be reused. Public transportation is available during the dry season, but it is more difficult to access transportation during the rainy season.

Sales
Pineapple fruits are sold to final customers (at Tono and Numbei markets) and brokers alike at $1.00/kg (or for 3 pineapples). The only competitors for fresh pineapple fruits are the other producers in the region, as there are no imports of fresh pineapple from the rest of Timor-Leste, Indonesia, or any other country. The pineapple producers in Oé-Cusse are not organized in associations or cooperatives.

25 Nanas Andalan Baru. Website: http://www.ternakpertama.com/2017/07/cara-budidaya-nanas-madu.html (visited: 26/3/2018)
26 The calculation is an approximation after visiting local producers. Most of the producers are using less than one hectare to produce pineapple and the land can be under a steep inclination..

Calculations
The suggested costs and profitability are estimated based on the financial data gathered during the fieldwork. These may vary between locations.

Estimated transportation cost per hectare:

(1300kg/20kg = 65 journeys) x $5 = $325 per ha ($250 per ton)

Estimated production costs per hectare:

Labor ($495/ha), transport ($325 + $25 boxes/year) = $1,045 per ha

Average profitability per hectare:

$1,300 (revenue/ha) - $1,045 (cost/ha) = $255 per ha per season ($510 per year)

As we can see, the number of fruits grown (10,000) remains low compared to potential yield (25,000), resulting in low profitability for the producers. If the density of plantation was doubled to 20,000 plants (7,800 fruits or 2.6 tons), the estimated profitability, assuming that producers have access to buyers, would be:

(2,600kg x $1)/ha – ($2,040.+ $25 boxes)/ha = $535 per ha per season ($1070 per year)

Additionally, transportation forms a large part of the total production costs. If contracts can be formed between farmers and buyers, this could allow the farmers to send only the produce to the buyer without needing to travel themselves, saving the majority of the transportation costs.

5.4 Major constraints and proposed solutions

There are few constraints related to the production, processing or transportation of pineapple fruits, except the low density of plantation. Other constraints identified are some pre-harvest losses (rodents, pigs), limited shelf-life of the produce (preventing storage) and some issues with transportation access in the rainy season. The key constraints are related to the market: there are currently no producer groups in the region, and the producers only sell in the local market (Oé-Cusse), mainly due to the lack of market linkages and a production cost that remains too high to consider larger buyers.

5. Pineapple

Table 16: Key constraints and proposed interventions

Major constraints	**Proposed solutions**
Production	
Lack of water supply	Improve irrigation infrastructure
No pest control and tree maintenance	Improve the quality of seeds and increase productivity.
Low productivity	Capacity building to improve plantation management and pest control
Processing	
Limited processing and storage	Improve storage
Transportation	
Difficult road access to markets	Improve rural road network and transportation
Sales	
Lack of producer groups to implement collective selling	Support the creation/consolidation of groups
Low technical and soft skills levels on market access and selling	Capacity building activities on marketing
Limited access to buyers	Facilitate market linkages, especially in Dili with Supermarkets and municipal fruit market

6. Candlenut

6. Candlenut

6.1 Relevance to SRADR objectives

There are more than 20 candlenut producing groups in Oe-Cusse. The candlenut trees require little maintenance and start to produce fruits after three to four years. Apart from the nuts, the wood is also a useful resource. Hence, candlenut could supplement farm income while requiring little input. The productivity in the candlenut regions is low however, due to ageing trees and a low density of candlenut trees per hectare. This also leads to a low quality of candlenut and to an uncertain supply, which makes selling the candlenut to Indonesian traders harder and reduces the profitability. The key constraint is that there is no scope to significantly increase profitability because the price is fixed by Indonesia for relatively low and mixed quality of candlenuts, without a premium for quality. Proposed interventions consist of improving the productivity while identifying more profitable markets such as candlenut oil (e.g. ACELDA company in Baucau) and candlenut-based products.

6.2 Value chain structure and functions

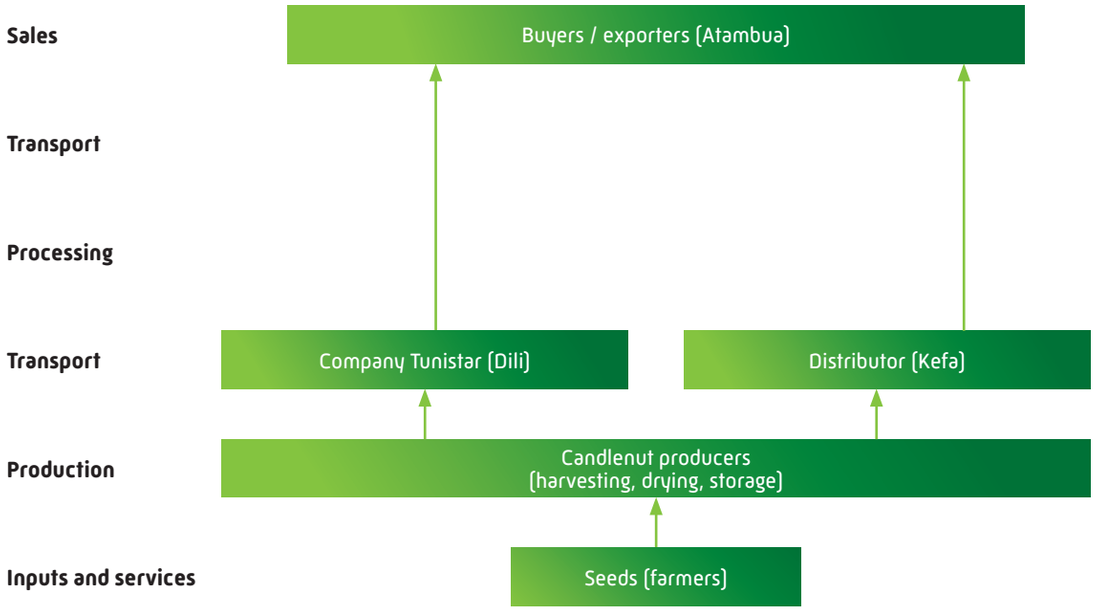


Figure 23: Candlenut value chain structure and main actors

Figure 24: Candlenut tree with fruits

6.3 Value chain dimensions

Production

The total cultivated area for candlenut in Oé-Cusse is 138 hectares[27], 5% of the total cultivated area for candlenut in Timor-Leste. There are more than 20 candlenut producing groups in Oé-Cusse, distributed in Leolbatan (80 households with 5-20 trees each), Kinat (10 households with 20-60 tree each), Kutete (6 households with 10-100 trees each), Passabe and Oesilo. Candlenut trees start producing fruits from the third or fourth year. The trees adapt well to a variety of conditions (drought tolerant and pest and disease resistant) and can even grow on rocky slopes with poor soil. The trees also typically require little maintenance. Candlenut has good prospects to be developed on farmers' forested land since the candlenut tree is a multi-purpose species, as nearly all its parts can be utilized. For instance, the candlenut fruit can be used as seasoning and medicine, the candlenut oil can be used for industrial products and the candlenut shell can be burnt as mosquito repellent. In Oé-Cusse, the nuts are typically harvested once per year, typically from September to February.

Figure 24: Candlenut tree with fruits

27 This section on the candlenut value chain relies heavily on: O'Donnell et al. (2015). Timor-Leste Economic Diversification Analysis: Candlenut, mobile finance market and tourism assessments, LEO report 20, ACDI/VOCA.

6. Candlenut

Table 17: Candlenut production by district

District	Productive Area (ha)	% of total
Baucau	933	32
Viqueque	629	21
Ainaro	320	11
Lautem	307	10
Bobonaro	307	10
Oé-Cusse	138	5
Manufahi	109	4
Covalima	94	3
Manatutu	92	3
Liquiça	10	1
Aileu	5	1
Dili	2	1
Ermera	1	1
Total	2,947	100

Source: National Directorate of Coffee & Industrial Plants, MAF, 2015

Two varieties of candlenut are found in Timor-Leste. There is a local variety which is higher (20-25 meters), and which produces bigger nuts. These nuts have a higher oil content, which makes them better suited for oil processing. There is also a hybrid variety which was introduced from Indonesia: it is shorter, and it produces smaller nuts. This second variety has lower oil content; however, its kernel is whiter, which is ideal to process it into spices commonly used in Indonesia. In general, the quality of the nut in Oé-cusse (Leolbatan) is medium: nuts are big and have good oil content.

In terms of agricultural inputs, seeds were provided by the Indonesian government during the occupation of Timor-Leste. Since then the farmers have been using the seeds from these same trees to grow new ones. The quality of these seeds remains relatively good. The farmers use organic fertilizer (from goat or cattle dung, and nuts) at early stages of growth, after which fertilizer use is discontinued. Concerning labor, the producer groups rely solely on household members (adults and youth); therefore, there is no labor cost per se[28].

PRODUCTION COST CALCULATION FOR 1 ha (at current density of 30 trees per ha):
1. plastic tarpaulin on which the nuts can be sun-dried ($15 x 2 units = $30);
2. sacks to store and carry the nuts ($0.75 x 30 units = $22.50);

The productivity of candlenut plantations in the region is low. First, the number of trees per hectare is limited to 30 (Leolbatan) to 100 (Kutete)[29], compared to the maximum capacity 250 trees per hectare. Second, because the trees are older, they only produce 20-30kg of candlenut (compared to a maximum of 80kg for young well-maintained trees). These older trees need to be replaced. Third, if the market price is low, the producers will concentrate on other economic activities rather than gathering the nuts; such alternation contributes to the consistently low productivity levels and creates uncertainty in terms of the availability of candlenut supply for Kefa traders.

28 A comprehensive economic assessment of production costs would necessarily attribute a cost (possibly based on opportunity costs in that specific case) for the work of household members, even if these do not receive a wage. In this report; however, we only consider explicit costs.

29 Based on interviews conducted to 10 local farmers in January 2018.

Processing

Some households collect the nuts and store them until a buyer comes, while other households simply wait to see if a buyer comes before they collect the nuts from the ground. Those who collect the nuts in advance proceed in the following way: Two to three times per week, during the harvest season, the producing households (including children) collect the thousands of nuts that fall from the trees over several weeks and transport them home. As a less effective method of sun-dying, the nuts are dried without removing the outer skin, unless buyers required to remove it.

In other areas of Timor-Leste, there are farmers that remove the outer skin of the nut to reveal the hard nut and leave it to dry or boil it. Once the nut is dry, they crack it manually to obtain the kernel, which fetches a higher price ($0.90/kg of kernel). This operation, however, requires a lot of time and, as it is done manually; many kernels are accidentally broken in the process.

On-farm storage is inadequate. The nuts are usually not sufficiently dried before being stored in sacks, especially during the rainy season, which affects products quality.

Figure 25: Traditional drying of candlenut

Transport

Currently, all candlenut producers in Oé-Cusse sell to brokers from Kefa, Indonesia. Transportation, by truck, is covered by the brokers. However, the commercialization of candlenut in Oé-Cusse is not yet established, as producers will sell only if a broker comes to their farm: there is no regular trade. There is also a possibility to send the produce to Dili, which would cost $0.04/kg, to be covered by the producer. There are also buyers in Atambua, Indonesia. In this case, however, an additional consideration would be the state of rural roads. All candlenut producing areas in Oé-Cusse have road connections; however most of them are not in good condition, especially during the rainy season. Only the Leolbatan area has a good road system.

Sales

There are two main market channels for candlenut: the Indonesian spice market and the candlenut oil market. Most of the candlenut is exported to Atambua, Indonesia, to supply large wholesale buyers in Surabaya. These wholesalers sort the kernels per quality and distribute them to different end markets in Indonesia, to be sold as Indonesian spice. Since the candlenut supply from Timor-Leste is very small compared to market demand in Indonesia, the Atambua buyers are willing to purchase all the candlenut produced in the country.

The market price for candlenut in Timor-Leste is determined in Atambua, since it is the point from which most of the candlenut in Timor-Leste is shipped to Surabaya, Indonesia. In turn, the price fixed in Atambua is based on the price of candlenut in Surabaya. The purchasing price of candlenut in Timor has been low, in US dollars, because of the strength of the US-Dollar compared to the Indonesian rupiah.

Table 18: Timor-Leste Candlenut exports

Year	2005	2006	2007	2008	2009	2010
MT Exported	1,009	1,070	344	1,094	459	502

Source: Ministry Commerce, Tourism and Industry

Although Oé-Cusse producers only sell to Kefa-based Indonesian traders (selling at $0.20/kg in-shell), there are also roughly 20 Timorese district-based traders in Timor-Leste, which gather small volumes of candlenut from farmers (paying farmers $0.20/kg in-shell or $5/25kg sack) that can then be transported with their trucks (or rented ones) to traders in Dili (selling at $0.30/kg in-shell or $1.10/kg of kernel). The Dili traders may also send trucks to collect the candlenut, and other commodities, from the district traders and provide the transport to Atambua. Once they gather sufficient supplies, they send them to Atambua; or, if volumes are large enough in Dili, the buyers in Atambua may themselves send trucks to collect the supplies in Dili. The district traders cannot supply the Atambua buyers directly because export costs to Atambua would be too high for their small volume of supplies. In addition to districts traders, there is also a company in Dili, named Tunistar, that purchases candlenut in-shell for $0.20/kg and kernels for $1.00/kg.

The second channel is the candlenut oil market, which may be accessed through a company in Baucau (ACELDA) that processes candlenuts into oil for exportation to a natural oils processor in Hawaii, USA (Oils of Aloha, a skin care products manufacturing company). ACELDA owns an organic certification for producers from five villages supplying the company with the candlenut kernels. ACELDA supplies Oils of Aloha with 45,600 liters of oil per year. This said there are also opportunities to increase the income of candlenut farmers by producing final products such as soap, shampoo and skin cream in Timor-Leste.

Calculations
The suggested costs, income and profitability are estimated based on the financial data gathered during the field-work. These may vary between locations.

Estimated gross income:

(30 trees/ha x 30kg/tree = 900kg) x $0.2/kg = $180 per hectare ($200/ton)

Estimated production costs per hectare:

Plastic tarpaulin ($30) + sacks ($22.50) = $52.50 per hectare (30 trees)

Average profitability per hectare:

$180 (revenue/ha) - $52.50 (cost/ha) = $127.50 per hectare (30 trees)

As the above calculations suggest, the current profitability per ha is very low, but this is mostly due to the limited number of trees that Oé-Cusse farmers own per hectare, in addition to the old age of these trees.

To compare, if the plantation density and productivity per tree were at their highest, the profit margin per year could be as high as:

(250 trees x 80kg x $0.2kg = $4,000) - $1,167 (cost for 20 tons) = $2,833 per hectare (250 trees)

6.4 Major constraints and proposed solutions

The main constraint for candlenut farmers (and traders in Timor-Leste) is that there is no scope to significantly increase profitability in the traditional Indonesian spice market channel, since one price is fixed for relatively low and mixed quality of candlenuts. For this reason, candlenut producers in Oé-Cusse do not have incentives to improve the quality of their produce. The low productivity rates further contribute to keep farmers' income low. Still, for the time being, development interventions could lead to some increase in producer income through planting more trees, improving seed selection and improving farm maintenance. At the same time, there is a need to identify more profitable markets such as candlenut oil and the production of candlenut-based products (soaps, shampoo, skin cream) while facilitating linkages with relevant market actors (especially traders).

Proposed intervention:
An investment in this value chain could be focused on two key areas: a) increasing production by planting new trees and promoting intensive production, and b) Improve market access by connecting existing buyers with producers and collectively sell production through the creation of a regional cooperative or association. As described in the previous section, candlenuts can be profitable for the farmers when intensive production is implemented (250 trees per hectare). In addition, there is a clear opportunity to sell the production in Dili to local companies that are selling to Indonesia. In terms of market strategy, the collective selling is key to ensure access to a better price and to sell to buyers in Dili. Furthermore, it will be important to promote shelling the nuts by the farmers, to sell the kernels for a higher price and bring more profit to the farmers. To do this, new machinery and equipment is required by the farmers.

6. Candlenut

Table 19: Key constraints and proposed interventions

Major constraints	Proposed solutions
Production	
No seed selection to improve grade	Training/advice to improve seed selection (to increase production)
Insufficient number of trees per ha	Planting more trees to increase plantation density and replace old trees
Insufficient maintenance	Technical training to improve maintenance of young trees
Processing	
Inefficient processing techniques	Technical training on processing and storage and provide equipment
Use child labour to collect nuts	Raise awareness on child labour, show more efficient collection techniques
No incentive to improve quality	Help producers identify higher quality and value-added niche markets
Transportation	
Transport is difficult in rainy season	Improve rural roads
Sales	
No access to Dili markets	Facilitate agreements with district traders for purchasing/transport to Dili
	Help producers identify higher quality and value-added niche markets
Limited profitability	Develop producer associations to ensure collective selling & price negotiation

7. Sea fish

7. Sea fish

7.1 Relevance to SRADR objectives

Fishing activities are an important contribution to the livelihoods of a number of coastal residents. The season for fishing is during the rainy season (December-February) when quantities up to 100-150 kg of fish can be cought per day. The average fish consumption per capita in Timor-Leste is much lower than other Asian nations, suggesting that marine resources are underexploited. Additionally, only few fishermen have the equipment and means to catch larger fish further out at sea and sell their fish to buyers in Dili. By far the main constraint is the low fish catch volume. Also, the more vulnerable fishermen may lack means of transportation to even sell the fish or store it properly. Proposed interventions are the provision of better fishing equipment to small fishermen groups and facilitating market linkages for these groups. Additionally, coordination is required to prevent overexploitation of Oé-Cusse's marine resources.

7.2 Value chain structure and functions

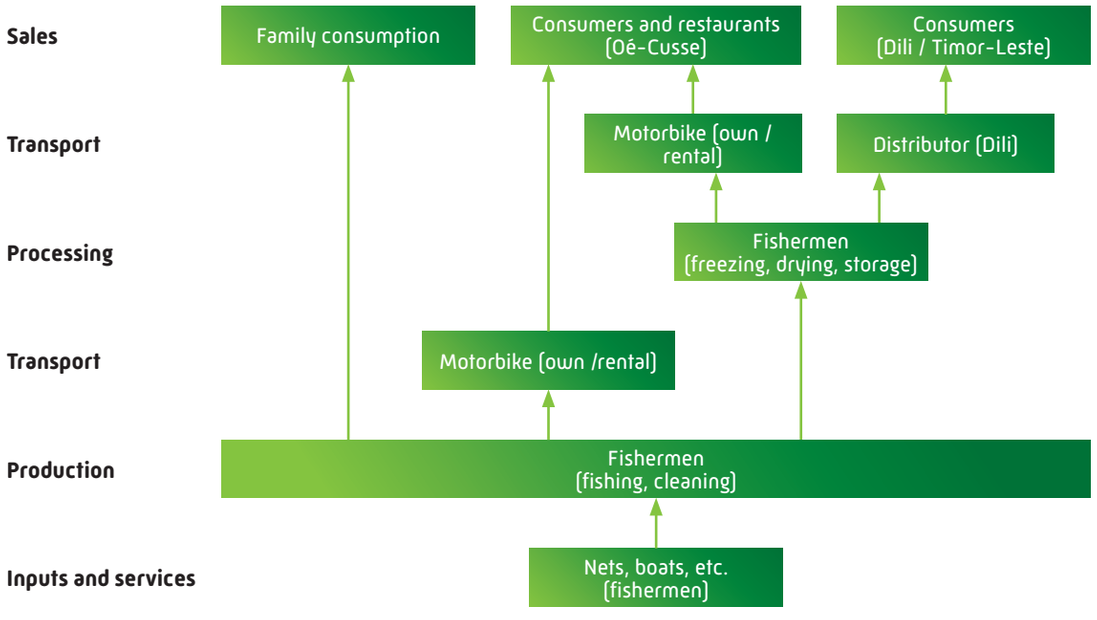


Figure 26: Sea fish value chain structure and main actors

7.3 Value chain dimensions

Production

There have been up to 51 fishermen household (HHs) groups in Oé-cusse (created in 1993), however at least some of them are now inactive. These households are distributed in 5 "villages": Lifau (20 HHs), Citrana (12 HHs), Sakato (9 HHs), Oesono (6 HHs) and Mahata (4 HHs). The high fishing season is the rainy season (December-April) as well as

October. Fishing usually takes place from 6am to 3pm daily. The main types of fish (or seafood) fished are lalosi, garota, salmon and coccu. Even when targeting bigger fish, fishermen also catch small fish that get caught in the nets.

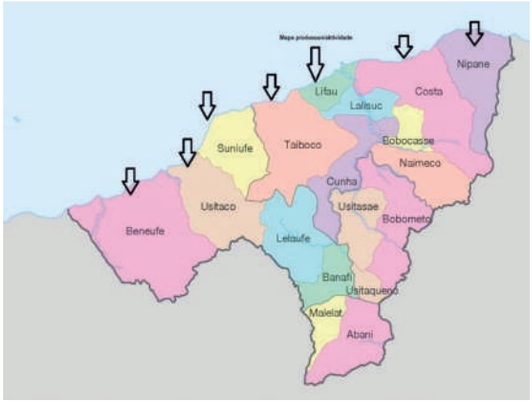


Figure 27: FIshing communities in Oé-Cusse

Figure 28: Unmotorized fishing boats

Concerning fishing-related costs, the fishermen households rely heavily on household members for labor (adults and youth) but they also hire external labor ($80/month). A fishing group comprising both household members and (additional) labor can represent 8-12 people.

To facilitate the analysis, we can divide fishermen households in two main groups: 1) the fishermen households that have only basic fishing equipment, typically fish smaller fish near the shore and mostly sell their fish locally (majority of groups); 2) the fishermen households that own better fishing equipment suited to fish bigger fish farther from the shore (such as better boats, an outboard motor and bigger and stronger nets) and sell their fish both on local markets and in Dili (minority of groups). Below are approximate costs for each group type.

FISHING COST CALCULATION PER DAY: For fishermen groups owning only basic equipment and selling fish locally
1. labor on fishing boats (2 workers x $80 monthly / 30 days = $2.5/day);
2. fuel for motorbike to sell the fish in town ($1 x 3 liters = $3/day);
3. ice packs to keep fish surpluses until the following day ($5 x 2 units = $10/day).

For fishermen groups with better equipment selling to Dili
1. labor on fishing boats (2 workers x $80 monthly / 30 days = $2.5/day);
2. fuel for the outboard engine for fishing ($1 x 4 liters = $4/day);
3. ice packs to ship the fish to Dili ($5 x 8 units = $40/day);
4. truck rental from the fisherman's location to the Oé-Cusse port (fixed rate of $25);
5. shipping to Dili (fixed rate of $10).

It is important to note, however, that these better equipped fishermen don't send fish to Dili every day, but typically twice per month, on particularly good fishing days[30].

30 When these fishermen sell locally, we can assume that their costs are similar to the fishermen groups owning only basic equipment, referred to above (adding only the cost of fuel for the outboard engine, estimated to $4 per day).

7. Sea fish

Average fish consumption per capita in Timor-Leste is much lower than other nations, with rates ranging from 0.3kg to 3.03kg. In comparison, Indonesia has a rate of 20.5kg per capita per year, while Asian countries and the worldwide average have respective consumption rates of 17.8kg and 16.4kg per capita per year[31].

In Oé-Cusse, average quantities fished are 5 buckets (125kg) on good days and more than 12 buckets (300kg) on very good days. On "bad" days, fishermen catch up to 4 buckets (100kg). The annual catch can vary significantly from one year to the next. For instance, in 2016, a fishermen group with an outboard motor could make up to $7000/month over a few months, while in 2017; the monthly income would remain around $500/month per group. Also, the fishing volume can vary significantly among fishermen groups, between those few that have an appropriate fishing boat, an outboard engine and appropriate nets for big fish and the majority that doesn't. More generally, fishing is affected by irregular raining patterns (climate change), big waves preventing fishermen from going into sea, and seasonal changes.

It is important to mention that there is no management plan for the fishermen or calendar for production.

Processing

For local sales, women simply clean the fish. Any surplus will either be dried or kept in an ice cooler box (till it is transported to Dili on another day). The households that don't have ice cooler boxes need to rent one or simply dry the fish before selling it at local markets or keeping it for own consumption (used mostly for fish curry).

Transport

Transportation for the fish that is sold locally is limited to the gasoline required ($1 x 2-3L/day) to wander around Pante-Makassar on a motorbike to sell the fish to families, in markets and at restaurants. Most fishermen own one or two motorbikes which they use for that purpose. Fishermen who do not own a motorbike, will need to rent one (possibly about $10 for a few hours), thereby significantly increasing their transport cost. To these costs, one should also include the cost of motorbike repairs.

For the Dili market, the fishermen first rent a truck from their dwelling to the Oé-Cusse port, with a fixed cost of $25. Then, transport by boat is $10. These costs are covered by the fishermen. The buyer will receive the fish at the port in Dili.

Figure 29: Local sales of fish without the use of a cooler box and ice

31 Food and Agriculture Organization (2007), FAO Yearbook, Fishery and Aquaculture Statistic, 2007, http://www.fao.org/fishery/publications/yearbooks See also JICA 2009: Interim report of study on project for promotion of agribusiness in Timor-Leste.

Sales

In Oé-Cusse, the fishermen households sell fish mostly to the inhabitants, per unit (2 small fish for $1 or 2-3 bigger fish for $2.5). Some fishermen households sell to local restaurants on an ad hoc basis, typically at $10 per fish bucket (25kg). Big fish can be sold at a higher price. For instance, a big coccu can fetch up to $70. Most of the time, fishermen can find customers locally, however during the rainy season, when fish is abundant, it is harder to sell all their produce.

Most fishermen households do not have access to bigger buyers which are purchasing on a regular basis. Those that do have agreements with buyers do not always have sufficient fish in stock to provide to the buyer. There is a need for better market coordination at this level.

Calculations

The suggested costs, income and profitability are estimated based on the financial data gathered during the field-work. These may vary between fishermen groups.

Estimated total costs for fishermen with no outboard motor selling locally:

Labor ($5) + fuel moto ($3) + ice packs ($10) = $18 per day

Estimated total costs for fishermen with outboard motor selling in Dili:

Labor ($5) + fuel boat ($4) + ice packs ($40) + transport ($25 + $10) = $84 for one day

Therefore, the estimated income of a fisherman selling fish locally may be:

100kg of fish @ $10/25kg bucket = $40 daily

When subtracting the daily fishing-related costs (for local sales), we obtain a profitability of:

$40 (revenue) - $18 (costs) = $22 daily ($660 per month)

The monthly profits from fishing shown above are significantly higher than those generated through farming, except for mandarins, which could fetch a higher monthly income if the producers had more trees. However, one needs to keep in mind that income from fishing can vary significantly from one day or one month to the next, forcing fishermen to cope with irregular income. One way of contributing to stabilize and increase income from fishing would consist of providing better fishing equipment to those fishermen groups that only own basic equipment.

If a development intervention provided improved fishing equipment to fishermen households currently unable to fish farther from the shore and hence fish bigger fish and bigger quantities of fish, we could reasonably assume that the daily amount of fish catch per day could be increased by 50% (to 150kg). The resulting increase in profitability could be:

$60 (revenue) - $23 (costs) = $37 daily ($1,110 per month) for local sales

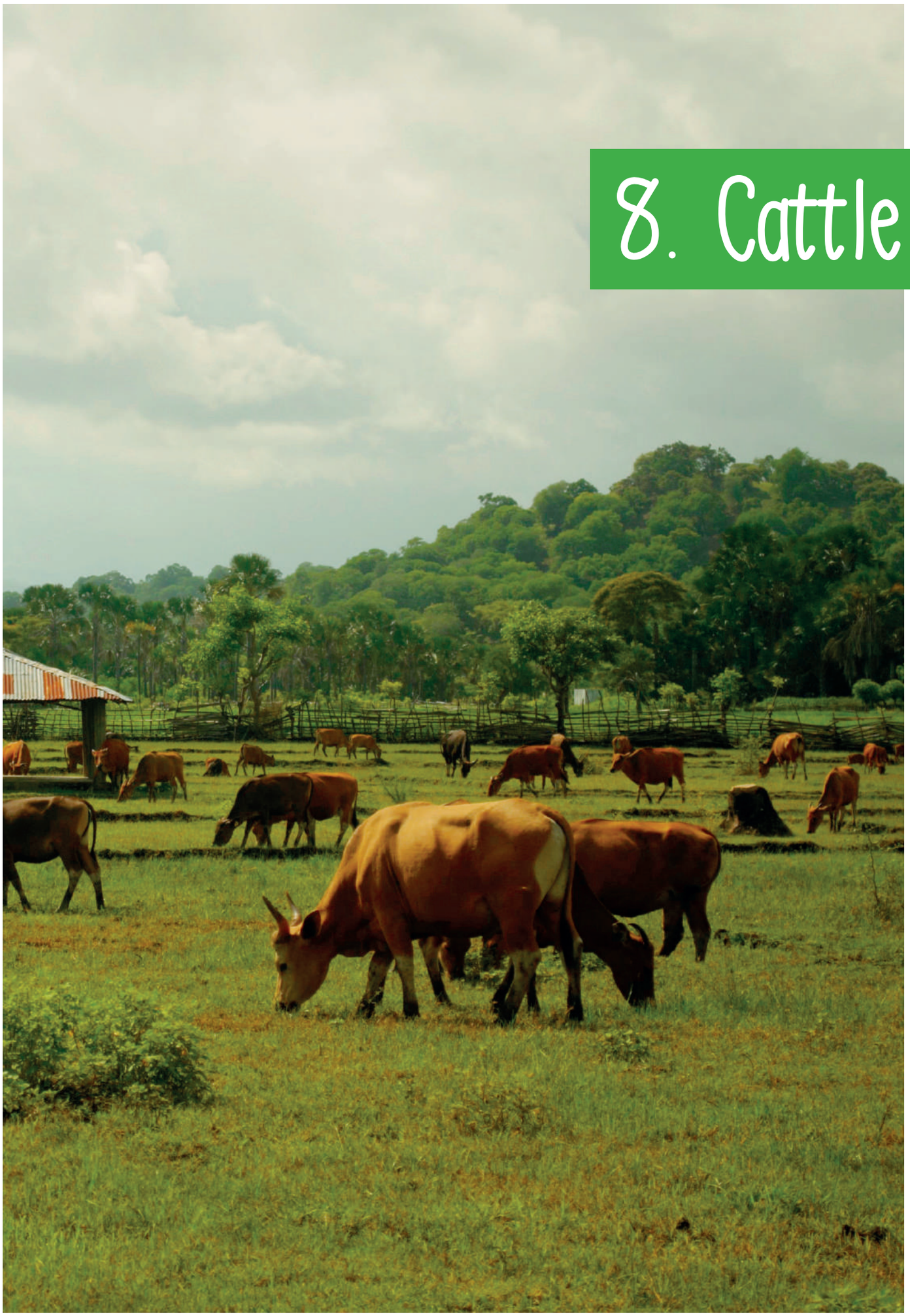
7.4 Major constraints and proposed solutions

The constraints identified affect especially the smaller fishermen households that own few fishing-related assets (appropriate fishing boat, outboard engine, big nets, motorbike, ice cooler boxes for storage). By far the most significant constraint is the low fish catch volumes due to most fishermen lacking proper equipment to fish in deeper seas. This situation concerns most fishermen groups but affects small groups more severely as these have no outboard motor to seek fish farther out in the sea. This situation also highlights the need to develop a fisheries management plan to control the depletion of fish stocks. Also, surprisingly, most fishermen households do not own even basic equipment to store or process the fish, such as ice cooler boxes. Fixed transport costs for trucking-shipping to Dili becomes an issue for bigger groups when their catch volume is too small. In the case of more vulnerable smaller groups, the issue is more related to the lack of means of transportation to sell the fish and therefore the need to sometimes rent a motorbike. Although bigger groups have connections with buyers in Dili, the smaller groups often do not. Therefore, there is also a need to facilitate market linkages for smaller fishermen groups.

Table 20: Key constraints and proposed interventions

Major constraints	Proposed solutions
Production	
Low fish catch (unreliable supply)	Provide equipment to catch bigger fish (e.g. engine, nets)
Processing	
Inadequate drying practices	Provide training on fish drying techniques
Insufficient equipment for processing	Provide ice cooler boxes and fish drying equipment
Transportation	
Costly transport to Dili for catch volume	Organize fishermen to negotiate lower transport costs to Dili
Improper transport of fish within town	Build awareness of fishermen on fish preservation and safety
Some small groups own no transport	Provide motorbikes to most deprived fishing groups
Sales	
Limited access to buyers for smaller groups (only sell in Oé-Cusse)	Facilitate market linkages (buyers in Dili) Promote the creation of a fish market
Variable selling price and no use of a balance when selling fish	Introduce selling by weight and standardize prices per fish type
No competitiveness (smaller groups)	Provide equipment to catch bigger fish (e.g. engine, nets)

8. Cattle



8. Cattle

8.1 Relevance to SRADR objectives

There are over 6,000 households in Oé-cusse in the posession of cattle. Although cows are mainly used as a long term investment, there are farmers raising cattle for commercial purposes. The estimated number of cows and buffalos is 16,562 and 1,791, respectively, although estimations differ between the regional veterinary department and the national census. There are over sixty trained farmers who keep larger numbers of cattle and produce commercially. This value chain is focused on the farmer groups raising (male) calves in a shed.

Table 21: Households involved in cattle and buffalo rearing and number of cows and buffalo owned

		Type of livestock reared			
		Cattle/cow		Buffalo	
Timore Leste, Dirstrict, Sub-district, Suco	Total households	Number of households	Number of cattle/cows	Number of households	Number of buffalos
(1)	(2)	(13)	(14)	(15)	(16)
Timor Leste	184,652	43,028	161,654	19,119	96,484
OeCussi	13,890	6,178	16,562	519	1,791
Pante Macasar	7,290	2,883	8,503	283	1,151
Nipani	415	221	905	8	50
Lifau	434	181	460	24	98
Cunha	933	336	1,008	82	223
Costa	2,551	862	2,315	64	344
Taiboco	1,217	555	1,872	38	168
Lalisuc	627	230	826	42	136
Bobocase	273	135	293	7	10
Naimeco	840	363	824	18	122
Nitibe	2,609	1,249	3,913	124	415
Usi-Taco	479	176	471	18	147
Bene-Ufe	589	286	1,596	19	55
Suni-Ufe	414	264	693	70	169
Lela-Ufe	724	393	982	12	31
Banafi	403	130	171	5	13
Oesilo	2,224	1,188	2,553	70	152
Bobometo	1,213	615	1,578	37	93
Usi-Taqueno	238	157	323	15	20
Usi-Tacae	773	416	652	18	39
Passabe	1,767	858	1,593	42	73
Abani	1,386	614	1,045	34	56
Malelat	381	244	548	8	17

Source: Departemento Veterinaya Regional Oé-Cusse 2010

The existing groups in Oé-Silo and Passabe (Selom-Nasi, Bioni-Tumin, Binoni-Case, Binoni-Saben) each have ten members owning two young bulls per person, making a total of eighty cows. New groups in Tnao Ba-Baun, Binipu, and Usitaqueno are forming.

8.2 Value chain structure and functions

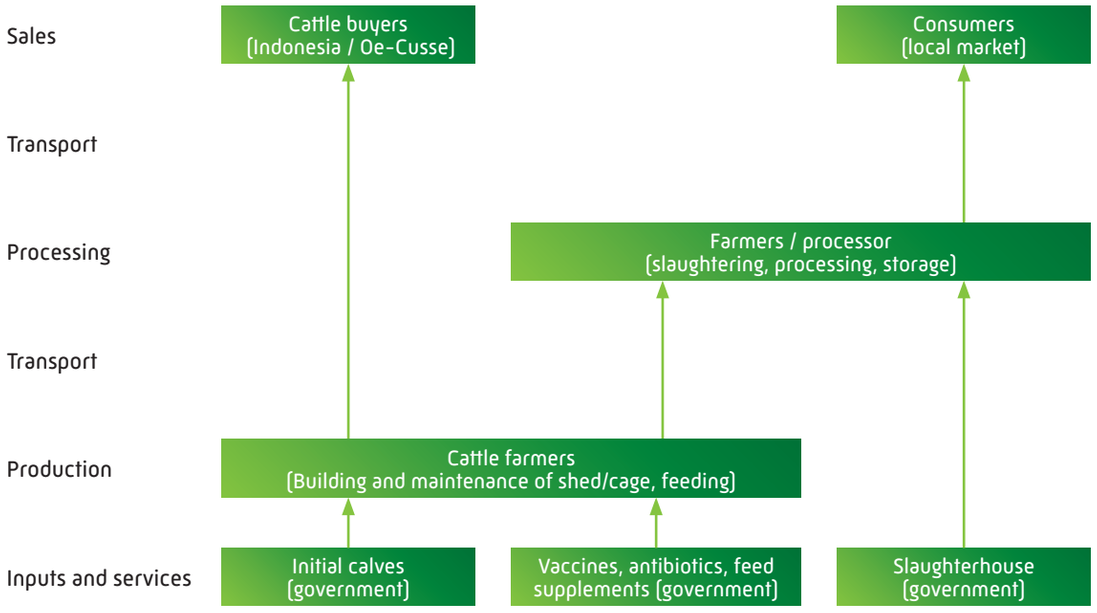


Figure 30: Cattle value chain structure and main actors

8.3 Value chain dimensions

Production

The breed of cow (Sapi Bali / Karau Vaka) and buffalo (Karau Timor / Karbau) kept in Oé-cusse are native to Timor. Initially, two (male) calves are provided by the Regional Secretary of Agriculture and Rural Development from the Department of Fisheries and Livestock. Each calf weighs about 150 kg. A shed is constructed (2x3 m) to keep and feed the cows, as illustrated below.

Antibiotics and vitamin supplements are sometimes illegaly purchased from Indonesia. Therefore, the government should provide vaccines, antibiotics and vitamin supplements to give the farmers a legal way to obtain these items.

The quality of the raised cattle is similar to the quality of cattle in west Timor. Typical problems are during the dry season when there is limited feed available for the cows, such as green grass, king grass, ai turi leaves and lamtoro leaves. The farmers have been trained to produce silage during the rainy season to store as feed for the dry season, but this is not practiced yet. When the calves reach 250-300 kg (after about 6-8 months ac-

8. Cattle

cording to the veterinary department) they can be sold for $600-800, depending on the market. Daily activities include feeding and watering the cows, while the shed requires regular maintenance throughout the season.

Figure 31: Cow shed for rearing the bulls

Figure 32: Measuring the bull to determine its weight

Medical treatment (vaccination) is provided once a year by the veterinary department, and feed supplements can be given about four times a year. The bulls raised in the sheds are sold after one year as their further growth from that time is limited. This is in contrast with the typical situation for cows, which are sold after 3-4 years. In these years the cows do not generate any income. This could be changed by introducing dairy production, which would generate income in those years the cow is kept on top of the income received upon sales of the cow.

Figure 33: Traditional sun drying of meat for family consumption

Processing
A slaughterhouse exists in Numbey, but the facilities are in bad conditions due to a lack of equipment and poor management. Plans exist with the Regional Secretary of Agriculture to move the slaughterhouse from Numbey to Mahata and create a more hygienic facility. Due to the absence of good processing facilities, the cattle is currently mainly sold alive, or slaughtered locally after which the meat is sold in the surrounding communities. Processing into beef jerky or floss is a possibility, but currently not practiced in Oé-Cusse.

Transport
When a buyer comes to purchase the cattle, transportation costs will be covered by the buyer. The cost of transporting cattle from Oé-Cusse to Dili is $15 per cow by boat through Nakroma or Laju-Laju. If farmers take their cow to the local market they generally rent public transport, for which the price depends on the distance travelled. From Oé-silo this is estimated to be $15 per cow, and from Passabe to Pante-Makassar $20. Although there is no formal export of cattle from Oé-Cusse to Indonesia, a number of farmers has sold cows in Kefa, illegaly crossing the border, receiving about $600-800. The Indonesian government has tried to stop the illegal crossing with a ban on Timorese cows, claiming that these cows are infected with a disease.

Sales
Raw meat is sold in Oé-Cusse for $20 per pile, or about $6.5 per kg, and could be sold in Dili for $8-10 per kg. Depending on the season and the feeding status of the cow, the meat is fat, and is consumed shortly after the slaughtering of the animal. The meat is not very tender, but for traditional applications this is not considered an issue. It may, however, limit acceptance of the meat with other consumer groups. The conditions during transportation and slaughtering can have large negative effects on the overall meat quality, which can be a point for future improvements. Processed meat could be sold in Oé-cusse or Dili, for instance beef jerky ($15 per kg) and beef floss ($2.5 per kg), but these are currently not produced.

Calculations
The suggested costs, income and profitability are estimated based on the financial data gathered during the fieldwork.

Production costs: No external labour is required and feed is harvested locally, hence the production costs consist of the intial price of the calves, upkeep to the shed and materials, and the cost of medical treatment with vaccines, antibiotics, and vitamin supplements.

Purchase of calf ($350) + Upkeep materials (pail, rope: $10) + Medical treatment ($5; Antibiotics, $20, Vitamins, $10) = $395 per cow

Distribution to the local markets (main end market): The transportation costs are generally covered by the buyer visiting the farm:

Local transport within Oé-Cusse ($15 per cow) + Transport to Dili ($15 per cow) = $30 per cow

Total gross income for local sales would be:

$600-800 per cow (250-300 kg, equivalent to about 130kg meat)

The estimated profitability would be:

$600-800 - $395 = $205-405 per cow (excl. transport cost)

Local meat production could provide further employability in the sector and add value. Additionally, the parts of the cow which are not consumed have to be valorised.

8.4 Major constraints and proposed solutions

Similar to other value chains, one of the main issues farmers have is the lack of a connection to the buyers of their products. Additionally, the absence of a hygienic well-equipped slaughterhouse limits the possibilities for the production of higher quality meat and meat products.

Proposed intervention

The government should continue to provide farmers with the opportunity to buy young bulls for commercial meat production. Additionally, the construction of a well-equipped slaughterhouse is important for future value-added activities. Quality control and hygienic processing of the meat are a necessity to develop a commercial meat processing sector in Oé-Cusse. Untill then, buyers of cattle should be linked to the farmers' groups to facilitate selling the fattened cows.

Table 22: Key constraints and proposed interventions cattle

Major constraints	Proposed solutions
Production	
Lack of water supply	Improve water infrastructure
Lack of feed during the dry season	Drought resistant Leucena trees in coffee plantations
Low productivity	Regular health checks cattle (parasites such as helminths)
Processing	
No functioning processing and storage facilities	Provide slaughterhouse and storage & processing facilities.
Transportation	
Difficult road access to markets	Improve rural road network and transportation
Sales	
Lack of contact between buyers and farmers	Link farmers' groups to cattle buyers in Pante Makassar and Dili

9. Conclusion

The purpose of this research was to provide an overview of value chains that have socio-economic development potential for the region, rather than an exhaustive research on the targeted commodities. In this report, we presented a value chain analysis of seven agricultural/fisheries commodities (rice, coffee, mandarin, pineapple, and candlenut, sea fish, and cattle) which have potential to improve and accelerate rural development in Oé-Cusse. We concentrated on four key dimensions of each value chain, namely production, processing, transportation and sales (markets).

Although the context in some cases differs significantly from one commodity to the other, a few common bottlenecks may be identified. These are low productivity or output levels (due to a variety of factors including seed quality, inadequate farming practices, lack of water supply, age of trees and low plantation density), inadequate processing techniques (often due to the production being used mostly for household consumption, in which case quality is not crucial), limited and irregular access to buyers (when there are buyers, these tend to come to the farms on an ad hoc basis to purchase production, making it difficult for producers to plan distribution of production). Another important point to remember is that most farmers in Oé-Cusse practice subsistence agriculture which influences their production goals and farming practices.

The key proposed interventions considered in this report consist of reducing production costs and increasing productivity (in all sectors), while facilitating market linkages with buyers at regional, national and international levels, but also of providing the means for farmers and fishermen to increase production/outputs and improve processing techniques to reduce losses and improve produce quality (through training and equipment).

This report was meant to serve as a basis for further research and action-oriented discussion on possible interventions in the agricultural sector in Oé-Cusse. We hope that this value chain assessment will encourage the regional government in Oé-Cusse (ZEESM-RAEOA), the different development organizations in Timor-Leste and the private sector to identify innovative ways to leverage the agricultural and fisheries potential in Oé-Cusse to foster the development of the region.

Already, ZEESM-RAEOA initiated a 'seven million trees campaign' which is planned to last from 2019-2023 and will make an important contribution to the situation for candle nut, coffee, and mandarin production.

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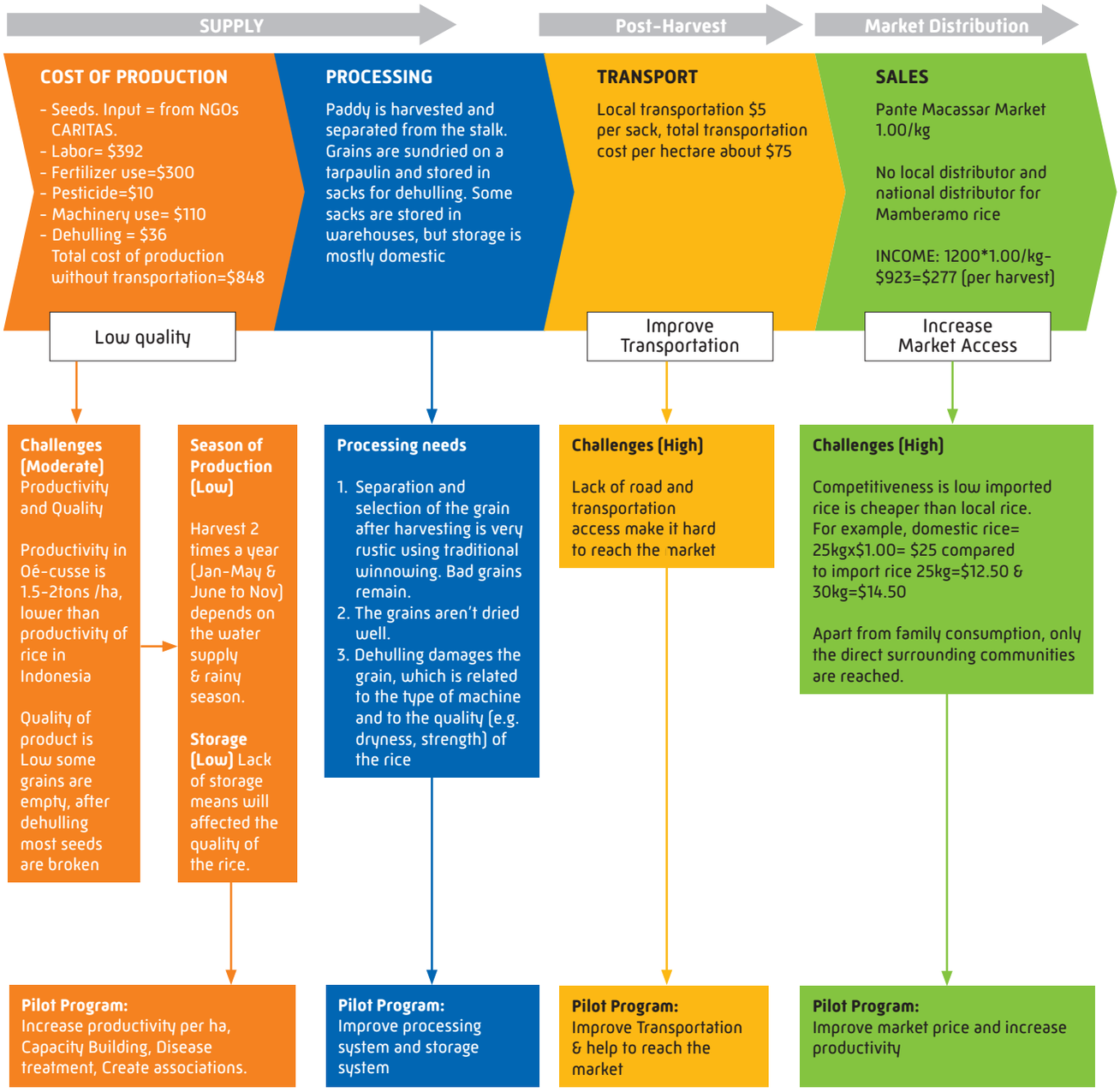
- Appendix

Appendix

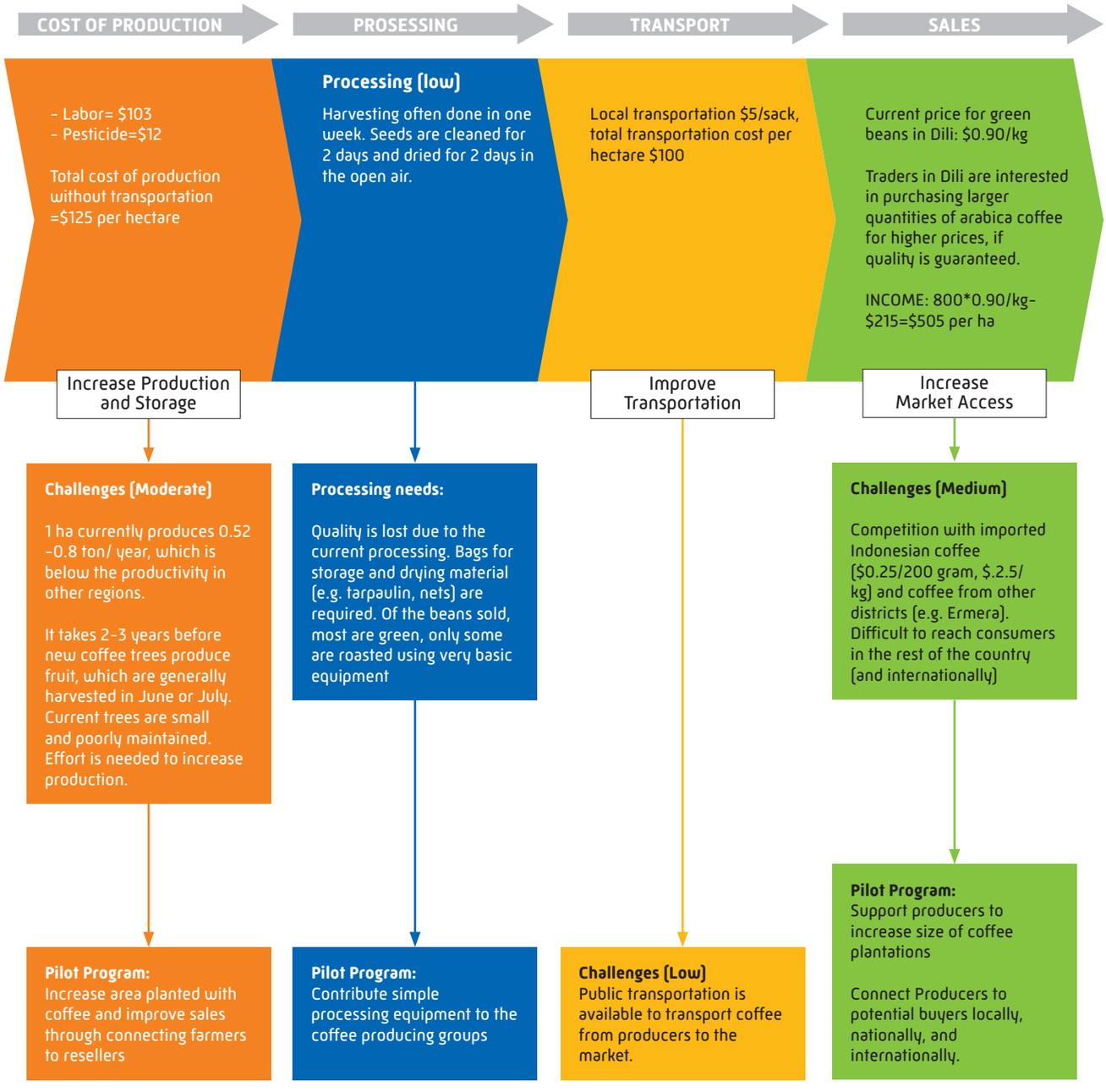
Appendix 1: Rice value chain summary

Group name: No group; **Number of Members:** Above 1500 family; **Formation of group:** No
Other Production: No; **Locations:** Kolamsina, Barasantu, Betbanae, Roti, Costa



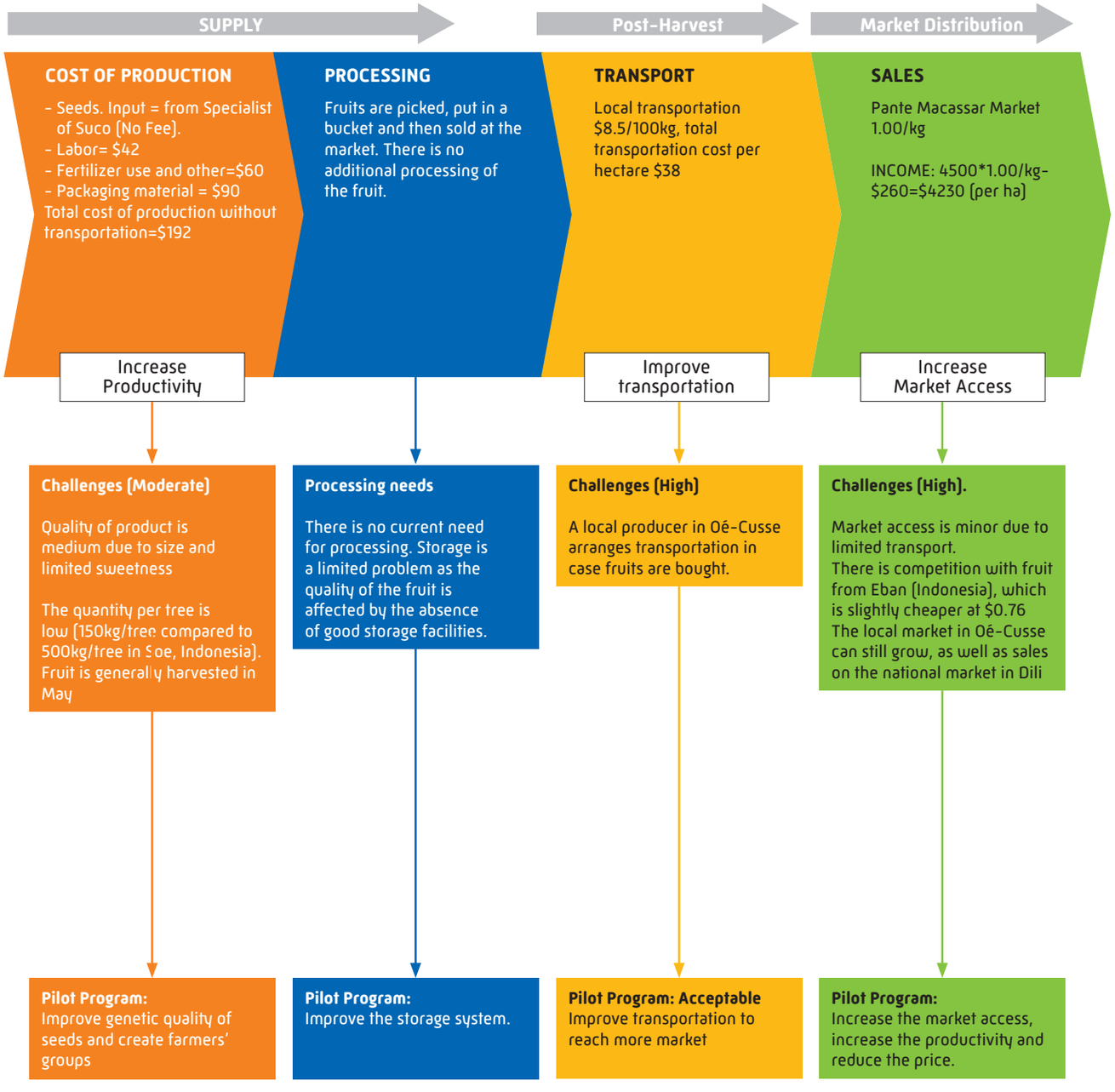
Appendix 2: Coffee value chain summary

Group name: several informal groups, Moris Foun only group commercially active, no official cooperative
Contact details: Francisca suni/Anis Piot



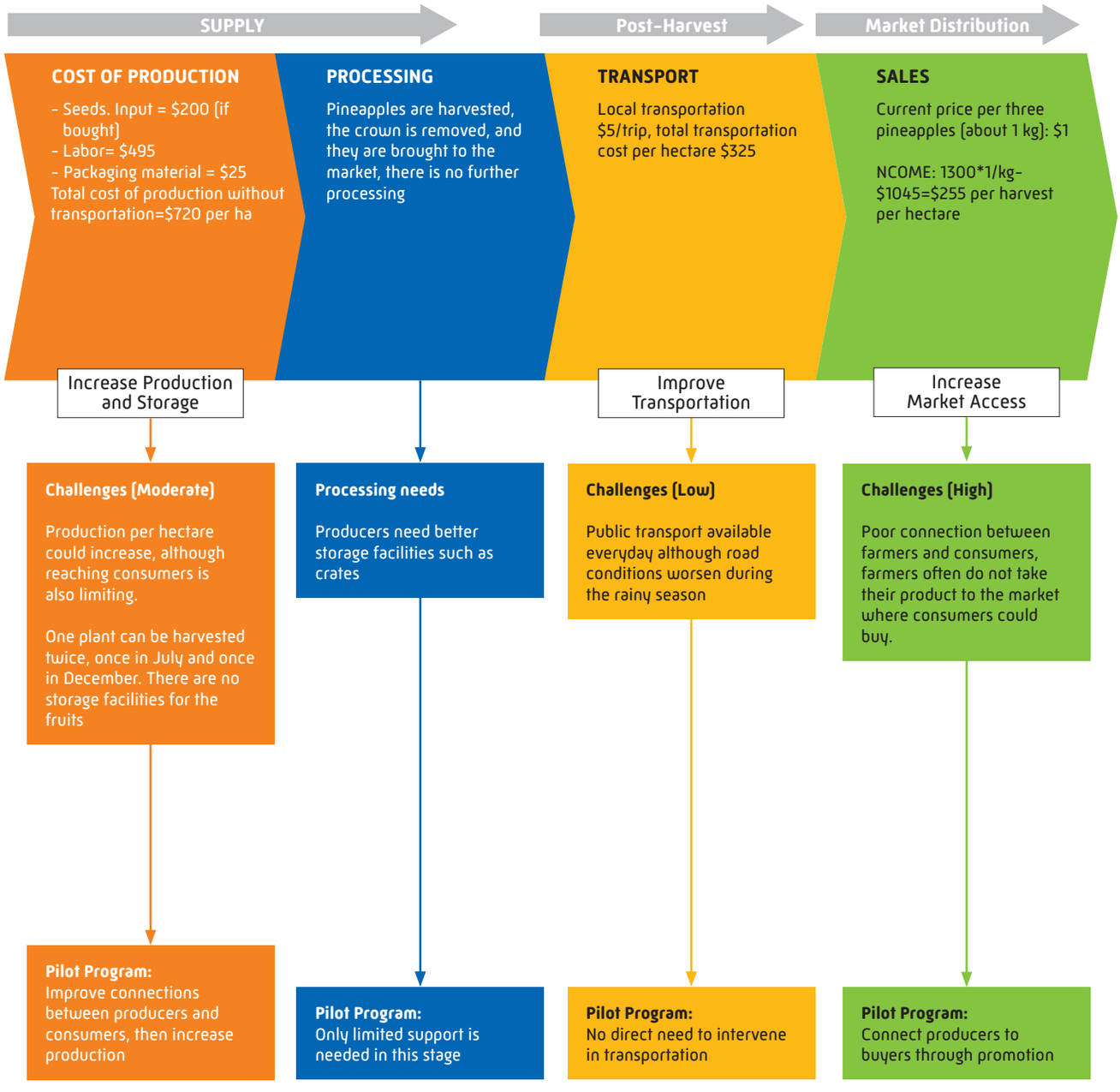
Appendix 3: Mandarin value chain summary

Number of producing families: 20; **Locations:** Pasabe, Kutete, Leolbatan; **Contact details:** Mario Ulan: 75912541



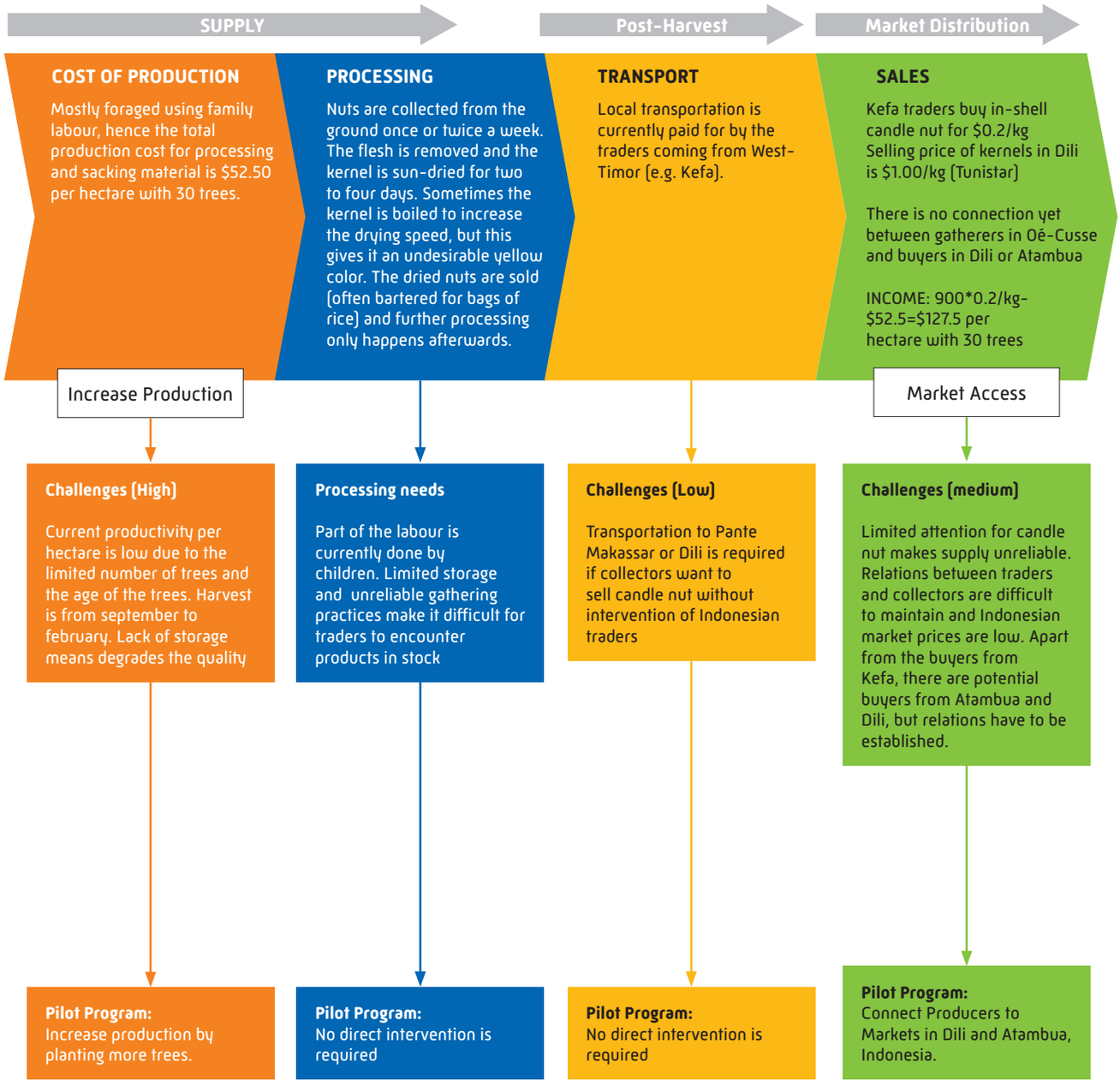
Appendix 4: Pineapple value chain summary

Locations of producing individuals: Nibin, Kiubiselo (Bobometo), Leol Batan(Costa) Kutete (Costa) and Oelullan (Naimeco); **Number of producing families:** Many, although only twenty produce surplus quantities which can be sold in the market



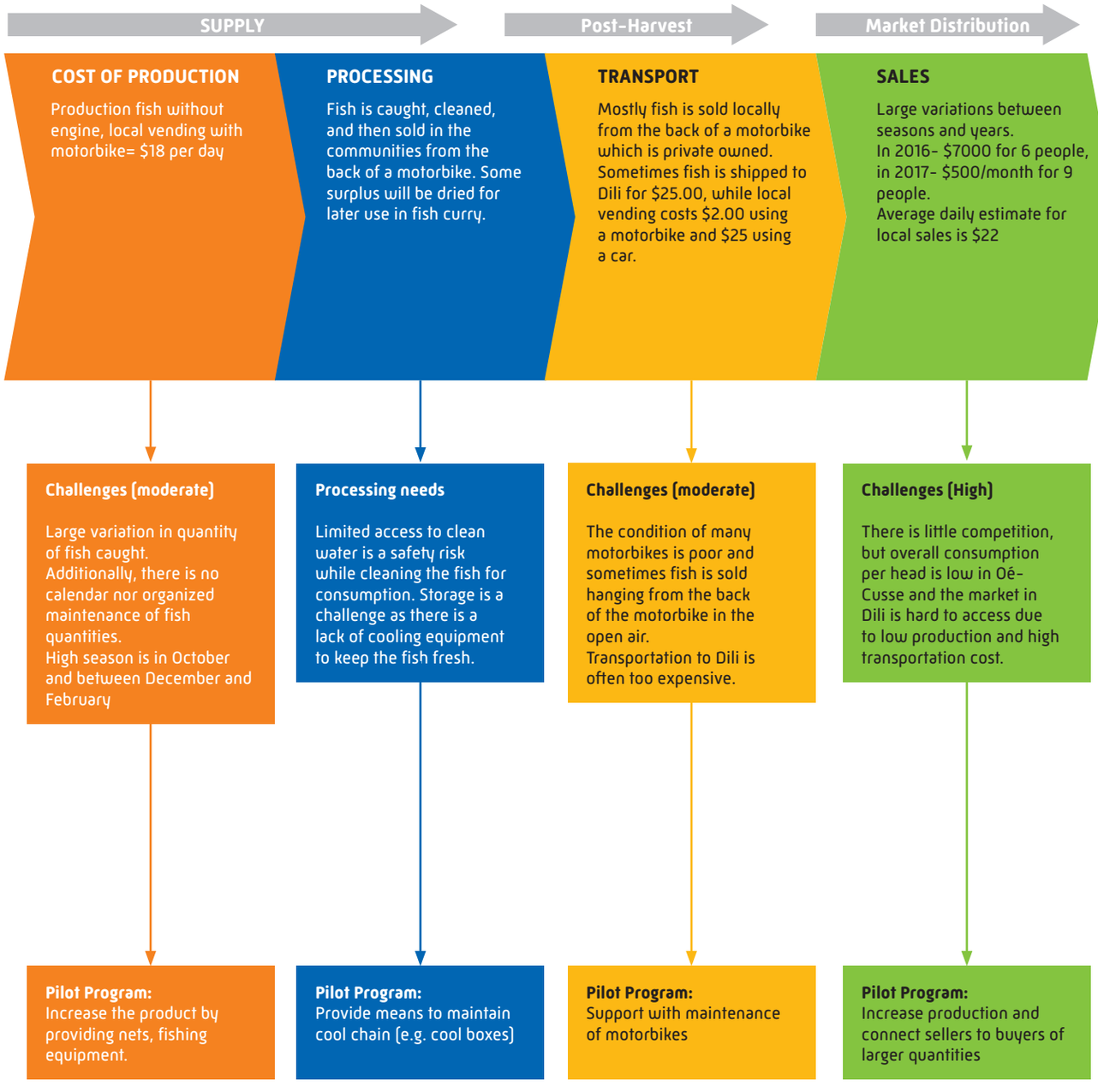
Appendix 5: Candlenut value chain summary

Group name: Moris Rasik(C); **Number of Members:** 20 members;
Place of production: Oésilo, Kutete, Kinat, Leolbatan; **Production:** Coffee, Orange



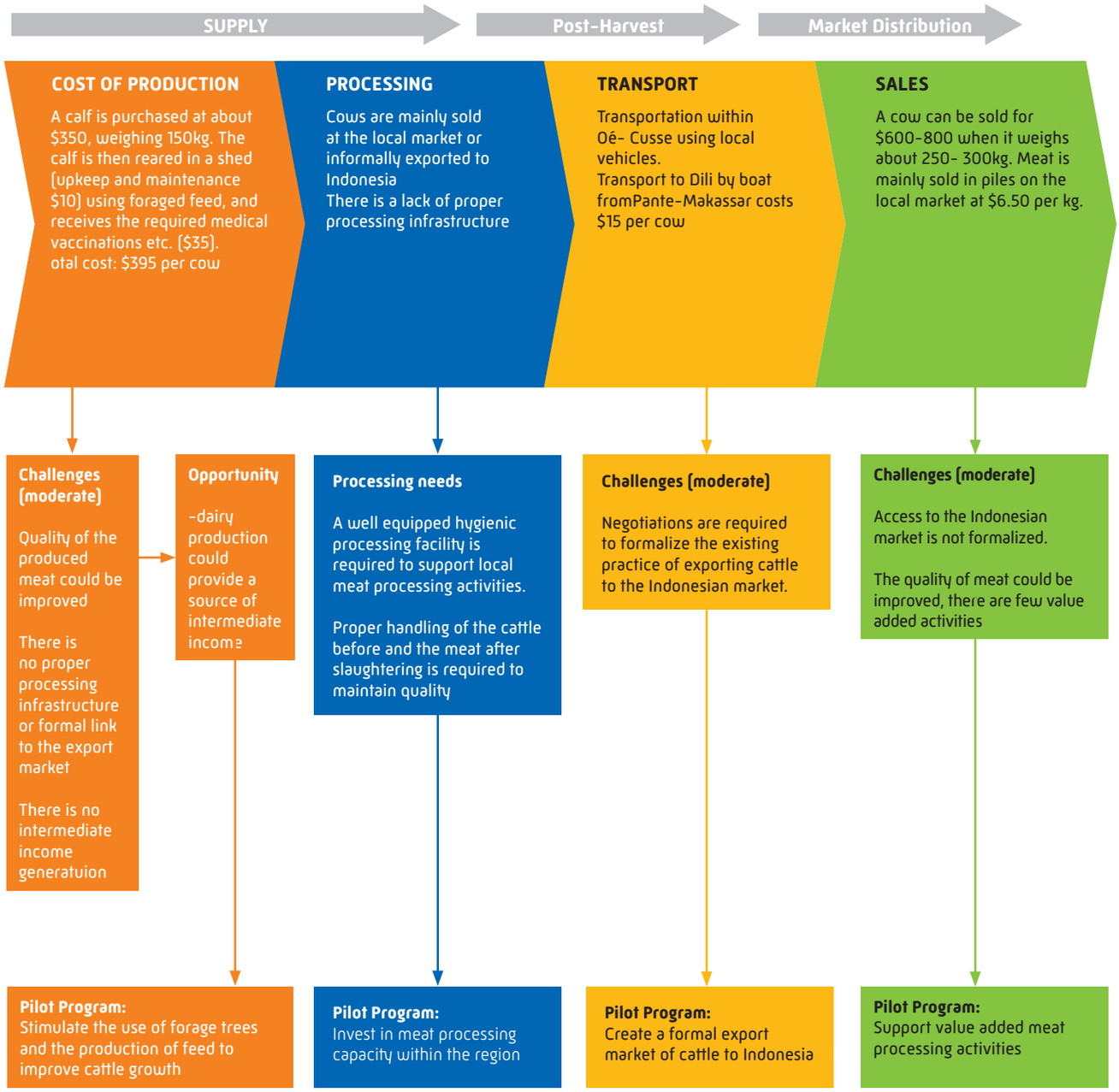
Appendix 6: Fish value chain summary

Group name: Bernado Koa; **Place of production:** Sakato, Mahata, Oesono, Lifau and Citrana; **Formation of group:** 1993
Contact details: +670 75712528 (Bernado)



Appendix 7: Cattle value chain summary

Group locations: Selom-Nasi, Bioni-Tumin, Binoni-Case, Binoni-Saben; **Place of production:** Oé-silo, Passabe;
Number of Members: 10 members with two bulls each



Appendix

No	Product	Aldeia	Suco	Sub Regional
1	Caffe	Haemnanu (3 groups)	Abani	Passabe
		Noke (1 group)	Naimeko	Pante Makasar
		Laokfoan (3 groups)	Costa	Pante Makasar
2	Pineapple	Nibin (1 group)	Usitaqueno	Oesilo
		Qiubiselo (1group)	Bobometo	Oesilo
		Noke (1group)	Naimeko	Pante Makasar
		Kutete (1 group)	Costa	Pante Maksar
		Oben (1 group)	Costa	Pante Makasar
3	Mandarin	Passabe (4 gorups)	Abani	Passabe
		Kutete (1 group)	Costa	Pante Makasar
4	Candlenut	Passabe (1 group)	Abani	Passabe
		Noek (1 group)	Naimeko	Pante Makasar
		Kutete (1 group)	Costa	Pante Makasar
5	Rice		Costa, Lifau, Lalisuk, Cunha, Beneufe	
6	Fish	Citrana (2 groups)	Beneufe	Nitibe
		Bauknana (2 gorups)	Beneufe	Nitibe
		Bona (2 groups)	Usitaku	Nitibe
		Kabana (2 gorups)	Suni Ufe	Nitibe
		Maquelab (2 gorups)	Taiboko	Pante Makasar
		Tula Ika (2gorups)	Lifau	Pante Makasar
		Sanana (1 gorups)	Costa	Pante Makasar
		Oesono (1 gorup)	Costa	Pante Makasar
		Mahata (2 gorups)	Costa	Pante Makasar
		Bausiu (1 group)	Nipani	Pante Makasar


Fly
mirates