Australian Aid

TOMAK
To'os ba Moris Di'ak

Analysis of the Spice Value Chain in Timor-Leste

June, 2018

Adam Sendall & Luis Gusmão

Adam Smith International

MERCY CORPS

Table of Contents

Abbreviations & Acronyms

ADB	Asian Development Bank
ADRA	Adventist Development and Relief Agency
ASEAN	Association of South East Asian Nations
ASI	Adam Smith International Pty Ltd
asl	Above sea level
ASTA	American Spice Trade Association
ASYCUDA	Automated Systems for Customs Date
Avansa	Avansa Agrikultura Project (USAID)
CBI	Centre for the Promotion of Imports (Netherlands)
CCT	Cooperativa Café Timor
cif	Cost, insurance & freight
DFAT	Australian Department of Foreign Affairs and Trade
EU	European Union
ESA	European Spice Association
FAO	Food and Agriculture Organization of the United Nations
FAQ	Fair Average Quality
fob	Free/freight on board
GoTL	Government of Timor-Leste
ha	Hectare
ISO	International Organisation for Standardisation
kg	Kilogram
km	Kilometre
M4P	Making markets work for the poor
MAF	Ministry of Agriculture and Fisheries
masl	Metres above sea level
MCIE	Ministry of Commerce, Industry and the Environment
MDF	Market Development Facility (Australian Aid)
MPWTC	Ministry of Public Works, Communications and Transport
MRG	Monitoring review group
MT	Metric tonne
NDPP	National Directorate of Policy and Planning
NGO	Non-government organisation
PSAF	Partnership for Sustainable Agroforestry Project (BMZ/EU)
SPS	Sanitary and Phyto-Sanitary
ToR	Terms of reference
UNIDO	United Nations Industrial Development Organisation
USAID	United States Agency for International Development
USD ($)	United States Dollar
USDA	United States Department of Agriculture

Executive Summary

The objectives of this assessment of spice value chains in Timor-Leste are to: i) identify spices with the best potential for further development; ii) map these value chains and identify constraints and root causes of underperformance; and iii) identify development opportunities and potential intervention areas for TOMAK. The value chain analysis was undertaken using the Making Markets Work for the Poor (M4P) approach and includes cloves, ginger, black pepper, long pepper, turmeric and vanilla.

Spices are mainly used for flavouring food and end-users include food processing industries; retailers supplying home consumers; and the catering sector. Globally, there is increasing demand for spices, although prices are falling year-on-year due to increased and intensified production in countries such as Vietnam and China. One exception is vanilla which has increased from USD7/kg farm-gate in Timor-Leste in 2015 to USD57/kg farm-gate in 2018. About 90% of spices are grown by smallholders and 80% of global production is for 'captive' use in producing countries such as India. The Asia-Pacific region accounts for 70% of global spice consumption by volume and is projected to be the fastest growing market. Growth in European Union and North American markets is slowing due to maturity of the market. Buyers are also becoming increasingly demanding regarding quality, food safety standards and sustainability certification.

Historically, small amounts of cinnamon, cloves, galangal, ginger, pepper and turmeric have been grown wild in Timor-Leste. Very little spice is consumed in Timor-Leste and opportunities to increase spice production have only recently been made possible through access to export markets provided by two or three trading companies, which are mainly coffee exporters. Cooperativa Café Timor has also supported industry growth by distributing cloves, pepper and vanilla seedlings to farmers with funding from United States Department of Agriculture and it is estimated there are now 6,000 spice farmers in Timor-Leste. Current annual production is estimated at 40 tonnes cloves, 20 tonnes black pepper and eight tonnes vanilla (fresh bean). Although prices are falling, they are still high compared with other crops and once the new seedlings are mature and can be harvested it is estimated spice exports will be worth nearly USD10 million, half of which is direct income for farmers.

The majority of spice seedlings have been planted by coffee farmers in existing coffee plantations, which provide an excellent growing environment for pepper and vanilla, with ready-made shade and climbing frames. Therefore most planting has taken place in uplands of Aileu, Ermera and Liquiça municipalities. Smaller production areas include the upland areas of Ainaro, Baucau and Viqueque municipalities. Farmers tend to let the spices grow wild with the only input being labour during harvest. Even though yields are low, this provides excellent returns on investment and labour, when compared with other crops. The exception is vanilla which requires hand pollination and is labour intensive.

Planting spices in coffee plantations reduces livelihood risks by diversifying income sources. Labour requirements for spices are complementary to coffee with vanilla harvest taking place before the coffee season and pepper and clove harvest taking place after the coffee season. Spice production fits well into agroforestry systems which are very appropriate considering Timor-Leste's topography. The main buyers are also coffee exporters and spices follow the same market channels as coffee, therefore institutional linkages are already established. Spice prices in Timor-Leste are determined by international market prices discounted backwards to the farm-gate.

If post-harvest treatments such as drying and cleaning are carried out correctly, spices can be stored for over six months and are also not affected by poor transport infrastructure, compared to perishable crops such as fresh vegetables. In short, spices appear to have multiple positive attributes and there are clear opportunities for increasing production in Timor-Leste.

TOMAK currently works in Baucau, Bobonaro and Viqueque municipalities and although wild socks of ginger and turmeric exist in these municipalities, they are not major spice producing municipalities. However, some coffee is grown in the higher elevation *suku* (villages) and it is possible to grow spices at lower elevations outside of coffee plantations, dependent on available shade and water. If TOMAK is to support spice production, it will be important to target these higher elevation *suku* and also develop production models for planting outside coffee plantations.

The assessment concludes that ginger, turmeric and long pepper are not viable if farmed commercially for the export market. All the above spices are harvested from wild stocks and if any were to be exported on a commercial basis, wild stocks would soon deplete. Therefore, planting would have to take place for annual cropping, requiring additional labour and investment. Current farm-gate prices are low and it is unlikely farmers would be willing to undertake annual cropping for export, considering the favourable returns from wild harvesting for the domestic market.

Cloves, black pepper and vanilla offer the best potential for further development in Timor-Leste. Clove prices are high and in addition to selling into the food ingredient market channel, there is a ready alternative market in the 'kretek' cigarette industry in Indonesia. However, further work is required in identifying the agronomic requirements for cloves. Some growers claim clove trees grow at a lower elevation but don't produce flowers. On the other hand, clove trees were grown successfully in Lospalos at an altitude of just 350m above sea level (asl) during Indonesian times. Agronomic literature states cloves must have a pronounced dry season during flowering in April and May, however, cloves grow successfully in Same which still receives some rain during these months.

Even though black pepper prices have fallen considerably over the past year, returns on investment are still high compared to other crops. There are ready market buyers and pepper prices are likely to recover over the next few years due to the cyclical nature of spice markets.

Vanilla prices are extraordinarily high at present and demand is unlikely to diminish as food processors do not appear deterred by the high prices. Although prices may fall as production resumes in Madagascar, returns are still expected to remain high compared to other crops in Timor-Leste.

This assessment concludes the 'regulatory environment' is not a constraint to performance of the spice value chain as agricultural policy is supportive, exports are tax free and exporters are satisfied with the Export Permits and phyto-sanitary declaration provided by the Ministry of Agriculture and Fisheries. Regarding transport infrastructure and services, although the road network is in disarray at the moment, it should be much improved over the next three years. Dili is also well connected to Singapore and international trading houses there, via regular cargo boats.

However, the assessment also concludes there is little opportunity to add-value through processing in Timor-Leste for spices destined for the export market. Most spices are exported dried and whole, with processing such as grinding, taking place in regions of consumption. Buyers are reluctant to source processed products from countries of origin due to concerns about quality, food safety and adulteration. Therefore, the main opportunity is to increase the number of spice farmers and area grown to supply export markets.

Main constraints affecting spice value chain performance are related to 'supporting functions', mainly because spice production is a relatively new phenomenon in Timor-Leste. For example it is difficult sourcing seedlings and projects have to propagate their own, rather than buying from private sector nurseries. This also adds to the time lag of three years between planting and first harvest, which can deter investment from projects as well as farmers.

Spice yields are low and very little maintenance is provided after planting. Technical know-how is difficult to find and farmers often leave pepper and vanilla vines to grow wild, which has a marked negative effect on yields and quality. Specific technical expertise is also required for hand pollinating vanilla. Training of trainers has been carried out for staff employed by projects but no technical support is available for farmers who are not direct beneficiaries of projects.

Spice production in Timor-Leste will always be a small fraction of global production and costs of production are higher than in other producing countries. Timor-Leste will never be able to compete on price but could compete on quality, if farmers are encouraged to improve quality through price premiums. There may also be potential to achieve price premiums through certification. Geographical Indication certification may be particularly appropriate for Timor-Leste, as has been achieved with Kampot Pepper in Cambodia.

Specific recommendations to improve the 'supporting functions' of the spice marketing system are as follows:

- Develop production models and techniques for cloves, pepper and vanilla production outside of coffee plantations for dissemination to interested farmers in Baucau, Bobonaro and Viqueque municipalities.
- Support establishment of private sector nurseries for the propagation of cloves, black pepper and vanilla seedlings.

- Create a cadre of ‘master farmer’ trainers in target municipalities to improve yields and quality.
- Facilitate smallholder aggregation.
- Introduce standardised grades related to price premiums to improve quality.
- Support accreditation to certification schemes to differentiate the product and add value.

Main Report

1. Background

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

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

The primary target area comprises inland mid-altitude areas that have some irrigation capacity. This zone includes around 66 *suku* (villages), located mainly in the Maliana basin (including most of Bobonaro) and the eastern mountain regions (including large parts of Baucau and Viqueque).

TOMAK is currently working on the development of four crop-based value chains: red rice, onion, peanuts and mung bean, but is looking to expand this portfolio to also include spices. A few projects and business are already involved in the production and marketing of spices, supplying both domestic and international markets. The most common spices currently being produced include cloves, pepper, vanilla, ginger, turmeric and long pepper (Tetum: *ai-manas ai-leten).*

2. Introduction

2.1. Objectives

The objectives of this assessment are to:

a) Identify spice value chains with the best potential for further development, based on production and market characteristics.

b) Map the core value chains for these spices and their market systems and identify constraints and root causes of underperformance.

c) In consultation with the TOMAK team and other relevant stakeholders, prioritise constraints and identify development opportunities and potential intervention areas for TOMAK.

2.2. Approach & methodology

The value chain analysis was undertaken using the Making Markets Work for the Poor Approach (M4P). A description of the M4P approach and background information on agricultural market systems in Timor-Leste can be found in the 'Market System and Value Chains Assessment' report prepared by TOMAK in 2016.[1]

Background documents on the spice sector were reviewed and the assessment team[2] interviewed key spice value chain stakeholders, including the MAF Director for Industrial Crops, private sector spice traders and donor project officers supporting spice development. A list of documents reviewed and persons met is provided in Appendices 1 and 2 respectively.

Field visits were made to Aileu, Ermera, Liquiça, Baucau, Viqueque and Lautem municipalities to interview spice farmers and carry out market surveys. The assessment concluded with a national validation workshop in Dili with key private sector players, government officials and donors.

[1] TOMAK (2016) *Market System and Value Chains Assessment,* Australian Aid.
[2] Adam Sendall and Luis Gusmão

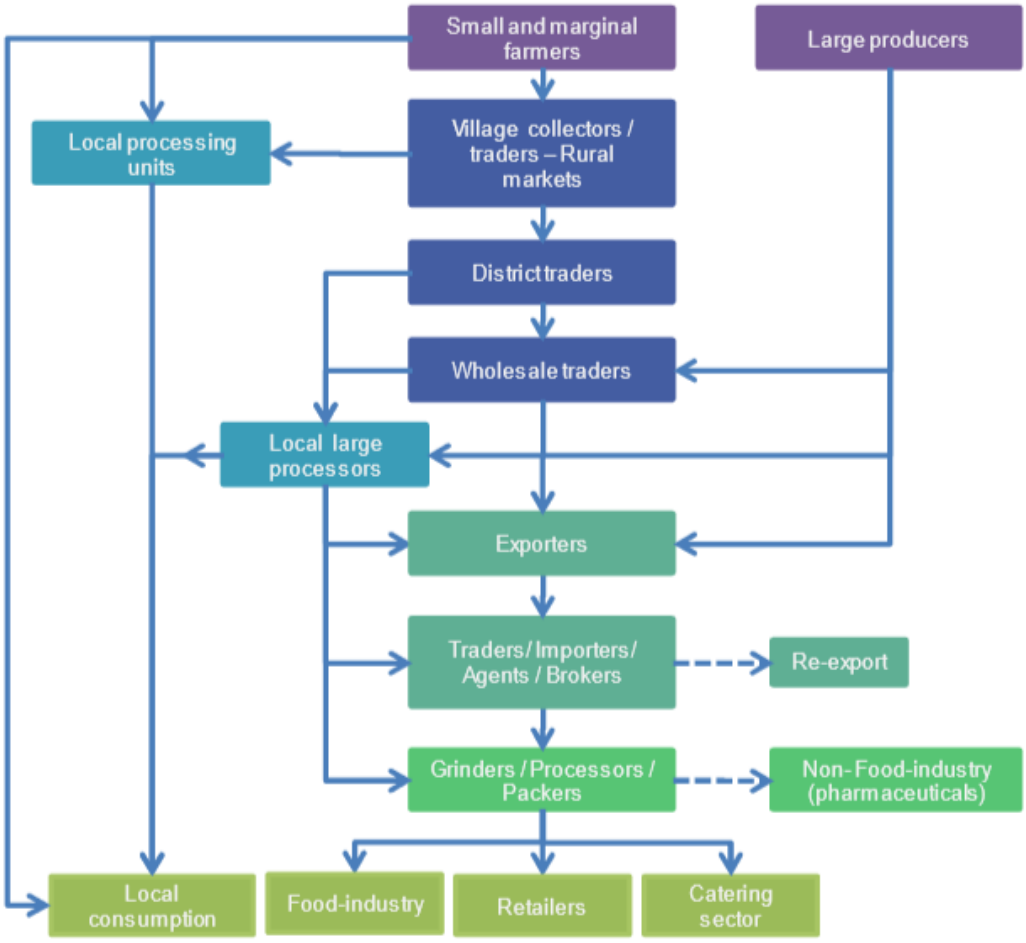
3. Spices: A Global Overview

Spices can be defined as non-leafy vegetable products such as roots, bark, stems and seeds used for flavouring, seasoning and imparting aroma in foods. Spices can also be used for medicinal purposes and in the production of cosmetics/perfumes. There are up to twenty spices of global economic and culinary importance including caraway, cardamom, cinnamon, cloves, coriander, cumin, galangal, ginger, nutmeg, pepper, star anise, turmeric and vanilla.

Up to 90% of spices are grown by smallholders. Traditionally, the main spice producing countries included India (pepper, ginger, turmeric, cumin) and Indonesia (cloves, nutmeg). However, other countries such as Vietnam (pepper) and China (ginger) have recently increased their spice production considerably. Nonetheless, India continues to be the largest producer and consumer of spices in the world.

About 80% of global production is for 'captive use' in the countries of origin with India exporting less than 20% of its production, resulting in it being a net importer of spices.[3] Vietnam is the most prominent export-oriented country and is responsible for approximately 50% of the global black pepper trade. Figure 1 summarises the main global market channels for spices.

Figure 1: Main Global Market Channels for Spices



Source: Pascale & von Opijnen (2010) *Could You Pass Me the Sustainable Pepper Please?* CREM.

Main international spice trading centres are Rotterdam, London and Hamburg for the European market, with countries such as Germany re-exporting after processing into final product. International trade in spices is concentrated between a small number of large multinational companies. Large international traders include

[3] CBI, Netherlands Ministry of Foreign Affairs

Olam, Euroma, Verstegen, Intertaste and NedSpice. Prominent grinders/processors/packers include Associated British Foods, Kraft Heinz, Unilever, Nestlé and McCormick.

Most spices are exported dried and whole, with processing such as grinding taking place in regions of consumption. Buyers are reluctant to source processed products from countries of origin due to concerns about quality, food safety and adulteration. Processors/packers purchase crude spices and perform cleaning, grading, grinding, blending and packaging; then distribute the ground or processed products to industrial users after this initial processing. Some processors manufacture end products to supply directly to retail or food service industries, integrating all post-production activities into one company.

Final users are:

(i) food processing industries (55-60% of the total use) that integrate spices in food and beverages manufactured for customers.
(ii) the retail sector (35-40% of total use) where consumers purchase branded spices sold for home consumption. These spices can be in many forms, such as powder mixtures, fresh/dried or essential oils and oleoresins.
(iii) the catering sector (10-15% of total use) such as restaurants, bakeries and confectioneries.[4]

A description of the global production and international trading of the spices included in this assessment is provided below.

- **Cloves**

Cloves are the flower buds of the clove tree which are dried and used whole, or powdered as a food ingredient, or processed into oil for cosmetics and medicine. However, the main use is in the manufacturing of 'kretek' cigarettes. Planting density is about 200 trees per hectare, with each tree producing about 20kg of fresh cloves/year, six years after planting. After drying this can produce 7kg dried cloves/tree/year. A distinct dry period is required during flowering for bud development to take place, otherwise output can be seriously affected by meteorological phenomena such as La Niña. Although maintenance requirements are low, harvesting is labour-intensive. Appendix 3 provides more information on the growing requirements for cloves and Appendix 4 shows the harvest calendar for the main clove producing countries.

Appendices 5 and 6 provide statistics on clove production and trade, respectively. Indonesia produces 77% of the world's cloves (139,522 tonnes) but is also a net importer (13,572 tonnes) as it consumes 90% of its own harvest, mostly for production of kretek cigarettes. India is the main importer, importing 20,580 tons in 2016/17.

Appendix 7 shows the international price for cloves over the past six years. Average prices have decreased from USD14,000/MT in 2013/14 to just above USD10,000/MT in 2017/18.

- **Ginger**

Although a perennial, ginger is grown as an annual crop with harvest taking place nine months after planting. The rhizome is harvested and can be used fresh or dried then ground into powder as a food and beverage flavouring. One hectare produces 16,000kg of fresh ginger, which is the equivalent of 4,000kg dried ginger. Appendix 3 provides more information on the growing requirements for ginger and Appendix 4 shows the harvest calendar for the main ginger producing countries.

Appendices 5 and 6 provide statistics on ginger production and trade, respectively. India is the largest ginger producer, producing 34% of world output (1,109,000 tonnes), however, it consumes most of the harvest domestically. Production in China has increased over recent years where much of production is mechanised. China is responsible for 72% of ginger exports (423,000 tons) and main importers are Pakistan, USA and Japan.

Appendix 7 shows the international price for ginger over the past six years. International prices peaked at just over USD5,700/MT in 2015/16 but have since fallen to USD4,873/MT in 2017/18, due to increased supply from China.

[4] Pascale & von Opijnen (2010) *Could You Pass Me the Sustainable Pepper Please?* Crem

- **Pepper**

Pepper is an evergreen vine with full production taking place three years after planting. As a creeping vine, pepper needs to be grown on supporting trees or specially erected poles with a planting density of 1,000 cuttings/ha. Each vine can produce 0.75kg black pepper a year. Freshly harvested 'green pepper' is dried to produce 'black pepper' and used as a food flavouring. 'White pepper' is black pepper with the mesocarp removed. Black pepper is usually exported dry and whole, with grinding taking place in the importing country. Appendix 3 provides more information on the growing requirements for pepper and Appendix 4 shows the harvest calendar for the main pepper producing countries.

Appendices 5 and 6 provide statistics on pepper production and trade, respectively. Vietnam is the largest pepper producer, producing 40% of the world's output (216,432 tonnes) and is also responsible for 32% of exports (13,000 tons). USA is the largest importer of black pepper, importing more than twice any other country (205,941 tons).

Appendix 7 shows the international price for black and white pepper over the past six years. International prices for black pepper reached a peak of USD10,364/tonne in 2014/15 but have fallen by half to USD5,072/tonne in 2017/18, due to increased production in Vietnam. Appendix 7 also shows the difference between prices in producing countries (fob Indonesia) and consuming countries (cif New York) are about 9%. Price differences between black and white pepper are high. One tonne of black pepper currently fetches USD5,072/tonne on the international market. The same tonne of black pepper produces 835kg of white pepper after processing which fetches USD7,960/tonne on the international market.

- **Turmeric**

Although a perennial, turmeric (like ginger) is grown as an annual crop with harvest taking place 10 months after planting. One hectare produces 10,000kg of fresh turmeric, which is the equivalent of 2,000kg dried turmeric. The rhizome is harvested and can be used fresh, dried or dried and ground into powder. The powder is mainly used as a food colouring or medicinal food supplement. Appendix 3 provides more information on the growing requirements for turmeric and Appendix 4 shows the harvest calendar for the main turmeric producing countries.

Appendices 5 and 6 provide statistics on turmeric production and trade, respectively. India is the largest turmeric producer, producing 80% of world output (1,130,000 tonnes), however, it consumes most of the harvest domestically. India is responsible for 87% of the world's export of turmeric (81,756 tonnes) and is also the world's largest importer (13,826 tonnes/year).

Appendix 7 shows the international price for turmeric over the past six years. International prices reached a peak at just over USD3,749/MT in 2013/14 but have fallen slightly to USD3,197/MT in 2017/18.

- **Vanilla**

Vanilla is a perennial vine of the orchid family with full production taking place three years after planting. When grown intensively under shade nets, 2,500 vines can be planted over one hectare. As a creeping vine, vanilla needs to be grown on supporting trees or trellises. Vanilla production is labour intensive and requires hand pollination and post-harvest processing into 'cured' beans. Appendix 3 provides more information on the growing requirements for vanilla.

Appendices 4 and 5 provides statistics on vanilla production and trade, respectively. Madagascar is the largest vanilla producer, producing 37% of the world's vanilla (2,926 tonnes). Madagascar is also the largest exporter (1,605 tons) and USA the largest importer of vanilla. Vanilla is an important flavouring in soft drinks, dairy products and baking/confectionary.

Appendix 7 shows the international price for vanilla over the past six years, which has risen from USD50/kg in 2013 to USD500/kg in 2018. Vanilla prices can vary considerably between the high peaks currently being experienced and lows, due to Madagascar being susceptible to cyclone damage, such as happened with Cyclone Enawo in 2017. Although artificial synthetic vanilla can be produced from lignite, demand for the natural product remains strong.

3.1. Market drivers & future trends

There continues to be a growing demand for spices due to increasing popularity in ethnic cuisine, healthy foods and an increasing consumption of convenience processed and ready-to-eat dishes, which often rely on spices and herbs to retain and enhance food flavour.

Global consumption of spices is expanding steadily with growth rates of between 2% and 5% per annum. Asian-Pacific and European consumers are the largest consumers of spices, and the global market is projected to exceed USD16 billion by 2019.[5]

Spice market prices can be volatile and there has been a general decline in prices over recent years due to large increases in production in Vietnam and China. Exceptions are cinnamon and cassia as supply has decreased owing to farmers substituting with other crops after previous years of low prices. Vanilla has experienced a recent meteoric increase in price due to Cyclone Enawo damage in Madagascar in 2017.

Previously, exports to developed economies in the EU, USA and Japan accounted for half the world's export trade. The market for spices in developed economies such as Europe and North America will continue to grow, but more slowly than in other regions due to maturity of the industrial sector. Asia-Pacific accounts for approximately 70% of spice consumption by volume and is projected to be the fastest-growing market with an annual growth rate of 8% from 2014 to 2019. The growing domestic demand for spices in China and India will lead to less exports to the EU from these countries.[6]

Whilst demand remains strong in Asia, supplying European markets is becoming increasing difficult due to compliance with food safety requirements. For example there has been a growing problem with pesticide residues in pepper from Vietnam. Other food safety concerns include mycotoxin (e.g. aflatoxin) and microbiological (e.g. salmonella) contamination, unauthorised food additives and adulteration, and maximum levels of polycyclic aromatic hydrocarbons being exceeded.[7]

European buyers are also becoming more concerned with 'sustainability' and the 'Sustainable Spices Initiative' was established in 2012 with members including most of the larger spice traders and processors. One of their objectives is to reach, or exceed, 25% sustainable sourcing in at least the top three product categories by 2025. Members of the Sustainable Spice Initiative have invested in training farmers and exporters to comply with Rainforest Alliance requirements and subsequent certification.

Food safety and sustainability certification requires transparent supply chain systems for traceability, which is a considerable additional cost. Consequently, processors/packers are strengthening upstream linkages with suppliers and importing their spices directly from supplying countries, rather than through intermediary brokers or traders.

In addition to an emergence of two distinct geographical market segments in EU/North America and Asia-Pacific with their differing food safety and sustainability requirements, there has been a growth in value-added products such as essential oils, oleoresins, speciality extracts and blends in addition to the final ground product. There has also been an emergence of smaller spice processors catering to a premium market with specialty products, which includes organic and natural spices, as well as a ready private-label market.

4. Spice Production in Timor-Leste

Timor-Leste is located 9º south of the equator, ideally placed within the 20º equatorial spice belt, and close to the historical spice islands of the Moluccas. Common spices grown in Timor-Leste are cinnamon, cloves, galangal, ginger, pepper, turmeric, and recently vanilla. Spices are generally grown in the same areas as coffee and are often inter-cropped within coffee plantations. The main production areas are therefore in the uplands of Aileu, Ermera and Liquiça municipalities. Smaller production areas include the upland areas of Ainaro, Baucau and Viqueque municipalities. The average elevation for spice production is estimated between 500 and 600

[5] Transparency Market Research, *Seasonings and Spices Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast, 2013 – 2019*

[6] Transparency Market Research, *Seasonings and Spices Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast, 2013 – 2019.*

[7] CBI, Netherlands Ministry of Foreign Affairs

meters above sea level (masl), although they can be grown at lower elevations dependent on shade and water availability.

With the exception of vanilla, spices are produced with very little maintenance in Timor-Leste. Once planted, pepper and cloves only require labour at harvest and ginger and turmeric are harvested from wild stocks as required. No fertilisers or sprays are used to increase productivity and although yields are low, return on investment and labour is high.

It is estimated just over 6,000 farmers currently grow spices in Timor-Leste. Current annual production is 40 tonnes of cloves, 20 tonnes of black pepper and eight tonnes of fresh vanilla beans. Wild stocks of ginger and turmeric cannot be estimated. Although output is small, considerable new planting of cloves, pepper and vanilla has taken place over the past three years as shown in Table 1.

Table 1: New Planting of Cloves, Pepper and Vanilla (no. of seedlings)

SPICE / DISTRICT	Aileu	Ainaro	Baucau	Bobonaro	Ermera	Lautem	Liquiça	Viqueque	Sub-Total	TOTAL
Cloves (Avansa)	1,130	1,780		475	950				4,335	**84,182**
Cloves (USDA)	35,230		3,783			12,841		7,993	59,847	
Cloves (CommEx)							20,000		20,000	
Pepper (Avansa)	1,130	1,780		475	1,425				4,810	**69,891**
Pepper (USDA)	29,478		3,426			17,543		13,134	63,581	
Pepper (CommEx)							1,500		1,500	
Vanilla (Avansa)	1,130	1,780		475	950				4,335	**53,822**
Vanilla (USDA)	17,220		7,659			17,260		7,348	49,487	

The majority of the new planting has been supported by the USDA-funded Timor-Leste Agribusiness Development project, with other planting supported by the USAID-funded Avansa project and the privately financed Commodity Exchange company in Liquiça municipality. Allowing for mortalities and low average yields, it is expected spice production will increase to the following volumes after three years when harvests of the new plantings come on line:

Cloves (dry): 84,182 trees x 70% survival rate x 7kg/tree + 40,000kg existing harvest = 452 tonnes, an increase of 1,000%.

Pepper (dry): 69,891 vines x 50% survival rate x 0.75kg/vine + 20,000kg existing harvest = 46 tonnes, an increase of 130%.

Vanilla (fresh bean): 53,822 x 50% survival rate x 0.50kg/vine + 8,000kg existing harvest = 21 tonnes, an increase of 163%.

Based on current prices and volumes of production, the export of spices is worth USD2,296,000 to the Timorese economy and provides a direct cash income of USD896,000 to farmers. Based on recent new planting and growth as described above, this will increase to exports worth USD9,547,800 and a direct cash income of USD4,909,000 to farmers by 2020. Spices are the second largest agricultural export after coffee which had an export value of USD24 million in 2016[8].

[8] GDS (2016) *External Trade Statistics 2016*, MoF

- **Spice production in TOMAK target municipalities**

As stated above, spices are generally grown in the coffee growing areas and very little coffee is grown in Baucau, Bobonaro or Viqueque municipalities. Nonetheless, Table 1 shows some planting of cloves, pepper and vanilla has recently been undertaken in these municipalities. Discussions with MAF and market surveys in each of the municipalities identified the following administrative posts as growing some spices:

Baucau:	Baguia (ginger, turmeric); Baucau (pepper); Laga (turmeric); Quelicai (ginger); Venilale (vanilla, pepper, ginger, turmeric)
Bobonaro:	Maliana Vila (ginger, turmeric), Cailaco (ginger, turmeric), Bobonaro (ginger, turmeric)
Viqueque:	(ginger, pepper, turmeric); Uatucarbau (vanilla, pepper); Uatulari (turmeric): Viqueque (pepper), Ossu (ginger, turmeric)

The areas with best potential will be the *suku* located at higher elevations. Spices can be grown out of coffee growing areas at lower elevations but need to be provided with shade and water.

4.1. Cloves *(Syzygium aromaticum)*

Small clove plantations were established during the Indonesian regime in the Laulara administrative post of Aileu municipality and the Lospalos administrative post of Lautem municipality to supply the Indonesian 'kretek' cigarette market. Table 1 shows that in the past few years an additional 84,000 seedlings have been planted in Aileu, Ainaro, Baucau, Bobonaro, Ermera, Lautem, Liquiça and Viqueque municipalities.

The expansion in clove production has been carried out by propagating seedlings using seeds from existing trees. Although up to 200 trees can be planted per hectare, farmers in Timor-Leste commonly plant clove trees amongst other tree crops. Once established, they provide little maintenance as no fertilisers or sprays are used. It is estimated 3,000 farmers grow cloves but tree ownership varies considerably, with individuals planting anything between 10 and several hundred trees, depending on individual capacity. The larger farmers are required to hire labour during harvest.

Cloves can be harvested five to six years after planting, usually between the months September and October. One tree produces an average of 7kg of dried cloves a year. With the current farm-gate price of USD7.50/kg, a single tree produces a gross annual income of USD52.50.

4.2. Ginger (*Zingiber officinale*)

Ginger in Timor-Leste is harvested from wild stocks as required, throughout the year, with the remaining rhizomes multiplying naturally. Large wild stocks reportedly exist in Baucau and Viqueque municipalities and exporters have managed to source volumes up to 400kg for single shipments. The current farm-gate price for fresh ginger is USD0.80/kg.

If ginger exports were to increase, wild stocks would soon deplete and need to be replanted as an annual crop. Ginger can be cultivated intensively to achieve yields of 16,000kg/ha of fresh root, however this requires additional investment and up to 350 days/ha/year of labour input, a significant disadvantage compared with harvesting wild stocks, which requires no investment.

4.3. Pepper *(Piper nigrum)*

Pepper is mainly grown in Aileu, Lautem and Viqueque municipalities. Table 1 shows that in the past few years an additional 70,000 vines have been planted in Aileu, Ainaro, Baucau, Bobonaro, Ermera, Lautem, Liquiça and Viqueque municipalities.

The expansion in pepper production has been carried out by propagating cuttings from existing vines. Farmers in Timor-Leste commonly plant pepper vines amongst other tree crops or host trees and once established, provide little maintenance, as no fertilisers or sprays are used. Although the use of trellises and posts has been introduced, most of the pepper is left to grow unchecked reaching heights of several meters with the upper reaches not able to be harvested.

It is estimated 2,000 farmers grow pepper but ownership varies considerably with individuals planting anything between ten and several hundred vines, depending on individual capacity. The larger farmers are required to hire labour during harvest.

Pepper can be harvested three years after planting, usually between the months of September and October. One vine produces 0.75kg of dried black pepper a year. With the current farm-gate price of USD4/kg, a single vine produces a gross annual income of USD3.

There is potential to increase productivity through improved management and also expand into lower elevation areas, which also requires improved shade and water management. If farmed intensively 1,000 vines can be planted over 1ha but labour requirements increase to 150 days labour input/year.

4.3.1. Long pepper (*Piper retrofactum*)

Long pepper grows wild, with the largest number of vines reportedly in Baucau municipality. Long pepper is mostly used as a traditional medicine. Collectors harvest the drupes and after drying, sell to vendors in local markets. Farm-gate prices are low compared to black pepper, at just USD0.50/kg.

Long pepper is similar to black pepper but with a more fragrant aroma and hotter taste and has traditionally been preferred for the preparation of stews and pickles in Indian cuisine. Although found in international markets as a specialty food ingredient, it is not traded as a major commodity. Due to its low price, low production and limited export potential, long pepper is discarded from any further analysis for the purpose of this assignment.

4.4. Turmeric *(Curcuma longa)*

Turmeric in Timor-Leste is harvested from wild stocks as required, throughout the year, with the remaining rhizomes multiplying naturally. Turmeric is processed into powder in Timor-Leste and used as a food colouring, for example to make *ketupat* (rice packed and cooked in woven coconut leaves) and traditional medicine. Quality testing of the local variety has shown a more than acceptable curcumin content. Large wild stocks reportedly exist in Baucau and Viqueque municipalities and traders have managed to source volumes up to 600 tonnes for export. The current farm-gate price for fresh turmeric is USD0.10/kg.

Turmeric can be cultivated intensively to achieve yields of 10,000kg/ha of fresh root, however this requires additional investment and labour of up to 350 days/ha/year of labour input, a significant disadvantage compared with harvesting wild stocks which require no investment.

4.5. Vanilla *(Vanilla planifolia)*

Vanilla is mostly produced in Aileu and Lautem municipalities with lesser amounts grown in Ainaro, Bobonaro, Ermera and Viqueque municipalities. The expansion in vanilla production has been carried out by propagating cuttings from existing vines. Farmers in Timor-Leste commonly plant vanilla vines amongst other tree crops on host trees and once established, provide little maintenance, as no fertilisers or sprays are used. It is estimated 1,200 farmers grow vanilla at present.

Vanilla production requires dedicated labour with specialist skills in hand pollination and also curing of the fresh beans after harvest to produce a final product. Pollination must take place in the mornings and a skilled pollinator can hand pollinate 1,500 flowers a day. Farm-gate fresh bean prices have escalated from USD7/kg in 2015, to USD17/kg in 2016, to USD35/kg in 2017, to a current high of USD57/kg in 2018. A single vine can produce 0.50kg of fresh bean a year and provide a gross annual income of USD28.50.

There is potential to increase productivity through improved management and also expand into lower elevation areas, which also requires improved shade and water management. Vanilla can be grown intensively with 2,500 vines/ha under shade nets with drip irrigation but requires 450 days/ha/year of labour input. Timorese vanilla reportedly has high vanillin content but quality could be improved through harvesting at the correct stage of bean maturity/ripeness. Farmers are often tempted to harvest before maturity to prevent theft, which reduces the vanillin content and subsequent flavour and aroma of the cured beans.

4.6. The role of women in spice value chains

The division of labour in spice value chains is analysed by chain segment.

- **Production and on-farm post-harvest segment**

The role of women in the 'production' segment of spice value chains does vary between spice types. Customarily, women have harvested wild ginger and turmeric as they are used in local cooking and the preparation of traditional medicines, both of which are considered women's work.

Cloves, pepper and vanilla have only recently been introduced to Timor-Leste, so are less tied to traditional norms. Based upon what appears to be a pragmatic sharing of labour, men tend to plant and harvest as it is considered heavier work; whilst women carry out post-harvest activities such as cleaning, drying and sorting which can be performed at home. The hand pollination of vanilla tends to be carried out by men only because it is men who have been trained and this could just as well be carried out by women.

- **Trading segment**

Local vending of spices in local markets is predominantly carried out by women. Export trading of spices is carried out by men, currently dominated by foreigners.

5. Market Linkages in Spice Value Chains

The spice sector in Timor-Leste is characterised by a small number of buyers. Value chains are short with very personalised market linkages in that each exporter sells to a specific buyer, none of whom the other exporters supply.

The spice sector is also unusual in that there are no local traders or collectors aggregating produce from farmers to sell to wholesalers. Farmers sell their spices direct to vendors in local markets or boutique packers in Dili or exporters. Exporters don't have any supply contracts with farmers and buy from individuals, not groups.

5.1. Institutional & spatial commodity flows

The spice value chain in Timor-Leste is made up of about 6,000 farmers, usually coffee farmers, who have planted spice seedlings within their coffee plantations. In addition to the supplemental income, it is also a means of diversifying earnings and reducing risk. The harvesting of vanilla is usually before the coffee season and

harvesting of pepper and cloves after the coffee season, so there is no conflict of labour requirements between the crops.

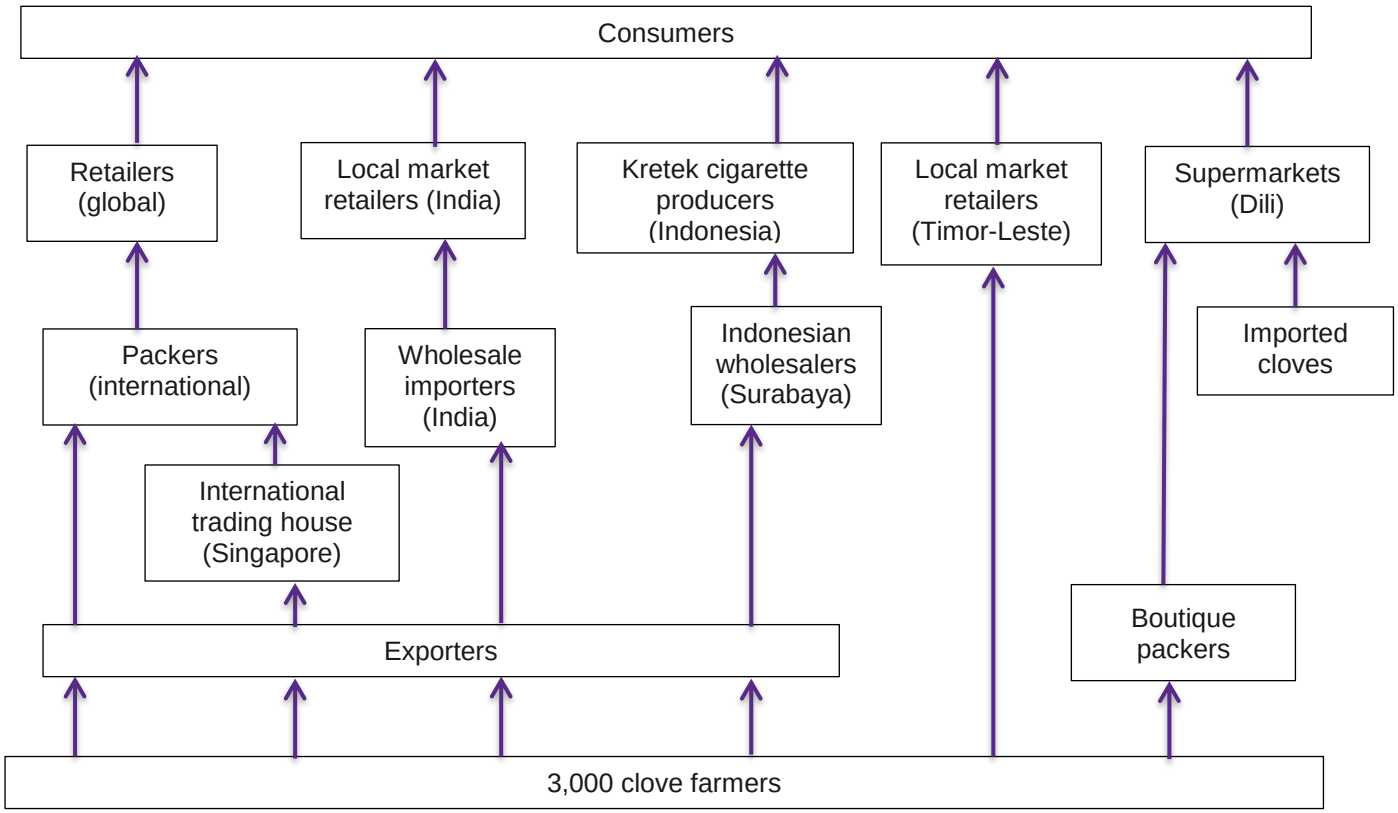
Very little spice is consumed domestically in Timor-Leste. Minor amounts of ginger and turmeric are sold in local markets and small amounts of pepper, ginger and turmeric are bought by boutique packers (e.g. Timorganic) for processing and sale to Dili supermarkets. The pepper most commonly found in local markets is white pepper imported from Indonesia as Timorese pepper is mostly exported.

Most if not all cloves, vanilla and pepper are exported. There are three main export traders (CCT, Timor Global and Commodities Exchange), two of whom are primarily coffee exporters. This capitalises on existing farmer linkages as they also buy coffee from the spice farmers. Unless sold direct to processors such as McCormick, spices follow the same market channel as coffee, through international trading houses in Singapore such as ECOM.

- **Cloves**

Figure 2 shows institutional and spatial commodity flow for cloves. The domestic market demand for cloves is tiny. Farmers may sell small amounts to retailers in local markets or to boutique packers in Dili. The boutique packers clean, sort and pack the cloves before selling onto supermarkets in Dili. The supermarkets also stock small amounts of imported cloves (whole and ground) from international packers.

Figure 2: Institutional and Spatial Commodity Flow for Cloves



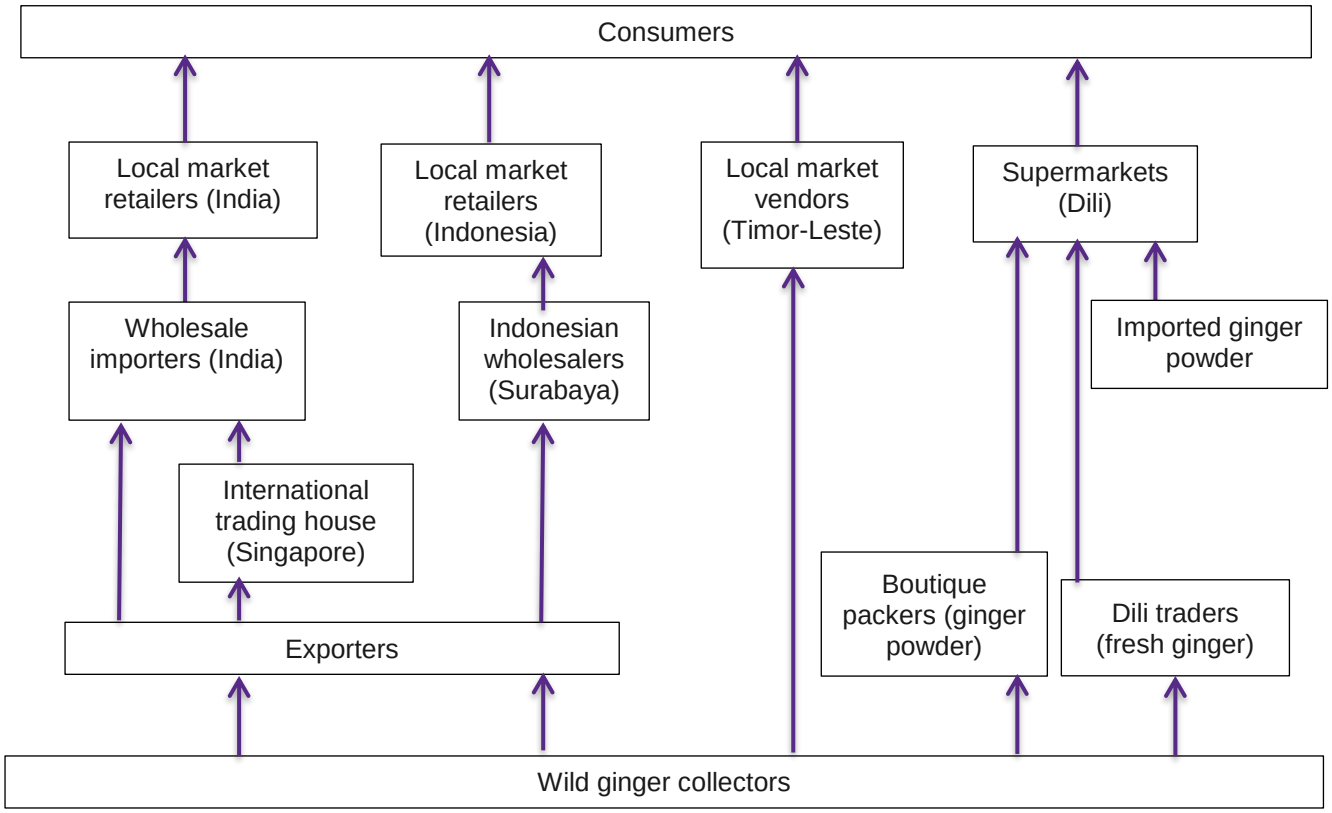
The majority of cloves are exported dried and whole; after being cleaned, sorted and bagged. CCT is the largest trader, exporting direct to McCormick, a large herb and spice packer in the USA. Other traders, such as Timor Global, sell through international trading houses in Singapore such as ECOM, which then supplies international packers or kretek cigarette manufacturers in Indonesia. Commodity Exchange exports direct to Indian wholesalers and Gajah Mada exports overland to Surabaya in Indonesia via Atambua, to supply the kretek cigarette industry.

- **Ginger**

Figure 3 shows institutional and spatial commodity flow for ginger. Small amounts of ginger are sold fresh in local markets, sourced directly from wild ginger collectors. Boutique packers may also buy ginger from the wild

collectors for drying, grinding and packing for sale to Dili supermarkets. The supermarkets also stock small amounts of imported ginger powder from international packers.

Figure 3: Institutional and Spatial Commodity Flow for Ginger

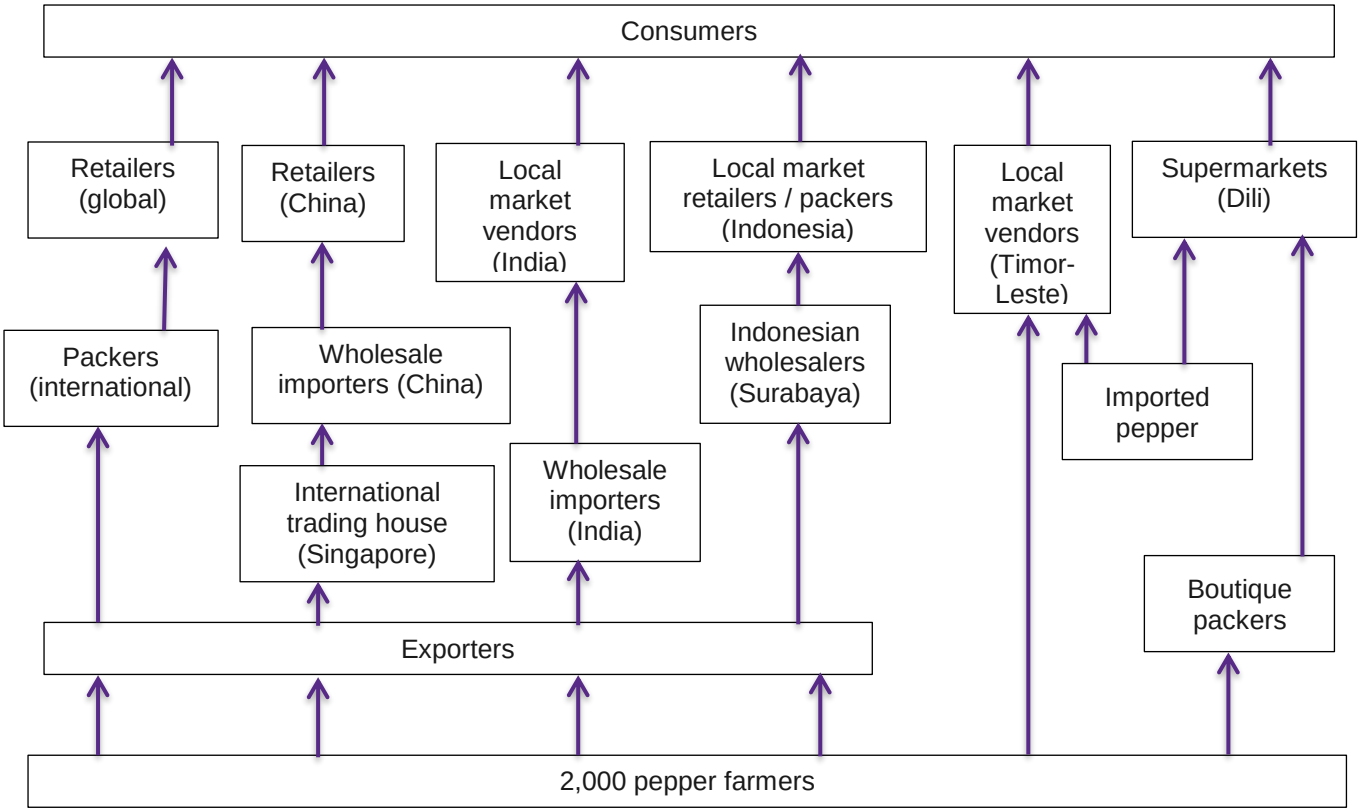


Small amounts of fresh ginger are also sold in supermarkets, sourced from Dili traders. Exporters such as Timor Global and Commodity Exchange, export dried ginger slices to India directly or through Singapore traders. Gajah Mada exports dry ginger slices overland to Indonesian wholesalers in Surabaya via Atambua.

- **Pepper**

Figure 4 shows institutional and spatial commodity flow for pepper. Farmers may sell small amounts of dried black or white pepper to retailers in local markets or to boutique packers in Dili. The boutique packers clean, sort and pack the pepper before selling onto supermarkets in Dili. The supermarkets also stock imported pepper (whole and ground) from international packers. Imported white pepper from Indonesia is frequently found in municipal local markets, as most Timorese pepper is exported after harvest.

Figure 4: Institutional and Spatial Commodity Flow for Pepper

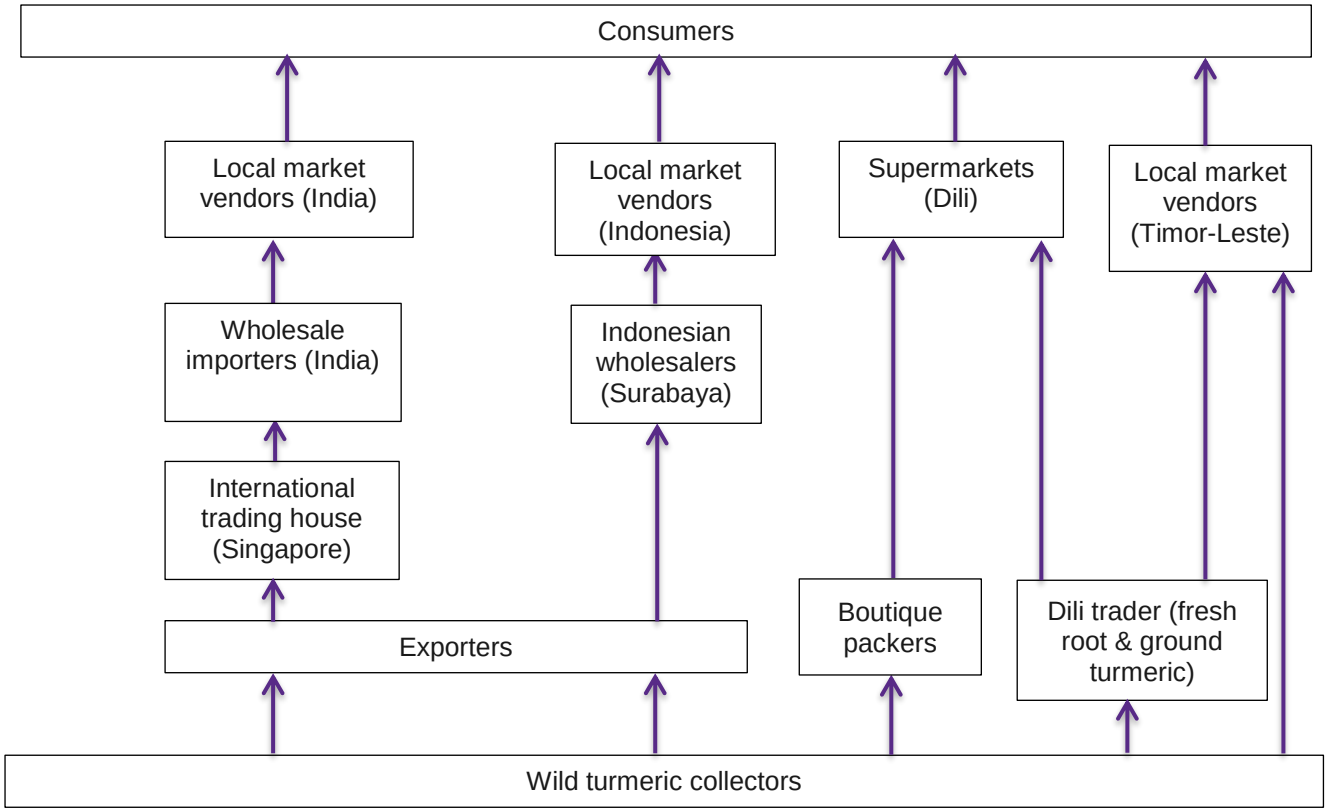


The majority of pepper is exported dried and whole; after being cleaned, sorted and bagged. CCT is the largest trader, exporting direct to McCormick in the USA. Other traders, such as Timor Global, sell through international trading houses in Singapore such as ECOM, which then supplies international packers or wholesale importers in China. Commodity Exchange exports direct to Indian wholesalers and Gajah Mada exports overland to wholesalers in Surabaya in Indonesia via Atambua.

- **Turmeric**

Figure 5 shows institutional and spatial commodity flow for turmeric. Small amounts of turmeric are sold in local markets, either fresh or dried and ground. The turmeric is sourced directly from wild turmeric collectors, or Dili-based traders, who also supply Dili supermarkets with small amounts of fresh turmeric. Boutique packers may also buy turmeric from the wild collectors for drying, grinding and packing for sale to Dili supermarkets. The supermarkets also stock small amounts of imported turmeric powder from international packers.

Figure 5: Institutional and Spatial Commodity Flow for Turmeric

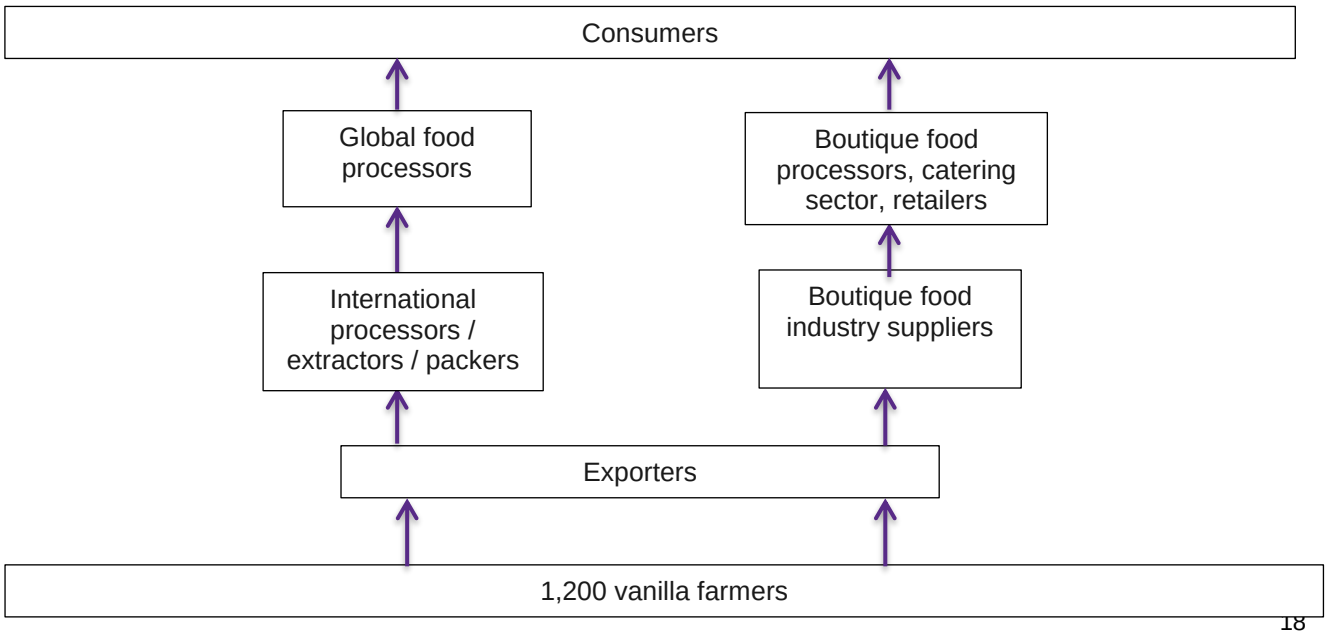


Exporters, such as Timor Global export dried turmeric powder to India through Singapore traders. Gajah Mada exports dry turmeric slices overland to Indonesian wholesalers in Surabaya via Atambua.

- **Vanilla**

Figure 6 shows institutional and spatial commodity flow for vanilla. CCT is the largest exporter of cured vanilla beans, supplying industrial extractors/processors/packers such as McCormick in the USA. Industrial processors then supply large food processors, for example Unilever, who make final food products such as ice-cream. Other smaller exporters sell to food industry suppliers who provide food ingredients for smaller niche market food processors and the catering sector.

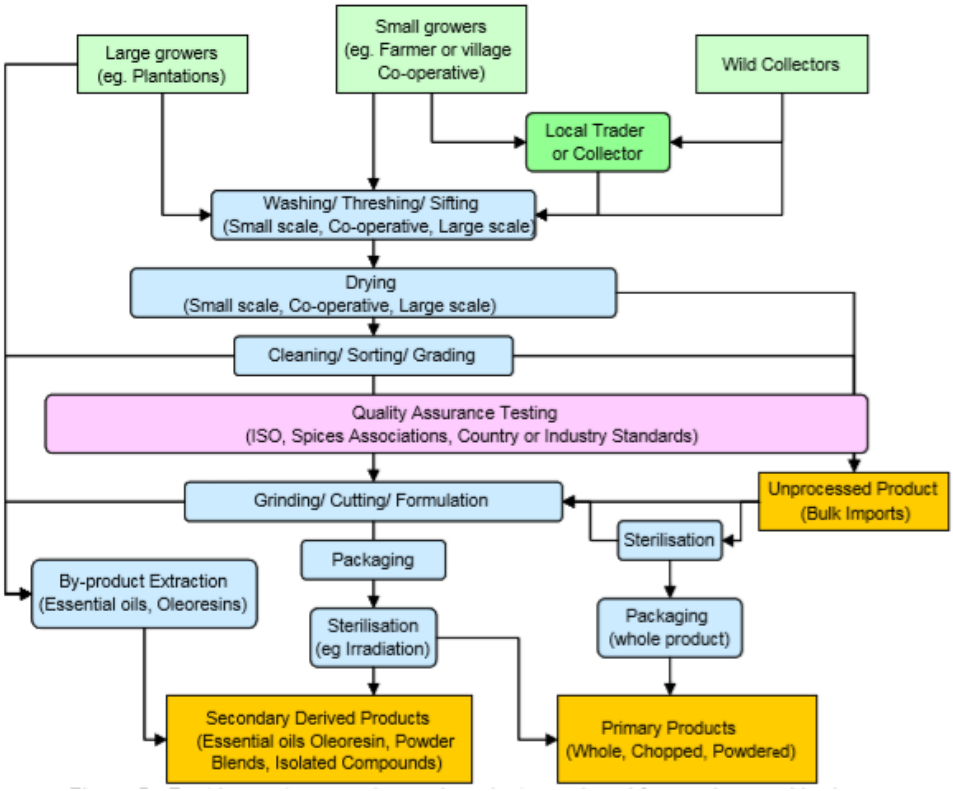
Figure 6: Institutional and Spatial Commodity Flow for Vanilla



5.2. Value-addition

Figure 7 summarises the procedures involved in processing spices on a commercial scale and shows the transformation from raw material to finished product.

Figure 7: Post-harvest Processing and Products Produced



Source: UNIDO (2005) *Herbs, Spices & Essential Oils: post-harvest operations in developing countries,* Austria

Post-harvest operations in Timor-Leste are much simpler than those described in Figure 7. Washing, cleaning/sorting, grinding/cutting and packaging is usually carried out by individual farmers by hand. No machinery is used and drying is carried out in the sun. With the exception of vanilla, no grading is carried out and also no sterilisation. Some processing is carried out, such as vanilla curing and turmeric grinding, but most spices are exported as unprocessed bulk.

Value can be added spatially (transport), temporally (storage) and by transformation (processing). Many buyers in the EU and US markets are hesitant to buy processed spices from developing countries due to concerns regarding adulteration. Furthermore, some EU buyers demand steam-sterilised spices to combat microbiological contamination and some US buyers prefer the irradiation of spices to kill pathogenic organisms. Steam sterilisation machinery costs several hundreds of thousands of dollars and is not financially viable considering Timor's current level of production.

The food industry prefers oils and oleoresins to dried spices but this also requires specialist machinery as essential oils are produced by steam distillation and oleoresins by solvent extraction. Again, production levels in Timor-Leste are too small to warrant investment in this type of machinery.

Once cleaned and dried, usually to around 12% moisture content, spices can be stored for over six months. In Timor-Leste, storage is not carried out to add value over time but spices are stored until a saleable volume has been aggregated to put in a container.

As an internationally traded commodity, Timorese spices end up all over the world. Fortunately Dili has direct shipping links to Singapore which is a major cargo hub and where commodity trading houses are located.

For bulk export whole dried cloves, pepper, ginger and turmeric are packed in jute sacks weighing between 36-65kg. If ginger or turmeric are sliced and powdered, it is packed in multi-walled laminated bags weighing 12.5kg or 25kg. Vanilla is sold in wax paper lined boxes. For retail purposes in Dili supermarkets, spices are sold in food-grade polypropylene pouches weighing between 10 and 50 grams (as shown in the photo to the right).

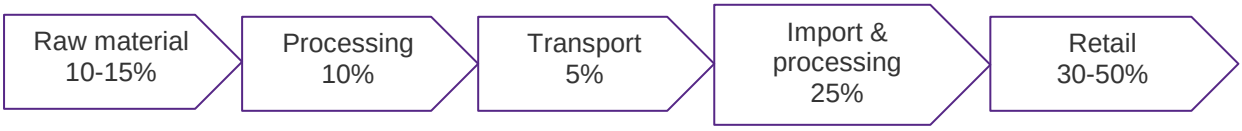
5.3. Value added in Timor-Leste

As so little spice is consumed in Timor-Leste, spice farmers are dependent on the export market. Spice prices in Timor-Leste are determined by international market prices and discounted backwards to the farm-gate. Exporters have access to this price information on a daily basis via various trading websites. Although spice prices can fluctuate widely depending on seasonal harvests across the world, farmers in Timor-Leste tend to sell their spices shortly after harvest to gain quick access to money and don't carry out any storage. As exporters often have to wait several months to aggregate enough volume for shipment, there is a risk the international price could have changed between buying from farmers and selling to international brokers.

There is a considerable variance between spice prices in Dili supermarkets. As spices are usually sold in small packets, the price differences do not appear significant until multiplied up to kilogramme equivalents. For example, cloves and clove powder imported from Portugal retails for USD100/kg and USD107/kg respectively, whereas whole cloves and clove powder from Indonesia retails for USD22/g and USD30/kg respectively. This suggests that as only small amounts of spices are used in cooking, they are relatively price inelastic.

Figure 8 shows the indicative price breakdown for spices sold in supermarkets, although it does vary between spices and the amount of processing carried out. Import and processing costs account for the largest proportion of costs due to the distance between producing and consuming countries. Retailers, such as supermarkets, usually make the highest margins in the value chain.

Figure 8: Indicative Price Breakdown for Spices Sold in European Supermarkets



Source: ProFound

Value chain margin analysis carried out below shows the largest margins going to boutique packers supplying Dili supermarkets. However, quantities sold are low and they are significantly cheaper than spices imported from other countries.

- **Cloves**

Farmers carry out post-harvest drying to about 12% moisture content after which no further processing is undertaken in Timor-Leste. Although cloves don't require steam sterilisation, international clove buyers demand a high level of purity and will not tolerate adulteration from dust, hair, etc. This can result in a 10% loss in weight during cleaning.

Figure 9 shows the value added along the marketing chain for cloves as a food ingredient which enjoys a 20% premium over cloves for kretek cigarettes. Exporters make a margin of USD2.80/kg before deducting costs, whereas boutique packers make a margin of USD20.50 before deducting costs.

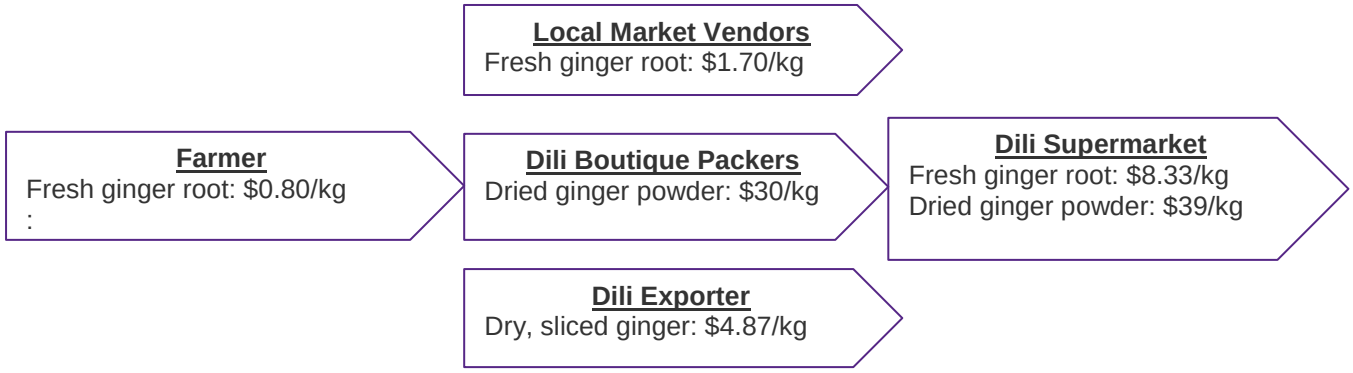
Figure 9: Cloves Value Addition

- **Ginger**

Farmers wash the ginger after harvest and sell as a fresh root. Ginger can be used fresh in cooking or the root dried and powdered. If exported, ginger is usually dried in the country of origin to about 10% moisture content, then ground by the packer in the importing country.

It takes 4kg of fresh ginger to produce 1kg of dry ginger. Therefore if fresh ginger costs USD0.80/kg, the processing parity price for dry ginger is USD3.20/kg. Figure 10 shows the value added along the ginger marketing chain. Exporters make a margin before deducting costs of USD1.67/kg, whereas ginger powder packers make a margin of USD26.80/kg before deducting costs.

Figure 10: Ginger Value Addition



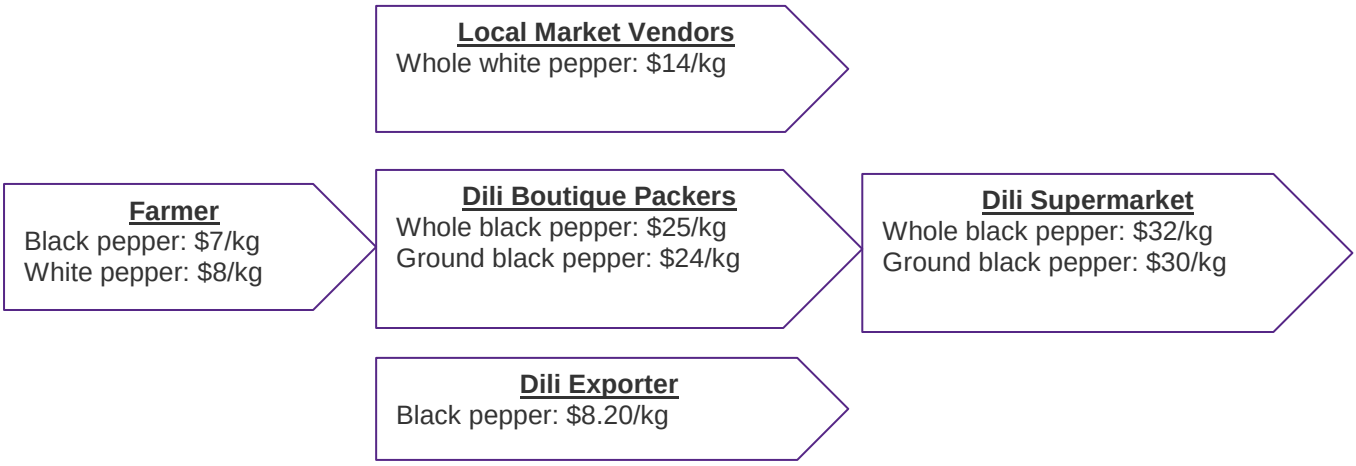
- **Pepper**

The value added in Figure 11 is based on 2017 prices. When harvested, the farm-gate price for pepper in 2018 is expected to be lower at USD4/kg.

After harvest, farmers dry green pepper to 12% moisture content to produce black pepper. Some farmers may also soak and remove the black mesocarp to produce white pepper. It takes 1.18kg of black pepper to make 1kg of white pepper, giving a processing parity price of USD8.26/kg for white pepper, which is higher than the USD8/kg farmers actually receive for white pepper. This suggests that value is actually lost processing black pepper into white pepper.

Boutique packers also produce ground black pepper at a slightly lower price than whole pepper, as broken corns are used, which would otherwise be discarded. Figure 11 shows exporters make a margin of USD1.20/kg before deducting costs, with boutique packers making a higher margin of USD18/kg before deducting costs.

Figure 11: Pepper Value Addition



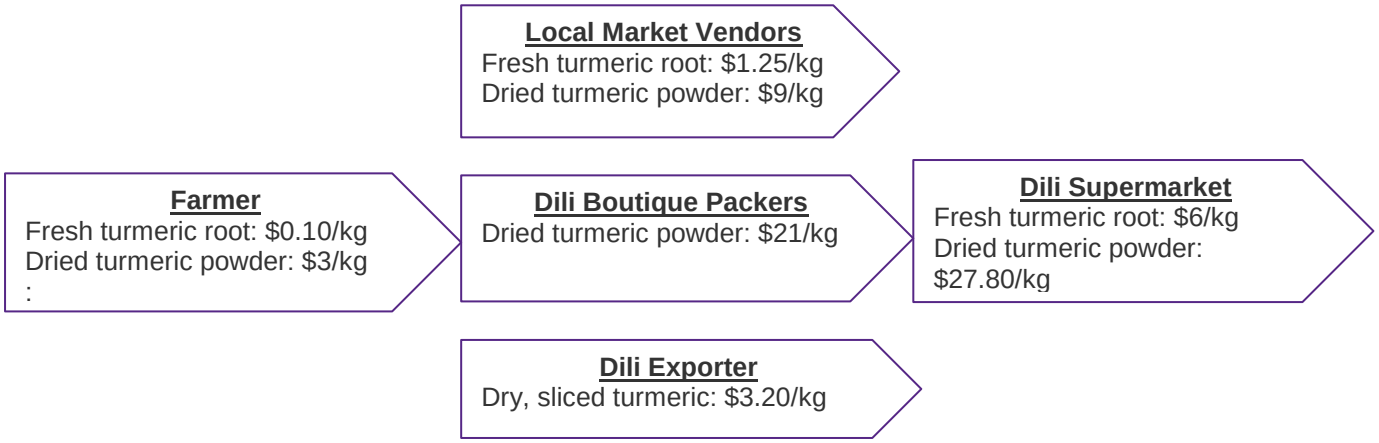
- **Turmeric**

Farmers wash the turmeric after harvest and sell as fresh root. Alternatively they dry the roots to produce turmeric powder, which is then used as a food colouring, for example in *ketupat*. Turmeric should be 'cured' before drying by dipping in boiling water and peeled before drying. If exported, turmeric is usually dried in the country of origin to about 12% moisture content, then ground by the packer in the importing country.

It takes 5kg of fresh turmeric to produce 1kg of dry turmeric powder. Therefore, if fresh turmeric costs USD0.10/kg, the processing parity price for dry turmeric powder is USD0.50/kg. As farmers receive USD3/kg for dried turmeric powder they sell to local market vendors, this represents a considerable value addition. Local turmeric powder is usually sold in small 30-gram plastic bags (as seen in the photo to the right).

Figure 12 shows the value added along the turmeric marketing chain. Exporters make a margin before deducting costs of USD2.70/kg, whereas turmeric powder packers can make a margin of USD18/kg before deducting costs.

Figure 12: Turmeric Value Addition



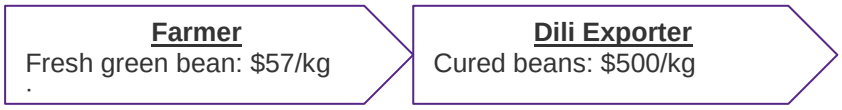
- **Vanilla**

Fresh vanilla beans are cured in Timor-Leste before export and it takes 5kg of fresh vanilla beans to produce 1kg of cured beans. 'Curing' is carried out by exporters, which includes immersing the beans in hot water (65ºC) for four minutes, 'sweating' the beans in a warm box for 36-48 hours, further alternate sun-drying and sweating over a period of one month, tying the beans into 200g bundles and finally 'conditioning' the beans in wood or metal wax paper-lined boxes for two months (as seen in the photo to the right).

Vanilla is primarily graded on bean length as follows: Grade I = >15cm, Grade II = 10-15cm, Grade III = <10cm. Figure 13 shows farmers receive a farm-gate price of USD57/kg for fresh vanilla beans (grade 2).

Currently most farmers in Timor-Leste receive a Grade II price of USD57/kg. Curing provides a processing parity price of USD285/kg, compared with the current international price of USD500/kg, therefore exporter margins are USD215/kg before deducting costs.

Figure 13: Vanilla Value Addition



6. The Spice Market System

A comprehensive description of rules and regulations and supporting functions within the wider agricultural marketing system of Timor-Leste is provided in the Market System and Value Chains Assessment report prepared by TOMAK in 2016. The following analysis is specific to spices only.

6.1. Policies & regulatory framework

- **Agricultural policy**

The Ministry of Agriculture and Fisheries (MAF) Strategic Plan 2014-20 includes a strategic objective to 'increase production and productivity of selected crops', including industrial crops. The National Directorate of Industrial Crops within MAF aims to enhance and develop industrial crops which will contribute to income earning opportunities and employment in rural areas, and export earnings for the nation. The strategy focuses on crops which involve value adding activities and cover traditional crops such as coffee, coconut and candlenut as well as emerging crops, such as cocoa, black pepper, cashew nut, hazelnut, ginger, cloves and vanilla.[9] However, to date there has been no significant public sector investment in any of the spices included in this value chain study.

- **Land Law**

A Land Law was passed by the Parliament in 2017. Timor-Leste faces three types of land reform challenges: farmland currently under customary practices, urban land in need of zoning and clear property rights, and Government land that can be used for public and private investment. One would expect insecure land tenure to discourage farmers from investing in perennial crops such as cloves, pepper and vanilla but based upon farmer interviews, this was not the case. Most of the new planting has taken place within existing coffee plantations and farmers feel secure, however, this may not be the case if planting was to take place outside of the coffee gardens.

[9] NDPP (2012) *MAF Strategic Plan 2014-2020,* Timor-Leste

- **Export requirements**

To export spices from Timor-Leste, the MAF Directorate for Industrial Crops must provide a letter of recommendation to Department of Plant Quarantine within the National Directorate of Quarantine and Biosecurity, which provides the Export Permit that includes a phyto-sanitary declaration. MAF also provides a Certificate of Origin. There are no taxes on agricultural exports.

Although Timor-Leste has promulgated a 'Decree Law No. 21/2003 on Quarantine and Sanitary Control on Goods Imported and Exported' and a 'Decree Law No. 1/2006 on General Regulations on Quarantine', Timor-Leste does not currently comply with internationally recognised Sanitary and Phyto-Sanitary (SPS) measures established by Codex Alimentarius, and the International Plant Protection Convention. Nonetheless, exporters do not complain of spices being rejected by importing countries for phyto-sanitary reasons.

A Customs Declaration is also required from the Ministry of Finance, which is issued in Dili with physical inspections carried out at the main international border points (Batugade terrestrial border with Indonesia, Nicolau Lobato international airport and the Dili Port). Customs procedures in Timor-Leste have been improved and simplified over recent years and are not considered an impediment for the export of non-perishable goods.

- **International standards**

If exporting to European or American markets there are standards established by the European Spice Association and American Spice Trade Association respectively. For example there is chemical/physical analysis of ash content, moisture content, volatile oil content, water activity, bulk density and microbiology; testing for contaminants/residues such as pesticide residues, heavy metals, mycotoxins and allergens; use of approved treatments such as fumigants and irradiation; acceptable levels of purity based on adulteration, infestation and foreign matter; and sensory properties such as odour.[10] Exporting to the Asian market by comparison is far less onerous.

- **Certification**

The most common certification schemes for spices are organic and Rainforest Alliance, the latter a mainstream sustainability scheme with a focus on both social and environmental issues. Rainforest Alliance has recently developed a standard specifically for spices. Geographical Indication certification has been used for spices, for example Kampot pepper in Cambodia. The use of a geographical indication acts as a certification that the product possesses certain qualities, is made according to traditional methods, or enjoys a certain reputation, due to its geographical origin. It can be a very powerful branding tool.

- **Grading**

With the exception of vanilla, grading is not carried out for spices in Timor-Leste and a Fair Average Quality price is paid for pepper and cloves. Grading and price premiums are a means of improving and rewarding quality, as well as reducing transaction costs. Several grades are available which have been established by the International Organisation for Standardisation and spice associations such as ASTA and ESA.

6.2. Supporting functions

Supporting functions mainly include infrastructure and services.

- **Roads**

Timor-Leste has 1,427km of national roads, 812km of municipal roads, 716km of urban roads and 4,702km of rural roads. The national roads are undergoing major works at present which should be completed by 2020 and will much improve road travel between municipalities.

Up to 57% of rural roads are judged to be in poor or bad condition and 43% are in fair or good condition. The Rural Road Five-Year Investment Plan (2016-20) has a budget of USD118.6 million for the rehabilitation of 1,465km of poor or bad roads; the periodic maintenance of 393km of roads in fair condition and the routine maintenance of 117km of roads in good condition. Roads for rehabilitation have been prioritised based upon the population served and engineering costs.[11]

[10] ESA (2015) *European Spice Association Quality Minima Document,* Germany
[11] MPWTC (2015) *Rural Roads Master Plan,* GoTL

- **Transport services**

Sea: There are four shipping lines with regular services calling at Dili, namely Meratus Shipping, Mariana Express Lines, Swire Shipping and ANL. These operators use small geared container and break-bulk vessels.

Dili Port is currently the only international port in Timor-Leste and has connections with China, Singapore and Darwin but the main connection is with Surabaya. Alongside physical restrictions, the Port suffers from inefficiencies which have led to the levy of a Port Congestion Charge. These include: (i) under-utilisation of the ASYCUDA system; (ii) lack of capacity of the National Maritime Transport Authority of Timor-Leste to prepare and enforce maritime regulations; (iii) lack of proper risk management regimes; and (iv) no routine information sharing with other customs organisations.

A new container port is being built at Tibar Bay which will reduce shipping costs but its depth and facilities will not be sufficient to attract mainline operators. This means existing connections between Dili and Surabaya are expected to strengthen as both economies develop. It will however be large enough to attract larger, more efficient vessels from Vietnam, Singapore, Malaysia or India reducing shipping costs to and from ASEAN and the world. Currently it costs USD1,500 to send a 20-foot container carrying 15 tonnes to Singapore (USD0.10/kg).

Air: The aviation infrastructure at the Presidente Nicolau Lobato International Airport in Dili does not house separate cargo handling facilities. The airport has a single 1,850m x 30m asphalt runway and relies heavily on the Ngurah Rai International Airport in Denpasar, Indonesia as its international gateway airport. Nam Air, Sriwijaya Air, and Citilink fly daily between the two points. Airnorth also flies daily to Darwin, Australia and Air Timor/Silk Air has a direct air link with Singapore once a week. Exporting spices by air would be prohibitively expensive and possibly only viable for vanilla whilst the prices are high.

Land: The most common means of transporting agricultural produce is by hiring four-tonne trucks. Hire costs from Maliana and Viqueque towns to Dili are USD250/trip and from Baucau town to Dili USD200/trip. Hire costs from the administrative posts to district capitals average USD50/trip. Bulk transport costs roughly average 0.04 cents/kg per kilometre.

When farmers transport their produce individually for sale in local markets, the transport price increases considerably. For example, when using the 'Angguna' bus, transport costs can rise to USD0.30/kg per kilometre, as the passenger transport costs are also included. Therefore, significant savings can be made from bulk transport, which costs less than 1% of transporting individually.

- **Technical support**

MAF does not provide any public extension services for spices, therefore, projects such as USDA and Avansa provide their own technical support for spice farmers to whom they have distributed seedlings. With the exception of vanilla, spices do not require a high level of technical knowledge or expertise. Technical officers are provided with 'Training of Trainers' by experts, usually from Indonesia. These technical officers then provide a short training course to farmers, after which they carry out monitoring and provide *ad-hoc* advice as required.

- **Availability of inputs**

Farmers in Timor-Leste don't use fertilisers or sprays to grow spices. Although clove seeds and ginger and turmeric rhizomes are readily available for planting, procuring pepper and vanilla seedlings is a constraint. Pepper and vanilla multiplication is carried out by taking cuttings from vines, which then prevents them from bearing fruit and so incurs a loss of income. USDA and Avansa have supported farmer-managed nurseries for the propagation of cloves, pepper and vanilla seedlings for distribution to beneficiary farmers.

- **Market Information**

Most farmers have a limited knowledge and awareness of value chains and marketing issues. There are no public market information services and most farmers receive their price information from traders. Nonetheless, most households have communication tools that could be used for disseminating market information, such as mobile phones (49% ownership), radio (22% ownership) and TV (10% ownership).[12]

[12] Seeds of Life survey, 2012

7. Spice Value Chain Investors

7.1. Private sector

There are four main spice traders in Timor-Leste, three of whom are exporters. Two of the traders also export coffee, which follows similar market channels to spices. Although Timorganic exports some spices, its main business is supplying the local gourmet spice market in Dili.

Both CCT and Commodities Exchange have invested 'upstream' in the spice value chain by providing seedlings and training to farmers, whereas Timorganic and Timor Global provide only a buying function in the value chain. Further information is provided below.

- **Cooperativa Café Timor**

Cooperativa Café Timor is a farmer cooperative primarily established to market coffee but is now also the largest spice exporter in Timor-Leste. The USDA-funded Timor-Leste Agribusiness Development Project (described below) has also supported the introduction of cloves, pepper and vanilla into cooperative member coffee plantations. CCT mostly sells spices to McCormick in the USA, a large global spice processor and packer for retail, commercial and industrial markets.

- **Timorganic**

Timorganic is a Timor-Leste based company that buys and processes pepper, ginger, turmeric, cloves, moringa, chilli, coffee, red/black rice and honey from farmers. As a boutique packer, it supplies high quality final product for sale in Dili supermarkets.

- **Commodity Exchange**

Commodity Exchange is a Timor-Leste based company that buys cloves, pepper, cinnamon, turmeric and betel nut from farmers and exports mainly to wholesalers in India. Commodity Exchange has also invested in distributing 20,000 clove seedlings to farmers in Liquiça, with technical training funded by Market Development Facility.

- **Timor Global**

Timor Global is a Timor-Leste based company located in Railaco, Ermera, trading mainly in coffee but also buying and exporting ginger, turmeric, pepper and cloves. Most of the trading is through international trading houses in Singapore, such as ECOM.

- **Gajah Mada**

Gajah Mada is an Indonesian agricultural commodities trader based in Atambua, West Timor. Gajah Mada buys black/white pepper, long pepper, cloves, ginger and turmeric from farmers in Timor-Leste and West Timor for sale to wholesalers in Surabaya. Gajah Mada also trades in copra, candlenut and konjac *(Amorphophallus konjac).*

7.2. Development Projects

There are currently two US-funded projects supporting spice development in Timor-Leste, the largest being the Timor-Leste Agribusiness Development Project. Both USDA and Avansa are due to close by 2020.

- **Timor-Leste Agribusiness Development Project**
  (Donor: USDA; Duration: 2013-19; Budget: USD9.2 million)

The USDA project covers Aileu, Baucau, Lautem and Viqueque municipalities, providing seedlings and training to farmers in the production of cloves, vanilla, cocoa, pepper, coffee, moringa and cassava.

- **Avansa**
  (Donor: USAID; Duration: 2015-20: Budget: USD19.2 million)

The Avansa project covers Aileu, Ainaro, Bobonaro, Dili and Ermera municipalities, providing seedlings and training to farmers in the production of cloves, vanilla, pepper and horticulture crops.

- **Adventist Development and Relief Agency**
  (Duration: 2018-2020)

ADRA will support ginger and coconut farmers increase production across 15 villages in Viqueque municipality.

- **Partnership for Sustainable Agroforestry Project (PSAF)**
  (Donor: BMZ/EU; Duration: 2017-2022; Budget: €18 million)

The PSAF project covers Baucau, Lautem, Manatutu, Viqueque municipalities aiming to strengthen agroforestry value chains (agriculture, fruits and vegetables, wood production and processing).

7.3. Possible development approaches

From discussion with private sector traders and development projects, there are several observations on how best to work with smallholder farmers. Main recommendations focus upon creating an assured market linkage, aggregating smallholder spice production and the sustainable provision of technical support. Firstly, the business model established by the USDA project has been successful as it has linked CCT with a major international spice buyer. Then the project has provided seedlings to farmers to increase production and grow the spice industry. An assured market linkage is necessary to attract farmer interest and participation.

There are no village aggregators for spices and traders have to buy from individual farmers, which is time consuming and costly. To facilitate aggregation there is a need to establish village spice aggregators, or cluster spice farmers to supply traders.

MAF extension workers don't work with spices, therefore, there is a need to provide private technical support to farmers. CCT has done this by contracting technical experts from Indonesia to train their coordinators (training of trainers), who in turn provide technical support to farmers as required. The coordinators are often resident in the area they serve, therefore the support is readily available and has a higher chance of being sustained.

8. Conclusions & Recommendations

The following section summarises the main conclusions of the assessment. Section 8.1 then analyses the main constraints.

- ***Spice production has become possible in Timor-Leste due to the export market access provided by export traders.***

Some traders have also been instrumental in growing the spice industry through distributing spice seedlings to farmers.

- ***Even though spice prices are falling internationally, returns are still better than other agricultural crops.***

Globally, demand is increasing for spices but prices are falling year-on-year due to increased intensive production in some countries, for example pepper in Vietnam. Vanilla is the exception, with a current farm-gate price of USD57/kg, compared with USD7/kg three years ago. Even though spice prices are falling, they are still higher than most other crops, for example the farm-gate price of coffee cherry is USD0.35/kg. Also once planted, farmers only provide labour during harvest, therefore labour and input costs are minimal when compared to crops such as rice.

- ***Spice production increases are dependent on export market linkages.***

Spice production in Timor-Leste will increase in the coming years due to new planting of cloves, pepper and vanilla by both private sector traders and development projects. Very little spice is consumed in Timor-Leste, therefore, any increase in production will be dependent on linkages to the export market to provide income for farmers.

- ***Spices follow the same export market channels as coffee.***

The main spice buyers are also coffee exporters and spices follow the same market channels as coffee. Exporters have trouble sourcing enough spices to fill a container, therefore, it is unlikely there will be new market entrants without a significant increase in production. Also, export market linkages are very personalised and would be difficult to penetrate by new market entrants, who will need to establish their own market channels.

- ***Spice farmers are willing to accept lower yields as labour and input requirements are also lower.***

Most new spice planting to date has taken place in existing coffee plantations and little maintenance is provided by farmers as shade and climbing frames already exist. Additional planting could take place outside of coffee plantations and at lower elevations if shade and water is available. However, this would require additional work and investment to create a suitable growing environment. Similarly, yields could be increased but farmers are willing to accept lower yields as maintenance costs are zero and they only have to provide labour for harvest.

- ***The production of spices within coffee plantations is complementary.***

Planting spices in coffee plantations reduces livelihood risks by diversifying income sources. Labour requirements for spices are complementary to coffee with the vanilla harvest taking place before the coffee season and pepper and clove harvest taking place after the coffee season. Spice production fits well into agroforestry systems which are very appropriate considering Timor-Leste's topography.

- ***Spices can be stored and are not significantly affected by poor transport infrastructure.***

If post-harvest treatments such as drying and cleaning are carried out correctly, spices can be stored for over six months. Spices are also not as affected by poor transport infrastructure, compared to more perishable crops such as fresh vegetables.

- ***Ginger and turmeric are not viable if farmed commercially.***

Spices consumed in Timor-Leste include ginger and turmeric which are harvested from wild stocks as required. Current farm-gate prices for both spices are low and if either of the spices were to be exported on a commercial basis, wild stocks would soon deplete. Therefore, planting would have to take place for annual cropping, requiring additional labour and investment. It is unlikely farmers would be willing to undertake this considering the additional costs, compared with current wild harvesting for the domestic market.

- ***Long pepper is not viable as an export crop from Timor-Leste.***

Long pepper also grows wild but farm-gate prices are much lower than black pepper. Although found in international markets as a specialty food ingredient, it is not traded as a major commodity.

- ***The 'regulatory environment' is not a constraint to performance of the spice value chain***

Agricultural policy is supportive, exports are tax free and exporters are satisfied with the Export Permits and phyto-sanitary declaration provided by the Ministry of Agriculture and Fisheries. Regarding transport infrastructure and services, although the road network is in disarray at the moment, it should be much improved over the next three years. Dili is also well connected to Singapore and international trading houses there, via regular cargo boats.

- ***There is little opportunity to add value in Timor-Leste for spices destined for the export market.***

Most spices are exported dried and whole, with processing such as grinding taking place in regions of consumption. Buyers are reluctant to source processed products from countries of origin due to concerns about quality, food safety and adulteration. Therefore, the main opportunity is to increase the number of spice farmers and area grown to supply export markets.

- ***Sourcing planting materials for pepper and vanilla is difficult.***

Sourcing cuttings of vanilla and pepper is difficult and there is a three year wait until the vines come into production. Although clove seeds from existing clove trees are readily available, there is a six year time lag between planting and the first harvest. Therefore a long-term commitment is required from farmers and investors.

- ***Current TOMAK municipalities are not major spice producers.***

TOMAK currently works in Baucau, Bobonaro and Viqueque municipalities and although wild socks of ginger and turmeric exist in these municipalities, they are not major spice producing municipalities. However, some coffee is grown in the higher elevation *suku* and it is possible to grow spices at lower elevations outside of coffee plantations, dependent on available shade and water. If TOMAK is to support spice production, it will be important to target these higher elevation *suku* and also develop production models for planting outside coffee plantations.

8.1. Key constraints

Key constraints to improving the wider agricultural market systems, as described in the Market System and Value Chains Assessment' report prepared by TOMAK in 2016, are presented in Appendix 8.

For the purpose of this report, the identification of constraints is limited specifically to the spice value chain and presented in Table 2. Each constraint is first described as a 'symptom'. The 'initial causes' and 'underlying causes' are then identified for each symptom and it is these symptoms that need to be addressed to improve the agricultural market system.

Table 2: Key Constraints to Improving Spice Value Chains

Symptoms	Initial Cause	Underlying Cause
RULES		
• No investment in commercial spice farms	• Insecure land tenure (land law) • Weak judicial system to enforce contracts and protect investments	• Newly independent country with evolving government institutions
SUPPORTING FUNCTIONS		
• Limited access to seedlings	• Pepper and vanilla seedlings are propagated as cuttings from existing vines, therefore farmers reluctant to sacrifice vines that would otherwise provide income • No private sector nurseries	• Planting spices is a comparatively new activity • Projects propagate their own seedlings
• Limited access to technical support	• Lack of trained technical advisors	• Planting spices is a comparatively new activity • Farmers unwilling to pay for technical support

Symptoms	Initial Cause	Underlying Cause
• Limited number of buyers/exporters	• Low volumes of production	• Seedlings previously unavailable and new seedlings only started distribution over past three years • Cloves, pepper and vanilla require 3-6 years after planting to get first harvest • Low yields • Production areas limited to coffee plantations
• Limited value added (with exception of domestic boutique packers)	• Importing countries carry out final processing and packing themselves • No steam sterilisation facilities in Timor-Leste	• Concerns over quality, food safety and adulteration in producing countries • Volumes exported do not warrant investment in sterilisation machinery
CORE SUPPLY & DEMAND		
• Low volumes of production	• Seedlings previously unavailable and new seedlings only started distribution over past three years • Cloves, pepper and vanilla require 3-6 years after planting to get first harvest • Low yields • Production areas limited to coffee plantations	• Previously no access to export market, therefore no interest in planting seedlings • No use of fertilisers • Easier to introduce spices into existing plantations, rather than establish new spice gardens
• Declining prices (except vanilla)	• Over production e.g. pepper in Vietnam	• Intensive production methods
• Very small domestic demand, reliance on export market	• Spices not used much in Timorese cuisine	• Traditional eating habits
• Quality not improving	• Farmers do not provide any crop management or maintenance (excepting vanilla) • With the exception of vanilla, no premiums are paid to farmers for graded spices	• Farmers happy to receive less income for less labour and investment

Based on Table 2, it can be concluded the main constraints are not caused by rules and regulations. Global demand exists but there are constraints supplying that demand, mainly due to spice production in Timor-Leste being a comparatively new activity. Therefore, most constraints relate to the supporting functions that facilitate increased production and forge export market linkages.

8.2. Opportunities for TOMAK intervention

The assessment conclusions are mainly positive regarding the potential for spice production in Timor-Leste. The challenge is to now increase production and grow a viable spice export industry. The purpose of this section is to identify interventions that support systemic change to increase production and also link spice farmers to export markets.

8.2.1. Spice selection

For reasons described above, it is not recommended to include ginger, long pepper and turmeric in any project support. However, it is recommended cloves, black pepper and vanilla are included.

- ***Cloves, black pepper and vanilla offer the best potential for further development***

Cloves is selected as the price is high. Also in addition to selling into the food ingredient market channel, there is a ready market in the kretek cigarette industry in Indonesia. However, further work is required in identifying the agronomic requirements for cloves. Some growers claim clove trees grow at a lower elevation but don't produce flowers. On the other hand, clove trees were grown successfully in Lospalos at an altitude of just 350masl during Indonesian times. Agronomic literature states cloves must have a pronounced dry season during flowering in April and May, however, cloves grow successfully in Same which still receives some rain during these months.

Black pepper is selected, even though prices have fallen considerably over the past year, as returns on investment are still high compared to other crops. There are ready market buyers and pepper prices are likely to recover over the next few years due to the cyclical nature of spice markets.

Vanilla is selected due to its high price and demand is unlikely to diminish as food processors do not appear deterred by the high prices. Although prices may fall as production resumes in Madagascar, returns are still expected to remain high compared to other crops in Timor-Leste.

8.2.2. Rules

- ***No interventions are proposed to address 'rules and regulations' as they don't pose any specific constraints to spice value chains***

8.2.3. Supporting functions

- ***Develop production models and techniques for pepper and vanilla production outside of coffee plantations for dissemination to interested farmers***

If TOMAK is to support spice production in Baucau, Bobonaro and Viqueque municipalities, production models must be developed outside of coffee plantations, which are fewer in those municipalities. For example, pepper can be grown on pillars and vanilla grown under shade nets with drip irrigation. These production models are more intensive and produce higher returns per area. However, they do require more investment and labour and may not be suitable for all farmers.

- ***Support establishment of private sector nurseries for the propagation of cloves, black pepper and vanilla seedlings***

Availability of planting materials is a major constraint in Timor-Leste. The seedlings also take several years nurturing before they produce a harvest. If TOMAK is to support spice production, it is recommended the propagation of seedlings starts as soon as possible, unless they can be imported ready to plant out. This may require a finance arrangement with stepped advance payments to attract the interest of possible nursery operators.

- ***Create a cadre of 'master farmer' trainers in target municipalities***

Farmers do not provide any maintenance to pepper and vanilla vines and just harvest. However, if vines aren't trained correctly, yields eventually reduce to almost zero. Vanilla also requires specialist skills in hand pollination. It is recommended a cadre of 'master farmers' are established and provided with 'training of trainers' instruction. Ideally the master farmers would be motivated spice farmers with a vested interest in the sector and could possibly also establish the nurseries.

- ***Facilitate smallholder aggregation***

There are no village aggregators for spices and traders have to buy from individual farmers, which is time consuming and costly. To facilitate aggregation, village spice aggregators are identified and trained to buy from farmers and sell to exporters. Alternatively, spice farmers are clustered to coordinate with traders.

- ***Introduce standards and quality grades related to price premiums.***

Timor-Leste will never be a large spice producer able to compete on price. Therefore, efforts should focus on quality. Quality improvements are usually made by creating a standardised grading system matched with price premiums.

- ***Support accreditation to certification schemes to add value***

Some large processors now require certification for sustainability, such as Rainforest Alliance. Another example of certification that may be appropriate for spices in Timor-Leste is Geographical Indication, which has successfully been carried out for 'Kampot Pepper' in Cambodia.

Appendices

Appendix 1: Documents Reviewed

ASTA (2016) *General Guidelines for Good Agricultural Practices for Spices,* USA.

ESA (2015) *European Spice Association Quality Minima Document,* Germany.

Gulick (2017) *Pepper Crop Report 2017,* NedSpice.

ITC (2006) *Marketing Manual and Web Directory for Organic Spices, Culinary Herbs and Essential Oils,* Geneva.

Matthews & Jack (2011) *Spices and Herbs for Home and Market,* FAO.

Medina et al (2009) *Vanilla: post-harvest operations,* FAO.

NDPP (2012) *MAF Strategic Plan 2014-2020,* Timor-Leste.

Pascale & von Opijnen (2010) *Could You Pass Me the Sustainable Pepper Please?* CREM.

Plotto (2002) *Ginger: post-harvest operations,* FAO.

Plotto (2004) *Turmeric: post-harvest operations,* FAO.

TOMAK (2016) *Market System & Value Chains Assessment,* Australian Aid Program.

UNIDO (2005) *Herbs, Spices & Essential Oils: post-harvest operations in developing countries,* Austria.

Appendix 2: Persons Met

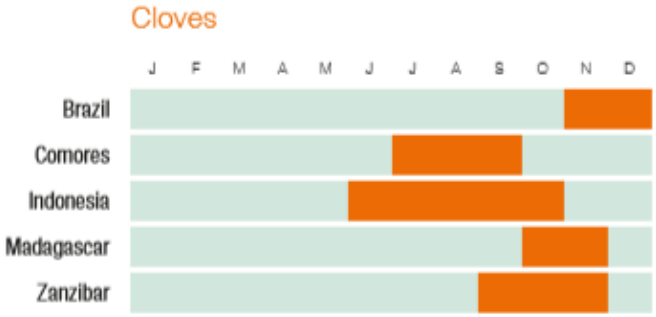
Name	Designation	Place
Private Sector Traders		
Bobby Lay	Director, Timor Global	Railaco, Ermera
Juergen Glembotski	Director, Timorganic	Dili
Martin Hardie	Director, Dili Vanilli	Dili
Kenny Mintura	Director, Gajah Mada	Dili
Subhash Mishra	Director, Commodity Exchange	Ulmera, Liquiça
Jose Ximenes	Director, Coracao	Atelari, Laga, Baucau
Farmers		
Ricardo Lolek		Aileu
Paulino Mendonsa		Aileu
Agustino Lekefelo		Aileu
Manuel Pinto		Aileu
Azinha da Costa		Lautem
Martinho de Jesus		Lautem
Joao Brito Freitas		Lautem
Government		
Fernando Santana	Director, Industrial Crops, MAF	Dili
Moises Lobato	Chief of Agricultural Extension, MAF	Baucau
Sebastião de Sousa	Extension Officer, MAF	Venilale, Baucau
Adelino Gusmão	Director (a.i), MAF	Viqueque
Antonio Soares	Chief of Agricultural Extension	Viqueque
Donors / Projects		
David Boyce	Advisor, CCT	Dili
Bency Issac	Advisor, CCT	Dili
Sam Filiaci	Regional Director, NCBA	Dili
Dorita Kese	Director, HAFOTI	Dili
Matthew Whitty	Country Director, ADRA	Dili
Zannatul Ferdous	Senior Market Development Advisor, MDF	Dili
Cesaltino Lopes	Agribusiness Specialist, AVANSA	Dili
Tomomi Hayashi	PARCIC	Dili
Jose Rangel	Coordinator, AVANSA	Aileu
Agusto do Carno	CCT Extension Officer	Buikarin, Viqueque
Lucio de Olivera	Coordinator, CCT	Lospalos, Lautem

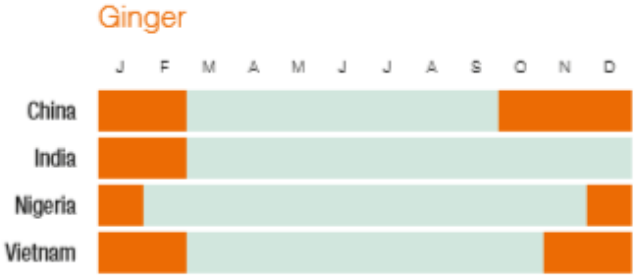
Appendix 3: Growing Requirements for Spices

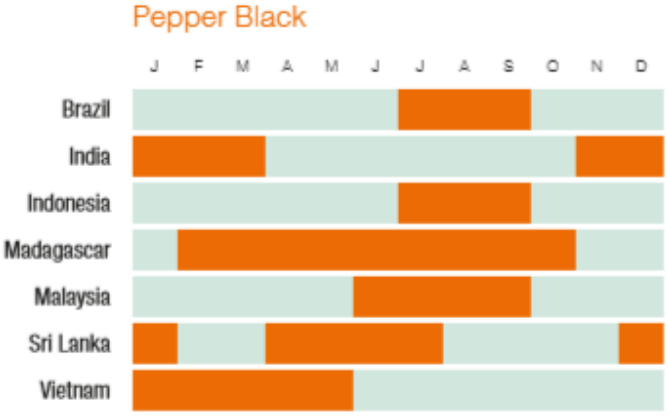
Spice	Cloves	Ginger	Pepper	Turmeric	Vanilla
Growth habit	Evergreen tree.	Plant with rhizome. Perennial grown as annual.	Evergreen vine.	Plant with rhizome. Perennial grown as annual.	Perennial vine.
Growing requirements	Maritime climate with marked dry period for flowering. Elevation 0-600 masl.	Hot, moist conditions. Elevation 0-1,500masl. Rainfall >700mm.	Hot and humid climate. Elevation <500 masl. Rainfall >2,000mm.	Hot, moist conditions. Elevation 0-2,000masl. Rainfall >800mm.	Hot, humid shade. Elevation 0-600masl. Rainfall >1,500mm.
Planting density	200 trees/ha	7,500kg rhizome/ha	1,000 vines/ha	2,500kg rhizome/ha	2,500 vines/ha
Yields	First harvest 6 years after planting, full production 20 years, economic life 60-100 years. Yield 20kg fresh cloves/tree/year. = 7kg dried cloves/tree/year.	Harvest 9 months after planting. Yield = 16t/ha fresh ginger = 4t/ha dried ginger.	Full production after 5 years, economic life up to 20 years. Low input = yields of 0.75kg dried black pepper per vine.	Harvest 10 months after planting. Yield = 10t/ha fresh turmeric under rainfed conditions = 2t/ha dried turmeric	Production 3 years after planting, economic life 10-15 years. Yield 0.50kg of fresh beans per vine. 5kg fresh beans = 1kg cured beans. Requires labour intensive hand pollination
Uses	Flower bud harvested as food seasoning and for kretek cigarettes. Oil has medicinal properties.	Food seasoning, medicinal.	Food seasoning.	Food colouring, medicinal.	Food flavouring.

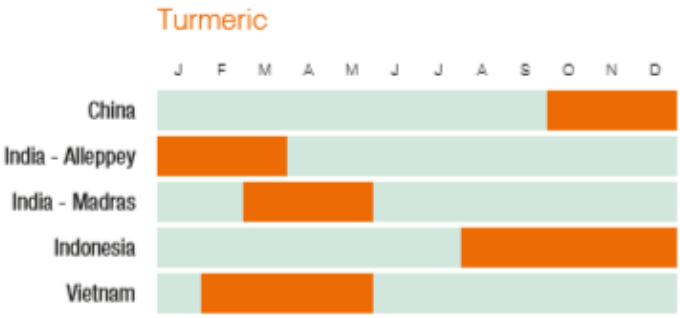
Source: FAO ECOCROP

Appendix 4: Spice Harvest Calendars









Source: NedSpice

Appendix 5: Main Spice Producing Countries

Spice	Production Quantity (tonnes)	Production Area (ha)
Cloves		
World	*181,765*	*637,163*
Indonesia	139,522	542,281
Madagascar	20,821	65,845
Tanzania	8,915	7,208
Ginger		
World	*3,299,960*	*407,772*
India	1,109,000	165,000
Nigeria	522,964	111,196
China	492,905	45,821
Pepper		
World	*546,489*	*527,847*
Vietnam	216,432	81,790
Indonesia	82,167	168,080
India	55,000	129,000
Turmeric		
World	*1,412,500*	
India	1,130,000	n.a
China	70,000	
Myanmar	56,500	
Vanilla		
World	*7,941*	*93,158*
Madagascar	2,926	67,823
Indonesia	2,304	14,104
China	885	6,933

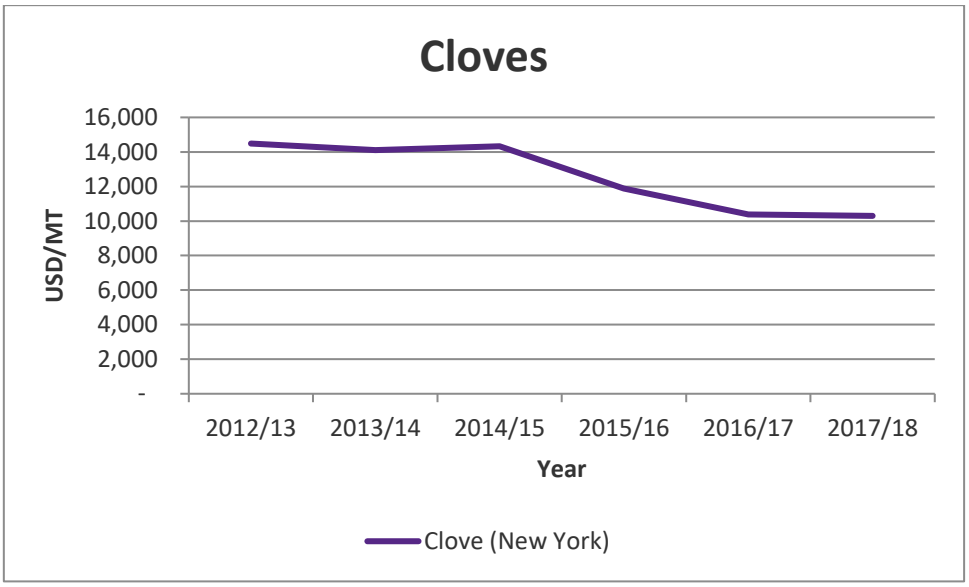
Source: FAOSTAT, 2016

Appendix 6: Main Spice Exporting & Importing Countries

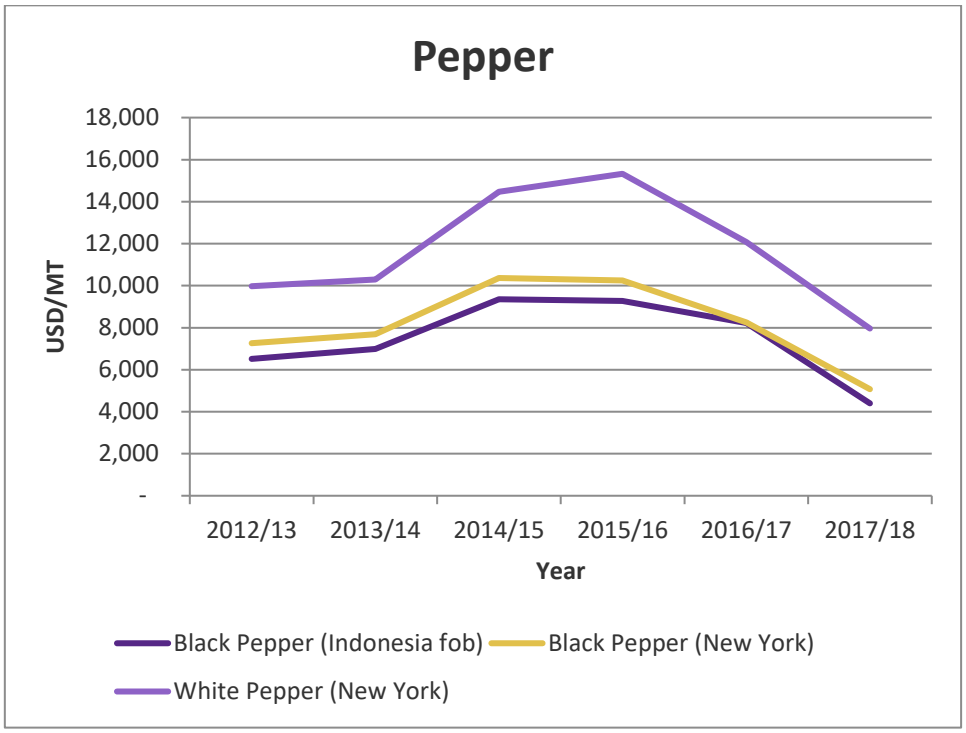
Spice	Main Exporters	Tons	Main Importers	Tons
Cloves	*World*	*63,031*	-	-
	Madagascar	30,653	India	20,580
	Singapore	11,801	Singapore	13,598
	Indonesia	7,422	Indonesia	13,572
Ginger	*World*	*591,000*	-	-
	China	423,000	Pakistan	89,000
	India	31,000	USA	73,000
	Nigeria	20,000	Japan	61,000
Pepper	*World*	*401,000*	-	-
	Vietnam	130,000	USA	205,941
	Indonesia	58,000	Thailand	93,753
	Brazil	38,000	Vietnam	90,071
Turmeric	*World*	*94,245*	-	-
	India	81,756	India	13,826
	Indonesia	7,995	USA	9,369
	Germany	1,216	Malaysia	7,322
Vanilla	*World*	*6,165*	-	-
	Madagascar	1,605	USA	1,529
	Netherlands	503	France	841
	Indonesia	227	Netherlands	640

Source: ITC, 2016/17

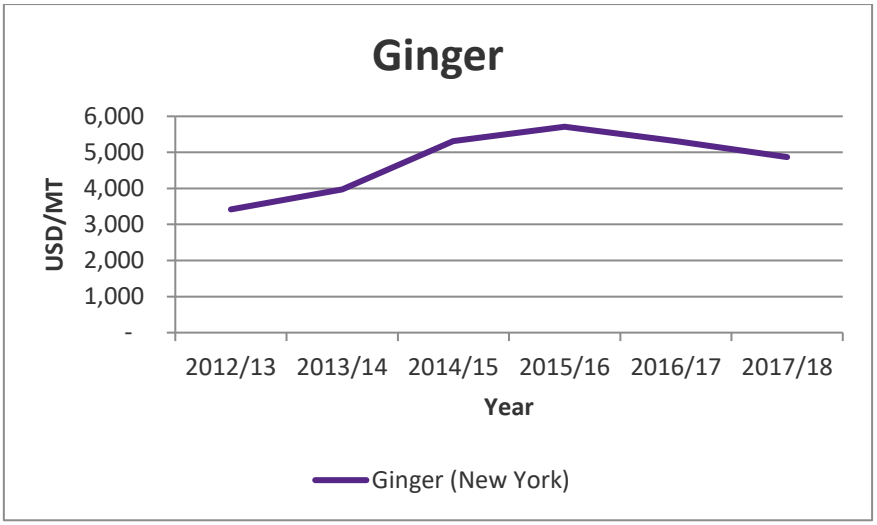
Appendix 7: International Spice Prices



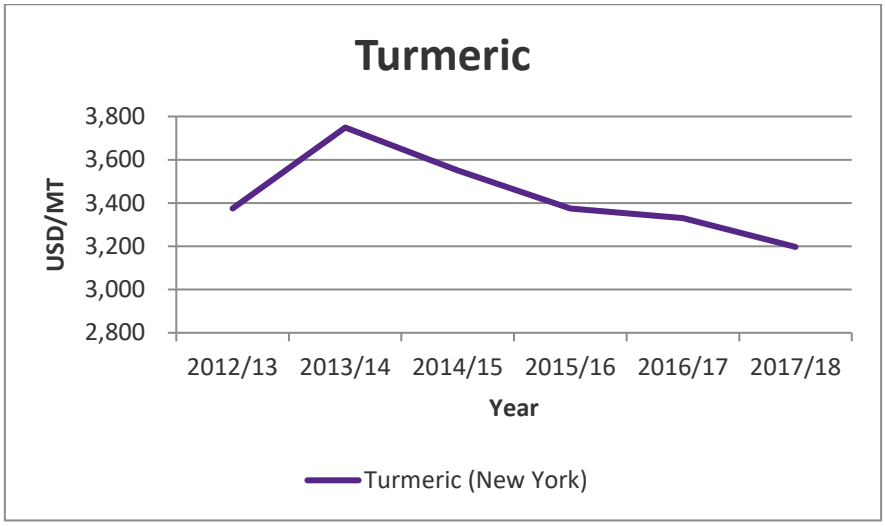
Source: Spice Board India



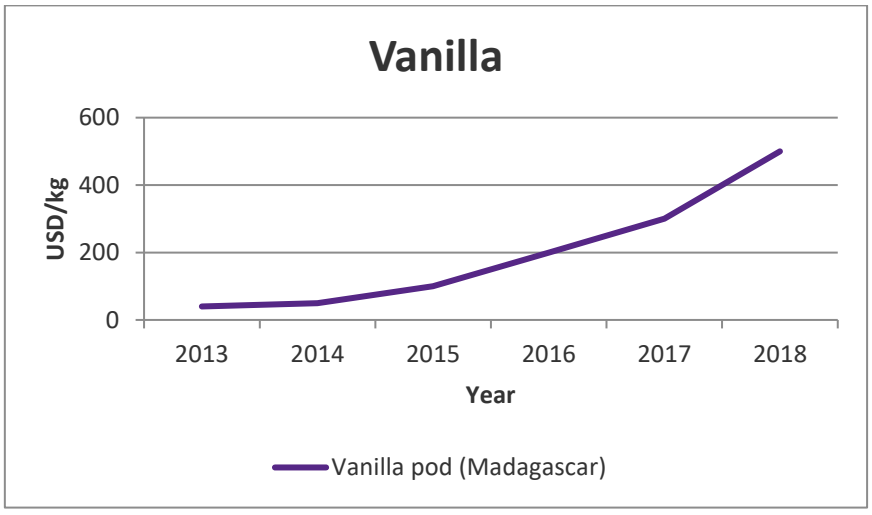
Source: Spice Board India



Source: Spice Board India



Source: Spice Board India



Appendix 8: Key Constraints to the Agricultural Market System

Symptoms	Initial Cause	Underlying Cause
RULES		
• Lack of private sector investment in agriculture sector	• Insecure land tenure • Weak judicial system to enforce contracts and protect investments	• Newly independent country with evolving Government institutions
• Decreasing agricultural output	• Welfare transfers • Out migration of young people from rural areas	• Traditional agriculture offers little financial reward
• Weak policy & regulatory framework to support commercial agriculture e.g. land law	• Limited capacity/experience of commercial agriculture amongst Government and donor partners	• Newly independent country with evolving Government institutions
• No trade agreements	• Apart from oil and a small amount of coffee, Timor-Leste doesn't produce export commodities that make trade agreements worthwhile	• Subsistence based agriculture sector
• Difficulty exporting agriculture goods due to NTBs	• No accredited SPS facilities • No agricultural standards for MAF to use when issuing Export Permits	• Volume of exports does not justify investment in SPS facilities
SUPPORTING FUNCTIONS		
• Uncoordinated (ad hoc) supply chains	• Fragmented production base (many small farmers producing small amounts of produce) • No supply agreements between farmers, traders and market vendors • No wholesale or aggregation system	• Trading is speculative, no long term investment due to unsure production and markets
• Poor rural roads	• High maintenance costs	• Difficult terrain
• Abandoned irrigation schemes	• Schemes not repaired or maintained • Rice no longer planted	• Schemes were originally designed to be operated and maintained by Government, not farmers. • Imported rice is cheaper • Welfare transfers • Out migration of young people
• No technical advice for commercial farmers	• SEW are generalists, not specialists • Farmers unwilling to pay for private extension services	• Current production income does not justify expenditure on private extension services
• No market or marketing information	• Lack of demand for market information	• Farmers are subsistence based, not commercial
• Limited agricultural finance available for farmers wishing to commercialise	• Farmers don't have collateral for loans • Farmers unwilling to borrow large amounts of capital	• Land cannot be used as collateral under customary tenure • Farming is high risk
CORE SUPPLY & DEMAND		
• Low volumes of production	• Subsistence-based farming systems with few commercially oriented farmers • Farmers stopping farming	• Unsure markets. • Traditional agriculture offers little financial reward for youth

Symptoms	Initial Cause	Underlying Cause
	• Imported food (e.g. rice) cheaper than domestically produced food	• Welfare transfers for pensioners & veterans • High costs of production
• Poor quality	• Produce grown for home consumption, not market • Farmers lack post-harvest handling skills (drying, storage)	• Subsistence based farming system
• Limited processing to add value	• Lack of processors	• Selected products don't offer much opportunity for processing
• No storage to add value	• Farmers require cash at harvest • High risk of storage losses	• Cash flow problems • Poor storage facilities and techniques
• High transport costs	• Farmers market produce individually	• No farmer coordination
• Limited domestic demand	• Small population with limited purchasing power • Main consumption centre limited to Dili (222,323 urban population)	
• Difficult to compete with imports	• Easier for large Dili retailers to import, than source locally • Imports are cheaper	• Fragmented local supply chains • High costs of domestic production
• Few export market linkages	• Difficult to aggregate quantities to fill a container	• Low volumes of production • Fragmented local supply chains

TOMAK Timor-Leste
@TOMAKTimorLeste
www.tomak.org | info@tomak.org

Adam Smith International
@adamsmithint

TOMAK