MÁSTER EN TECNOLOGÍAS AVANZADAS PARA EL DESARROLLO AGROFORESTAL

TRABAJO FIN DE MASTER

"PROPOSING A SUSTAINABLE DEVELOPMENT MODEL IN TIMOR-LESTE BASED ON FOOD SOVEREIGNTY"

Universidad de Valladolid

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Acknowledgements

Food Sovereignty is one of the current biggest issues that has been taken into account by many international government bodies, international organizations and agencies to develop the idea and concepts in order to determine each country's rights, ecologically and culturally appropriate, avoid dependency on international food policies for alleviating poverty and hunger.

As a new nation, it is necessary that Timor-Leste determines its own policies relying on the existence of natural resources and socio-cultural conditions. Hence, it is necessary for each entity to contribute and develop relevant development models suitable for the future. As part of my participation to the development of sciences, I would like to contribute this paper on *"Proposing a Sustainable Development Model in Timor-Leste based on Food Sovereignty"*.

This paper draws on my experience and the best of my knowledge during the master's degree studies at Universidad de Valladolid (UVa), Spain. I am aware that there are a lot of limitations of ideas in this paper; however I hope that this paper would contribute to the development of insights and knowledge of academic students and those international organizations, Civil Society Organizations, Government institution and farmers, small scale producers, pastoralists, fisher-folks, peasants and cooperatives in every corner of the world.

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I would love to dedicate my immense love and uncountable thanks to my ancestors spirits, my father and brother's souls for accompanying my life during my studies and stay in Spain, to my beloved wife Donela Joana Guterres and my children (Key-Loy and Noloitelo), my beloved mother Julieta dos Santos and stepfather Nicolao Santana, Juviana dos Santos and her family, Belita dos Santos and her family, my sister Lenny and brother No-Lesu who are always praying for my success in my study.

For all of you my brothers and sisters who are not mention here with your support and ideas I dedicate to all of you. I hope that this paper is useful for you!

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ABSTRACT

This paper aims to analyse the role of food sovereignty as an alternative to the current economic growth based on exploitation of oil. Proposing a sustainable development model based on food sovereignty is one of the solutions to alleviate poverty rates hunger and malnutrition due to the indicators by people engaged in agriculture, rich in natural resource, availability of local staple food, availability of organic food, diversity of genetic resources and ecological purities. The econometric methodology was used to value the different weight of socio-economic variables of the economic growth in the country, while the method of AHP was establish priorities strategies from the SWOT diagnosis. The result showed the dependency on petroleum revenue is currently dominating the whole Gross Domestic Product (GDP), while followed by the agriculture sector, tourism and other sectors tended to contribute to the GDP in the country. While strengthen in the strategies from the SWOT diagnosis to population rely on agriculture as their livelihood and the lowest criteria self-motivated farmers in agriculture activities. The most opportunity is to determine its own agriculture system based on food sovereignty and finally balancing social cohesion for people's rights and justice. While the most problems are related to the water and irrigations and the lowest criteria is lack of agriculture inputs. Competitive local and global markets are most threats for smallholder farmers, peasants, fisher-folks and small producers while domination of imported foods also hampered local foods available in the country. Thus sustainable development based on food sovereignty potentially depends on current agriculture situation and self determination of food and agriculture while a big challenge is provision of agriculture inputs in order to balance local and global markets systems.

Key words: Sustainable Development model, SWOT, Food sovereignty, Timor-Leste

RESUMEN

Este trabajo tiene como objetivo analizar el papel de la soberanía alimentaria como una alternativa al actual crecimiento económico basado en la explotación del petróleo. La propuesta de un modelo de desarrollo sostenible basado en la soberanía alimentaria es una de las soluciones para paliar las tasas de pobreza, el hambre y la desnutrición debido a los indicadores de las personas dedicadas a la agricultura, rica en recursos naturales, la disponibilidad de alimentos locales de primera necesidad, la disponibilidad de los alimentos ecológicos, la diversidad genética de recursos y purezas ecológicos. La metodología econométrica se utilizó para valorar el diferente peso de las variables socio-económicas del crecimiento económico en el país, mientras que el método de AHP se utilizó establecer estrategias prioritarias del diagnóstico DAFO. El resultado mostró que la dependencia de los ingresos del petróleo actualmente domina todo el Producto Interno Bruto (PIB), seguido por el sector de la agricultura, el turismo y otros sectores contribuyen al PIB en el país. Mientras se fortalecen las estrategias de diagnóstico DAFO la población depende de la agricultura como su medio de vida y los criterios bajo los agricultores automotivados en actividades agrícolas. La mayor oportunidad es determinar su propio sistema de agricultura basada en la soberanía alimentaria y, finalmente, el equilibrio entre la cohesión social de los derechos y la justicia de las personas. Mientras que la mayoría de los problemas están relacionados con el agua y los riegos y los criterios más bajos es la falta de suministros agrícolas. Los mercados locales y globales competitivos son la mayor amenaza para los pequeños agricultores, campesinos, pescadores y pequeños productores. Mientras que la dominancia de los alimentos importados también obstaculiza los alimentos locales disponibles en el país. Por lo tanto el desarrollo sostenible basado en la soberanía alimentaria potencialmente depende de la actual situación de la agricultura y la autodeterminación de los alimentos y la agricultura, mientras que un gran reto es el suministro de insumos agrícolas para equilibrar los sistemas de mercado locales y globales.

Palabras clave: modelo de desarrollo sostenible, análisis DAFO, la soberanía alimentaria, Timor-Leste

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List of Abbreviations

ADB	Asian Development Bank
AHP	Analytic Hierarchy Process
CIA	Central Intelligence Agency
CPLP	Community of Portuguese Language Speaking Countries
CSO	Civil Society Organizations
ETSIIAA	Higher Technical School of Agricultural Engineering
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Statistics
GDP	Gross Domestic Product
HDR	Human Development Report
IAASTD	International Assessment of Agricultural Science and Technology for Development
IMF	International Monetary Fund
KONSSANTIL	National Committee for Food Security, Sovereignty and Nutrition in Timor-Leste
MAF	Ministry of Agriculture and Fishery
MDG	Millennium Development Goals
NGOs	Non Government Organizations
NSD	National Statistic Data
OLS	Ordinary Least Square
PEDN	National Strategic Development Plan
SPSS	Statistical Product and Service Solution
SWOT/DAFO	Strengths, Weaknesses, Opportunities and Threats
UN	United Nations
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WFS	World Food Summit
WTO	World Trade Organization

CHAPTER 1. INTRODUTION AND JUSTIFICATION

Timor-Leste (or East Timor) is a small country in Southeast Asia with land area of about 19,000 km^2. It shares a border with West Timor, part of the Indonesian province of Nusa Tenggara Timur (NTT). The local climate is tropical and generally hot and humid, characterized by distinct rainy and dry seasons. The population is estimated at 1 million with a growing rate of 2.9 percent annually. The total agricultural land is estimated at about 240,000 ha out of which about 52,000 ha are under irrigation for some part of the year. The per capita agricultural land is therefore small and is estimated at about 0.39 hectares. Land ownership is not always clear and there are different tenure systems. The Government is carrying on a process to establish formal or legal land ownership rights.

The country is mountainous, largely deforested with poor soils and erratic rainfalls. In view of the mountainous terrain and substantial deforestation of the country the land is subject to substantial erosion. In spite of these severe constraints the country is substantially agricultural with 80 percent of the population being heavily dependent on agriculture, including forestry and fisheries, for its livelihood.

However given the low productivity and expanding population, overall Timor-Leste is not self-sufficient in terms of food production. According to the Food and Agriculture Organization of the UN, 30-40 % of food consumed in the country every year is imported (FAO, 2011).

Figure 1 Map of Timor-Leste (Presidencia republica.tl. 2015);

Timor-Leste declared its full independence in May 2002, as the newest country in the 21st century. Timor-Leste lost about 70% of its infrastructures after the Indonesian occupation in 1999 and the 2006 crisis (UNDP, 2011). The government of Timor-Leste has prioritized to rebuild its infrastructures, laying the foundations for democratic governance and the national delivery of essential services. However poverty reduction remains the biggest issue to be tackled within the sustainable development agenda (PEDN, 2010).

Timor-Leste is a low-middle-income country despite the large natural resources. This is because the country main revenue originated from gas and oil exploration in the Timor Sea (81.6%) while agriculture and services account respectively for 2,6% and 15,8% of the total budget. This obvious imbalance makes Timor-Leste the second country more heavily dependent on oil revenue in the world. CIA Fact book (2015).

While, UNDP Human Development Report in (2011) stated that Timor-Leste's annual population growth is high at a rate of 2.9% per annum and the current population is 1.066 million. However, the Human Development Index (HDI) showed that Timor-Leste is ranked 134th out of 187 countries, an increase in poverty rate from 36.3% in 2001 to 49.9% in 2007 while an adult illiteracy is 50.6% even an estimate income per capita is USD$ 5,446 (HDR, 2011). Furthermore, about 41% of the population lives under 1 dollar per day, 58% of population are suffered from chronic malnutrition while 19% is severe malnutrition. Moreover 70% of the population unemployed in vulnerable employs and about 90% of citizen between 15-35 years old are unable to find jobs (UNDP, 2011; World Bank 2013).

Agriculture and tourism are considered as the other potential resources to add an advantage to the nation's economy (PEDN, 2010). Therefore, the government of Timor-Leste should prioritize them through new policies and capital investment in order to boost the creativity of farmers, cooperatives, peasants and fishermen to increase production for family food and selling for family's income generation.

Agriculture is the second most important resources since 80% of the populations are dependent on agriculture as their potential livelihood. Therefore it is crucial that the Government gives priority to the development of the agriculture sector to achieve food self-sufficiency and promote a sustainable socioeconomic growth the country (Lao Hamutuk, 2014).

Agriculture has widely changed from a traditional system to a semi modern. A shift model of agriculture has been transforming the agricultural system based on the food security aims to respond to the needs of the domestic and international markets. This atmosphere gave way to the introduction of improved seeds from Indonesia, the cultivation with advanced technology, the use of chemical fertilizers, weed and pest eradication with chemicals that have been recommended by the Indonesian government. This system has been eroding the local agricultural traditions, increasing the reliance of farmers on advanced tools, chemical fertilizers and pesticides that were harmful to human consumption and the environment. On the other hand, this change has also resulted in the loss of many sources of biodiversity (UNDP, 2011). One of the most prominent examples is the unavailability of seeds during the planting season: all seed should come from Indonesia and the seeds were only used for the monoculture system. Despite monoculture systems, a threat of loss of germplasm and the diversity of natural resources existed, especially local seed extinction due to less protection and conservation of biological resources, seeds scarcity can also be due to low productivity and bad storage techniques, both flora and fauna (Kammen, 2011).

Along with these issues, at the beginning of the transition period between 1999 up to 2012, under the auspices of the United Nations (UN) and the influence of other nation's agriculture systems such FAO promoted a "for a world without hunger" and push the government to Promote agricultural growth and sustainable food security (FAO, 2011). To 'aggregate growth' in the national economy, the government consequently privileging large corporations and export industries, this logic fails everywhere; but especially so in a country like other pacific nations, with large rural populations, large subsistence sectors and large informal economies (Anderson, 2015).

However, various problems, such as malnutrition, are faced by society, and especially children and women under age at the time of conception, today. Children are particularly vulnerable during the hungry season, where 58% of those under the age of five suffer from chronic malnutrition and it weakens the immune system and can lead to a heightened risk of illness and disease (UNICEF, 2013). In relation to the above statement, CIA Factbook (2015) also cited that maternal mortality rate is 300 deaths/100,000 live births and 38.79 deaths/1,000 live births. This situation

affects every year continuously the children under five years old, especially those who live in rural areas.

One of the indicators showed that Timor-Leste has the highest burden among 40 stunting countries. The percentage of malnutrition is expected malnutrition around 55% and most of them are malnourished children under 5 years old. Underweight and waste are increased in each family as well as the difficulties of poor families in providing sufficient and healthy food for the growth and development of the nation's children (Sarma, 2011).

The Government defined its objectives and tools to eradicate poverty and contrast malnutrition through the establishment of the Comoro agreement in 2012 and an operational unit under the Ministry of Agriculture and Fishery (MAF), namely the National Council for Food Security, Food Sovereignty and Malnutrition in Timor-Leste (KONSSANTIL) (MAFP, 2014).

On the other hand, food imports and the need for basic materials from abroad continuously improve people's dependence on food supplies from abroad over the country's own productions. For example, farmers and small-scale rice producers in Timor-Leste are no longer able to keep pace with the needs of domestic rice. As a result, many of those feel disadvantaged in small-scale business ventures of domestic rice (Kammen, 2011).

In addition, individual farmers and groups are unmotivated to compete with foreign products, which are basically implementing dumping prices or predatory prices, and as a result less domestic rice is sold at high prices. Mostly the rural population in East Timor engages in subsistence agriculture divided between staple crops, vegetable gardens, and animal husbandry while peasants and farmers have shifted their mentality from being producers to consumers (Datt *et al.,* 2014; Kammen, 2011). While those who carry out domestic agricultural productions are the elders, who approach the average age for unproductiveness (Anderson, 2015).

It should be noted that, food insecurity is also caused by lack of knowledge of information and technology. Many rural farmers are engaging in subsistence agriculture and less motivated by new innovations that are beyond their knowledge. Overall, with the resources concentrated in the city, there are many people who cannot get access to adequate information about sustainable agriculture that is in accordance with the purpose of their farming (Rola-Rubzen, et al., 2011).

Despite access to information and technology, one of the main obstacles is that investment in the agricultural sector is very limited due to the human resources and planning. Every year the government allocates a very small amount of money to the agriculture sector, compared to investment in infrastructures that are two-fold greater than the state budget. Furthermore, limited investment on agricultural output that is seen as a function of inputs (land, capital and labor) and technology, which in turn are influenced by the infrastructure and institutions of the economy and by external factors which cannot be influenced by policy measures (Lundahl and Sjöholm, 2012).

In addition, the soil conditions of Timor-Leste, which consists of rocky areas and many mountains, also become a major impact in increasing domestic food production. Aside from the rocky area there are also areas prone to landslides and soil erosion as a result of climate change and human activity act by opening new land, cutting down trees and burning forests.

Climate change resulted in many problems for the people and farmers, namely much productive land that is not explored and abandoned, and crop failure. Many people suffer from hunger during times of climate change because they cannot adapt to the local environment.

Turning from existing agricultural issues, laws or regulations to the status of land ownership is unclear among farmers in Timor-Leste. Some farmers are using tribune land, but many farmers are using the land owned by private owners and when the farmers want to plough that, they need to sign a contract with the landowner, deciding on how they will divide the production for each harvest season. Although there is still a lot of vacant land, it is rocky land, marginal to farmers to grow and needs special skills to plough and grow the crops (UNDP, 2011).

The agricultural sector suffers from inadequate institutional support. At the national level, the capacity to plan for sustainable agricultural and rural development is limited. Although 80% of Timor-Leste's population directly depends on agriculture for their livelihood, the budget of the MAF account for more than four percent of the total government budget. Agricultural research and extension training programmes are weak, lack coordination and are often detached from field implementation. Distant and poorly developed market systems and inadequate road connectivity and public transport severely limit participation in market-based activities.

Nevertheless, such initiatives must be sustained and further strengthened in order to fulfil its obligations on right to food by implementing the food sovereignty model to enable farmers and peasants to participate in the food system for their sustainable life. Based on those problems a research has been undertaken to propose a sustainable development model in Timor-Leste based on Food Sovereignty.

1.1. General Objective

To analyse the role of food sovereignty as an alternative to the current economic growth based on exploitation of oils. Proposing a sustainable development model based on food sovereignty is one of the solutions to alleviate poverty rates hunger and malnutrition due to the indicators by people engaged in agriculture, rich in natural resource, availability of local staple food, availability of organic food, diversity of genetic resources and ecological purities**.**

1.2. Specific Objectives

1. To analyse the current situation in Timor-Leste based on Human Development Index, poverty rates, malnutrition, literacy rate and employment

2. To perform a theoretical revision based on bibliography in the role of development model based on food sovereignty;

3. To identify which variables are available to explain more about the economic situation in Timor-Leste;

4. To analyze variables in relation to the situation of agriculture sector in Timor-Leste;

5. To establish a diagnosis of the economic structure in the country based on Strengths, Weaknesses, Opportunities and Threats (SWOT).

CHAPTER 2. General Description, Food and Agriculture Policies

2.1. Food Security vs Food Sovereignty

Food Sovereignty arose from the evolution of experience from the farmers, peasants, civil societies, community organizations, labourers and indigenous people all over the world to claim their right to food and agriculture. They found the food security gaps as the major impacts that logically used by the world neo-liberalism to dominate in the world economic sector. The flexibility of market access through export and import of agriculture products has been given more opportunity for the free-market models designed by the World Trade Organization via World Bank and International Monetary Fund (Lee, 2007; Chaifetz and Jagger, 2014).

The shifting definition of Food Sovereignty (SA) was first time raised in the la Via Campesina in 1996 in Tlaxcala-Mexico. At the same year, the issue of food sovereignty was raised at the World Food Summit in Rome.

Food Sovereignty was raised as cited bellow:

> 'We, the Via Campesina, a growing movement of farm workers, peasant, farm and indigenous peoples' organizations from all the regions of the world, know that food security cannot be achieved without taking full account of those who produce food. Any discussion that ignores our contribution will fail to eradicate poverty and hunger. Food is a basic human right. This right can only be realized in a system where Food Sovereignty is guaranteed.' (Via Campesina, 1996b).

In 1996, Food sovereignty defined the right of each nation to maintain and develop its own capacity to produce its basic foods and respecting cultural value of all people (Via Campesina, 1996). While in 2002, Food sovereignty was the right of people to define their own food and agriculture, to protect and regulate the domestic agricultural production and trade in order to achieve sustainable development objective to "determine the extent to which they want to be self-reliant" (Windfurh and Jonsén, 2005). And in 2007, Food Sovereignty was defined as the right of people to healthy and culturally appropriate food produced through ecologically sound and sustainable methods and their rights to define their own food and agricultural system (Nyéléni Declaration, 2007).

Food sovereignty was born in response to campaigners' disillusion with food security, the dominant global discourse on food provisioning and policy. The

latter emphasises access to adequate nutrition for all, which may be provided by food from one's own country or from global imports. In the name of efficiency and enhanced productivity, it has therefore served to promote what has been termed the "corporate food regime": large-scale, industrialised corporate farming based on specialised production, land concentration and trade liberalisation. Food security's inattention to the political economy of the corporate food regime blinds it to the adverse effects of that regime, notably the widespread dispossession of small producers and global agroecological degradation (Giménez, 2009).

Food sovereignty goes beyond the concept of food security. "Food security means that everyone must have the certainty of having enough to eat each day but says nothing about where that food comes from or how it is produced." Food sovereignty includes support for smallholders and for collectively owned farms, fisheries, etc., rather than industrializing these sectors in a minimally regulated global economy. Food sovereignty also defined as "a platform for rural revitalization at a global level based on equitable distribution of farmland and water, farmer control over seeds, and productive small-scale farms supplying consumers with healthy, locally grown food (Rosset, 2003).

2.2. Food Sovereignty Implication in Timor-Leste

In should be emphasis that Timor-Leste has been relying and leading towards large-scale farming based on cash economy and at the same time the majority of people in the farming communities have been steadily neglected by ignoring the real condition as a country that the majority of people are from farming communities

Agriculture has the potential of increasing both micro and macroeconomic level and therefore it can be developed by the government to advance food sovereignty; it should be based on a solid legal basis so that the goals in the national strategic plan can be achieved.

Most of the Timorese people have known "food security" rather than "food sovereignty" as good development model of agriculture in the country without searching more detail about the impact of its benefit. Finally, it is difficult to exit from the long-term unstable food status, who produce the food, how to produce and where to sell as an income generation.

The issue of food sovereignty was slightly no being included in the policy of National Development Plan 2011-2030 as a model of the sustainable development in the country. However the government have planned a green revolution as future of agriculture in the country, where this model has failed in many countries like India that green revolution technologies have blamed for the unintended consequences such as income inequality, environmental degradation, and malnutrition. Similarly, since the introduction of genetically engineered cotton in 2002, India witnessed an unprecedented period of cotton productivity growth (Kolady, 2010).

The government through the Ministry of Agriculture and Fisheries (MAFF) adopted the food security as one of the main objectives without analysing the concept and the impact for the future. The agriculture sector itself cannot guarantee the national food security hence the government through the Ministry of Tourism, Commerce and Industry (MTCI) spent about $53 million per year ($660/Mt for 80,000 Mt6) and it would cost $160 million per year ($2,000/Mt) to grow the equivalent tonnage under the current inefficient and unproductive rice production systems (Young, 2013). The reality imposed that the food security models have failed in this country and there continues to be food insecurity throughout the country in more severe forms. Besides it, the food security model has not given benefit for the farmers whilst giving profit to the companies, national and international corporations (FAO, 2003). Farmers are continuously living with insufficient of food, less access to markets, less productive land mainly in the land where the chemical fertilizers were applied.

In order to eradicate hunger and poverty in Timor-Leste based on those indicators; the government should shift its political models to food sovereignty as to guarantee food self-sufficiency for people, increasing food production, market accessibility and sustainable environment.

CHAPTER 3. INDICATOR OF SOCIO-ECONOMIC AND HUMAN DEVELOPMENT IN TIMOR-LESTE

3.1. National Annual Gross Domestic Product (GDP)

3.1.1. Petroleum Revenue

CIA Fact book 2015 has noted that, Timor-Leste's source of economic incomes are from different sectors; such as 2,6% from agriculture sector, 81,6% from oil sector and other 15,8% from services. The estimation of the total Gross Domestic Product (GDP) in 2013 has collected about 14 billion USD. While annual GDP growth is 8.9%. The major contribution is coming from the petroleum revenue while only a minor part of the add value comes from the agriculture and tourism sectors.

Timor-Leste has abundance of natural resources in the maritime zone and even the inland zones, such as oil and gases, minerals, gold, agriculture, forestry and fisheries, however petroleum remains the main source of economic income.
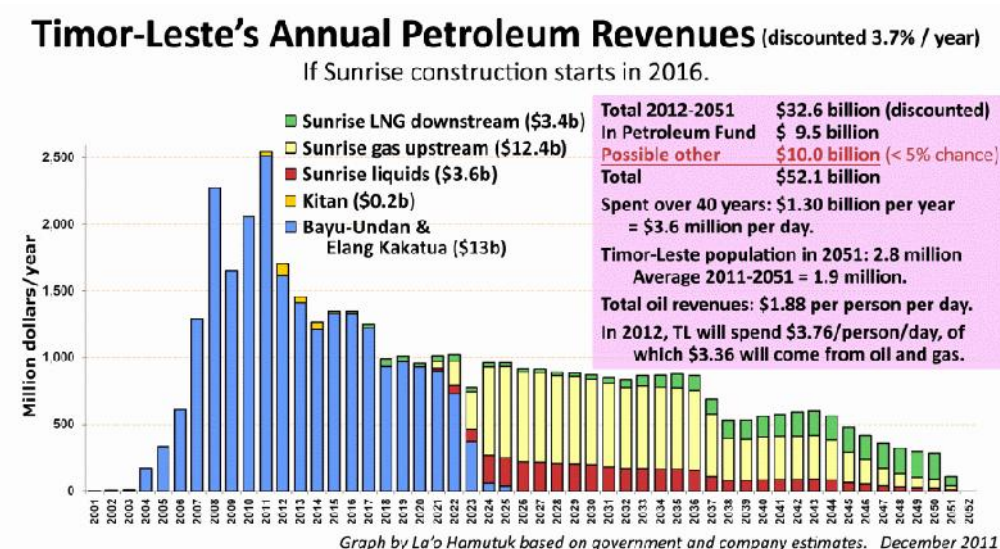
Figure 2 Timor-Leste Annual Petroleum Revenues (Lao Hamutuk 2011)

As the graphic shows, the petroleum revenue is gradually decreasing every year. Estimations foresee that the only two oil fields, Bayu-Undang and Elang Kakatua, will be drastically down until their lowest trough in 2025. As in 2004 the income was estimated around 200 million dollars

and the highest peak were 2,500 million dollars in 2011 and going down in the following years (Lao Hamutuk, 2011).

Given the great dominance of oil revenues within the national budget, this situation is very alarming for Timor-Leste. It is vital to explore and assess alternative productive sectors such as agriculture and tourism to sustain the country economy.

3.1.2. Agriculture Value

The second source of income of the country is agriculture where it has been added value to the GDP of the country. In 2014, it was estimated around 2.6% from the agriculture sector. This percentage is very small compared to the industries and services. The government of Timor-Leste should invest in this area as source of family economic income and further for the national income through export of agriculture products.

3.1.3 Tourism sector

Tourism is a potential sector after agriculture where it is important to contribute in the development of micro-economy and macro-economy of the country. The landscape of the country, historical places, sacred sites, local living cultures and arts are unspoiled and well capable of attracting tourism and people from abroad willing to come to visit.

Despite of its potential, it is important to preserve and protect in order to have the purity in the long term days. It is essential for all the Timorese people to take care and preserving this riches and the government of Timor-Leste to invest in this viable sector as a local and national income generation.

Table 1: Type of Tourism in Timor-Leste

Type of Tourism	Number of respondents	Percentage
Eco tourism	21	29.2%
Cultural/historical tourism	18	25.0%
Community base tourism	14	19.4%
Adventure tourism	10	13.9%
Business tourism	4	5.6%
Voluneteer tourism	4	5.6%
Sun, sea and sand mass tourism	1	1.4%
Totals	72	100%

Source: Tolkach, 2013

As a source of income, there are different types of tourism that can be developed by the Timor-Leste government and people in Timor-Leste such as: Eco-tourism, cultural/historic tourism, community-based tourism, business tourism, volunteer tourism and mass tourisms in few places like in Walu sere (Lautem), Baguia (Baucau) and Atauro (Dili). It has been recorded that eco-tourism and cultural/historic tourism are most potential in the country rather than the other type of tourism (Tolkach, 2013). It is necessary to invest in this sector as a source of income for the community and the nation. In addition these types of tourism are more important to the sustainable development of Timor-Leste in the future beside agriculture and ecology.

3.2. Human Development Index (HDI)

The Human Development Report in (2011) stated that the Timor-Leste's annual population growth is high every year at the rate of 2.9% and the current population is 1.066 million. However, the Human Development Index (HDI) showed that Timor-Leste is ranked of 134 out of 187 countries, an increase in poverty rate of 36.3% in 2001 to be 49.9% in 2007 while an adult illiteracy is 50.6% even an estimate income percapita is USD$. 5,446 (HDR, 2011). In addition, about 41% of the population live under 1 dollar per day, 58% of population are suffered from chronic malnutrition while 19% is severe malnutrition. Moreover 70% of the

population unemployed in vulnerable employs and about 90% of citizen between 15-35 years old are unable to find jobs (UNDP, 2011; World Bank 2013).

3.2.1. Poverty and malnutrition

In terms of tackling poverty there has been little improvement for the poorest people of Timor-Leste, generally those who have little or no education and work in agriculture. Also disadvantaged are widows and orphans of the Resistance, as well as veterans and former child soldiers. About half of the Timorese population lives below the basic needs poverty line of $0.88 per person per day as compared with 36% in 2001. Given the political transition in 2002 and the political crisis of 2006, this stasis is to some extent understandable. However, this makes the task of achieving the head count ratio of 14%, a target set in the 2004 MDG report, even more challenging.

Sharma (2011) reported that Timor-Leste was included to the country of Prevalence of Stunting in 40 Countries of High Burden Regarding Malnutrition in the world and the highest one in Southeast Asia that has more 40% malnutrition. This indicator reflects the poor social conditions of the Timorese people, with 45% of children under five years below their target weight in 2001. In 2007, 50% of all children were underweight. In the longer term, poor nutrition in the early years of childhood development impacts on physical and mental development, causing poorer quality human resources for the country in future.

3.2.2. Literacy

Timor-Leste is a newly-created country in which the standard of education is still poor. Approximately 38% of the population are students and half of them are those who are enrolled in primary education and pre-primary school. While adult literacy – the ability to speak, read and write a simple sentence in any one language Tetun, Indonesian, Portuguese or English - is 63.1% for men aged 15 years and above and 52.5% for women. Literacy is much higher amongst youth, at 80 percent, for males aged 15-24 years and 78.1 percent for females. (NSD and UNFPA 2012).

This is more in need of a comprehensive education both in rural and in urban areas disregard to race and gender. (UNDP, 2009).

3.2.3. Water and Sanitation

The major problem faced by population in both rural and urban areas is to access to water and sanitation. Improvements in sustainable access to improved water sources were hampered by the political crisis in 2006, and this setback will make it difficult to reach the 2015 target of 78%. In 2007 only 60% of the population had sustainable access to an improved water source, and there was a sharp divide between urban and rural areas. Regarding access to improved sanitation, there has been significant improvement in both urban and rural areas and the country as a whole is likely to achieve the 2015 target (UNDP, 2009)

In 2011, only 69.1% of population access of the improved drinking water sources, and more severe was the population who live in the rural area rather than the population in the urban area. In addition there were only 38.7% of improved sanitation facilities where only 27.3% of rural population could be accessed (UNICEF, 2013).

3.2.4. Employment

Timor-Leste with abundant natural resources with percapita income of US $ 5.446 but the number of unemployment increases every year. Approximately 41% of people living on less than 1 dollar per day. According to reports from the UNDP that about 70% of the population vulnerable or and 90% of them from the age of 15-35 years old who did not get a job even though they are productive ages and average those who are living in rural areas (UNDP, 2011).

CHAPTER 4. DEVELOPMENT POLICY IN TIMOR-LESTE

4.1. Future Development Approach with the Petroleum
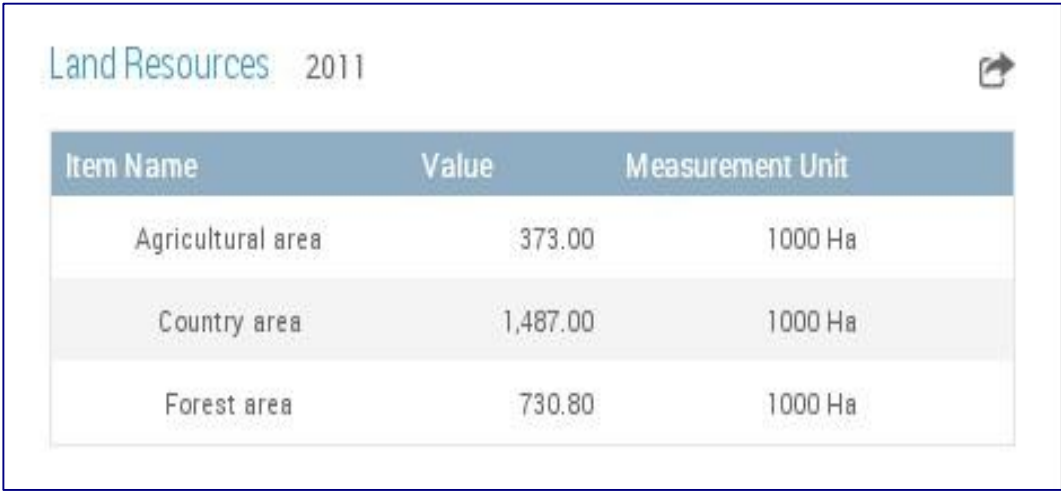
One of the most potential state revenue in the state of Timor-Leste is derived from oil and gas production from two oil fields namely Elang-kakatua and Bayu-Undang. Of which approximately 81.6% is the result of revenues from petroleum. However, the results of this petroleum decreased drastically every year and these two fields are expected to be exhausted in 2023 and the government of Timor-Leste yet another alternative plan. In case this happens it will be a big threat to the economy of Timor-Leste to the front. Therefore, the policy makers, politics and civil society experts have argued that the only way to sustain the economy of Timor-Leste is a massive investment in other productive sectors such as agriculture and tourism.

4.2. Alternative Approach in the Future

4.2.1. Agriculture and forestry areas

Timor-Leste's total country area is about 14.000 sq km that rich of its natural resources, gases and mineral. It also potential for tourism, agriculture and forestry sector that can be utilized as the income of the country.

Table 2 Agriculture and Forest area in Timor-Leste (FAOSTAT 2015)

Land Resources 2011		
Item Name	Value	Measurement Unit
Agricultural area	373.00	1000 Ha
Country area	1,487.00	1000 Ha
Forest area	730.80	1000 Ha

According to the FAOSTAT 2015 showed in the table of the land resources in 2011 that major surface of Timor-Leste is forest area around 730, 80 thousand hectare while agriculture area comprises of 373 thousand hectare from the total surface of the country. This data is

representing the Timor-Leste's potential resources are agriculture and forestry sector (FAOSTAT, 2015).

4.2.2. Agriculture Production Index

The index of agricultural production in Timor-Leste every year did not show significant numbers and are always fluctuating. These results are not conspicuous from data obtained from FAOSTAT (2015) that, the agricultural index from the beginning of 2001 about 100 thousand dollars and jumped about 120 thousand in 2009 but declined in 2011. The cereal production figures which show significant results in 2009 and 2010 but the results did not last long so the decline in 2011.
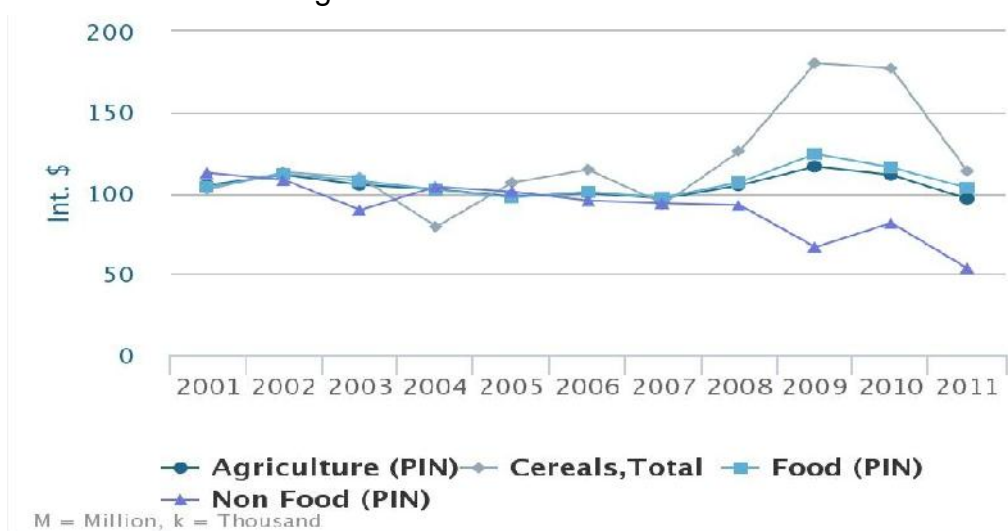
Figure 3 Timor-Leste Agriculture Production Index (FAOSTAT 2015);

This means investing in agriculture sector is minimal and needs government efforts, civil society organizations, international NGOs to plan for an integrated long-term program in accordance with the National Development Plan 2011-2030 (PEDN, 2011).

4.2.3. Land Utilization

The main constraints faced by the government of Timor-Leste are on land ownership and land distribution. Where, most of the land into private land, community land or customary land as well as land that have been sold but the status are disputed and unclear. The country has not yet provided a proper regulation planning to bind people's land rights and there is limited vision to guide the land laws, regulations, services and bodies

necessary to address confusion over land ownership (Lao Hamutuk Buletin, 2010).

Nevertheless, Timor-Leste has a ground potential bias utilized for agriculture and forestry. According to FAOSTAT (2015) that the use of land around 49.1% is forest area, 4.9% permanent crops, 10.1% of permanent meadows and pastures, 10.1% Arable land and 25.8% other land.
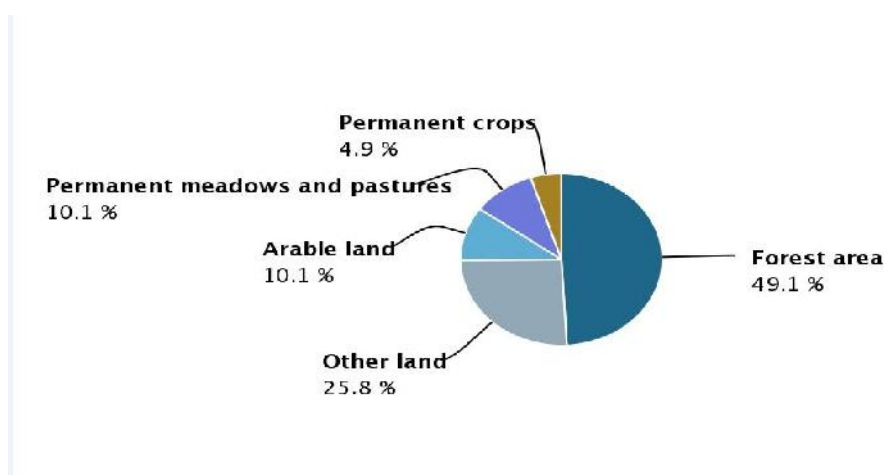
Figure 4: Land utilization in Timor-Leste (FAOSTAT 2015);

Even though it is necessary to resolve land disputes and uprights the land justice that reflected the real conditions of people to access as a key element for poor people as home to survive, culturally considered as part of the body and the whole life system such as to grow food and shelters.

4.2.4. Investment in Agriculture

Aside from petroleum, Timor-Leste also has a natural potential that is suitable for agriculture. It is very promising self-sufficiency and food sovereignty and is able to generate the economics of people where the majority of the community's rely on farming.

Almost every year, the government of Timor-Leste has not put a significant investment in order to boost the country's second greatest economic sector. For example, it has been noted in 2010 only 7% of the annual budget went into the agricultural sector through the Ministry of Agriculture, Forestry and Fisheries. There were including the procurement of appropriate technologies, information, agricultural extension and subsidies to boost agricultural production. This amount of money is not

enough to fix the agricultural infrastructures such as irrigation systems, demonstration sites in each municipality. The government needs to increase the annual budget in order to boost farmers on producing foods in the country.
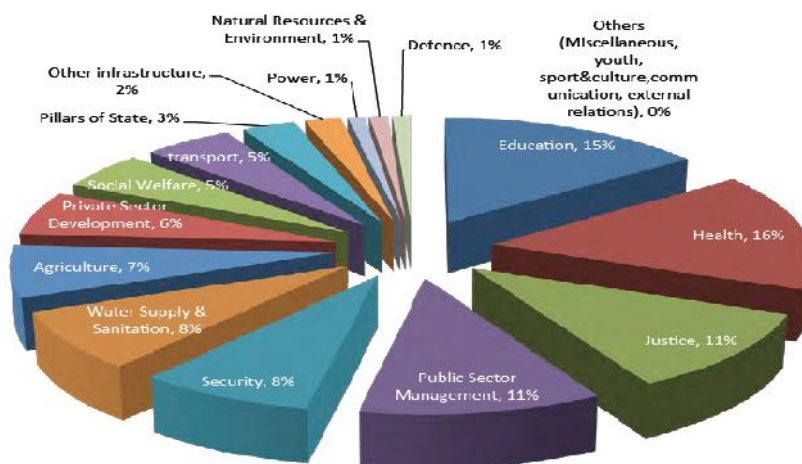
Figure 5: Government Funds Allocation per Sector in 2010 (PEDN 2011);

However, the amount of funds invested in unbalanced agricultural production is in line with the expectations. Approximately agricultural production estimated for staple crops are unstable. Even more farmers are reluctant to compete with foreign agricultural products, which are cheaper compared to domestic agricultural products.

Therefore, it is very important for the government of Timor-Leste to establish a farming system that involves all small farmers, cooperatives and farmer groups to be able to produce the diversification of agricultural production, for the continuation of life and can balance foreign products.

4.2.5. Irrigation System

Timor-Leste composed of 12 *Hydrologic Units* and has 29 *main river systems* where 12 in north and 17 in the south. Total lenght of those rivers is about 4.286 km with a total surface area of 18.342 ha, while the renewable surface water is estimated about 8.129 km3 / year and 90% return as base flow. (La'o Hamutuk, 2010).

In 1999, before the withdrawal of the Indonesian government the total design irrigation area in Timor-Leste was an estimated 72 159 ha

covering more than 427 schemes. However, in 2002 only 34 649 ha or 48 percent was left, of which 5 384 ha are technical schemes, 7 770 ha semi-technical schemes and 21 495 ha traditional schemes (Table 2).

Table 3 Water and Irrigation Systems in Timor-Leste (ADB 2002);

Irrigation schemes and irrigation areas, March 2002 (ADB, 2002)				
	Number of schemes	Pre-1999 design area (ha)	Area currently functioning (ha)	Percentage functional (%)
Technical schemes	24	10 587	5 384	51
Semi-technical schemes	58	18 320	7 770	42
Traditional schemes	345	43 252	21 495	50
Total	427	72 159	34 649	48

The current limited demand for water development lends weight to the view that comprehensive and sophisticated policies are not warranted. However, the water and sanitation and the irrigation agencies all perceive the need for a water resources policy from their perspective (ADB, 2002).

CHAPTER 5. MATERIALS AND METHODOLOGY

The research uses a survey method designed to collect both quantitative and qualitative data. Data was collected in Timor-Leste between April to June 2015 using the questioner prepared in two versions Tetum and English then sent to the respondents (Annex 6).

Those questionnaires were primarily drafted by the researcher and sent to the academic tutor and experienced community organizations and individuals who have ample experience in data collection concepts.

A simple random sampling design was used to select 33 individuals or key informants by selecting individuals from different positions and organizations, such as: farmers, members of agriculture cooperative, university agriculture department teachers, and university agriculture department students, local NGOs, Government staff and normal citizens (Annex 7).

The questionnaire was sent to an experienced representative person in Timor-Leste with explanations on how to use the questionnaire and what is required from respondents through the questionnaire and direct non-formal conversation. Each individual was given the freedom to provide ideas and preferences during the interview session. This interview was given more opportunity to the female gender participation as holds the key important persons in agriculture and food process in Timor-Leste.

The interviews were confidential to each individual's different organizations and were conducted in Tetum, English and other local dialects when necessary. The interview took place at home base or organization for 15 to 30 minutes for each respondent including clarification and filling the questions.

5.1 Primary Source Data Collection

A representative person was chosen based on different sites from one to another. There were given the whole questionnaire guidelines to use for interviewing respondents.

For the general overview of the questioner comprises of general in formations, major problem faced by Timor-Leste, proposing the solution and SWOT analysis in order to provide future plan and strategies of the research objectives.

Simple random method was used to interview individuals from different organization and occupations. The list of respondents was prepared in order to know the interested individuals were included and interviewed.

After all data were collected then a researcher representative scanned them to the researcher for further analysis.

5.2 Secondary Source Data Collection

To fulfil the third objective of the study, secondary sources were also collected from FAO database (FAOSTAT) which was accessed through online in order to access the agriculture situation in Timor-Leste (www.faostat.org). Besides it, a library research approach by using data from the previous documentations, such as government reports, academic articles, statistical compilation and manipulations, reference and abstract guides and content analysis (C.R. Kothari, 2004).

Broadening references, this research also used government institutions and websites to obtain updated information on current policies related to food sovereignty and agriculture. In addition to primary sources such as household and agricultural census data and poverty assessment reports, government literature focusing on current food security initiatives and agricultural development are also referenced. Food and agricultural development reports were reviewed to gain an understanding of the relative importance of gardening initiatives and the activities of small subsistence and commercially oriented farmers in current policy agendas. Scholarly journal articles analysing these topics are also used to contextualize the study as they pertain to food and agricultural policy at different scales and historical periods.

5.3 Data Analysis

5.3.1. Analysis of Linear Regression Model

Data from the FAOSTAT were tabulated in the Excel spreadsheet then analysed by using the Statistical Product and Service Solutions (SPSS) based on analysis of regression lineal and the result will be tested to convince its confidential for supporting the primary data.

Ordinary Least Squares (OLS) or linear least squares is a method for estimating the unknown parameters in a linear regression model, with

the goal of minimizing the differences between the observed responses in some arbitrary dataset and the responses predicted by the linear approximation of the data (visually this is seen as the sum of the vertical distances between each data point in the set and the corresponding point on the regression line - the smaller the differences, the better the model fits the data). The resulting estimator can be expressed by a simple formula, especially in the case of a single regressor on the right-hand side.

The analysis of Linear Regression Models supposes the data consists of n observations $\{y_i, X_i\}^n$ i=1. Each observation includes a scalar response y_i and a vector of p predictors (or regressors) x_i. In a linear regression model the response variable is a linear function of the regressors:

$$y_i = x_i^T \beta + \varepsilon_i;$$

where   is a $p{\times}1$ vector of unknown parameters; $_i$'s are unobserved scalar random variables (error) which account for the discrepancy between the actually observed responses y_i and the "predicted outcomes" x_i^T ; and ^{T}denotes matrix transpose, so that x^T is the dot product between the vectors x and   . This model can also be written in matrix notation as

$$y = X\beta + \varepsilon;$$

where y and   are $n{\times}1$ vectors, and X is an $n{\times}p$ matrix of regressors, which is also sometimes called the design matrix.

As a rule, the constant term is always included in the set of regressors X, say, by taking $x_{i1} = 1$ for all $i = 1, \ldots, n$. The coefficient $_1$ corresponding to this regressor is called the *intercept*.

There may be some relationship between the regressors. For instance, the third regressor may be the square of the second regressor. In this case (assuming that the first regressor is constant) we have a quadratic model in the second regressor. But this is still considered a linear model because it is linear in the   s.

This relationship is modeled through a *disturbance term* or *error variable* $_i$ — an unobserved random variable that adds noise to the linear

relationship between the dependent variable and regressors. Thus the model takes the form

$$y_i = \beta_1 x_{i1} + \cdots + \beta_p x_{ip} + \varepsilon_i = \mathbf{x}_i^\mathrm{T} \boldsymbol{\beta} + \varepsilon_i, \qquad i = 1, \ldots, n,$$

where $^\mathrm{T}$ denotes the transpose, so that $\mathbf{x}_i^\mathrm{T}$ is the inner product between vectors $\mathbf{x}_i$ and .

Often these *n* equations are stacked together and written in vector form as

$$\mathbf{y} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon},$$

where

$$\mathbf{y} = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix}, \quad \mathbf{X} = \begin{pmatrix} \mathbf{x}_1^\mathrm{T} \\ \mathbf{x}_2^\mathrm{T} \\ \vdots \\ \mathbf{x}_n^\mathrm{T} \end{pmatrix} = \begin{pmatrix} x_{11} & \cdots & x_{1p} \\ x_{21} & \cdots & x_{2p} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{np} \end{pmatrix}, \quad \boldsymbol{\beta} = \begin{pmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_p \end{pmatrix}, \quad \boldsymbol{\varepsilon} = \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{pmatrix}.$$

Some remarks on terminology and general use:

• y_i is called the *regressand*, *endogenous variable*, *response variable*, *measured variable*, *criterion variable*, or *dependent variable* (see dependent and independent variables.) The decision as to which variable in a data set is modeled as the dependent variable and which are modeled as the independent variables may be based on a presumption that the value of one of the variables is caused by, or directly influenced by the other variables. Alternatively, there may be an operational reason to model one of the variables in terms of the others, in which case there need be no presumption of causality.

• $x_{i1}, x_{i2}, \ldots, x_{ip}$ are called *regressors*, *exogenous variables*, *explanatory variables*, *covariates*, *input variables*, *predictor variables*, or *independent variables* (see dependent and independent variables, but not to be confused with independent random variables). The matrix X is sometimes called the design matrix.

5.3.2. Analysis of Hierarchy Process (AHP)

This analysis was done with the data from the questionnaires; interviews and field notes were transcribed using Microsoft Excel in order to organize them. The results were then coded and statistically analysed using

Analysis of Hierarchy Process (AHP) to compare each statements from the SWOT analysis.

The contribution to the strategic planning process comes in the form of numerical values for the factors. New goals may be set, strategies defined and such implementations planned as take into close consideration the foremost factors.

The matrix of pairwise comparisons (Eq. (1)) is constructed in Step 2. In this matrix, the element $a_{ij}=1/a_{ji}$ and thus, when $i=j$, $a_{ij}=1$. The value of w_i may vary from 1 to 9, and 1/1 indicates equal importance while 9/1 indicates extreme or absolute importance.

Equation(1)

$$A = (a_{ij}) = \begin{bmatrix} 1 & w_1/w_2 & \dots & w_1/w_n \\ w_2/w_1 & 1 & \dots & w_2/w_n \\ \vdots & \vdots & \dots & \vdots \\ w_n/w_1 & w_n/w_2 & \dots & 1 \end{bmatrix}$$

In the comparisons, some inconsistencies can be expected and accepted. When **A** contains inconsistencies, the estimated priorities can be obtained by using the matrix [Eq. (1)] as the input using the eigenvalue technique [Eq. (2)].

Equation(2)

$$(A - \lambda_{max}I)\, q = 0,$$

where λ_{max} is the largest eigenfactor of matrix **A**; **q** is its correct eigenfactor; and **I** is the identity matrix. The correct eigenfactor, **q**, constitutes the estimation of relative priorities. It is the first principal component of the matrix of pairwise comparisons. If the matrix does not include any inconsistencies, i.e. the judgments made by a decision maker have been consistent, **q** is the exact estimate of the priority vector. Each eigenfactor is scaled to sum up to one to obtain the priorities.

Saaty (1977) has shown that λ_{max} of a reciprocal matrix **A** is always greater or equal to n (=number of rows=number of columns). If the pairwise comparisons do not include any inconsistencies, $\lambda_{max}=n$. The more consistent the comparisons are, the closer the value of computed λ_{max} is to n. Based on this property, a consistency index, CI, has been constructed (Eq. (3)).

Equation(3)

$$CI = (\lambda_{max} - n) \ / \ (n-1)$$

CI estimates the level of consistency with respect to a comparison matrix. Then, because CI is dependent on *n*, a consistency ratio CR is calculated, which is independent of *n* (Eq. (4)). It measures the coherence of the pairwise comparisons. To estimate CR, the average consistency index of randomly generated comparisons, ACI, has to be calculated. ACI varies functionally, according to the size of the matrix (e.g.Saaty, 1980).

Equation(4)

$$CR = 100 \, (CI \, / \, ACI)$$

As a rule of thumb, a CR value of 10% or less is considered to be acceptable. Otherwise, all or some of the comparisons must be repeated in order to resolve the inconsistencies of the pairwise comparisons.

Thus, the results of the comparisons are quantitative values expressing the priorities of the factors included in SWOT analysis. Thereby, persons formulating strategies gain access to new quantitative information about the environment surrounding their firm to support their decision making. They can concentrate on connecting the most important and compatible opportunities and strengths in the strategy-building process or see if the firm is facing some critical threats or weaknesses that must be reacted to (Kajanus *et al.*, 2000).

CHAPTER 6. RESULTS AND DISCUSSION

6.1. Country Economy

Timor-Leste as a newly-constituted country which relies on its natural resources as a primary income of country economy, the Gross Domestic Product (GDP) comes from diverse sources of income such as Petroleum, Agriculture, Tourism and Taxes. Here are a few variables that should be analyzed, such as the country economy, Analysis of the agriculture sector, GDP in agriculture sector and GDP total. Details of the result of the analysis are provided in the next parameters to be discussed more and further recommendations would be based on the analysis result.

6.1.1. Petroleum Revenue

The petroleum revenue is the major income of the country's economy. The analysis of linear regression or Ordinary Least Square (OLS) showed that the function of Petroleum Revenue is significant when compared to annual population and agriculture production values. Where the overall R corrected square is 67% with the Durbin Watson is 1,807, this is viable to analyze by using linear regression to indicate interrelation between variables.

As indicated in the Table 1, between variables that annual population and agriculture values are not influenced by the petroleum revenue. The annual petroleum revenue is more influenced significantly. Each coefficient of annual population is -0,506 or non significant to the petroleum revenue of 4,732 (P<00,5). While agriculture production value (0,638) is lower when compared with petroleum revenue (5,354). Although the growth of annual population is increased the petroleum revenue is still enough to sustain where agriculture production is also contribute to the Gross Domestic Product (GDP).

Table 4: Analysis of country economy base on Petroleum

Explanatory Variables	Not Standardized Coefficient		Standardized Coefficient	t	Sig.
	B	Error típ.	Beta		
Annual Population (000)	-0,004	0,009	-0,654	-0,506	0,618
Petroleum Revenue (million)	0,004	0,001	0,775	4,732	0,000
Agriculture Production Values (US$)	4,28E-05	0,000	0,793	0,638	0,530
R Square Corrected: 67,5%					
F : 0,000					
Durbin-Watson : 1,807					

GDP Growth (%)

Source: Own elaboration

From the result, it can be concluded that the major income of Timor-Leste is coming from the petroleum revenue which is a significantly influence on other sources of income in the country such as agriculture values. Although the agriculture sector is lower however it contributes positively to the economy of the country (Lopes, 2013).

Asian Development Bank reported that the strong economic growth continued in 2012, with non-oil GDP expanding by 10.6%. However high inflation is consistent with the economy's high rate of growth. Inflation is projected to remain high at 9.0% in 2013, but this is lower than in 2012, reflecting some success in the government's efforts to stem inflation (ADB, 2013).

6.1.2. Agriculture Production Value

The function of Agriculture Value includes the agriculture land area, forest area, total equipment for irrigations, females active in agriculture and export value of crops and livestock products. Where the overall R corrected square is 99% with the Durbin Watson is 1,115. This is viable to analyze by using linear regression to indicate interrelation between variables.

The results showed that overall, forest area, total equipped for irrigation and export value (crops and livestock) are generally not

significant. Table 5 shows that the following indicators: Female Active in Agriculture (0.548), Export Value (Crops and livestock products) (0.111), Agriculture Value added to GDP (0.653) and Forest area (0.156) are not significant. While agriculture area (0.009) showed significant although the total equipped irrigation (0.075) tends to be significant.

Table 5: Analysis of Agriculture Sector

Explanatory Variable	Not Standardized Coefficient		Standardized Coefficient	t	Sig.
	B	Error típ.	Beta		
Female Active in Agriculture (000)	91,644	149,894	0,101	0,611	0,548
Agriculture area (000 ha)	524,791	179,12	1,58	2,93	0,009
Total area equipped for irrigation (000 Ha)	-1548,524	821,368	-0,39	-1,885	0,075
Export Value (Crops and livestock products)	1,431	0,856	0,123	1,671	0,111
Agriculture Production Values (US$)	337,884	739,933	0,072	0,457	0,653
Forest area (000Ha)	-69,235	46,867	-0,494	-1,477	0,156
R Square Corrected: 99,5%					
F : 0,000					
Durbin-Watson : 1,115					

Agriculture Production Values (US$)

Source: Own elaboration

From these results, it can be concluded that Timor-Leste has a potential for agriculture area, while total equipment for irrigation is not sufficient even though it tends to be available throughout the country. In addition to these influences forest area in comparison to the other indicators is also significantly diminished in each model.

6.1.3. Agriculture added value to GDP

The functions of the explanatory variables include export value, female active in agriculture, rural populations and agriculture production values.

The model of linear regression analysis indicated that almost all variables are significant or close to (0.05) only the variable of export value is not significant (0.545). The R square corrected is 99.7% and F value is 0.000 and Durbin-Watson is 2.685. This means that there is independence between variables. The females active in agriculture (0.050) is significant, rural population (0.000) is very significant and an agriculture production value (0.052) is also significant. While the export value, female active in agriculture value and agriculture production values are negative. This

means that, those variable are generally significant however their contributions are very low to added value to the GDP in the country. While rural populations have significantly contributed to the agriculture.

Table 6: Analysis of Agriculture added value to GDP

Explanatory Variable	Not Standardized Coefficient		Standardized Coefficient	t	Sig.
	B	Error tip.	Beta		
Export Value (Crops and livestock products)	0,000	0,000	-0,067	-0,635	0,545
Female Active in Agriculture (000)	-0,259	0,110	-1,294	-2,360	0,050
Rural Population (000)	0,137	0,020	3,739	6,753	0,000
Agriculture Production Values (US$)	0,000	0,000	-1,399	-2,342	0,052
R Square Corrected : 99,7%					
F : 0,000					
Durbin-Watson : 2,685					

Agriculture value added to GDP (US$)

Source: Own elaboration

From the result on this table it can be concluded that, every year Female active in agriculture and adult literacy are reduced significantly. While rural population and the employment population ratio has increased every year.

The second potential income source of the country is agriculture which has added value to the (%GDP) in the country. There are referenced by the International Standard Industrial Classification (ISIC), divisions 1-5, and including forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources (World Bank, 2015).

6.1.4. Total Country GDP

The functions of the explanatory variables referred the export value, economically active population in agriculture, urban populations, and employment to population ratio ages 15-24 and economically active populations.

The coefficient of the following model in the table 4 indicated that the R corrected data is 0,997 or 99.7%, it means that data are ranged well

as close to 1, while the value of F is significant (0.000) and Durbin-Watson is 1,738. In general economically active populations in agriculture and employment to population ratio ages 15-24, urban populations are significant whilst export value both crops and livestock products are not significant.

The mortality economically active populations in agriculture shows negative values (-2,735) that means that the current GDP is significant but economically active population and agriculture have not shown their contribution into the country GDP. While it also similar to the employment of population ratio ages 15-24 that did not fully contributed to the country GDP. This can be explained that participation of the population in the country is not bringing the positive impact to the GDP. Agriculture added value to the GDP mostly comes from other private companies or individual farming. For instance in Timor-Leste the exportation of coffee and other industrial plants are the major contribution to the GDP.

While the export value (0.377) is positive to the GDP however in small amounts, urban population (3.111) are showing positive impact to the GDP due to the accessibility of jobs centered in the urban and the contribution of services cost to the GDP.

Table 7: Analysis of Total GDP

Explanatory Variable	Not Standardized Coefficient		Standardized Coefficient	t	Sig.
	B	Error tip.	Beta		
Export Value (Crops and livestock products)	0,003	0,007	0,049	0,377	0,718
Economically Active Population in Agriculture (000)	-15,45	5,65	-7,954	-2,735	0,029
Urban Population (000)	20,521	6,596	9,179	3,111	0,017
Employment to Population ratio, ages 15-24, total (ILO)	-7,493	2,035	-0,33	-3,682	0,008
Economically Active Population (000)	-0,822	0,294	-6,871	-2,796	0,023
R Square Corrected : 99,7%					
F : 0,000					
Durbin-Watson : 1,738					

Current Country GDP (million)

Source: Own elaboration

The country's economic structure involving Industry's and services' shares of non-petroleum GDP have been declining, and the

economy relies too strongly on low-productivity agriculture for sustenance. Contribution of non-petroleum economy appears to be contrary to the rapid economic acceleration and transformation needed for post conflict recovery. This recovery was related to the return of internal conflict in early and mid-2006 and a period of severe droughts, economic activity throughout Timor-Leste ground once more to a halt, both in Dili and in the countryside, where agriculture and transportation were severely disrupted (e.g., coffee production, the main non-petroleum export commodity, declined by 20 percent11) and real non-petroleum GDP dropped by 2.9 percent for the year (USAID, 2008).

6.2. SWOT Analysis

One of the important analysis is by structuring the Strengths, Weaknesses, Opportunities and Threats (SWOT) where this is intentionally analyzed the possibility of sustainable development model can helps to define the future. Analytic Hierarchy Process (AHP) is very a common tool utilized in designing this type of model and to lead us to performing decisions. While this analysis is referred to the sustainable development model based food sovereignty, then SWOT analysis is also a qualitative decision to determine future agriculture development model in Timor-Leste.

Each proposal is designed in the results of analysis by AHP alternative models are presented in each criteria bellow:

6.2.1. Strengths

The results Analytic of Hierarchy Process is shown in the table 7 indicate that 33.13% of respondents recommended the best strength was that 80% of population engage in agriculture as their livelihood. This means the current population are relying on farming activities as a source of livelihood and income.

Table 8: Analytic Hierarchy Process (AHP) based on criteria of SWOT

SWOT ANALYSIS	Normalized Agregate Vector	Analytic Hierarchy Process (AHP)
	28,68%	a. Rich in natural resources
	33,13%	**b. Around 80 % of populations are engaged in agriculture**
	31,06%	c. Most of farmers are rural families, peasants, fisher folks, pastoralists, small scale producers
	7,12%	d. Farmers are motivated to produce food and sustain life and sell for income generation
STRENGHTS	**100,00%**	
	32,49%	a. Lack of knowledge, information and technology.
	33,58%	**b. Lack of access to water irrigations, irregular rain and land with steep slope**
	27,45%	c. Excessive intervention by local governments such.
	6,48%	d. Lack of agriculture inputs (land, capital and labour)
WEAKNESSES	**100,00%**	
	31,87%	**a. Determine its own agriculture policies and development models.**
	28,59%	b. Opportunity to guarantee the micro and macro economy and contribution to the economic resilience in the future after the petroleum income.
	29,68%	c. Distribution of income justly and guarantees the prosperity of people.
	9,86%	d. Opportunity to balance social cohesion (social inclusion, capital and mobility)
OPPORTUNITIES	**100,00%**	
	29,35%	**a. Competitive locals and global markets (including free trade)**
	27,39%	b.Technology exclusion (inaccessible, unaffordable price and how to manage them)
	20,75%	c. Domination of imported food (such as rice and other basic foods)
	22,51%	d. Pressure and threats of global politics, economy and social
THREATS	**100,00%**	

Source: Own elaboration

While the second most important results is 31.06% of respondents where farmers, rural families, peasants, fisher folks, pastoralists, small scale producers and need to be considered in the food sovereignty model. The third results is 28.68% respondents believe that Timor-Leste is rich in natural resources, beside oil and gases it has availability of local staple food, availability of organic food, diversity of genetic resources and ecological purities. The last results is that 7.12% recommended to motivation of producing food and sustain life by rural dwellers, peasants, fisher folks, pastoralists, small scale producers as well as to increase

family incomes. This means that even farmers are motivated but they face limitations in other factors in order to boost the agriculture activities.

Self motivation is not enough to push the agriculture sector in the country but it needs to rely on the significant investment from the government on this area for instance providing skills and knowledge, demonstration plots, micro credits to the farmers, accessibility to land, and agro-input.

6.2.2. Weaknesses

The results of Analytic Hierarchy Process shown in the table 7 indicated that 33.59% of the respondents stated that most weaknesses faced by the farmers are due to lack of access to water irrigations, irregular rain and land with steep slope. Even though farmers have access land however water is still the main issue in the country. Farmers depend on rain water and water fountain is not available throughout the year. The dry season is longer than the rainy season and the drought hampers farmer's life almost the whole year. The second result is that 31.87% of respondents pointed out that the second weakness is due to lack of knowledge, information and technology. While the third results is that 27.45% of respondents said that the third problem is due to excessive intervention by local governments such as: facilitate domination of basic food import with dumping prices (low price), free sharing money such as veteran pension, tertiary age subsidies, and low investment on productive sectors. The last result is that 6.48% of respondents mention to lack of agriculture inputs (land, capital and labour). This means that farmers still have land and labours even capital is not such a big problem. For example, the government and the NGOs are providing agriculture inputs however this is not as important as water and irrigation for the farmers.

6.2.3. Opportunities

The result of analytic hierarchy process as indicated in the table 7 that, 31.87**%** of the respondents stated that there are opportunities to determine its own agriculture policies and development models, to practice food sovereignty and guarantee its socio-culture and environment. This is

reflected to the current policy of determining agriculture system is not clear. The dependency on international system is dominating the mindset of the decision makers. Timor-Leste needs to define its own agriculture policy rather than adopt policies from other countries that do not reflected the current agriculture situation in the country. The second result is that 29.68% of respondents think that Timor-Leste has opportunity of a just distribution of income and can guarantee the prosperity of its people. While 28,59% of respondents stated that the third opportunity is to guarantee the economy of small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers as part of contribution to the economic resilience in the future after the petroleum revenue is exhausted. Lastly, there is opportunity to balance social cohesion (social inclusion, capital and mobility). This means that all the above mentioned priorities and social cohesion can be achieved regularly by maximizing people's involvement, capital sharing and accessible to all people irrespective of race and religion.

6.2.4. Threats

The result of analytic hierarchy process as shown in the table 7 indicated that, 29.35% of the most threats are due to competitive locals and global markets (including free trade). This means that smallholder farmers, peasants and small producers are reluctant to compete with the local and global markets. The implementation of global market criteria and price is not fair. Local products are higher in price than the import products. While 29.68% might be due to the technology exclusion because of inaccessible, unaffordable price and how to use it. Followed by 22.51% is regarding to the pressure and threats of global politics, economy and social conditions. However the lower result is that 20.75% of respondents believe that the domination of imported food (such as rice and other basic foods) a sharp fall of prices occurs. Imported food is a threat while internal production is also a challenge to be achieved. There should be an import quota implemented because of the insecure and instable production throughout the seasons.

The graphic 2 of the analytic hierarchy process bellow reflects the structure of the strengths, weaknesses, opportunities and threats that Timor-Leste must face its own decision and strategy based on a food sovereignty model as people desire in the future. The model was clear to determine that Timor-Leste has potential based on real reliance on farming, most of the farmers are rural families, while it has abundance of natural resources including biodiversity and genetic resources. Moreover farmers are motivated to sustain life and generate income for their families. It is strong enough show that policy makers must take it into account.

STRENGTHS

+ Around 80 % of populations are engaged in agriculture
+ Most of farmers are rural families, peasants, fisher folks, pastoralists, small scale producers
+ Rich in natural resources
+ Farmers are motivated to produce food and sustain life and sell for income generation

OPPORTUNITIES

+ Determine its own agriculture policies and development models.
+ Distribution of income justly and guarantees the prosperity of people.
+ Opportunity to guarantee the micro and macro economy and contribution to the economic resilience in the future after the petroleum income.
+ Opportunity to balance social cohesion (social inclusion, capital and mobility)

WEAKNESSES

- Access to water irrigations, irregular rain and land with steep slope
- Knowledge, information and technology.
- Excessive intervention by local governments.
- Agriculture inputs (land, capital and labour)

THREATS

- Competitive locals and global markets (including free trade)
- Technology exclusion (inaccessible, unaffordable price and unmanageable)
  Pressure and threats of global politic, economy and social.
- Domination of imported food (such as rice and other basic foods)

Figure 6: Analytic Hierarchy Process (AHP)

Along with the positive strengths, there are few significant opportunities to set up a self determination of agriculture concept and policies based on food sovereignty as prospective sustainable development model to guarantee people's life. Besides it, a just distribution of income and prosperity of life can be guaranteed. Moreover, micro economy is important and has positive impact on the country's macro economy by balancing social cohesion through social inclusion, capital distribution and mobilities.

Despite these potentials, decision makers neglect through their policies the agricultural sector by not given it the first priority. Dependency on petroleum revenue is more dominating the mindset of the policy makers rather than to boost agriculture sector to balance the economy of the country.

CHAPTER 7. CONCULSIONS AND RECOMENDATIONS

7.1. Conclusions

The model of sustainable development which was proposed base on food sovereignty has the positive impact on various sources, such as:

I) Timor-Leste's economy is strongly dependent on the petroleum revenue as it represents the major income to the Gross Domestic Product (GDP), while agriculture, tourism and other sector also contribute to the GDP in the country, but still in minor importance. Timor-Leste has to face the major problem of such strong dependency on a no-renewable resource. As long as petroleum revenues are available, Timor-Leste needs to change its political strategy on how to manage those funds and shift its focus to the development of other productive sector that would guarantee the internal economy and the economic resilience after the petroleum revenues.

II) Timor-Leste has the opportunity to determine its own agriculture policies and development models, to practice food sovereignty and guarantee its socio-culture and environment. Besides them, the just distribution of income guarantees the prosperity of people. While other Opportunity to guarantee the micro and macro economy and contribution to the economic resilience in the future after the petroleum income also a chance to balance social cohesion (social inclusion, capital and mobility).

7.2. Recommendations

Timor-Leste has strong impact on adopting sustainable development model as indicated that most of the populations are engaged in agriculture. Beside that Timor-Leste has rich in natural resource, beside oil and gases it has availability of local staple food, availability of organic food, diversity of genetic resources and ecological purities. In addition Farmers are motivated to produce food and sustain life and sell for income generation.

1. International organization such as FAO to address the issue of sustainable development into the concrete actions.
2. The government of Timor-Leste, Non-government Organizations, Civil Society Organizations and academics to implement a sustainable development model as to guarantee national food sovereignty base on the right of people. There are several steps to be undertaken such as:
   - Motivate young people, small farmers, peasants, fisher folks, pastoralists, small scale producers to involve in agriculture development process through cooperatives.
   - Needs to solve land tenure problem, land sharing to farmers, investment on agriculture, improving farmer's knowledge to access in information and technologies.

- Set up the political shift from food security into the food sovereignty model and providing more rights to the local government to determine their policies, produce food for nutrition and self-sufficiency based on socio cultural and ecological approach rather than food trade only.
- It is necessary to review impact of free market and adoption of fair market with logical standard price and affordable, facilitate local market access for all small farmers, peasants, fisher folks, pastoralists, small scale producers.

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Annex 1. Analysis of Petroleum Revenue

Variables introducidas/eliminadas[a,b]

Variables introducidas	Variables eliminadas	Método
Agriculture Production Values (US$), Petroleum Revenue (million), Annual Population (000)[c]	.	Introducir
.	Annual Population (000)	Hacia atrás (criterio: Prob. de F para salir >= ,100).
.	Agriculture Production Values (US$)	Hacia atrás (criterio: Prob. de F para salir >= ,100).

a. Variable dependiente: GDP Growth %

b. Regresión lineal a través del origen

c. Todas las variables solicitadas introducidas.

Resumen del modelo[e,f]

Modelo	R	R cuadrado[b]	R cuadrado corregida	Error típ. de la estimación	Estadísticos de cambio					Durbin-Watson
					Cambio en R cuadrado	Cambio en F	gl1	gl2	Sig. Cambio en F	
1	,844[a]	,712	,675	3,654	,712	18,979	3	23	,000	
2	,842[c]	,709	,685	3,596	-,003	,256	1	23	,618	
3	,831[d]	,691	,678	3,633	-,018	1,517	1	24	,230	1,807

a. Variables predictoras: Agriculture Production Values (US$), Petroleum Revenue (million), Annual Population (000)

b. Para la regresión a través del origen (el modelo sin término de intersección), R cuadrado mide la proporción de la variabilidad de la variable dependiente explicado por la regresión a través del origen.

ANOVA[a,b]

Modelo		Suma de cuadrados	gl	Media cuadrática	F	Sig.
1	Regresión	759,992	3	253,331	18,979	,000[c]
	Residual	307,008	23	13,348		
	Total	1067,000[d]	26			
2	Regresión	756,577	2	378,289	29,247	,000[e]
	Residual	310,423	24	12,934		
	Total	1067,000[d]	26			
3	Regresión	736,950	1	736,950	55,821	,000[f]
	Residual	330,050	25	13,202		
	Total	1067,000[d]	26			

a. Variable dependiente: GDP Growth %

b. Regresión lineal a través del origen

c. Variables predictoras: Agriculture Production Values (US$), Petroleum Revenue (million), Annual Population (000)

d. Esta suma de cuadrados total no se ha corregido para la constante porque la constante es cero para la regresión a

través del origen.

e. Variables predictoras: Agriculture Production Values (US$), Petroleum Revenue (million)

f. Variables predictoras: Petroleum Revenue (million)

Coeficientesa,b

Modelo		Coeficientes no estandarizados		Coeficientes tipificados	T	Sig.
		B	Error típ.	Beta		
1	Annual Population (000)	-,004	,009	-,654	-,506	,618
	Petroleum Revenue (million)	,004	,001	,775	4,732	,000
	Agriculture Production Values (US$)	4,282E-005	,000	,793	,638	,530
2	Petroleum Revenue (million)	,003	,001	,731	5,354	,000
	Agriculture Production Values (US$)	9,089E-006	,000	,168	1,232	,230
3	Petroleum Revenue (million)	,004	,001	,831	7,471	,000

a. Variable dependiente: GDP Growth %

b. Regresión lineal a través del origen

Variables excluidasa,b

Modelo		Beta dentro	t	Sig.	Correlación parcial	Estadísticos de colinealidad
						Tolerancia
2	Annual Population (000)	-,654[c]	-,506	,618	-,105	,007
	Annual Population (000)	,166[d]	1,163	,256	,231	,600
3	Agriculture Production Values (US$)	,168[d]	1,232	,230	,244	,649

a. Variable dependiente: GDP Growth %

b. Regresión lineal a través del origen

c. Variables predictoras en el modelo: Agriculture Production Values (US$), Petroleum Revenue (million)

d. Variables predictoras en el modelo: Petroleum Revenue (million)

Estadísticos sobre los residuos[a,b]

	Mínimo	Máximo	Media	Desviación típica	N
Valor pronosticado	,00	13,97	2,73	4,585	26
Valor pronosticado tip.	-,655	2,438	-,050	1,016	26
Error típico de valor pronosticado	,000	1,869	,365	,614	26
Valor pronosticado corregido	,00	16,11	2,80	4,836	26
Residual	-8,328	7,000	,847	3,882	26
Residuo típ.	-2,292	1,927	,233	1,068	26
Residuo estud.	-2,300	1,927	,224	1,116	26
Residuo eliminado	-8,434	7,000	,778	4,264	26
Residuo eliminado estud.	-2,539	2,046	,221	1,185	26
Dist. de Mahalanobis	,000	6,881	,976	1,925	26
Distancia de Cook	,000	1,319	,121	,320	26
Valor de influencia centrado	,000	,265	,038	,074	26

a. Variable dependiente: GDP Growth %

b. Regresión lineal a través del origen

Annex 2. Analysis of Agriculture sector

Variables introducidas/eliminadas[a,b]

Modelo	Variables introducidas	Variables eliminadas	Método
1	Forest area (000Ha), Total area equipped for irrigation (000 Ha), Export Value (Crops and livestock products), Female Active in Agriculture (000), Agriculture Value added to GDP (%), Agriculture area (000 ha)[c]	.	Introducir
2	.	Agriculture Value added to GDP (%) Female Active in Agriculture (000)	Hacia atrás (criterio: Prob. de F para salir >= ,100).
3	.		Hacia atrás (criterio: Prob. de F para salir >= ,100).

a. Variable dependiente: Agriculture Production Values (US$)

b. Regresión lineal a través del origen

c. Alcanzado límite de tolerancia = ,000.

Resumen del modeloe,f

Modelo	R	R cuadrado[b]	R cuadrado corregida	Error típ. de la estimación	Estadísticos de cambio					Durbin-Watson
					Cambio en R cuadrado	Cambio en F	gl1	gl2	Sig. Cambio en F	
1	,998[a]	,996	,995	8500,451	,996	808,540	6	19	,000	
2	,998[c]	,996	,995	8330,555	,000	,209	1	19	,653	
3	,998[d]	,996	,995	8191,006	,000	,302	1	20	,589	1,115

a. Variables predictoras: Forest area (000Ha), Total area equipped for irrigation (000 Ha), Export Value (Crops and livestock products), Female Active in Agriculture (000), Agriculture Value added to GDP (%), Agriculture area (000 ha)

b. Para la regresión a través del origen (el modelo sin término de intersección), R cuadrado mide la proporción de la variabilidad de la variable dependiente explicado por la regresión a través del origen. NO SE PUEDE comparar lo anterior con la R cuadrado para los modelos que incluyen una intersección.

c. Variables predictoras: Forest area (000Ha), Total area equipped for irrigation (000 Ha), Export Value (Crops and livestock products), Female Active in Agriculture (000), Agriculture area (000 ha)

d. Variables predictoras: Forest area (000Ha), Total area equipped for irrigation (000 Ha), Export Value (Crops and livestock products), Agriculture area (000 ha)

e. Variable dependiente: Agriculture Production Values (US$)

ANOVA[a,b]

Modelo		Suma de cuadrados	gl	Media cuadrática	F	Sig.
1	Regresión	350539395763,970	6	58423232627,328	808,540	,000[c]
	Residual	1372895707,318	19	72257668,806		
	Total	351912291471,288[d]	25			
2	Regresión	350524328532,622	5	70104865706,524	1010,184	,000[e]
	Residual	1387962938,666	20	69398146,933		
	Total	351912291471,288[d]	25			
3	Regresión	350503347222,336	4	87625836805,584	1306,044	,000[f]
	Residual	1408944248,952	21	67092583,283		
	Total	351912291471,288[d]	25			

a. Variable dependiente: Agriculture Production Values (US$)

b. Regresión lineal a través del origen

c. Variables predictoras: Forest area (000Ha), Total area equipped for irrigation (000 Ha), Export Value (Crops and livestock products), Female Active in Agriculture (000), Agriculture Value added to GDP (%), Agriculture area (000 ha)

d. Esta suma de cuadrados total no se ha corregido para la constante porque la constante es cero para la regresión a través del origen.

e. Variables predictoras: Forest area (000Ha), Total area equipped for irrigation (000 Ha), Export Value (Crops and livestock products), Female Active in Agriculture (000), Agriculture area (000 ha)

Coeficientes[a,b]

Modelo		Coeficientes no estandarizados		Coeficientes tipificados	t	Sig.
		B	Error típ.	Beta		
1	Female Active in Agriculture (000)	91,644	149,894	,101	,611	,548
	Agriculture area (000 ha)	524,791	179,120	1,580	2,930	,009
	Total area equipped for irrigation (000 Ha)	-1548,524	821,368	-,390	-1,885	,075
	Export Value (Crops and livestock products)	1,431	,856	,123	1,671	,111
	Agriculture Value added to GDP (%)	337,884	739,933	,072	,457	,653
	Forest area (000Ha)	-69,235	46,867	-,494	-1,477	,156
2	Female Active in Agriculture (000)	79,487	144,562	,087	,550	,589
	Agriculture area (000 ha)	516,137	174,554	1,554	2,957	,008
	Total area equipped for irrigation (000 Ha)	-1383,873	723,244	-,349	-1,913	,070
	Export Value (Crops and livestock products)	1,224	,712	,105	1,718	,101
	Forest area (000Ha)	-56,955	37,616	-,406	-1,514	,146
3	Agriculture area (000 ha)	590,238	109,081	1,777	5,411	,000
	Total area equipped for irrigation (000 Ha)	-1584,232	614,277	-,399	-2,579	,018
	Export Value (Crops and livestock products)	1,289	,691	,111	1,866	,076
	Forest area (000Ha)	-70,003	28,697	-,499	-2,439	,024

a. Variable dependiente: Agriculture Production Values (US$)

b. Regresión lineal a través del origen

Annex 3. Agriculture Value added to GDP

Variables introducidas/eliminadas[a,b]

Modelo	Variables introducidas	Variables eliminadas	Método
1	Agriculture Production Values (US$), Export Value (Crops and livestock products), Female Active in Agriculture (000), Rural Population (000)[c]	.	Introducir

a. Variable dependiente: Agriculture Value added to GDP (%)

b. Regresión lineal a través del origen

c. Todas las variables solicitadas introducidas.

Resumen del modelo[c,d]

Modelo	R	R cuadrado[b]	R cuadrado corregida	Error típ. de la estimación	Durbin-Watson
1	,997[a]	,995	,992	2,390	2,685

a. Variables predictoras: Agriculture Production Values (US$), Export Value (Crops and livestock products), Female Active in Agriculture (000), Rural Population (000)

b. Para la regresión a través del origen (el modelo sin término de intersección), R cuadrado mide la

proporción de la variabilidad de la variable dependiente explicado por la regresión a través del origen.

NO SE PUEDE comparar lo anterior con la R cuadrado para los modelos que incluyen una

intersección.

c. Variable dependiente: Agriculture Value added to GDP (%)

d. Regresión lineal a través del origen

ANOVA[a,b]

Modelo		Suma de cuadrados	gl	Media cuadrática	F	Sig.
1	Regresión	7738,014	4	1934,503	338,655	,000[c]
	Residual	39,986	7	5,712		
	Total	7778,000[d]	11			

a. Variable dependiente: Agriculture Value added to GDP (%)

b. Regresión lineal a través del origen

c. Variables predictoras: Agriculture Production Values (US$), Export Value (Crops and livestock

products), Female Active in Agriculture (000), Rural Population (000)

d. Esta suma de cuadrados total no se ha corregido para la constante porque la constante es cero para la

regresión a través del origen.

Coeficientes^{a,b}

Modelo		Coeficientes no estandarizados		Coeficientes tipificados	t	Sig.	Estadísticos de colinealidad	
		B	Error típ.	Beta			Tolerancia	FIV
1	Export Value (Crops and livestock products)	,000	,000	-,067	-,635	,545	,065	15,291
	Female Active in Agriculture (000)	-,259	,110	-1,294	-2,360	,050	,002	409,292
	Rural Population (000)	,137	,020	3,739	6,753	,000	,002	417,530
	Agriculture Production Values (US$)	,000	,000	-1,399	-2,342	,052	,002	485,930

a. Variable dependiente: Agriculture Value added to GDP (%)

b. Regresión lineal a través del origen

Diagnósticos de colinealidad[a,b]

Modelo	Dimensión	Autovalores	Índice de condición	Proporciones de la varianza			
				Export Value (Crops and livestock products)	Female Active in Agriculture (000)	Rural Population (000)	Agriculture Production Values (US$)
1	1	3,917	1,000	,00	,00	,00	,00
	2	,080	6,978	,61	,00	,00	,00
	3	,002	49,549	,01	,62	,87	,02
	4	,001	51,928	,38	,38	,12	,98

a. Variable dependiente: Agriculture Value added to GDP (%)

b. Regresión lineal a través del origen

Estadísticos sobre los residuos[a,b]

	Mínimo	Máximo	Media	Desviación típica	N
Valor pronosticado	21,03	29,84	26,37	2,992	11
Residual	-4,434	2,387	-,005	2,000	11
Valor pronosticado tip.	-1,785	1,160	,000	1,000	11
Residuo típ.	-1,855	,999	-,002	,837	11

a. Variable dependiente: Agriculture Value added to GDP (%)

b. Regresión lineal a través del origen

Annex 4. Country GDG Growth

Variables introducidas/eliminadas[a,b]

Modelo	Variables introducidas	Variables eliminadas	Método
1	Employment to Population ratio, ages 15-24, total (ILO), Export Value (Crops and livestock products), Economically Active Population in Agriculture (000), Urban Population (000)[c]	.	Introducir

a. Variable dependiente: Current GDP (million)

b. Regresión lineal a través del origen

c. Alcanzado límite de tolerancia = ,000.

Resumen del modelo[c,d]

Modelo	R	R cuadrado[b]	R cuadrado corregida	Error típ. de la estimación	Durbin-Watson
1	,997[a]	,993	,989	59,294	1,738

a. Variables predictoras: Employment to Population ratio, ages 15-24, total (ILO), Export Value (Crops and livestock products), Economically Active Population in Agriculture (000), Urban Population (000)

b. Para la regresión a través del origen (el modelo sin término de intersección), R cuadrado mide la proporción de la variabilidad de la variable dependiente explicado por la regresión a través del origen. NO SE PUEDE comparar lo anterior con la R cuadrado para los modelos que incluyen una intersección.

c. Variable dependiente: Current GDP (million)

d. Regresión lineal a través del origen

ANOVA[a,b]

Modelo		Suma de cuadrados	gl	Media cuadrática	F	Sig.
1	Regresión	3646885,881	4	911721,470	259,326	,000[c]
	Residual	24610,119	7	3515,731		
	Total	3671496,000[d]	11			

a. Variable dependiente: Current GDP (million)

b. Regresión lineal a través del origen

c. Variables predictoras: Employment to Population ratio, ages 15-24, total (ILO), Export Value (Crops and

livestock products), Economically Active Population in Agriculture (000), Urban Population (000)

d. Esta suma de cuadrados total no se ha corregido para la constante porque la constante es cero para la

regresión a través del origen.

Coeficientes[a,b]

Modelo	Coeficientes no estandarizados		Coeficientes tipificados	t	Sig.	Estadísticos de colinealidad	
	B	Error típ.	Beta			Tolerancia	FIV

1	Export Value (Crops and livestock products)	,003	,007	,049	,377	,718	,057	17,665
	Economically Active Population in Agriculture (000)	-15,450	5,650	-7,954	-2,735	,029	,000	8834,655
	Urban Population (000)	20,521	6,596	9,179	3,111	,017	,000	9091,174
	Employment to Population ratio, ages 15-24, total (ILO)	-7,493	2,035	-,330	-3,682	,008	,120	8,363

a. Variable dependiente: Current GDP (million)

b. Regresión lineal a través del origen

Variables excluidas[a,b]

Modelo		Beta dentro	t	Sig.	Correlación parcial	Estadísticos de colinealidad		
						Tolerancia	FIV	Tolerancia mínima
1	Rural Population (000)	-19,740[c]	-4,751	,003	-,889	1,359E-005	73588,834	1,359E-005

a. Variable dependiente: Current GDP (million)

b. Regresión lineal a través del origen

c. Variables predictoras en el modelo: Employment to Population ratio, ages 15-24, total (ILO), Export Value (Crops and livestock products), Economically

Active Population in Agriculture (000), Urban Population (000)

Diagnósticos de colinealidad[a,b]

Modelo	Dimensión	Autovalores	Índice de condición	Export Value (Crops and livestock products)	Economically Active Population in Agriculture (000)	Urban Population (000)	Employment to Population ratio, ages 15-24, total (ILO)
				Proporciones de la varianza			
1	1	3,794	1,000	,00	,00	,00	,01
	2	,128	5,443	,05	,00	,00	,71
	3	,077	7,001	,46	,00	,00	,01
	4	5,577E-005	260,841	,48	1,00	1,00	,28

a. Variable dependiente: Current GDP (million)

b. Regresión lineal a través del origen

Estadísticos sobre los residuos[a,b]

	Mínimo	Máximo	Media	Desviación típica	N
Valor pronosticado	341,97	930,33	546,89	188,906	11
Residual	-103,967	49,429	-,349	49,607	11
Valor pronosticado tip.	-1,085	2,030	,000	1,000	11
Residuo típ.	-1,753	,834	-,006	,837	11

a. Variable dependiente: Current GDP (million)

b. Regresión lineal a través del origen

Annex 5. Result of SWOT Analysis

SWOT ANALYSIS	Normalized Agregate Vector	Analytic Hierarchy Process (AHP)
	28,68%	a. Rich in natural resources
	33,13%	**b. Around 80 % of populations are engaged in agriculture**
	31,06%	c. Most of farmers are rural families, peasants, fisher folks, pastoralists, small scale producers
	7,12%	d. Farmers are motivated to produce food and sustain life and sell for income generation
STRENGHTS	**100,00%**	
	32,49%	a. Lack of knowledge, information and technology.
	33,58%	**b. Lack of access to water irrigations, irregular rain and land with steep slope**
	27,45%	c. Excessive intervention by local governments such.
	6,48%	d. Lack of agriculture inputs (land, capital and labour)
WEAKNESSES	**100,00%**	
	31,87%	**a. Determine its own agriculture policies and development models.**
	28,59%	b. Opportunity to guarantee the micro and macro economy and contribution to the economic resilience in the future after the petroleum income.
	29,68%	c. Distribution of income justly and guarantees the prosperity of people.
	9,86%	d. Opportunity to balance social cohesion (social inclusion, capital and mobility)
OPPORTUNITIES	**100,00%**	
	29,35%	**a. Competitive locals and global markets (including free trade)**
	27,39%	b.Technology exclusion (inaccessible, unaffordable price and how to manage them)
	20,75%	c. Domination of imported food (such as rice and other basic foods)
	22,51%	d. Pressure and threats of global politic, economy and social
THREATS	**100,00%**	

STRENGTHS

+ Around 80 % of populations are engaged in agriculture
+ Most of farmers are rural families, peasants, fisher folks, pastoralists, small scale producers
+ Rich in natural resources
+ Farmers are motivated to produce food and sustain life and sell for income generation

OPPORTUNITIES

+ Determine its own agriculture policies and development models.
+ Distribution of income justly and guarantees the prosperity of people.
+ Opportunity to guarantee the micro and macro economy and contribution to the economic resilience in the future after the petroleum income.
+ Opportunity to balance social cohesion (social inclusion, capital and mobility)

WEAKNESSES

- Access to water irrigations, irregular rain and land with steep slope
- Knowledge, information and technology.
- Excessive intervention by local governments.
- Agriculture inputs (land, capital and labour)

THREATS

- Competitive locals and global markets (including free trade)
- Technology exclusion (inaccessible, unaffordable price and unmanageable)
- Pressure and threats of global politic, economy and social.
- Domination of imported food (such as rice and other basic foods)

Annex 6. Questioner (Interview data)

GUIDELINES

This guideline is introducing you what to do with the following questionnaire, you might need to understand them before answer questions in the following pages (You do not need to circle or tick nor cross in this guidance)

Analysis of the sustainable development models based on Food Sovereignty

1. Strengths:
   a. Rich in natural resources, availability of local staple food, availability of organic food, diversity of genetic resources and ecological purities.
   b. Around 80 % of population are engaged in agriculture as their livelihood
   c. Around 60% of the small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are able to access to the land even the government need to regulate land tenure in Timor-Leste.
   d. Many small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are motivated to produce food and sustain life and sell for income generation.

2. Weaknesses
   a. Lack of knowledge, information and technology mostly for small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers.
   b. Lack of access to water irrigations, irregular rain and land with steep slope and low fertility
   c. Excessive intervention by local governments such as: facilitate domination of basic food import with dumping prices (low price), free sharing money such as veteran pension, tertiary age subsidies, and low investment on productive sectors.
   d. Lack of agriculture inputs (land, capital and labor)

3. Opportunities
   a. Opportunity to determine its own agriculture policies and development models, to practice food sovereignty and guarantee its socio-culture and environment.
   b. Opportunity to guarantee the economy of small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers as part of contribution to the economic resilience in the future after the petroleum revenue.
   c. Timor-Leste has opportunity in distribution of income justly and guarantees the prosperity of people.
   d. Opportunity to balance social cohesion (social inclusion, capital and mobility)

4. Threats
   a. Competitive locals and global markets (including free trade)
   b. Technology exclusion (inaccessible, unaffordable price and unmanageable)
   c. Domination of imported food (such as rice and other basic foods)
   d. Pressure and threats of global politic, economy and social.

Good morning/afternoon. My name is Leovogildo Belarmino and I am a Timorese student who is studying at the University of Valladolid, Spain. Currently, I am doing my final paper as part of my obligation to obtain a Masters Degree in Advance Technologies of Agroforestry Development. I have chosen the topic of *"Proposing a Sustainable Development Model in Timor-Leste based on Food Sovereignty".* This topic is quite important to the current situation in Timor-Leste where high poverty, malnutrition and hunger, food insecurity, unfair trade and dependency on imported food dominate the country. My thesis will also contribute to academic research as well as be a source of taking an alternative direction to allow the country exit from the food insecurity and choose self-sufficiency based on a food sovereignty model in the Timor-Leste's future. Hence, I would like your participation and to contribute your ideas in this questioner. Your responses will be used to develop my research

SESSION 1. GENERAL INFORMATION (Circle or tick nor cross which one is belong to your reality conditions)

1. Type of the organization
   a) Farmer
   b) Private business
   c) Cooperatives
   d) NGOs
   e) Government institutions
   f) Students
   g) Professor
   h) Others

2. Sex
a) Male   b) female

3. Age
a) < 25   b) 25-35   c) 36-45   d) 46-55   e) 56-66   f) > 66

4. Education
   a) Primary School
   b) Junior high school
   c) Senior high school
   d) University
   e) Others

SESSION 2. SWOT ANALYSIS (sustainable development models based on Food Sovereignty)
2.1. Strengths

2.1.1	a). Rich in natural resources, availability of local staple food, quality of food, diversity of genetic resources and ecological purities.	
	b). Around 80 % of population are engaged in agriculture as their livelihood	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.1.2	a). Rich in natural resources, availability of local staple food, quality of food, diversity of genetic resources and ecological purities.	
	c). Around 60% of the small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are able to access to the land even the government need to regulate land tenure in Timor-Leste.	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.1.3	a). Rich in natural resources, availability of local staple food, quality of food, diversity of genetic resources and ecological purities.	
	d). Many small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are motivated to produce food and sustain life and sell for income generation	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.1.4	b). Around 80 % of population are engaged in agriculture as their livelihood	
	c). Around 60% of the small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are able to access to the land even the government need to regulate land tenure in Timor-Leste.	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.1.5	b). Around 80 % of population are engaged in agriculture as their livelihood	
	d). Many small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are motivated to produce food and sustain life and sell for income generation	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.1.6	c). Around 60% of the small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are able to access to the land even the government need to regulate land tenure in Timor-Leste.	
	d). Many small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers are motivated to produce food and sustain life and sell for income generation	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.2. Weaknesses

2.2.1	a). Lack of knowledge, information and technology mostly for small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers.	
	b). Lack of access to water irrigations, irregular rain and land with steep slope and low fertility	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.2.2	a). Lack of knowledge, information and technology mostly for small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers.	
	c). Excessive intervention by local governments such as: facilitate domination of basic food import with dumping prices (low price), free sharing money such as veteran pension, tertiary age subsidies, and low investment on productive sectors.	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.2.3	a). Lack of knowledge, information and technology mostly for small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers.	
	d). Lack of agriculture inputs (land, capital and labor)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.2.4	b). Lack of access to water irrigations, irregular rain and land with steep slope and low fertility	
	c). Excessive intervention by local governments such as: facilitate domination of basic food import with dumping prices (low price), free sharing money such as veteran pension, tertiary age subsidies, and low investment on productive sectors.	

	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.2.5	b). Lack of access to water irrigations, irregular rain and land with steep slope and low fertility	
	d). Lack of agriculture inputs (land, capital and labor)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.2.6	c). Excessive intervention by local governments such as: facilitate domination of basic food import with dumping prices (low price), free sharing money such as veteran pension, tertiary age subsidies, and low investment on productive sectors.	
	d). Lack of agriculture inputs (land, capital and labor)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.3. Opportunities

2.3.1	a). Opportunity to determine its own agriculture policies and development models, to practice food sovereignty and guarantee its socio-culture and environment.	
	b). Opportunity to guarantee the economy of small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers as part of contribution to the economic resilience in the future after the petroleum revenue.	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.3.2	a). Opportunity to determine its own agriculture policies and development models, to practice food sovereignty and guarantee its socio-culture and environment.	
	c). Timor-Leste has opportunity in distribution of income justly and guarantees the prosperity of people.	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important		Moderate		Very important		Extremely important

2.3.3	a). Opportunity to determine its own agriculture policies and development models, to practice food sovereignty and guarantee its socio-culture and environment.	
	d). Opportunity to balance social cohesion (social inclusion, capital and mobility)	

Similar importance		

In case they are similar, indicate level relative superiority in the important function:

	Less important			Moderate			Very important			Extremely important

2.3.4	b). Opportunity to guarantee the economy of small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers as part of contribution to the economic resilience in the future after the petroleum revenue.	
	c). Timor-Leste has opportunity in distribution of income justly and guarantees the prosperity of people.	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important			Moderate			Very important			Extremely important

2.3.5	b). Opportunity to guarantee the economy of small farmers, rural families, peasants, fisher folks, pastoralists, small scale producers as part of contribution to the economic resilience in the future after the petroleum revenue.	
	d). Opportunity to balance social cohesion (social inclusion, capital and mobility)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important			Moderate			Very important			Extremely important

2.3.6	c). Timor-Leste has opportunity in distribution of income justly and guarantees the prosperity of people.	
	d). Opportunity to balance social cohesion (social inclusion, capital and mobility)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important			Moderate			Very important			Extremely important

2.4. Threats

2.4.1	a). Competitive locals and global markets (including free trade)	
	b). Technology exclusion (inaccessible, unaffordable price and how to manage them)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

	Less important			Moderate			Very important			Extremely important

2.4.2	a). Competitive locals and global markets (including free trade)	
	c). Domination of imported food (such as rice and other basic foods)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

Less important		Moderate		Very important		Extremely important

2.4.3	a). Competitive locals and global markets (including free trade)	
	d). Pressure and threats of global politic, economy and social	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

Less important		Moderate		Very important		Extremely important

2.4.4	b). Technology exclusion (inaccessible, unaffordable price and how to manage them)	
	c). Domination of imported food (such as rice and other basic foods)	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

Less important		Moderate		Very important		Extremely important

2.4.5	b). Technology exclusion (inaccessible, unaffordable price and how to manage them)	
	d). Pressure and threats of global politic, economy and social	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

Less important		Moderate		Very important		Extremely important

2.4.6	c). Domination of imported food (such as rice and other basic foods)	
	d). Pressure and threats of global politic, economy and social	
	Similar importance	

In case they are similar, indicate level relative superiority in the important function:

Less important		Moderate		Very important		Extremely important

SESSION 3. Open questions (This questions are very general, regarding to the problem faced by the small famers, rural families, peasants, fisher folks, pastoralists, small scale producers in Timor-Leste)

1. Do you think poverty and hunger remain higher in Timor-Leste? What are the root causes of poverty and hunger? Do you have any ideas or solutions to reduce poverty, hunger and malnutrition in Timor-Leste ?

2. Do you know what is sustainable agriculture & food sovereignty? Is it important to Timor-Leste? Why is important for a nation like Timor-Leste?

3. Do you think small farmers able to produce food and improve family nutrition and sustain life every day? What are the problem that they face and do not want to produce more? What ability do you see from them to tackle their own problem?

4. Do you think its important from the government intervention? What are the basic interventions do you think relevent to tackle the food and nutrition issue in Timor-Leste?

5. Access to market: Do you think small farmers able to compete in the local, national and global market? do you think the prices are fair? Do you see any dominations, for instance imported food, dumping price and small farmers are unconvinced to produce more. Give your opinion! Thank you for your contributions!

Annex 7. List of Interviewers

No	Full Name	Occupation/Institutions
1.	Jose Adriano Marcal	Profesor Fac. Agricultura UNTL
2.	Mario Tilman	Profesor Fac. Agricultura UNTL
3.	Imanuel do Rego	Student UNTL
4.	Felicidade Neto	Student UNTL/ Univ. Lisboa
5.	Sidonio Joao da Silva Pereira	Student UNTL/ UCM, Madrid
6.	William S	Student UNTL
7.	Donela Joana Guterres	Coord. Koperativa LOUD
8.	Ilda da Cruz	Membro Koperativa LOUD
13.	Amelia Fernandes	Membro Koperativa LOUD
14.	Valemtim Guterres	Farmer
15.	Vicente Maria	Farmer
16.	Daniel Trindade	Farmer
17.	Salvador Bareto	Farmer
18.	Jacinta da Costa	Farmer
19.	Olimpia da Cruz	Farmer
20.	Celso da Fonseca	Citizen
21.	Elidio Nelson B.	Citizen
22.	Armindo Guimaraes	Citizen
23.	Joana Soares	Together in Development NGO