

Analysis of Coffee Quality and Value Chain Collaboration for a Sustainable Agro-Industry in Timor-Leste

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ABSTRACT

This study investigates the coordination of coffee quality within the agro-commercial chain in Timor-Leste by analyzing the interaction between producers and companies engaged in production and commercialization. Coffee, as the country's most important agricultural export and a key contributor to the non-oil economy, is internationally recognized as an organic product, with the Timor Hybrid (HDT) gaining global attention. Data were collected through documentary analysis and questionnaire surveys from 111 smallholder producers and 6 companies in Ermera Municipality, particularly in Leteffoho Administrative Post, the region with the largest plantation area and highest dependence on coffee as a source of income. **The findings reveal** that producers mainly cultivate Arabica and Robusta, with quality control focusing on cherry harvesting and processing, while companies predominantly purchase parchment coffee and determine prices based on quality, with only one company buying cherry coffee. All companies export green coffee, and four also sell roasted coffee in the domestic market. **This study further proposes** a framework that emphasizes coordination mechanisms between producers and companies to enhance quality assurance, sustain competitiveness in international markets, and strengthen the resilience of Timor-Leste's agricultural economy.

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1. INTRODUCTION

Coffee is one of the most important agricultural commodities in the world, providing livelihoods for more than 100 million people across over 60 producing countries. In Timor-Leste, coffee has been a central pillar of the economy for more than a century, serving as the country's largest non-oil export and a vital source of income for rural households [1]. Despite its economic significance, the sector faces structural challenges such as low productivity, poor quality consistency, and limited modernization of production and processing methods [2]. These challenges undermine farmers' income, which is highly vulnerable to fluctuations in international coffee prices, as Timor-Leste remains a small exporter and a global price taker [3].

Addressing these issues requires a strategic focus on enhancing productivity and quality throughout the coffee value chain. Aging plantations, lack of access to modern agricultural inputs, and inadequate training for farmers have contributed to stagnant yields [4]. However, the organic nature of Timorese coffee presents

a comparative advantage in global markets where demand for sustainable and ethically produced commodities is rising. With improved cultivation practices, better post-harvest processing [5], and adoption of certification schemes, Timorese coffee has the potential to command higher premiums and strengthen its position in international trade [6], [7].

The development of the coffee sector in Timor-Leste also aligns with the United Nations Sustainable Development Goals (SDGs) [8]. Strengthening coffee production directly contributes to SDG 1 (No Poverty) by improving rural livelihoods, and SDG 8 (Decent Work and Economic Growth) by creating employment opportunities along the value chain [9]. Furthermore, encouraging environmentally responsible practices supports SDG 12 (Responsible Consumption and Production) and SDG 15 (Life on Land) [10], ensuring that economic development does not come at the expense of environmental sustainability [11]. In this context, the sector's growth is not only an economic imperative but also a pathway to achieving broader social and environmental objectives [12].

Given this multidimensional importance, the coffee sector requires coordinated action among farmers, cooperatives, agro-commercial enterprises, and government institutions [13]. Agro-commercial companies, in particular, play a crucial role in linking smallholder farmers with national and international markets, providing training and technical assistance, and promoting transparency in trade [14]. Strengthening these partnerships is essential to ensure sustainable improvements in productivity and quality, while at the same time enhancing farmers' resilience against market volatility. This research therefore aims to analyze the dynamics of coffee production in Timor-Leste, focusing on the role of agro-commercial actors in driving sustainability, improving competitiveness, and contributing to the long-term development of the sector [15], [16].

2. RESEARCH METHOD

This chapter presents and substantiates the itinerary followed in preparing the research process, designed according to the theme and the objectives formulated techniques for data collection [17], sampling technique and sample selection, as well as the data analysis process. The research begins the chapter with a brief characterization of the study area [18].

2.1. Study Area

The study was conducted in the Letefoho Administrative Post in Ermera district which is the main coffee producing area of Timor-Leste. Letefoho covers 129 km² or 16.8% of Ermera and consists of eight sucos namely Ducurai Haupo Lauana Catrai Leten Catrai Kraik Hatugau Goulolo and Eraulu [19]. The population mainly speaks Mambae and the economy is dominated by agriculture with 80% of 3702 families engaged in farming and 78% in livestock. Coffee corn and cassava are cultivated by more than 80 percent of farming families while pigs and chickens are raised by a similar proportion for subsistence [20].

Methodologically the study began with secondary research including literature reviews of theoretical and empirical works official statistics institutional bulletins and scientific articles. Data sources included coffee trade records from companies as well as statistics from the Ministry of Agriculture and the National Directorate of Statistics [21]. Relevant texts on the coffee sector in Timor-Leste were selected analyzed and incorporated into the thesis to conceptualize and deepen the research theme [22].

2.2. Primary Data – Questionnaires

In the second stage, primary data were collected through a questionnaire survey of farmers and marketing companies. The questionnaire for farmers had two parts, covering respondent identity and questions on coffee quality [23]. For coffee producers, it was divided into six sections general characteristics, land characteristics, production techniques, cherry coffee production, parchment and green coffee, and overall coffee production as detailed in the appendix [24]. For processing companies, the questionnaire had three sections company characteristics, destination of coffee production, and purchase and production characterization as shown in Appendix 2.

2.3. Sample Selection

The study used a non-probabilistic convenience sampling method, where participants were chosen based on accessibility and diversity. This method is simple and inexpensive but limits the possibility of generalizing results. In contrast, probabilistic sampling allows each population element a measurable chance of

inclusion but is more complex, time-consuming, and costly [25]. For this study, coffee producers and agro-trading companies willing to respond were prioritized. In each coffee-producing family, only one member was surveyed to avoid response bias, while in companies, owners or managers were interviewed. In total, 111 farmers from Letefoho and 6 coffee processing companies in Timor-Leste participated [26].

2.4. Data Processing and Analysis

The data from questionnaires to coffee producers and agro-industrial companies were entered into SPSS, where coding, editing, and validation ensured reliability. Analysis involved tables, figures, and statistical measures to describe the sample and present information clearly, though conclusions apply only to the sample units [27]. For farmers, data were analyzed using descriptive statistics and ANOVA in SPSS, including tests such as correlations and frequency counts, to identify key factors influencing coffee quality in Timor-Leste [28], [29]. Hypotheses tested the relationship between farm size and farmer characteristics. Due to the small number of agro-industrial companies, their data were processed qualitatively through comparative analysis of main indicators and variables [30].

2.5. Analysis and Discussion of Results

The sample shows high homogeneity in responses which limits cross-variable analysis. Farm sizes are classified as small (≤ 0.5 ha), medium ($0.5 < \text{size} \leq 1$ ha), and large (> 1 ha). Income is higher for larger farms although the differences between small and medium are not significant. Small producers tend to have higher education levels, while large producers are slightly younger though not significantly [24]. Small farms have fewer plots than medium and large ones. Most robusta producers belong to the large class. There are significant differences in cultural practices. Small farms perform more pruning, small and medium farms use more organic fertilization, while medium and large farms encounter more shade tree issues [31, 32].

Table 1. Relationship Between Producer Size and Characteristics

| | Small ≤ 0.5 ha | Average > 0.5 ha and ≤ 1 ha | Big > 1 ha | F-Test | p-value |
|---|------------------------|--|--------------|--------|---------|
| Average yield (USD) | 1024.5 | 1051.3 | 1443.2 | 6.394 | 0.002 |
| Level of education (% in each area class) | | | | | |
| Illiterate | 8.2 | 30.8 | 43.5 | | |
| Primary | 16.3 | 17.9 | 21.7 | 6.069 | 0.003 |
| Pre-Secondary | 40.8 | 25.6 | 13.0 | | |
| Secondary | 34.7 | 25.6 | 21.7 | | |
| Middle Ages | 46.3 | 46.8 | 44.3 | 2.073 | 0.131 |
| Average number of installments | 1.1 | 2.1 | 2.1 | 36.738 | 0.000 |
| Coffee pruning (%) | 61.2 | 33.3 | 21.7 | 6.760 | 0.002 |
| Does organic fertilization (%) | 79.6 | 66.7 | 43.5 | 4.960 | 0.009 |
| Have problems with shadetrees (%) | 34.7 | 74.4 | 82.6 | 12.595 | 0.000 |
| Type of coffee produced (% in each area class) | | | | | |
| Cherry coffee | 69.4 | 48.7 | 30.4 | 5.495 | 0.005 |
| Cherry coffee and parchment coffee | 30.6 | 51.3 | 69.6 | | |
| Contribution of coffee type to yield (% in each area class) | | | | | |
| Cherry coffee 1st place | 69.4 | 48.7 | 30.4 | | |
| Cherry Coffee 1st and Parchment | 12.2 | 17.9 | 4.3 | 5.983 | 0.003 |
| 2nd place | | | | | |
| Cherry coffee 2nd and Parchment | 18.4 | 33.3 | 65.2 | | |
| 1st place | | | | | |
| Perception of the price offered by the company CCT (% in each area class) | | | | | |
| Very good | 49.0 | 28.2 | 21.7 | 3.435 | 0.036 |
| Good | 51.0 | 71.8 | 78.3 | | |
| Type of company to which parchment coffee is sold (% in each area class) | | | | | |
| Large companies | 40.0 | 35.0 | 6.3 | 2.824 | 0.069 |
| Small businesses | 60.0 | 65.0 | 93.7 | | |

| | Small ≤0.5 ha | Average >0.5ha and ≤1ha | Big >1ha | F-Test | p-value |
|---|------------------|-------------------------------|----------|--------|---------|
| Type of incentives (% in each area class) | | | | | |
| Training and health care | 81.6 | 66.7 | 34.8 | | |
| Training | 18.4 | 17.9 | 17.4 | 2.371 | 0.098 |
| Money and Training | 0.0 | 15.4 | 47.8 | | |
| Makes plantation formation (%) | 79.6 | 74.4 | 47.8 | 4.192 | 0.018 |
| Makes pruning formation (%) | 77.6 | 53.8 | 52.2 | 3.659 | 0.029 |
| Makes fertilization formation (%) | 93.9 | 71.1 | 87.0 | 4.574 | 0.012 |
| Makes transformation training (%) | 20.4 | 38.5 | 69.6 | 9.293 | 0.000 |

Shown in Table 1 the price offered by the CCT for cherry coffee shows clear differences across company sizes. Smaller companies tend to receive better prices, while medium and large companies more often settle for “good” prices and increasingly shift sales toward parchment coffee sold to smaller processors [33]. This reflects not only market orientation but also structural inequalities in value distribution along the coffee chain, where larger producers consolidate advantages despite higher volumes [34]. In terms of incentives, smaller companies benefit from training and non-financial support such as free health care, whereas larger firms receive more financial incentives but less social support [35]. This substitution highlights how company size shapes access to benefits, with smaller producers relying more on welfare-based support and larger firms prioritizing financial growth, raising concerns for sustainability and equity in the sector. Such dynamics suggest that economic opportunities and social welfare are unevenly distributed, creating barriers for inclusive growth [36].

Training patterns further highlight this divide. Small companies engage more in agronomic training such as planting, pruning, and fertilization, while large companies dominate processing-related training in transformation and quality control, where value addition is concentrated. This shows how company size determines different roles in the value chain [37], with smallholders sustaining resilience at the production stage and larger firms consolidating power downstream. These disparities in pricing, incentives, and training access shape the dynamics of the coffee sector in Letefoho [38]. Addressing them requires inclusive policies that balance financial and social incentives, expand training opportunities across production and processing stages, and encourage cooperation rather than competition among companies [39]. In the long term, such strategies will strengthen the value chain and promote equitable, sustainable development, ensuring that both smallholders and larger companies grow together within the coffee industry [40].

Table 2. Coffee Farming Groups in Letefoho

| Variables | F | P-value | Sample | Group 1 | Group 2 |
|--|---------|---------|--------|---------|---------|
| Age (Years)* | 3.013 | 0.085 | 46.1 | 46.7 | 45.1 |
| Marital Status (1=married 2=divorced 3=widowed) | 0.190 | 0.664 | 1.12 | 1.13 | 1.09 |
| Sex (1=Male 2=Female) | 1.158 | 0.284 | 0.92 | 0.94 | 0.88 |
| Education Level (0=illiterate 1=primary 2=pre-secondary 3=secondary) | 0.358 | 0.551 | 1.64 | 1.59 | 1.72 |
| Monetary yield (USD)* | 217.561 | 0.000 | 1121 | 791 | 1642 |
| Total Area (ha)* | 20.254 | 0.000 | 0.83 | 0.62 | 1.16 |
| Land Owner (1=man 2=woman 3=both) | 0.107 | 0.744 | 1.02 | 1.01 | 1.02 |
| Who makes decisions about production (1=man 2=woman 3=both) | 0.475 | 0.492 | 1.09 | 1.07 | 1.12 |
| Who makes decisions about coffee yield (1=man 2=woman 3=both) | 0.475 | 0.492 | 1.09 | 1.07 | 1.12 |
| Who makes decisions about selling coffee (1=man 2=woman 3=both) | 0.475 | 0.492 | 1.09 | 1.07 | 1.12 |
| Type of coffee produced (1=cherry 2=cherry and parchment)* | 2.771 | 0.099 | 1.46 | 1.40 | 1.56 |

| Variables | F | P-value | Sample | Group 1 | Group 2 |
|---|--------|---------|--------|---------|---------|
| Type of coffee variety (1=arabica 2=arabica and robusta) | 0.003 | 0.953 | 1.05 | 1.04 | 1.05 |
| Prune coffee (0=yes 1=no)* | 4.626 | 0.034 | 0.57 | 0.65 | 0.44 |
| Do you use organic fertilization (0=yes 1=no)* | 4.326 | 0.040 | 0.32 | 0.40 | 0.21 |
| Have problems with shade trees (0=yes 1=no)* | 4.284 | 0.041 | 0.41 | 0.34 | 0.53 |
| The companies that are most demanding with cherry quality (1=CCT 2=CCT and Paece Winds) | 1.206 | 0.275 | 1.33 | 1.29 | 1.40 |
| The price offered by the company for cherry coffee (1=very good 2=good)* | 13.103 | 0.000 | 1.64 | 1.76 | 1.44 |
| Importance of coffee (1=Cherry 1st 2=Cherry 1st and Parchment 2nd Parchment 1st and Cherry 2nd) | 2.704 | 0.103 | 1.79 | 1.69 | 1.95 |
| Received training in planting (1=No 2=Yes) | 0.029 | 0.866 | 1.71 | 1.71 | 1.72 |
| Received training in pruning (1=No 2=Yes) | 1.017 | 0.316 | 1.64 | 1.60 | 1.70 |
| Received training in fertilization (1=No 2=Yes)* | 9.771 | 0.002 | 1.85 | 1.76 | 1.98 |
| Received training in transformation (1=No 2=Yes)* | 2.782 | 0.098 | 1.37 | 1.31 | 1.47 |
| How many times have you received training* | 5.955 | 0.016 | 3.477 | 3.338 | 3.698 |

* Variables that are significant for a p-value < 0.10

From the analysis of the results, it was possible to clearly identify two groups of farmers. The first group has 68 farmers and the second group has 43 farmers [41]. Table 2 shows the variables that served as a basis for the formation of the groups. The main variables were age, monetary income, total area, type of coffee produced, pruning, fertilization, problems with shade trees, the price offered, received training in fertilization and processing and number of times received training. Given the characteristics of the variables, the research can say that the first group corresponds to the 'small coffee producers' and the second group 'the medium coffee producers'. The small coffee producers are older, have a lower income, an area of little more than half a hectare, produce almost more cherry coffee than cherry and parchment coffee, do more pruning, do more organic fertilization [42], have fewer problems with coffee shade trees, put cherry coffee first as a source of income, receive less training in fertilization and processing and receive training less often [43].

2.6. Agro-Industrial Companies

There are many companies involved in the coffee industry in East Timor, but the research will focus on 6 companies that market coffee in Timor-Leste. These 6 companies are, Cooperativa Café Timor (CCT), Timor Global, Peace Winds, Alter Trape Timor (ATT), Peace Coffee and Timor Global. These companies not only buy cherry coffee, but also buy parchment coffee and green coffee to later process and export [44].

2.7. Characterization of Agro-Industrial Companies

Below the research present a brief characterization of the companies operating in Timor-Leste that were the subject of the study, a summary of which is presented in Table 3.

2.8. Cooperative Coffee Timor (CCT)

CCT has been operating in East Timor for 22 years. It is the oldest company with the largest production volume. The company has 516 permanent employees, consisting of 435 men and 81 women. The company's economic activity is coffee, livestock, vanilla, pepper and health services [45]. To ensure good quality production in the coffee sector, CCT has installed coffee processing facilities in all coffee areas in 6 municipalities in Timor-Leste. The facilities mentioned are the following, in the municipality of Ermera in Railaco and Estado, Ainaro, in Aitalo and Maubisse [46]. These three facilities are for processing the transformation of cherry coffee into parchment coffee.

The other facilities located in the municipality of Dili are for to handle the processing of parchment coffee into green coffee and a facility for processing green coffee into roasted coffee [47]. In the Tibar area, on the outskirts of Dili, in the municipality of Liquiçá, a facility was built to dry the coffee before processing parchment coffee into green coffee. The total revenue volume of the CCT company is 13,132,827.26 USD, and the revenue volume of the coffee that the CCT company has is 12,916,308.26 USD, with a volume of green coffee produced of 14187.6112 tons, which was exported [48, 49].

2.9. Global Timor

The company Timor Global has been operating in East Timor for 15 years. It has 140 employees, 115 men and 25 women. The company's main economic activity is coffee. In order to produce better quality coffee, the company Timor Global has set up a facility in Railaco Ermera that processes parchment coffee into green coffee, and at the same time has also set up a drying facility in Railaco [50]. The total revenue volume of the company Timor Global is 995,775.00 USD, the revenue volume of coffee is also 995,775.00 USD, with the volume of coffee produced by the company being about 210 tons of green coffee [51].

2.10. Peace Winds

Peace Winds has been operating in Timor-Leste for 14 years, with 9 permanent employees, 6 men and 3 women. The economic activity of Peace Winds is coffee and in the social and humanitarian area. In the coffee activity, the company purchases parchment coffee that the producer groups produce in the Letefoho area, and in the social activity the company provides humanitarian assistance to the producer groups that are part of Peace Winds, for example, drinking water equipment, health care and construction equipment [52, 53]. The company has facilities in Dili, for processing parchment coffee into green coffee and green coffee into roasted coffee. The company's total revenue is 595,500.00 USD, the coffee revenue is 595,500.00 USD, and the volume of coffee produced by the company is 90 tons.

2.11. Alter Trape Timor (ATT)

The company ATT has been working in East Timor for 9 years, with 3 permanent employees, 2 men and 1 woman. This company carries out its economic activity in coffee, in Ermera. In addition to its economic activity in the coffee sector, it also has a social activity, providing assistance with sanitary equipment and drinking water for the groups of farmers it has. The company's total revenue is 348,500.00 USD, the coffee revenue is 337,700.00 USD, and the coffee produced by the company is 55 tons of green coffee.

2.12. Peace Coffee

Peace Coffee has been operating in East Timor for 10 years. It has 15 permanent employees, divided between 12 men and 3 women. The company's economic activity is in the area of coffee, social and health. In the social and health area, the activity refers to providing assistance with sanitary equipment, drinking water and free healthcare. The company has facilities in Dili Municipality. The total volume of revenue is 319,500.00 USD, the volume of revenue from coffee of the company is 319,500.00 USD. The volume of coffee produced by the company Peace Coffee is 40 tons.

2.13. Timor Corp

This company has been operating in East Timor for 15 years. It has 35 permanent employees, 26 men and 9 women. The economic activity of this company is in the coffee sector, with headquarters in Dili. The total turnover of the company Timor Corp is 529,500.00 USD, and the turnover from coffee is 529,500.00 USD, and the volume of coffee produced by the company is 74 tons.

Table 3. Summary of the Main Characteristics of Agro-Industrial Companies

| Variables | CCT | Timor Global | Peace Winds | ATT | Peace Coffee | Timor Corp |
|------------------------|--|--------------|---------------------------|-------------------|---------------------------|------------|
| Uptime (years) | 22 | 15 | 14 | 9 | 10 | 15 |
| Activity | Coffee, Vanilla, livestock, pepper, health | Coffee | Coffee, health and social | Coffee and social | Coffee, social and health | Coffee |
| Total workers | 516 | 140 | 9 | 3 | 15 | 35 |
| Male workers | 435 | 115 | 6 | 2 | 12 | 26 |
| Women workers | 81 | 25 | 3 | 1 | 3 | 9 |
| Location of facilities | Dili, Ermera, Ainaro | Ermera | Dili | Dili and Ermera | Dili | Dili |

| Variables | CCT | Timor Global | Peace Winds | ATT | Peace Coffee | Timor Corp |
|-----------------------|------------|-----------------|----------------|---------|-----------------|---------------|
| Coffee turnover (USD) | 12,916,308 | 995,775 | 595,500 | 337,700 | 319,400 | 529,500 |
| Production volume | 14,181,761 | 210 | 90 | 55 | 40 | 74 |

2.14. Coffee Purchasing and Coffee Quality

In this section the research characterizes the companies operating in Timor-Leste that were the subject of study regarding the purchase of coffee and its quality, a summary of which is presented in Table 4.

2.15. Cooperative Coffee Timor (CCT)

The type of coffee this company buys is Arabica and Robusta coffee. CCT Company works with coffee producers in 6 municipalities, Ermera, Aileu, Liquiça, Ainaro Manufahi and Bobonaro (Lolotoe). CCT Company works with 146 juices and 22,550 coffee producers, in a coffee harvesting campaign. The CCT also establishes some type of contract with coffee producers and establishes an exclusivity contract with coffee producers. At the time of purchase from coffee producers, payment is made upon delivery of the coffee. The type of coffee the company buys from producers is cherry coffee, with red coffee being the preferred color. The price it pays producers for cherry coffee depends on its color.

2.16. Global Timor

The company Timor Global buys Arabica and Robusta coffee production, and also works with coffee producers from the municipalities of Ermera, Aileu, Liquiça, Ainaro and Manufahi. The company Timor Global in a coffee harvest campaign works with 8 juices and 120 coffee producers. Timor Global also establishes a type of contract with the coffee producers and establishes an exclusivity contract with the coffee producers. Timor Global only buys coffee from parchment coffee producers.

When buying from parchment coffee producers, payment is made upon delivery of the coffee. During the process of purchasing parchment coffee, the company supervises the coffee processing process by the farmer. Before purchasing parchment coffee, Timor Global will first perform moisture tests and tests on the hardness/color of the beans on the farmers' coffee. The price paid to the parchment coffee producers depends on the results of the tests. When purchasing parchment coffee, the company has two ways of acquiring the coffee: the company collects the coffee from the villages and the producers also bring the coffee to the company.

2.17. Peace Winds

The Peace Winds company buys Arabica and Robusta coffee, and also works with coffee producers from the municipality of Ermera (Letefoho) and Liquiça. The Peace Winds company in a coffee harvesting campaign works with 12 juices and 240 coffee producers. Peace Winds also establishes a type of contract with coffee producers and establishes an exclusivity contract with coffee producers. When purchasing parchment coffee from producers, payment is made upon delivery of the coffee. Peace Winds only buys coffee from parchment coffee producers.

During the process of purchasing parchment coffee, the company supervises the coffee processing process by the farmer. Before purchasing parchment coffee, Peace Winds will first perform moisture tests and tests on the hardness/color of the coffee beans from the farmers. The price paid to parchment coffee producers depends on the tests. When purchasing parchment coffee, the company has one way of acquiring the coffee: the company goes to collect the coffee from the villages.

2.18. Alter Trape Timor (ATT)

The company ATT buys Arabica and Robusta coffee and also works with coffee producers in the municipality of Ermera. The company ATT in a coffee harvesting campaign works with 21 juices and 450 coffee producers. ATT also establishes a type of contract with coffee producers and establishes an exclusivity contract with coffee producers. When purchasing parchment coffee from producers, payment is made upon delivery of the coffee. ATT only buys coffee from parchment coffee producers. During the process of purchasing parchment coffee, the company supervises the coffee processing process by the farmer. Before purchasing parchment coffee, the company ATT will first perform moisture tests and tests on the hardness/color of the beans on the

farmers' coffee. The price paid to parchment coffee producers depends on the tests. When purchasing parchment coffee, the company has a way of acquiring the coffee, it collects the coffee from the villages.

2.19. Peace Coffee

Peace Coffee buys Arabica and Robusta coffee. The company also works with coffee producers in the municipality of Manufahi (Same). During a coffee harvest campaign, Peace Coffee works with 2 juices and 150 coffee producers. Peace Coffee It also establishes a type of contract with coffee producers and establishes an exclusivity contract with coffee producers. When purchasing parchment coffee from producers, payment is made upon delivery of the coffee. Peace Coffee only buys coffee from parchment coffee producers. During the parchment coffee purchasing process, the company supervises the coffee processing process by the farmer. Before purchasing parchment coffee, the company first performs moisture tests and tests on the hardness/color of the beans on the farmers' coffee. The price paid to the parchment coffee producers depends on the results of the tests. When purchasing parchment coffee, the company has a way of acquiring the coffee, it goes to the villages to collect the coffee.

2.20. Timor Corp

The company Timor Corp specializes in purchasing Arabica and Robusta coffee, mainly from producers in the municipality of Ermera. In each coffee harvesting campaign, the company collaborates with around eight coffee agents and establishes formal contracts with producers, including exclusivity agreements to secure as table supply. Timor Corp exclusively buys parchment coffee, with payments made directly upon delivery to provide immediate financial support to farmers. Before any transaction, the company supervises the coffee processing carried out by farmers and conducts moisture, hardness, and color tests on the beans. The final price paid depends on the results of these quality assessments, which encourages producers to maintain better cultivation and processing practices.

Beyond financial transactions, Timor Corp strengthens its relationship with farming communities by collecting coffee directly from villages, thereby reducing farmers' logistical burdens. This approach not only ensures consistency in supply but also creates closer ties with local producers. By combining strict quality control with community-level engagement, Timor Corp secures reliable coffee supplies while contributing to the livelihoods of smallholder farmers in Ermera.

Table 4. Summary of Coffee Purchases and Quality from Agro-Industrial Companies

| Variables | CCT | Global Timor | Peace Winds | ATT | Peace Coffee | Timor Corp |
|---------------------------|--|--|---------------------|---------------------|---------------------|---------------------|
| Coffee species | Arabica and robusta | Arabica and robusta | Arabica and robusta | Arabica and robusta | Arabica and robusta | Arabica and robusta |
| Location of the producers | Ermera, Aileu, Liquiçá, Ainaro, Manufahi, Bobonaro | Ermera, Aileu, Liquiçá, Ainaro, Manufahi | Ermera, Liquiçá | Ermera | Manufahi | Ermera |
| Juices | 146 | 8 | 12 | 21 | 2 | 8 agents |
| Producers | 22,550 | 120 | 240 | 450 | 150 | – |
| Contract with producers | Yes | Yes | Yes | Yes | Yes | Yes |
| Exclusion of contract | Yes | Yes | Yes | Yes | Yes | Yes |
| Type of coffee | Cherry | Parchment | Parchment | Parchment | Parchment | Parchment |
| Price function of quality | Yes | Yes | Yes | Yes | Yes | Yes |
| Acquisition of coffee | Go to the villages | Go to the villages; receives in the villages | Go to the villages | Go to villages | Go to villages | Go to villages |

2.21. Market for Agro-Commercial Companies

At this point the research present to the companies operating in East Timor and which were the subject of study in this work, a characterization of their markets, the summary of which is in Table 4. Based on the results of the survey of the coffee industry in Timor-Leste, regarding the companies that buy coffee from farmers, it can be seen that for the 6 companies the destination of the coffee production is firstly export while for 4 companies, in addition to export, they also sell on the national market. These four companies are the CCT, Peace Winds, ATT and Peace Coffee. The main destination countries for coffee exports are varied, with the USA and Southeast Asian countries playing an important role in the destination of Timor-Leste's coffee, as they are ranked first by all six companies. Southeast Asian countries and the USA continue to dominate in second and third place. European countries are only mentioned in second place by two of the companies, Timor Global and Timor Corp. The coffees that are exported are all green coffees and the companies that sell coffee on the national market sell roasted coffees.

All the companies that buy green coffee from Timor have quality tests carried out. Timorese companies and importing companies communicate by telephone and email to conduct their business. All importing companies visit Dili to make coffee purchases and four of the six companies also visit the importing companies, Timor Global, Peace Winds, ATT and Peace Coffee. For companies that process green coffee into roasted coffee, CCT sells coffee under the Café Timor brand, Peace Winds under the Café Letefoho brand, ATT under the Café Distrito Ermera brand and Peace Coffee under the Peace Coffee brand. These roasted coffee products are sold on the national market, mainly in stores located in the city of Dili. For the time being, Timor Global and Timor Corp do not produce roasted coffee.

Table 5. Summary of Coffee Exports by Agro-Industrial Companies

| | CCT | Global Timor | Peace Winds | ATT | Peace Coffee | Timor Corp |
|--|----------------|--|------------------------|----------------|-------------------------|--|
| International market | Yes | Yes | Yes | Yes | Yes | Yes |
| National market | Yes | No | Yes | Yes | Yes | No |
| 1st exporting countries | USA | Australia, Japan, Korea, Taiwan and China | Japan | Japan | Korea | Australia and China |
| 2nd exporting countries | Australia | Europe (Germany, Netherlands and Portugal) | Australia | Korea | - | Europe (Germany, Netherlands and Portugal) |
| 3rd exporting countries | Singapore | USA | USA | Australia | - | USA |
| Product that exports | Coffee green | Green coffee | Coffee green | Coffee green | Coffee green | Green coffee |
| Product that sells national market | Coffee toasted | - | Coffee toasted | Coffee toasted | Coffee toasted | - |
| Export quality test (quality test: moisture and color/hardness test) | Yes | Yes | Yes | Yes | Yes | Yes |
| Communication by email and telephone | Yes | Yes | Yes | Yes | Yes | Yes |
| Importing company visits Dili | Yes | Yes | Yes | Yes | Yes | Yes |
| Exporting company visits the importing company | No | Yes | Yes | Yes | Yes | No |

2.22. Analysis and discussion of Results

The research can say that the coffee market is dominated by a very large company, CCT, a large company, Timor Global, and four small-medium sized companies. The main activity of the companies is coffee, although CCT also develops other processing and marketing activities in the agricultural area. Four of the companies that buy coffee from farmers, CCT, ATT, Peace Winds and Peace Coffee, complete their activity by providing services to farmers in the social and health areas. With the exception of CCT, which only buys cherry coffee, as a way of controlling the quality of the coffee during the processing process, all the other companies buy parchment coffee directly from the producers or their facilities. The quality of the parchment is controlled through tests carried out at the time of purchase or through monitoring of the processing process carried out by the farmers.

The price paid depends on the quality of the coffee purchased. Four of the companies that buy coffee from the farmers, CCT, ATT, Peace Winds and Peace Coffee, sell the coffee on the international and national markets, while Timor Global and Timor Corp only sell the coffee to the export market. The coffee sold on the national market is roasted and packaged. All the companies establish direct communication with the importing companies, which usually visit the exporting companies in Dili and in some cases the Timorese companies also visit the importing companies.

These results confirm previous studies on the coffee market in Timor-Leste, Deus and Henriques, which highlight that the market presents oligopoly characteristics due to the small number of participants and the fact that there is imperfect information about the prices received by exporting companies. Coffee quality is controlled at the time of purchasing parchment coffee or during the harvesting of cherry coffee or its processing. Coffee quality is reflected in the price paid to producers. This study indicates that both companies and coffee producers are aware of the importance of improving quality, how to improve quality, and how to implement quality improvement techniques. This is the beginning of the path that should be followed by all participants in the coffee chain.

In response to the three questions posed in the objectives, the research can say that farmers are concerned about the quality of the coffee they harvest, since they all say that they harvest red coffee cherries to sell or process. Regarding the processing of coffee cherries by producers, the research also found unanimous responses regarding the fermentation time and the removal of deficient coffee beans before drying. However, the research believe that this unanimity needs to be confirmed in the future through direct observation of the harvest and the fermentation practiced by producers. It is not clear whether the unanimous responses given by producers are what is actually done or whether it is the farmers' perception of what should be done.

There is unanimity among producers and agro-industrial companies that the price paid for cherry or parchment coffee is a function of its quality, cherry coffee is evaluated by its color while parchment coffee is evaluated by color, hardness and humidity tests. There is clear coordination of coffee quality between producers and agro-industrial companies. This coordination is expressed in several ways, by the presence of agro-industrial companies in the different coffee-producing areas, by the process of harvesting coffee at the production site, by the demands made by companies on producers for the coffee that is purchased, by the differentiation of the price paid, and by the technical training given to farmers mainly in terms of harvesting and processing.

3. MANAGERIAL IMPLICATIONS

The findings of this study carry several managerial implications for agro-industrial companies, cooperatives, and policymakers in Timor-Leste. First, strengthening coordination between coffee producers and companies is essential for ensuring consistent quality standards across the value chain. Managers of agro-commercial enterprises should invest in training programs, technical assistance, and quality monitoring systems that enhance farmers' capabilities in cherry selection, processing, and storage.

Second, the results highlight the importance of incentive structures in motivating producers. Companies should balance financial incentives with social support, such as healthcare and community services, to foster long-term loyalty and trust among smallholder farmers. These strategies not only improve supply stability but also contribute to inclusive rural development.

Third, managers must consider market diversification and branding strategies. Beyond exporting green coffee, there is an opportunity to expand domestic roasted coffee markets under recognizable brands. This can increase value addition within the country while reducing reliance on volatile international markets.

Finally, policymakers and industry leaders should encourage collective action and partnerships among producers, cooperatives, and companies to reduce structural inequalities in value distribution. Such efforts will improve competitiveness, promote sustainable farming practices, and strengthen Timor-Leste's positioning in global specialty coffee markets.

4. CONCLUSIONS

4.1. Coffee Producers

The coffee farmers surveyed in the Administrative Post of Letefoho, Municipality of Ermera, share relatively similar socio-economic characteristics. Their average age is 46 years, the majority are male, married, and have no formal education beyond secondary school. The average annual monetary income per producer is USD 1,120, with coffee serving as the primary source of livelihood. Most producers own only one plot, with an average plot size of 0.68 ha, while the average landholding per producer is 0.83 ha, indicating that smallholders dominate the area.

Most coffee land was acquired through inheritance, and farmers generally expressed unwillingness to sell their coffee plots. Decisions related to coffee production and marketing are mainly made by men within the household. Arabica is the most commonly cultivated variety, with farmers producing cherry coffee, about half of which is further processed into parchment coffee.

In terms of technology and farm management practices, the findings show that about half of the producers prune their coffee trees, all producers weed their plantations, and the majority apply organic fertilization. However, shade trees present a challenge for more than half of the farmers, highlighting the need for improved agroforestry management to optimize coffee productivity and quality.

4.2. The Workforce is Family-Based

Most coffee producers sell their cherry coffee to the company CCT, which is the most demanding when it comes to cherry coffee quality, with a higher price that reflects the quality of the coffee. Regarding the transformation of coffee cherries into parchment coffee, carried out by half of the producers. This processing of parchment coffee after harvesting is done on the same day by all the producers who produce this type of coffee, using pulp from the cherry coffee a traditional wooden machine, wet fermentation, the coffee is washed before drying. All parchment coffee producers store the parchment coffee before selling at home. The parchment coffee is sold to several companies, Peace Winds, ATT, Timor Global. Most of the parchment coffee producers consider the price offered by the companies to be good.

All coffee producers have already received incentives for their production and all of the incentives came from private companies. Coffee producers received various trainings regarding coffee production. The sample of selected farmers presents a very high level of homogeneity of responses for many variables, which means that crossing these variables with others does not produce a rich discussion of results. Regarding the physical size of the producers, the research found that the income obtained is higher for companies with larger areas, although the differences between medium and small companies are not significant. Although there are producers of robusta coffee in the small (1) and medium (1) classes, the vast majority (3) are in the large class.

Regarding cultural operations, the research found that there are significant differences in terms of pruning, fertilization and shade trees depending on the size of the farms. Thus, small farms do more pruning than medium and large farms, small and medium farms do more organic fertilization than large farms, and medium and large farms have more problems with coffee shade trees than small farms. Regarding the type of coffee produced, the research found that as the size of the farms increases, the production of parchment coffee increases. Smaller companies produce mainly cherry coffee, while larger companies produce not only cherry coffee, but also parchment coffee. Thus, the contribution of the type of coffee to income varies according to size. Larger companies place parchment coffee first, while smaller companies place cherry coffee.

The perception of the price offered by the CCT for cherry coffee is better for smaller companies than for medium and large companies, where good coffee predominates. As the size of coffee producers increases, parchment coffee is sold to smaller processing companies. With regard to the incentives received, the research found that smaller companies receive, in addition to training, free health care, and that as the size of the companies increases, companies receive more financial incentives and less free health care. With regard to training in planting, pruning and fertilization, the research found that smaller companies are those with higher levels of training, while in processing, larger companies have higher levels of training.

4.3. The Companies

The company Cooperativa Café Timor (CCT) is the oldest company operating in East Timor with great economic activity and the largest volume of coffee production, compared to other companies (Timor Global, Peace Winds, Alter Trape Timor, Peace Coffee and Timor Corp). It also has more. In addition to economic activities, i.e. trade activities, the companies also work with social activities, i.e. humanitarian assistance for coffee producer groups (free health care, drinking water equipment, assistance with sanitary equipment and construction equipment).

The company Cooperativa Café Timor (CCT) works with coffee producers in 6 municipalities, producing both Arabica and Robusta coffee. These companies The company Cooperativa Café Timor (CCT) buys red cherry coffee, while the companies Timor Global, Peace Winds, Alter Trape (ATT), Peace Coffee and Timor Corp only buy parchment coffee and only two companies (Timor Global and Timor Corp) buy green coffee. All companies that buy parchment coffee test the moisture and hardness/color of the coffee beans from the farmers. The price paid depends on the results of these tests.

4.4. For All Companies, the First Destination for Coffee Production Is Export

The main destination countries for coffee exports are the USA, Southeast Asian countries, and European countries. The coffees that are exported are green coffee. In addition, the four companies that also transform green coffee into roasted coffee with branding, CCT sells roasted coffee under the Café Timor brand, Peace Winds under the Café Letefoho brand, ATT under the Café Distrito Ermera brand, and Peace Coffee under the Peace Coffee brand and these coffee products sold in the national market mainly in stores that are located in Dilicity East Timor.

5. DECLARATIONS

5.1. About Authors

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Conceptualization: PD; Methodology: ML; Software: CA; Validation: and ML; Formal Analysis: CA and PD; Investigation: ML; Resources: CA; Data Curation: PD; Writing Original Draft Preparation: ML and CA; Writing Review and Editing: ML and PD; Visualization: CA; All authors, CA, PD, and ML, have read and agreed to the published version of the manuscript.

5.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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5.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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