

## Ecological politics and sustainability of Arabic coffee (*Coffea arabica* L) in Timor Leste

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### ABSTRACT

The research has been carried out in three districts consisting of Liquica, Ermera, and Ainaro districts, from January 2021 to January 2022. The location was chosen with consideration: (i) Geographically Liquica district represents lowland areas with an altitude of 700-900 m asl, Ermera district represents moderate plains with an altitude of 1000-1400 m asl and Ainaro district represents highland areas with an altitude of 1500-1750 m asl; (ii) Ecology of coffee farming in the districts of Liquica, Ermera and Ainaro under the supervision of the agriculture and plantation service. This study aimed to determine the ecological characteristics of arabica coffee farming in Timor Leste and to analyse the ecological politics and sustainability of Arabica coffee (*Coffea arabica* L) farming in Timor Leste. The type of research used in this study was a case study. The research method used was Mix-methods, i.e., a research approach that combines or associates qualitative and quantitative forms in the data collection stage. Respondents were selected as many as 180 coffee farmers using Purposive Sampling Technique. Respondent characteristic data were analysed descriptively, and data related to ecological politics on the sustainability of coffee farming management were analysed using multiple linear regression, continuing with the T test. The results showed that from the aspect of farmers' characteristics, they still needed improvement and assistance considering that the age of the farmer was dominated by 51-56 years (30%), with relatively low formal education, only elementary school by 40%. Political ecological analysis of the sustainability of coffee farming from the social aspect, community aspect and product responsibility aspect displayed a very significant effect ( $p < 0.01$ ) and for environmental aspects it has a significant effect ( $p < 0.05$ ) on the sustainability of coffee farming. Meanwhile, the economic and labour aspects exhibited no significant effect.

**Keywords:** Timor Leste, Ecological politics, Arabica coffee, Sustainability.

**Article type:** Research Article.

### INTRODUCTION

Arabica coffee, *Coffea arabica* L is a refreshing drink that has a fragrant taste and caffeine aroma that can excite 157 million coffee drinkers in the world (ICO 2021). Arabica coffee was introduced by the Portuguese colonizers to the people of Timor Leste as a plantation commodity in 1815 and then developed on a large scale in 1860 during the reign of the Governador Celestino da Silva in 1860. This commodity has quite good economic value, and the people gave the nickname coffee Arabica with the most familiar name "The Green Gold (Orro Verde)". Coffee by the people of Timor Leste is well received from the upper class to the lower class and to date, it is promoting Arabica coffee as the first export commodity in the agricultural sector, and ranks second in total export commodities after oil and natural gas. The Arabica coffee commodity is a mainstay of Timor Leste's agricultural exports besides coconut, vanilla, cloves and cocoa. Coffee is a plantation commodity that is expected to increase

the value of Timor Leste's export foreign exchange (Santoso 2016). Ermera is one of the districts that ranks first as the owner of the largest coffee plantation area, namely 56,000 ha with a production of around 5,600 tons/year. When compared with the number of requests (needs) for coffee consumption from the people of Timor-Leste which reach 10,600 tons every year, it is clear that the gap is quite high. From the aspect of regional development, Ermera district is also one of the areas that has quite high economic potential, especially in the plantation sub-sector. Therefore, it is not excessive if the paradigm of economic development in Ermera district is focused on the harmony of agricultural development with a focus on the development of local resources. Smallholder coffee plantations are one of the agricultural sub-sectors that have the potential to be developed into a centre for high-quality Arabica coffee production in Timor Leste (Badan Pusat Statistik 2021). When viewed from the level of productivity, Arabica coffee developed in Timor Leste looks lower than the average productivity level of neighbouring countries such as Indonesia. However, Ermera district has the highest score in terms of planting area for coffee commodities, even the coffee planting area continues to increase, so that it is designated as a coffee agro-tourism area. Ermera Regency is also the area that develops the most Arabica coffee 90% compared to other districts in Timor Leste. If you look at the history of its development, the people's coffee plantation business in Timor Leste was pioneered by the Portuguese colonialists through forced labour carried out by the colonialists to the ancestors of the people of Timor Leste. In the colonial era, the Portuguese saw coffee as one of the farming activities that provided bright future prospects for the people of Timor Leste, who had the potential for suitable, fertile land, very supportive topography for the development of coffee plants in six districts, namely Ainaro, Aileu, Bobonaro, Ermera, Liquica and Manufahi. One of the problems in the development of Arabica and Robusta coffee in the Democratic Republic of Timor Leste (RDTL) is that farmers' knowledge in choosing coffee quality and coffee picking is still weak. Limited manpower working in coffee plantations, climate change and weather for a very long time, farmers in managing their farming are still traditional, have not used adequate technology to increase maximum production. Buyers do not allow farmers to use fertilizers and medicines. They only allow the use organic material derived from plant residues in the form of compost and animal manure. Sustainable coffee plantations emphasize long-term production while remaining profitable and environmentally friendly. This system not only produces coffee beans, but also provides services to the environment such as soil and water conservation and biodiversity conservation. Ecological processes include nutrient and water cycles, energy flows, and population regulation mechanisms. At least seven kinds of activities are needed to achieve sustainable agriculture goals, i.e., (i) Increasing economic development; (ii) Prioritizing food adequacy; (iii) Increasing the development of human resources; (iv) Increase self-esteem; (v) Empowering and liberating farmers; (vi) Maintain environmental stability (safe, clean, balanced, updated); and (vii) Focus on long-term productivity goals (Salikin 2003; Sukma 2017; Ketaren & Rangkuty 2021). This study aimed to determine the ecological characteristics of Arabica coffee farming in Timor Leste and to analyze the ecological politics and sustainability of Arabica coffee, *Coffea arabika* L farming in Timor Leste. The ecological characteristics referred to in this study are land conservation activities, and the Arabica coffee farming system.

## **MATERIALS AND METHODS**

### **Place and time**

This research was carried out in three districts, i.e., Liquica, Ermera, and Ainaro, starting from January 2021 to January 2022. The locations were chosen with the following considerations; (i) Geographically Liquica district represents lowland areas with an altitude of 700-900 m asl; Ermera district represents moderate plains with an altitude of 1000-1400 m asl; and Ainaro district represents highland areas with an altitude of 1500-1750 m asl; (ii) Ecology of coffee farming in Liquica, Ermera and Ainaro under the supervision of the agriculture and plantation service.

### **Types and Research Methods**

The type of research used in this investigation was a case study in farming communities in coffee farming areas in Liquica, Ermera and Ainaro. Nasir (1988) explains that case studies are used to provide a detailed description of the background of the traits or characteristics that are typical, or the status of an individual, which then the characteristics above will be made general. The results of this case study were a generalization of typical case patterns from individuals, groups, institutions and so on. Depending on the objective, the scope of the study may cover certain segments or sections or cover the life cycle of individuals, groups, etc., either with an emphasis on

certain case factors or covering all of the factors. In this study the unit of case analysis included farmer households and coffee farming institutions in Liquica, Ermera and Ainaro. The research method used was Mix-methods, which was a research approach that combines or associated qualitative and quantitative forms in the data collection stage (Creswell, 2014). Qualitative descriptive was focused on answering research questions related to the questions of who, what, where and how an event or experience occurs until finally it is examined in depth to find the patterns that emerged in the event (Sefcik dan Bradway 2016). Quantitative descriptive study is a type of research that is used to analyze data by describing those which has been collected, used to examine certain populations or samples. Data collection used research instruments, and data analysis was quantitative (Sugiyono 2015).

### **Population and sampling**

The research population was the whole (universum) of research objects which could be humans, animals, plants, air, symptoms, values, events, attitudes to life, and so on. Sampling was a procedure in which only a portion of the population was taken and used to determine the desired characteristics of a population. In this study, we used coffee farmer respondents from three districts across Timor Leste. Respondents were selected as many as 180 coffee farmers using the "Purposive Sampling Technique." which is a sampling technique with certain considerations (Sugiyono 2015).

### **Types of data and methods of collection**

The data collected were primary and secondary. Primary data obtained through direct interviews with predetermined respondents, while secondary data, included data obtaining from related agencies or institutions such as the national director of plantations, the national director of agriculture, the village office, and the sub-district. Data collection in qualitative research was carried out using the triangulation method, i.e., in-depth interviews, literature studies, and field observations. In-depth interviews were conducted with respondents, coffee farming ecological actors, local government officials, related agencies, and companies engaged in coffee farming ecology. The results of the in-depth interviews with the respondents were then recorded in field diaries recorded by the researchers. The literature study was carried out as an effort to collect information secondarily through data in the form of reports and official letters from government officials to support and strengthen the data from in-depth interviews, while field observations are carried out by thoroughly observing the actual conditions that occur.

### **Variables and their measurement indicators**

This research is a qualitative and quantitative one where qualitative data can be collected through interviews based on farmer age (years), education level (years), farming experience (years), while quantitative data can be collected based on the results of field observations and interviews in the form of area (ha), total production (tons), total exports (tons) to key respondents. Key respondents were actors from farming families and various agricultural institutions in the study area, i.e., the districts of Liquica, Ermera and Ainaro. The observation variables and their measurement indicators are described in Table 1 as follows:

### **Data analysis**

Primary data was collected based on information from the respondents recorded in daily notes and used as a guide in analyzing primary data. The information obtained in the form of statements is then constructed to interpret each statement from the respondents for the characteristics of the respondents analyzed descriptively, and data related to ecological politics on the sustainability of coffee farming management is analyzed using multiple linear regression, and continued with the T test. The multiple linear regression model used is:  $Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5 + a_6X_6$

Where

Y = Sustainability of coffee farming

X<sub>1</sub> = social aspect

X<sub>2</sub> = Economic aspect

X<sub>3</sub> = Environmental aspects

X<sub>4</sub> = Labor aspect

X<sub>5</sub> = Aspects of society

X<sub>6</sub> = Product responsibility aspects

**Table 1.** Indicators of Variable Measurement.

No	Variable	Indicator
1	Social Aspect	a. Participate in farmer groups b. Activeness in participating in farmer group activities c. Participate in community activities d. Number of community groups involved e. Activeness in mutual cooperation activities
2	Economic Aspect	a. Productivity of coffee farming b. Convenience in obtaining market information in the form of the current coffee price c. Selling price of coffee d. Transparency in assessing the quality of coffee produced (moisture content, bean defects, etc.) e. Ease of marketing coffee
3	Environmental Aspect	a. Handling wild animals in the garden b. Carry out steps and conservation actions by planting various intercropping/shade plants c. Control of pests, diseases and weeds in the garden
4	Aspects of Use of Labor and Decent Work	a. Occupation b. Labor/Management Relations c. Occupational Health and Safety d. Training and education e. Diversity and employment opportunities
5	Community Aspect	a. Community b. Corruption c. Public policy d. Non-competitive behavior e. Obedience
6	Aspects of Product Responsibility	a. Customer Health and Safety b. Labeling for Products c. Communication and Marketing d. Customer privacy e. Obedience

## RESULTS AND DISCUSSION

### Respondent characteristics

The characteristics of farmer respondents in Arabica coffee farming in Liquica, Ermera and Ainaro included the categories of farmer age, education, farming experience, family dependents, the details described are as follows:

#### a) Farmers age

The age of the farmer is one of the factors that can affect the percentage of work and ability, both physically and mentally or in making decisions about the Arabica coffee plantation business to be carried out. To find out the age of Arabica coffee farmers can be seen in Table 2. Liquisa Regency is a district that represents a lowland area with an altitude of 700-900 m above sea level. Table 2 shows that 60 respondents (farmers) were selected with age intervals between 41 and 45 years; 4 people with a percentage of 6.67%, 6 people aged 46-50 years (10%), aged 51-55 years (n = 15; 25%), aged 56-60 years (n = 17; 28.33%), age category of 61-65 years (n = 12; 20%) and those aged over 66 years (n = 6; 10%). This shows that the Arabica coffee farmers in Liquica district are mostly 56-60 years old (28.33%) and only 6.67% of farmers with an age range of 41-45 years. Ermera Regency represents an area with an altitude of 1400 meters above sea level with varying age of respondent farmers with the most numerous farmer categories in the age range of 45-50 years as many as 20 people (33.33%), followed by the age category of 51-55 (n = 18; 30%), 15 people aged 56-60 (25%) and the smallest were farmers aged 66 with 1 person (1.67%). This shows that the Arabica coffee farmers in Ermera district were over 45-year olds and only 1.67% were over 66-year olds. Ainaro Regency is one of the regencies located in the central region and is under the foot of Mount Ramelau with an altitude of 3000 m above sea level. It represents a highland area with an altitude of 1600-1800 m above sea level. A total of 60 respondent farmers were selected with age intervals ranging from 41 to > 66 years. An age range of 51-55 years were the highest, being 18 people (30%), followed by

farmers with 46-50 years (n = 16; 26.67%). Thereafter, we selected 56-60 years (n = 14; 23.33%), 61-65 years (n= 8; 13.33%) and 41-45 years (n = 4; 6.67%). This shows that in aggregate the age of farmers involved in the cultivation of Arabica coffee farming is dominated by farmers with an age category of more than 51 years.

**Table 2.** Age classification of the respondent farmers.

Regency	Age (Year)	Number (Person)	Presentation (%)
Liquisa	41-45	4	6.67
	46-50	6	10
	51-55	15	25
	56-60	17	28.33
	61-65	12	20
Ermera	>66	6	10
	45-50	20	33.33
	51-55	18	30
	56-60	15	25
	61-65	6	10
Ainaro	>66	1	1.67
	41-45	4	6.67
	46-50	16	26.67
	51-55	18	30
	56-60	14	23.33
	61-65	8	13.33

Source: Processed primary data,(2022).

#### b) Respondent farmers education

Education is an important factor in farming management. The level of education can generally affect the way one thinks and behaves in doing something, such as managing a business, increasing business productivity and farmer's income. The level of education of a farmer in a village will affect the mindset of the community, the higher a person's education, the better the quality of his mindset. The condition of the respondents based on their level of education is presented in Table 3.

**Table 3.** Classification of respondent farmer education levels in the three districts.

Kabupaten	Tingkat Pendidikan	Jumlah (Orang)	Presentase (%)
Liquica	No school	24	40
	PS (primary school)	20	33.33
	JHC (Junior high school)	10	16.67
	HS (high school)	6	10
Ermera	No school	5	8.33
	PS (primary school)	15	25
	JHC (Junior high school)	30	50
	HS (high school)	10	16.67
Ainaro	No school	16	26.67
	PS (primary school)	24	40
	JHC (Junior high school)	15	25
	HS (high school)	5	8.33

Source: Primary Data After Processing (2022).

Table 3 explains that the conditions of formal education of respondent farmers in the three districts were 45 people who did not go to school (25%), 59 who attended elementary school (32.78%), 55 with junior high school education (30.56%) and high school education (n = 21; 11.67%). It provides an indication that the education level of respondents greatly influences the production and productivity of farmers. This is caused by the low economic level and the lack of motivation of parents to send their children to school. Respondents with low education usually find it difficult or lack new information in the world of Arabica coffee plantations, in contrast to the respondents with high level of education, who can easily get information, so that they can increase production and profits from their crops.

### c) Business experience

Experience in farming or high knowledge is not enough to support the success of a business. In addition to education, both formal and non-formal experience is needed. Most of the respondents have been working as farmers for a long time. They reasoned that farming was hereditary from their parents. Nitisemito and Burhan (2004) stated that the longer a person carries out an activity, the more knowledge will be obtained in that field, so that it can facilitate decision-making related to the technical implementation of a business. For more details, the level of experience of the respondents' farming experience can be observed in Table 4 as follows.

**Table 4.** Respondents' farming experience.

Business Experience (Year)	Number of Respondents (Person)	Percentage (%)
0-5	10	5.56
5-10	30	16.67
10-15	40	22.22
15-20	60	33.33
20-25	20	11.11
<25	20	11.11

Source: Primary Data After being processed (2022).

Table 4 explains that the respondent farmers have quite varied farming experience from simple 0-5 years (n = 10; 5.56%), 5-10 years (n = 30; 16.67%), 10-15 years (n = 40; 22.22 %), followed by 15-20 years of experience with the highest number (n = 60; 33.33%), followed by 20-25 and more than 25 years of experience (n = 20; 11.11%). This indicates that the average Arabica coffee farmer has quite good experience, and only a few have minimal experience (5.56%).

### d) Number of family dependents

Respondent farmers have family responsibilities determined by the number of family members who are the responsibility of the head of the family or the farmer himself. Children, wives and siblings who live together in one house and family members can function as workers in the family. For more details, the number of dependents of the respondent's farming families can be observed in Table 5.

**Table 5.** Total dependents of respondent farmer families in 3 regencies.

Family Dependents (Person)	Number of respondents (person)	Percentage (%)
2 – 4	160	88.89
5 – 8	20	11.11

Source: Primary Data After Processing (2022).

Table 5 explains that the respondent farmers who have 2-4 family dependents are 88.89% and only a few respondents with 5-8 family dependents are 11.11%. By looking at these data, it can be concluded that family conditions are relatively small because the more dependents, the greater the cost, the more family members are displaced.

### Ecological Political Analysis of the Sustainability of Coffee Farming

The results of research conducted in the Democratic Republic of Timor Leste (RDTL), to analyse ecological politics and their impact on the sustainability of Arabica coffee farming are discussed with reference to the measurement indicators (Table 1) with the results of the analysis showing that the coefficient of determination ( $R^2$ ) is used as a measure to see the goodness of fit of the multiple regression equation used. The multiple regression equation is said to be good (fit) if  $R^2$  is close to 1. F-count is used as a tool to test the significance of the coefficient of determination or  $R^2$ . According to Pratisto (2009), the calculated F-value can also be used to determine whether the model compiled is acceptable or not. Because the probability (sig) of the F-count is  $0.000 < \alpha (0.01)$ , the model compiled can be used to estimate the value of the regression coefficient. The results of data analysis using SPSS version 24 show that the  $R^2$  value obtained is 0.265, which means that 26.5% of the

sustainability of Arabica coffee farming can be explained by all independent variables included in the equation, and the remaining 73.5% can be explained by other variables not included in this study. In the F test, the calculated F-value was 11.742 with a significant value of 0.000. The significant value  $< \alpha$  (1%) means that all independent variables together have a very significant effect on the sustainability of Arabica coffee farming. So far no research results have been found that are similar to utilizing six independent variables in this study. Partially, Wollni & Brümmer (2009) used coffee plant pruning as a variable, while Suwarno *et al.* (2005) and Poudel *et al.* (2010) used organic fertilizer as variables. The t test was used to analyse the effect of each independent variable on the sustainability of Arabica coffee farming as shown in Table 6.

**Table 6.** Results of ecological political regression analysis on the sustainability of coffee farming.

Variable	Coefficient		t	Sig.
	Regression	Standard Error		
Constant	10.404	5.752	1.809	0.016
Social Aspect (X <sub>1</sub> )	0.345**	0.099	3.471	0.001
Economic Aspect (X <sub>2</sub> )	0.407	0.879	0.463	0.644
Environmental Aspect (X <sub>3</sub> )	-2.999*	1.298	-2.311	0.022
Labor Aspect (X <sub>4</sub> )	0.885	0.832	1.064	0.289
Aspects of Society (X <sub>5</sub> )	4.807**	0.783	6.142	0.000
Aspects of product responsibility (X <sub>6</sub> )	4.409**	1.409	3.128	0.002

n indicates social aspect variables (X<sub>1</sub>), community aspects (X<sub>5</sub>) and product responsibility aspects that have a very significant effect on the sustainability of Arabica coffee farming (Y) at the level of  $\alpha = 0.01\%$ ; The \* sign indicates that the environmental aspect variable (X<sub>3</sub>) has a significant effect on the sustainability of Arabica coffee farming (Y) at the  $\alpha =$  level, 0.05%

#### a) Social aspect

Social aspect is a term that has a very broad meaning, about interaction and human nature in communicating between individuals, farmer groups and community groups who live side by side in one community environment. Table 6 depicts that there is a very significant influence ( $p < 0.01$ ) of the social aspect on the sustainability of coffee farming. In this study, it implies that the application of ecological politics in the farming system is in line with the Timor Leste government's efforts to encourage an increase in premium prices through certification of ecological-based coffee. By interacting with one another, people can construct the rules, institutions, and systems in which they seek to live. This has the effect of increasing the spirit of mutual cooperation and collaboration between individuals or groups to increase each farmer's income and Timor-Leste's foreign exchange, sine coffee is one of the prima donna commodities that has contributed to farmers by 60-70% and state foreign exchange by 45% (MTCI 2021). This can happen because social sustainability activities carried out by farmers and families are focused on coffee plantation businesses that can increase their income. Farmers are required to participate in these activities: (i) Participate in farmer groups; (ii) Being active in farmer group activities, (iii) Participating in community activities, (iv) Number of community groups that are followed, and (v) Being active in mutual cooperation activities. As for the contribution of coffee farming in the study area to the planting area and coffee production for five years (Table 7).

**Table 7.** Total area of coffee planting and production in 2016-2020.

Regency	Total Area (ha)					Total production tons/ha				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
National	58.745	58.805	58.895	58.898	59.216	10.468	10.448	9.966	10.609	10.448
Liquica	11.964	11.969	11.970	11.966	11.969	1.959	1.254	1.254	1.959	1.254
Ermera	32.000	32.025	32.141	32.142	32.252	4.360	5.102	5.020	4.336	5.102
Ainaro	5.695	5.698	5.698	5.697	5.698	1.540	1.489	1.489	1.540	1.489
Total	49.659	49.692	44.111	49.805	49.919	7.859	7.845	7.763	7.835	7.845
Contribution	84.53	84.50	74.90	84.56	84.30	75.08	75.09	77.89	73.85	75.09

Source: Primary Data After being processed (2022).

The social contribution in carrying out farming activities and the sustainability of coffee farming as a mainstay commodity for Timor-Leste fluctuates and is very dynamic with contribution values between 74.90%-84.56%

(planting area) and between 73.09%-77.89% (production). Social aspects to stakeholders, especially to carry out and report social responsibility can improve the welfare and loyalty of farmers in working together, so that it can lead to increased company productivity (Ernst dan Young 2013).

### b) Economic aspect

Table 6 depicts that the economic aspect has no significant effect ( $p > 0.05$ ) in this study. This has implications that the application of an economic system to coffee farming should be in line with efforts to increase premium prices through ecological-based coffee certification. In other words, labelled coffee farming will be an attractive incentive for farmers if they want a significant increase in production to be compensated by premium prices for coffee beans at the farm level. Economic aspects and a series of interrelated production and consumption activities in determining natural resources (environment) have no effect on farmers' income and foreign exchange in Arabica coffee farming in Timor-Leste, and three districts specifically as coffee research locations. Coffee business actors can follow the indicators listed in Table 6 including (i) Productivity of coffee farming; (ii) Ease of obtaining market information in the form of current coffee prices; (iii) Selling price of coffee; (iv) Transparency in evaluating the quality of the coffee produced (moisture content, bean defects) as a consideration for the selling price of coffee; and (v) Ease of marketing coffee. Several parts of the economy need to be addressed to increase production, distribution, trade and consumption capabilities. Economic growth based on environmental exploitation exacerbates social justice. Therefore, improving the economic aspect should synergize with environmental improvements. An extreme environment that is not managed properly will affect the decline in coffee production and as a consequence cause the income of farmers and the country's foreign exchange to decrease as well. The contribution of the economic aspect to coffee production, to farmers' income and foreign exchange can be observed in Table 8.

**Table 8.** Contribution of coffee production to the income of farmers and foreign exchange for the State of Timor-Leste during 2011-2019

No	Year	Number of Farmers	Surface Area (ha)	Production Amount (ton)	Export Amount (ton)	Value (Million Dollars; US\$)
1	2012	54.317	53.844	8.461	6.636	11,917,000
2	2013	54.396	54.267	8.204	6.417	9,817,000
3	2014	54.525	54.538	8.034	8.034	9,342,000
4	2015	54.666	55.082	8.019	7.157	11,919,000
5	2016	54.875	58.745	10.468	8.898	10,814,000
6	2017	55.676	58.805	10.448	9.848	12,781,000
7	2018	55.755	58.921	9.966	6.543	13,771,000
8	2019	55.825	58.894	10.605	8.898	9,731,000
9	2020	55.847	59.216	10.448	7.718	12,962,000
Total		495.882	512.308	84.653	70.149	103,054,000
Average		55.098	56.924	9.406	7.794	11,450,444
SD		664	2.388	1.183	1.221	1,595,016

Source: RDTL Ministry of Industry and Trade (2021).

Table 8 depicts that the contribution of the Arabica coffee plantation sub-sector to the income of farmers who manage coffee plants in Timor Leste is still traditional and has not been touched by technology such as the correct application of the seven principles of farming, namely maintenance, weeding, fertilizing, controlling pests and diseases, harvesting and post-harvesting, in order to produce coffee with quantity and good quality.

### c) Environmental aspects

Environmental science studies the interrelationships between living things and their environment and with a combination of physical conditions which include the state of natural resources such as land, water, solar energy, minerals, as well as flora and fauna that grow on land and in the oceans, with institutions that include human creations such as decisions about how to use the physical environment. According to Table 6, environmental aspects have a significant effect ( $p < 0.05$ ) on the sustainability of coffee farming in this study, indicating that at the macro level the environment is very supportive of the process of coffee growth and production. Results of a study on the relationship between ecological aspects of shade trees and coffee production in the state of Chiapas-



Mexico revealed that coffee cultivars, plant age, species enrichment, shade tree populations, and land slope, showed no significant effect on coffee production. Meanwhile, canopy cover of more than 50% can reduce coffee production (Soto-Pinto *et al.* 2000). The environment can also be interpreted as everything that is around humans and influences the development of human life. The biotic component of the environment includes all living things in it, i.e., animals, humans, plants, fungi and other living things, while the abiotic components are inanimate objects that are beneficial for the survival of living things in an environment that includes soil, water, fire, rock, air, and so on. Damage to the environment occurs due to two factors, either natural factors or due to the ignorant hands of humans. The importance of a well-maintained environment is sometimes forgotten by humans, and this can result in ecosystems and life that are not optimal in that environment. The following are several factors that cause environmental damage, i.e., (i) Natural factors, which occur not due to human intervention, but natural activities, such as natural disasters and erratic weather, are the causes of environmental damage. (ii) Artificial factors include human behaviour as intelligent beings and have high abilities compared to other creatures which will continue to develop from a simple lifestyle to a modern life. By the development of life, of course, their needs will also greatly develop, including the need for excessive exploitation of natural resources. An analysis of environmental aspects is carried out to determine the positive and negative impacts, both direct and indirect. Environmental studies also aim to find solutions as well as overcome the impacts that occur from these environmental aspects. Environmental impacts are alterations in an environment from its original form such as physical, chemical, biological and social ones. Environmental alterations if not anticipated will damage the existing order, both for fauna, flora and humans. In developing countries, the problem of maintaining environmental sustainability has not received enough attention in order to improve welfare through development in all fields. Environmental sustainability in this case is an environment that is dynamic and still able to support a higher standard of living, meaning that the impact caused by development can still be absorbed properly by the carrying capacity of the surrounding environment. Impact on development is an activity positive or negative that causes all changes to the environment. Therefore all activities should be based on environmental insight by magnifying positive impacts and minimizing negative ones.

#### **d) Labour Aspect**

Based on Table 6, the labour aspect has no significant effect on the sustainability of Arabica coffee farming. The labour aspect is an activity carried out by each individual as a workforce to earn income on a daily basis, monthly wages and annual wages. The labour factor does not significantly affect it, since the labour effort is difficult to calculate, bearing in mind that coffee is an annual plant so it does not need to devote a lot of labour in particular. In this case, it can be understood that in general, farmers do not need to look for a lot of labour from outside and it is enough to involve their families in coffee farming (Pawiengla *et al.* 2020). In the context of manpower development, the government establishes policies and prepares manpower planning covering two aspects including: macro- and micro- manpower planning. In formulating policies, strategies, and implementing sustainable manpower development programs, the government should be guided by manpower planning as contained in the manpower planning document and prepared on the basis of manpower information, including among others: (i) Population and workforce; (ii) Employment Opportunity; (iii) Job training including job competence; (iv). Labour productivity; (v) Industrial relations; (vi) Environmental conditions; (vii) Labour wages and welfare; and (viii) Labour social security (Hinkelman 2002). To improve the ability of the workforce, it is mandatory through the following trainings. Job training is organized and directed to equip, improve, and develop work competencies in order to increase capabilities, productivity, and welfare: (i) Every workforce has the right to obtain and/or improve and/or develop work competencies in accordance with their talents, interests and abilities through job training; (ii) Job training for workers with disabilities is carried out by taking into account the type, degree of disability, and ability of the workers with disabilities concerned; (iii) Job training can be organized with an apprenticeship system; (iv) Organizing job training can be carried out by the government or the private sector, or in collaboration with one another; and (v) Training institutions held by the private sector can be in the form of legal entities or individuals, however, in conducting them, they should obtain permits and register with the agency responsible for manpower affairs.

#### **e) Aspects of society**

The results of the analysis in Table 6 show that the community aspect in coffee farming activities has a very significant effect on the sustainability of coffee farming. Community access to agricultural activities, especially

coffee cultivation, is sensitive because Liquica, Ermera and Ainaro are the largest Arabica coffee growing centres in the State of Timor Leste, so that the average community has high access to coffee cultivation activities. Family participation in the Arabica coffee farming is quite high, since each family member can involve themselves in coffee farming that has been established for a long time, so that this farming will continue, besides that family participation in coffee farming is also an effort to reduce production costs. The public's view of coffee farming is a very promising business opportunity, so that the community continues to improve the quality of the coffee it produces. Coaching for farmers is expected to be able to encourage the community to produce high-quality coffee. So far, on average, the people of the Liquica, Ermera and Ainaro districts have not only marketed their coffee at the local level but have also penetrated foreign markets (exports).

#### **f) Product responsibility aspects**

The results of the analysis in Table 6 above show that the aspect of product responsibility has a very significant effect on the sustainability of Arabica coffee farming in the Liquica, Ermera and Ainaro districts. This is understandable, since the coffee products produced are export commodities (penetrating foreign markets). Measurement indicators on aspects of product responsibility include: (i) Customer Health and Safety; (ii) Labelling for products; (iii) Communication and Marketing, (iv) Customer Privacy, and (v) Compliance. Maintaining the quality and quantity of the product will have a double effect, namely increasing the selling value of the product as well as increasing public interest in coffee farming, since coffee is considered as a quite promising business, and because coffee can be sold in any form, from freshly-picked to dry-processed, or wet. By the results of planting coffee, farmers are able to support their families. Therefore, in the future, the community and the government can evaluate and continue to encourage the growth of the community of coffee farming through economic aspects and dimensions.

#### **CONCLUSION**

From the description of the research results above, it can be concluded as follows:

- 1) Ecological politics on the sustainability of coffee farming in the districts of Liquica, Ermera and Ainaro from the aspect of farmer characteristics still requires improvement considering that the age of the farmers is dominated by the group between 51-56 years (30%), with relatively low formal education, only elementary school at 40% .
- 2) The results of ecological political analysis on the sustainability of coffee farming from the social, community and product responsibility aspects have a very significant effect ( $p < 0.01$ ) and for environmental aspects they have a significant effect ( $p < 0.05$ ) on the sustainability of coffee farming. Meanwhile, the economic and labor aspects have no significant effect.

#### **SUGGESTION**

To increase the income of farmers and the selling price of coffee, the farmer should know the method and understanding of the proper and correct way of processing coffee, so that coffee farmers can sell coffee at a higher price. This should be assisted and supported by the farmer groups and extension workers, so that the farmer members can increase their income and can also advance the farmer groups themselves.

#### **REFERENCES**

- Amir, MS 2003, Strategy to Enter the Export Market, PPM, Jakarta Moleong, Lexi. Journal of Research Methodology, PT. Rosdakarya Youth, Bandung p. 3.
- Amir, MS 2000, The Ins and Outs of Foreign Trade Techniques, PPM, Jakarta, Indonesia.
- Annual Report of IMF Staff Timor-Leste 2005, Economic developments of various sectors of the national economy, Timor-Leste.
- Ball, DA, Geringer, JM, McNett, JM & Minor, M 2004, International business: Challenges of global competition. New York, NY: McGraw-Hill/Irwin.
- Chandra, G 2005, Marketing strategy and program. A, Yogyakarta & DR, Freed 2006, Strategic management, Salemba Empat, Jakarta, Indonesia.
- Dess, LE 2005, Strategic Management, McGraw-Hill, International Edition.
- FAO 2009, FAO Report, A Setback in the War against Hunger, <http://www.fao.org> (25 October 2022).

- Graff, JD 1998, The economic of coffee. Economic of crops in Developing Countries, No. 1. Pudoc Wageningen, Netherlands.
- Hinkelman, GE, 2002, International business development methods, PPM, Jakarta.
- Hitt, A & Michael, DKK 2001, Strategic management competitiveness and globalization concepts. Salemba Empat, Jakarta, Indonesia.
- Internet Information: <http://www.ico.annualreview.org> Diakses tanggal 4 November 2022.
- Internet Information: <http://www.itc.org> Diakses tanggal 4 November 2022.
- Internet Information: <http://www.TIMOR-LESTE.GOV.TL.com> Accessed 4, November 2022.
- Internet Information: <http://www.diraccaostatisticanacionaltimorleste.com> Accessed 4, November 2022.
- Internet Information: <http://www.diraccaostatisticanacionaltimorleste.com> Accessed 4, November 2022.
- International Coffee Organization Report 2016, About East Timor registration organic coffee. 46 p.
- Ketaren, A & Rangkutry, RP 2021, Study on the Development of Food Security for Farmer Families. *Malikussaleh Journal of Social and Political Sciences (JSPM)*, 2: 218-237.
- Krugman, K 1980, International Trade, Salemba, Jakarta Analysis CSIS: 26: 464-477.
- Masngudi, M 2006, International trade. <http://www.eksportdanimporth.com>. Accessed 13<sup>th</sup>, November 2009.
- Mudrajad, K 2006, Strategy: How to achieve Competitive Advantage, Erlangga Publisher, Jakarta, Indonesia.
- Najiyati, S & dan Danarti, D 2004, Coffee Cultivation and Post Harvest Handling. Jakarta: Independent Spreader.
- Panglayakim, J 2000, International Business in a Changing Environment, Sinar Harapan, Jakarta.
- Pawiengla AA, Yunitasari D, dan Adenan, M 2020. Analysis of Community Coffee Farming Sustainability in Silo District, Jember Regency. *Journal of Agricultural Economics and Agribusiness (JEPA)*. 4: 701-714.
- Porter, EM 2007, Competition Strategy. Karisma Publishing Group, Tangerang.
- Rugman, M & Alan. DKK 1999, International Business, PT. Presindo Development Library, Jakarta.
- Supratikno, H 2003, Strategy management: Theory and application, FEUKSW. Salatiga.
- Ratya, A & Dan Reed, RM 2008, International business and trade. Andy, Yogyakarta.
- Supramono, DUI 2004, Research Proposal Design, Andi Offset, Yogyakarta.
- Sumita, S 2002, The coffee industry needs a new paradigm. Indonesian Coffee, Edition 110, Th. IX, September-October 2002, pp: 18-19.
- Susila, RW 2004, The European Ota Standard for Coffee: The Enemy of the Constructive. [on line] [http://www.ipard.com/art\\_perkebun/0020504wrs.asp](http://www.ipard.com/art_perkebun/0020504wrs.asp) [16 January 2022]. Bogor: National Plantation Research Institute.

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