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MASTER THESIS

**GOVERNMENT SUPPORT FOR A SUSTAINABLE DEVELOPMENT
OF RICE PRODUCTION IN TIMOR-LESTE**

FE306E Sustainable Management

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Abstract

Agriculture has been restructured around the world. Such as the types of commodities are produced, the way in which all productions are organized, and all the livelihoods, which it engenders are all changing. Sustainability is a powerful one as it has the potentiality to alter all the ways that productions are occurred. It captures the idea that we must work toward satisfying the needs of the current generation, without endangering the lives of future generation.

The purpose of this thesis is to reveal Timor-Leste agricultural issues regarding inefficient government support on providing tractors to local farmers. In general, the aim of government to give away tractors for farmers is to pursue sustainable ways in agriculture system, to increase domestic rice production and help farmers cultivate in an efficient way. However, with those tractors, there is no positive result for the farmers living condition and lack of domestic rice production becomes a national issue and is challenging for the country's agriculture sector. Hence, the aim of the paper is to provide a deep explanation regarding government support to increase national domestic rice production with the following research question

“How does the introduction of tractors influence farmer's rice production in Timor-Leste”?

Furthermore, the research method of this thesis is a case study where researchers collect information through interview from both farmers and government side, which links to sustainable agriculture, institutional theory and resources, based view. In order to respond to the research question, we have interviewed twenty-one informants in total as the main sources on thesis development.

Hence, this thesis will be useful in the future with knowledge connected to understanding how adopting new technologies, like tractors, influence the rice production sector in the country. As well as useful knowledge for developing and improving, the government systems set in place for distribution of tractors in the Timor-Leste agriculture sector.

Acknowledgment

The main purpose of this research is to contribute economic development of the country in the agriculture sector especially to improve farmers' life conditions in general. The other side of this thesis will finalize our master program. Furthermore our personal purpose of the research is to bring forward knowledge which is useful, and can be applied for better performance on education and progress in future perspective. After a being long overdue this thesis came to an end, and we must first and foremost praise Lord the almighty for granting us the strength and perseverance to get through these long years of study so far and this study would not have been completed without many parts.

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Table Contents

Abstract	1
Acknowledgment	2
Abbreviations	6
1.0. INTRODUCTION.....	7
1.1. Further structure of the thesis.....	9
2.0. THEORETICAL FRAMEWORK	11
2.1. Sustainable Agriculture	11
2.2. Institutional theory	13
2.2.1. Legal framework	13
2.2.2. Social framework	16
2.3. Resource Based View.....	18
2.3.1. Human Capital.....	18
2.3.2. Assets	20
3. LOCAL CONTEXT.....	22
4.0. RESEARCH METHODOLOGY	25
4.1. A qualitative approach	25
4.2. The process of data collection.....	25
4.3. Study Area.....	25
4.4. Interview Guide.....	26
4.5. Validity and Reliability	27
4.6. Weakness and strongest in our method.....	28
4.7. Research Challenges	28
5.0. ANALYSIS	29
5. 1. Sustainable Agriculture.....	29
5.2. Institutional Theory.....	31
5.2.1. Legal point of view	31
5.2.2. Social point of view.....	33
5.3 Resourced Based View.....	35

5.3.1. Human Capital.....	35
5.3.2 Asset.....	37
6.0. CONCLUSION	40
6.1. Sustainable Agriculture	41
6.2. Institutional Theory	41
6.2.1. Legal.....	41
6.2.2. Social.....	43
6.3. Resource Based View.....	44
6.3.1. Human Capital.....	44
6.3.2. Asset.....	45
7.0. IMPLICATION, RECOMENDATION AND FUTURE RESEARCH.....	46
7.1. Implication	46
7.2. Recommendation.....	47
7.2.1. National Government	47
7.2.2. Local and or District Government.....	48
7.2.3. Farmers.....	49
7.3. Future Research.....	49
LIST OF REFERENCES	51
LIST OF APPENDIXES	60

Abbreviations

1. AM: Agricultural Mechanization
2. AMP : Alliance Majority Parliamentary
3. ARP: Agricultural Rehabilitation Program
4. CRS : Catholic Relive Services
5. FNSTF: Food and Nutrition Security Task Force
6. FSI: Farmer Sustainability Index
7. LISA: Low input of Sustainable Agriculture
8. MAF: Ministry of Agriculture and Fisheries
9. MED-TL: Ministry of Economic and Dezenvolment of Timor-Leste
10. MTCI: Ministry of Tourism Commerce and Industry
11. NDAH: National Direction of Agriculture nad Horticultue
12. NGOs: Non-Governmental Organizations
13. RDP: Rural Development Program
14. RDTL: Democratic Republic of Timor-Leste
15. SOL: Seeds Of Life
16. TLNSDP: Timor-Leste National Strategic Development Plan
17. TLS: Timor-Lorosa`e
18. UNCSD: United Nation Conference on Sustainable Development
19. WCED: World Commission on Environment and Development
20. WVI : World Vision International

1.0. INTRODUCTION

Asian people are traditionally dependent on agricultural sector, mainly growing corn and rice. Even in the era of globalization this fact remains important. Growth in population challenges the government to meet the growing, demand for food, which means that government needs to implement effective programs of increasing the food production. These steps are necessary to agricultural sustainability, which means that in the future, the current agricultural activities might endanger the continuity of agricultural production system (Cornelissen, et al; 2001).

Rice is a primary food source for more than half of the world's population, which is mostly in the developing countries such as Asia, Africa and Latin America, and hence makes it significantly important for food security. On the global scale, in the year 2011, 720 million tons of paddies rice was produced, and more than 90% produced in Asia. However the food security is uncertain, since the growth rate of the world's rice production has slowed down during recent years and the current annual rice consumption has exceeded annual rice production. With a growing global population, with an expectation of nine billion people in the year 2050 the demand of food is expected to be increased as well (Claudia and Knauer, 2013).

Some researchers argue that rice farming is the main use of land for producing food in Asia and considers rice as the most important economic activity and nearly half of the world's populations is eating rice. This makes it important sources of employment and income for rural people. Rice occupied an extraordinarily high portion of the total planted area in Southeast, and East Asia (J.L, Dawe, Hardy and Hettel 2002).

In low and middle-income countries, rice is the most important crop. With population pressure and limited land resource the balance between rice production and food need is important. The world rice demand predicts to be increased at about 1% per year from 2001 to 2025, more or less equal to population growth in Asia during the same period. In some parts of the world, precisely in North America and Europe rice is developed as a new market niche as essential food, this situation is a result of the arrival of large number of immigrants from Southeast Asia, who has introduced rice to the market where it was previously unknown (J.L, Dawe, Hardy and Hettel 2002).

In Timor-Leste, agriculture is the main activity, and 85% of its population is engaged with agriculture (Borges, et. al.2009). Rice is the most fundamental food source in Timor-Leste with biggest production districts in Eastern part: Viqueque, Baucau, and Western part; Bobonaro, Covalima and Manatuto, counting for about 75% of the total production in the

country. However, this amount seems not to be enough to respond to the growing demand for rice, this means domestic rice production does not cover domestic demand, despite the recent government import of rice from Vietnam Thailand and Indonesia (Pinto, 2009).

Therefore, to assess this issue, the government tries to replace the traditional system (Buffaloes) with a new technology in this case of tractors. According to Singh et al. (2011), a tractor has been known as the most important tool in the agriculture and the effect of tractor power on agricultural efficiency is still significant. The use of modern technologies during recent decades has resulted in a rapid growth of farm productions. Tractor and farm machineries are the most important examples of this modern technology, the tools availability in different countries have demonstrated that productivity was positively correlated with the use of farm machineries. Another impact of tractorization is made on the agricultures' productivity (yield and cropping intensity) and economic growth (income and employment) (Ghadiryantar, M, et al. 2009).

The provision of hand tractor based service in Timor-Leste is intrinsically linked to agricultural mechanization. Mechanization policies have been subject too much debate and have often centered on the economic feasibility and rationale of using tractors to increase agricultural productivity and overall production in developing countries. Unfortunately, some research papers indicated that this type of mechanization was uneconomic in Asia (Binswanger, 1978) and from the late 1980's onwards most western donor agencies stopped supporting projects related to tractor-based on agricultural operations, especially in Africa (Kienzle et al., 2010).

The introduction of tractors to local farming resulted in a timely land preparation, expansion of the cultivated area and increased cropping intensity. Before the introduction of hand, tractors the productivity of farmers was limited and even with incentives they would be unable to increase their production. However, the utilization of hand tractors by the group of farmers became uneconomic, because they have not used the whole capacity of hand tractors. At this level of utilization, farmers have not been able to support themselves in a downward spiral of insufficient income. At the same time, hand tractors have required additional costs of their maintenance, which consists of repairs, replacement, machinery operators and mechanics. Trainings have become of important to learn how to operate machines efficiently to avoid an expensive downtime and but yet many countries do not have an adequate technical training programs (Kienzle et al.,2010).

The main objective of farm mechanizations is to replace human and animals power and to increase labor productivity and income of agricultural workers, changing the characteristic of farming work to emancipate farmers from heavy and arduous labor (Paman et al., 2012). However, the introduction of tractors into small farms in the Southeast Asia, without paying attention to the economic conditions and customs' preferences, is likely to be ineffective and may often result in a negative effect (Maamun and Yusuf, 1991). Meanwhile Binswanger (1978) has also concluded that according to tractor surveys in India, Pakistan and Nepal, there was no evidence that tractors are responsible for substantial increase in intensity, yield, timeliness and gross return.

Timor-Leste agricultural situation is almost the same as Asian countries like India, Pakistan and Nepal. Therefore, the government tries to introduce tractor facilities for increased rice production. Countries are importing rice due to insufficient home stock. To understand how the tractorization program worked, and the challenges related to implementation, the focus of this thesis and the research question is as following:

“How does the introduction of tractors influence the farmer`s rice production in Timor-Leste?”

In order to answer this research question, we have to start by introducing the traditional agricultural sector in Timor-Leste, secondly we present the theoretical framework, thirdly methodology, fourth analysis, and fifth implication.

1.1. Further structure of the thesis

Next, in chapter 2 – “Theoretical Framework”, which consists of three parts: first, we introduce the perspective of sustainable agriculture, secondly the institutional theory and third, resource based theory. The literature review that we present in this part will enable us to place our research in the already existing body of knowledge and will help us to discuss the challenges faced by the introduction of hand tractor to farmers in Timor-Leste. In chapter 3 Local Context, we present the local situation in Timor-Leste regarding rice production. In chapter 4- Research Methodology, we present the design of our research, and we also present in this section our unit of observation and analysis of why we have chosen a qualitative approach in our research. There is a description of our data collection procedures, study area, and assessment of the reliability and validity of our study, weakness and strengths of our research and final the main research challenges. In chapter 5- we present theoretical analysis of our findings, in this section separated into three main parts, one for sustainability, one for Institutional theory and the last one for resource based view. In chapter 6 we draw

conclusion, and finally in chapter 7 we draw an implication, recommendation and future research.

2.0. THEORETICAL FRAMEWORK

In this chapter, we will present the frame of theoretical references for our theses. First, we will present the general view of sustainable agriculture in rice production and if farmers are more likely to adopt a technology if they understand the reason behind; which is increased effectiveness and opportunities. Second, we introduce institutional theory which is assert that an institutional environment could strongly influence the development of a formal structure in an organization, third we introduce resource base theory which is saying that the success of an organization is largely determined by the resources that it obtains.

2.1. Sustainable Agriculture

Sustainable development of the agricultural sector, in this case rice production is determined by government support (provide tractors for the farmers), with the hopes to cultivate more land, increase rice production, reduce poverty and improving the economy of the farmers. This is a top priority and topic of discussion among Timorese government, parliament, civil societies and the general public. Farmers are more likely to adopt a technology if the understand the reason behind which influences the effectiveness and opportunity of the action, and will benefit the agriculture in a long-term perspective (Borges, et al. 2009).

Agriculture has been restructured around the world. Such as the types of commodities that are produced, the way in which production is organized, and all the livelihoods which it engenders are all changing (David and Watts 1997). Some argue that, sustainable agriculture is a practices that should meet current and future societal needs for food and fiber, for ecosystem services, and for healthy lives (Hasna and M 2006), and doing this through maximizing the net benefit to society when all costs and benefits of the practices are considered. If society is to maximize the net benefits of agriculture, one must take in to account both the costs and the benefits of alternative agricultural practices, and such an analysis should be the foundation of policies, ethics and actions.

The methods used in order to measure the adoption of sustainable agricultural practices are the paddy growers, and a farmer sustainability index (FSI). However, at present time there exists little market incentive for private development or adoption of low inputs agriculture (LIA) system. Farmers adopt certain techniques and use certain inputs because it's economically beneficial to do so, and this idea links it to the main thoughts in resource based theory, and in this case, how framers adopt tractors, to obtain benefits and increase their income through enhance rice production activity (Daberkow, and Reichelderfer 1988).

The idea of sustainability is a powerful one as it has the potential to alter all the ways that productions are occurred and it captures the idea that we must work toward satisfying the needs of the current generation, without endangering the lives of future generation (Kates, Robert, et al. 2000). Sustainable agriculture needs more than new technologies and practices, it needs agricultural professionals willing and who are able to learn from farmers and other stakeholders; such farmers need the government support on providing sufficient training, and facilitate for efficient rice production in order to support the nations long term perspective on food production.

On the other side, sustainable from an innovational point of view, means how the farmer adopts new technology and learning something new. Such as the change from traditional to modern or buffalos to tractors. Innovation means introducing a new program or activity to an organization, product, practice or idea perceived as a new by the adopter (Aiken, Michael and Hage 1971) and Innovations are likely to improve as they increasingly formalize and recognize that strategy and innovation culture are inseparable throughout the innovation process.

Meanwhile Olmstead, Alan and Rhode (2001) argue that a common argument is the tractor actually saved fixed costs because the animal (Buffaloes) must be fed whether or not they worked. Furthermore there is consensus that the advantage of adoption technology help farmer on their agricultural system in term of cost management such as *“one of the main attractions of the tractor was that it allowed farmers to do work in a timely fashion without relying on hired help, thus saving the transactions costs and uncertainty associated with the highly imperfect rural labor market”* (Olmstead, Alan and Rhode 2001; P.667).

Other external factor which influences the agricultural system is the subsidy from the government. Subsidies have often succeeded in stimulating the adoption of conservation measures, but farmers frequently abandon their use and sometimes actively destroy conservation structures (Pagiola Stefano 1996; P. 256). Moreover subsidies often promote particular conservation measures because of administrative convenience rather than because of cost effectiveness. In other side there is a factor such as land speculation and land tenure security can override expected effects of subsidizing (Fearnside 2002; P. 9).

2.2. Institutional theory

Institutionalization refers to the adaptive process; its most significant meaning to institutionalize is to infuse value beyond the technical requirements of the task at hand Selznick (1957:17). Institutional approach also emphasizes the importance of "natural history" of the evaluation of living, which changing over time. Selznick (1957; 16) and institutional is a process, as something that happens to the organization or institution over time. Yet, there is some leaders who have limited impacts on organizational outcomes (Liberson, 1972 and Salancik 1977).

Barnard (1938) argue that the main important point on institutional implementation is that it's being embraced and enacted, conception emphasized that effective leaders are able to define, and defend the organizations institutional values. Meanwhile Berger and Luckmann (1967:52) mention social order as a human product. Institutions always have a history of which they are the product. It's impossible to understand an institution adequately without an understanding of the historical process in which it was produced. Berger and Luckmann (1967:54-61) clarify; "*Institutional rules are classification built into society as reciprocated typifications of interpretation*". On the other side Zucker (1977, 1983; 728) mention that institution is a process by which individual actors transmit what is socially defined as real. And Institutionalization operates to produce common understanding about what is appropriate and fundamentally, meaningful behavior (Zucker, 1983:5). The state is rationalization and the regulation of human activity by legal and bureaucratic hierarchies (Scott, 1987). Some argue; institutional theory tends to devocalize interest in the explanation of human behavior DiMaggio (1988:4-5,). Institutional theory reminds us that interest are institutionally defined and shaped (Scott, 1987).

To understand deeply regarding which way government provides tractor and what extent farmer's adoption tractor, what factors that influence farmer's production to adopt certain rules, regulations, policies, plans and programs to pursue the sustainable of agriculture, we divide institutional theory into two parts: Legal and Social framework.

2.2.1. Legal framework

To implement the institutional power the leader need legal authorization based on law and legitimacy. Dornbusch and Scott (1975: 56-63) define; "*authorization as the process by which norms supporting the exercises of authority by a giving agent are defined and enforced by a superordinate unit and authority is referring legitimacy power and Legitimacy power is normatively regulated power*". Furthermore Burns (1986: 28-29) argue; "*rule system as important social technologies become resources and stakes in social interaction and the*

strategic structuring of social life". It also needs support from external institutions, local groups and institutions capable of managing resources effectively, according to the above all it needs is agricultural policies that could support these features (Pretty, Jules N 1995). Some argue; modern consciousness is shaped by the set of interconnected belief system associated with the development of technological production, bureaucracies, and pluralization of life words (Berger and Kellner 1973).

Hertzlers (1961: 81 – 84) mention, the institution of society have a high degree of stability and function as the major mechanism for social continuity. Meanwhile Clark, Louise (2006) states that; institutional or Government should emphasize how to improve and transmit information flows through supply chains and interact with a constantly changing panorama of governmental, non-governmental and private sector. However those institutional environments that are characterized by the elaboration of rules and requirements to which individual organization must conform if they are to receive support and legitimacy (Scott and Meyer 1983:140-149).

In Agricultural system, Binswanger (1989) and Renkov (1994) mention that, technique provides the tractor more essential part on agriculture sector which integration on innovation and distribution process among producer in a given region, between producer and consumer, also essential between landowner and workers. Meanwhile in other side previous study mention; there is inefficiency on policy decision making regarding budget set up to stimulating agriculture sector which budgetary constraints reduced the amount of available fuel to run the machines (Lopes, Modesto, and Harry Nesbitt 2012).

On the other side some argue; innovation adoption was most strongly influenced by those with power, communication linkages, and with the ability to impose sanctions (Baldrige and Burnham 1975). However previous studies found the adoption of tractor in some places not improving the farmers living condition and also it had risen a barrier and made farmers more stressed, the adoption of tractors influences decreased labor requirements (Willock, Joyce, et al 1999), therefore the majority of population including farmers working with the tractors, have to buy foreign rice, which imported from Vietnam, Thailand and Indonesian (Pinto, Carlito 2009). Also, tractors are used mainly for transportation and other non-farm purposes (Perkins and Yusuf 1984) even farmers caught up in a process of social learning imposed by the rapid transformations of their institutional and socioeconomic environment (Castella, Christophe, Trung, and Boissau 2005).

Jayne and Muyanga (2012) reported that much greater potential for this form of productivity growth will depend on the pace of food and input market development, improvements in physical infrastructure, investments in commodity value chains for high-value commodities, and stable marketing and trade policies. So government have to improve infrastructure in rural area and transportation to facilitate the expansion of product and market and offering opportunities and facilitate farmers through encouraging them to increase agriculture production (Yifu, Justin 1999).

Market power is the ability to affect price (setting buyer prices above and supplier prices below open market levels), to reduce competition (for example, by keeping out new entrants) and to set standards for a sector of economic activity (Murphy, Sophia 2006). Through contracts, establishment could offer a number of important protections to farmers and they can include clauses that share risks between the producer and buyer, they can lock in a price, which protects the producer (Murphy, Sophia 2006).

Privies literature concerning “Rural reforms and agriculture growth in China” mention that; first step to rural reform is to improve management within collective system and increasing budget expenditure on agriculture sector (Lin, Justin Yifu 1992; P.39), and state would no longer set any mandatory production plans in agriculture and that obligatory procurement quotas were to be replaced by purchasing contracts between the state and farmers (Lin, Justin Yifu 1992; P.39).

Two distinct prices existed in the state commercial system: quota prices and above quota prices. Quota prices applied to crops sold in fulfilment of procurement obligations; above-quota prices applied to crops sold in excess of the obligation and collective farming is attractive method for land consolidation and productivity improvement (Lin, Justin Yifu 1992). The import quotas also can be replaced by two-tier tariff regime, which Under the two-tier tariffs, can be limited quantity of imports and the policy interventions agriculture sector and the levels of support and protection provided to different commodities are the cumulative result of convoluted economic (Orden, David 1996).

A study about Vietnam's rice policy mentions; within agriculture system a decentralization of production is responsibilities from collective to individual farm household (Nielsen, Chantal Pohl 2003). The successful penetration of world market has created a new trade-off for policymaker between ensuring that sufficient amounts of rice are supplied to domestic consumer and Contract system was introduced to improve rice market condition, this means farmers have to enter into contract with a designated cooperative to produce a specific level

of output on their land, which then had to be sold to the state at a fixed price (Nielsen, Chantal Pohl 2003).

White (1997) argue that; the advantage of contract farming also leads to changes in the way agricultural production, processing, and marketing are organized and furthermore contract farming benefits not only consumers but also the farmers (Hill and Ingersent 1982). At the macro-economic level, contracting can help to remove market imperfections in product, land, labor, information and insurance markets, this can lead to better coordination of local production activities which often involve initial investment in processing, extension and can reduce transaction costs (Grosh 1994; Key and Runsten 1999). However there could be codes of conduct for farmers for use of labor which can be enforced by contracting agribusiness who should also work toward more ethical and human labor standards (Singh, Sukhpal 2002).

Meanwhile there is external input in cultivating systems in agricultural sector, such as irrigation which is an important element in the agricultural development strategy, and irrigation development requires the successful implementation of irrigation technology and appropriate institution and organization to govern that technology (Coward, E. Walter 1980). Meanwhile, land suitable for lowland rice production is limited and irrigation water in many of the rice areas is available only from rivers thereby limiting double cropping (Lopes, Modesto, and Harry Nesbitt 2012). Proper water management systems, would increase and lead to high yield of rice (Fu, Regina Hoi Yee, et al 2009; P.380).

2.2.2. Social framework

In agricultural system, the insufficient use of land areas is a barrier faced by agriculture to increase their productivity in the field, which influences some farmer's motivation towards maximizing the potential of a given technology, and was reduced because a portion of the reward of such effort went to the landlord (Ali, 1995). However, regarding the consolidation of landholdings into holdings consisting of fewer plots with larger average sizes, can stimulate the adoption of new technologies, but is also likely to reduce agricultural employment (Shuhao, et al. 2008).

Meanwhile Fujimoto (1996) argues that there could be farmers used as tenants on land owned by an estate company who purchased their cultivated land under the government. Even pursue and establishment of formal contract between farmers and landowners can be specified sharing rules for both inputs and outputs; in doing so, they pull enforcement costs by making both the farmer and the landowner residual claimants and this reduces the farmer's incentive to deplete the capital value of the soil (Klein 1998; P. 474).

Some studies mention that the important rule to encourage farmers for working the land is how farm households make decisions about their production activities based on their capacity to supply the rice needs of their families from their own paddies (Castella, Christophe, Trung and Boissau 2005). Furthermore through contracts make smaller demands on scarce capital resources, even impose less of an additional burden of labor relations, ownership of land, and farm production activities (Buch Hansen and Marcussen 1982). The main point to deal with is identifying land-use changes and the problems that are a priority with local stakeholders. In this case head of villages, and can also involve intervention through the design and testing of technical and organizational innovations, in collaboration with farmers (Castella, Christophe, Trung, and Boissau 2005).

Meanwhile Fujimoto (1996) describes one of the challenges for farmers in adoption processes are that there is a clear tendency for machinery owners to be relatively large farmers irrespective of tenure status. The tenancy incidence would be high if population pressure was high, land area owned by the farmers was limited, landownership distribution was skewed, and off-farm employment opportunities were limited. In other words, the smaller the area owned by the farmers and the more economically important the role of rice farming, the higher should be the demand for tenancy (Fujimoto, 1996). Meanwhile those farmers who have no tractor have to depend on the hiring services made available by large farmers or professional contractors. This means tenant farmers were technologically better than land-owning farmers, or rented land is more fertile than owner operated land (Fujimoto, 1996).

Some mention that tractor's emerging in these regions generates considerable controversy, as contemporaries both lauded it as a symbol of progressive agriculture and condemned it for destroying a traditional way of life (Olmstead, Alan & Rhode 2001). So require the local government participation such as head of villages with authority in respect to land issues have their positions by inheritance or by community appointment and recognized social status as an influential leader, (Yoder, Laura S. Meitzner, et al. 2003). Furthermore many rural land disputes among individuals arise from conflicts over inheritance and division of parental land.

There are other customary practices with rich inclusive, power-sharing, or 'democratic' traditions. Which is that everyone has a right to access land and in case of incapacity to work and assistance (Vaughan, Sarah, and Tronvoll 2003; P.74). Previous studies clarify that the important point which can be understood by local people is that land have to manage by local chiefs in a transparent way by advocating the idea of customary tenure and ownership of land

by local people rather than the existing legislation where land belongs to the government (Harragin, Simon 2003).

Customary decisions when it comes to inheritance disputes is to frequently divide the land between the parties or require both parties to divide harvest or products of the land, as sharing the land is viewed as one means of preserving a harmonious family relationship (Yoder, Laura S. Meitzner, et al. 2003), However, resolution by traditional means is relatively unproblematic which these disputes often arise on individually held land when one person prepares another's agricultural fields for planting without permission (Yoder, Laura S. Meitzner, et al. 2003).

Head of the villages have the possibility to withdraw land and to allocate a different land plot to the farmer which reduces further the certainty of ownership which improve better agricultural sector performance (Wegerich, Kai 2000). Furthermore another way is to increase the production through following collectivization, due to the change from collective to individual tenure, which village government have primary responsibility for farm reorganization and land and property share distribution (Giovarelli, Renee 1998).

2.3. Resource Based View

The resource based view described in the literature by Wernerfelt (1984), was built upon the theory that a firm's success is largely determined by the resources that it have and control. Resources are typically defined as either assets or capabilities, which is asset about tangible or intangible that are own and controlled by the firm, and capabilities are all intangible bundles of skills and knowledge accumulation exercised through the organizational routines (Galbreath 2005).

Regarding with the case of agricultural mechanization or the adoption of tractor in the rice field by farmers we divided these resources into two parts, Human capital, and Assets.

2.3.1. Human Capital

Human capital in this part is about the education, capability, ability and the experience of the farmers concerning the adoption of tractors in the rice fields. Education influences productivity by affecting farmers' ability to comprehend the production system and the complicated information related to modern technology and to adjust quickly to farm management practices. Information dissemination and education systems should complement each other. While the extension system provides the information necessary to adopt and operate new technologies, education enables farmers to understand and use this information (Ali, 1995).

In India, farmers' education has some effect on yield, where it had relatively greater effect on gross sales by farmers in the early stages of the Green Revolution in the Punjab because the allocation of the ability is a specially valued in dynamic technological environment and the education also increase with the technological change. Meanwhile in South America education has no impact on any productivity in regions with traditional agriculture practices but in some parts, education is positively worked in the regions that are in the modernization (Gershon, Just, Zilberman, 1985).

In other parts of the world, for example American farms in the 20th century, lack of knowledge in using tractor leads to increase number of death on farm, as shown on a research in 1998 that states: 32% of agricultural deaths are tractor-related, average of 270 fatalities per year and based on the data from 1986 showed that the risk of agricultural related accidents is that tractor is the principal agent of fatalities or disabling injury on farms, which accounted for more than three-fourths of machine related deaths, lack off personal knowledge and experience were the cause of injuries and deaths on farm (Myers, M. L, 2002).

Meanwhile, the agricultural education history in the United States is close to the development of agricultural science in the land. They obtain a university system, where till the early of twentieth century, farmers developed and share knowledge about agriculture among themselves and the extension worker orients much of its educational efforts to incorporate multiple methods of information transfers varying in their degree of farmer participation in the process of knowledge creation with the experiences and local knowledge of farmers are essential to learning about farming which is focused for new and beginning farmers (Trauger, Sachs, Barbercheck, Kiernan, Brasier, and Findeis 2008)

From an economic point of view, an innovation is a technological factor of production which can be identified as an uncertainty regarding its impact on production, and farmers seek to reduce this uncertainty by acquiring experience, modifying the innovation and become more efficient on its production. Hence, the economists have defined final adoption at the farm level as the degree of use of new technology in the long run. Equilibrium is reached when the farmers have full information about the new technology and its potential. Therefore we considered the imperfection of knowledge as a barrier for the adoption of mechanization. However, the experience increases the ability to make an appropriate decision of new technologies, and the effect of these technologies increase over time as the experiences develops. The impact of farm size depends heavily on the technology and institutional setting as its often fill-in for a large number of other factors such as access to credit, risk bearing capacity, wealth and access to information. Risk and uncertainty has long been recognized as

important factors when initiating new technologies to the agricultural sector (Mercer and Evan, 2004).

Meanwhile Previews study regarding system of rice intensification (SRI) in East Timor mention that farmers depend on family labor which cannot easily be replaced by hired labor, because of specific knowledge, training and experiences required (Noltze, Martin, Schwarze & Qaim 2012). Also, some studies show that when traditional farmers adopt new technologies it increases their stress-level and that it results in less need of manpowered labor. (Willock, Joyce, et al 1999).

2.3.2. Assets

An asset in this case is recognized as the land and tractors farmers in rice production own. Where tractor is known as the most important power sources in agriculture and the effect of tractor power on agriculture is significant. The use of modern technologies during recent decades resulted in a rapid growth of farm productions, tractors and other farm machineries are examples of this modern technologies (Ghadiryafar, M., et al. 2009).

The agricultural mechanization is the most important input in the modern agriculture where it improved the productivity of land by increasing the size of land ploughing and cropping intensity. The crop becomes more efficient, cultural practices and experience increase which contributes to less harvest losses in the sector (Amjad, et al. 2014).

The impact of the tractorization on the land productivity (yield and cropping intensity) and the economic growth (income and employment) were previously assessed, however the trend in the Asian and European countries are distinctly different (Ghadiryafar, M., et al. 2009). The food production could not improve without good irrigation systems and mechanization of food production contributes to improvement of water control, better soil or land preparation for planting, and more efficient insect control. This leads to: easier harvest and handling processes resulting in larger farming and food output (Maamun, 1991).

The size of the land is one of the most important factor for the adoption of technology. Farm size have several effects on the rate of adoption and depend on the characteristics of the technology and institutional setting, therefore, the capital for adoption technology may be more appropriate for larger farms, however all farms may increase short run profit by adopting these technologies in different scales (Gershon, Just, Zilberman, 1985).

All agricultural vehicles or tractors are operating under a variety of conditions, and the proper selection of gear and engine speeds depends heavily on the skill of operator. It has been

found that many drivers operate their agricultural vehicles in a lowest gear than necessary causing the engine to operate at high speed where fuel consumptions and amount of emission is high. This shows a lack of experience and training, with this in place, it could result in more efficient use of new technologies in the agricultural sector (Lindgren and Hansson, 2002).

Adoption of the new technology lower the unit cost of rice production and provide an opportunity to reconcile the inherent conflict of food policy objectives for providing low and stable price for the customers. It leads to an increase in farms financial income, and achieving self-sufficiency of food supplies. Furthermore, increasing in farm size and income of large farmers may have promoted mechanization, further reducing the opportunities for employment and wage rate for landless household and scale small farmers (Hekkert, Marko P., et al. 2007).

Karlson, Trudy & Noren (1979) argues that hazards of farm tractors have been widely recognized since tractors replaced animal as the primary power source for farming. Meanwhile Freeman and Soete (1997) mentions that innovation such as technical design also consist of commercial activities, such as marketing of a new or improved processes or equipment. Previous studies found that farmers are not using technology in the proper way; they mainly use it for transportation and other non-farm purposes (Perkins and Yusuf 1984).

Furthermore landownership patterns and their economic implications differed in accordance with the conditions of each area. There are two different types of conditions: one where a large population depended upon farming (1) and another where an increasingly large population moved out of the village and farming (2) (Fujimoto, 1996).

In Agricultural system, Binswanger (1989) and Renkov (1994) described that technology was a major source of agricultural growth so as in other businesses, the farmer is likely to be interested in maximizing production and making profits. As the tractor becomes an essential part of farming in underdeveloped countries, it increases innovation, distribution processes, contributes to the producer-consumer relationship, and land-owner worker relationship. It's been stated that the tractor does not automatically lead to less costs, as the traditional farming methods (such as buffaloes) still required resources, such as food (Olmstead, Alan & Rhode 2001).

3. LOCAL CONTEXT

Timor-Leste is one of the new and small countries in the world with a population of 1,066,582 and the majority of population engaged in agriculture. Traditionally people both plant the food for their everyday needs, as well as collect wild greens, while animals are left to grow and reproduce freely in the whole territory (Borges, 2009). Agriculture sums up to about one third of the national GDP, giving a source of income to more than 80 % of the Timorese population (Deichert et.al, 2009). As an independent country, Timor-Leste is looking back at its history, and exploring ways in which it can harness its social, cultural, economic and natural capital to move towards a sustainable development and equitable future.

At the time of independence in 2002 the new government of Timor-Leste made food security a priority. The national development plan developed targets for increasing production of basic food crops, particularly rice, corn, cassava and other tubers to reduce the country's dependence on imported food. Despite all these good intentions, little was done to increase plant area, improved yield, maintain of irrigation system, encourage the consumption of traditional staples or support rural producers. But with the outbreak of the military crisis in 2006, food security became intertwined with peacekeeping and political struggle over state power (Kammen, Douglas 2012).

Since the fourth constitutional government in September 2007, the new Parliamentary Majority Alliance (AMP) government of Democratic Republic of Timor-Leste has made rice-production a central focus for state policy. The fourth government has spent millions of dollars on the purchase of rice importation, where free rice has distributed to civil servants of the constituency recruited under the first Fretilin government and therefore of questionable loyalty, and the free rice is one of the strategies of an incentive offered to encourage the tens of thousands of internally displaced people (IDPs) to vacate the camps and returned them to their places of residence (DeWit, 2008).

Plough or '*Halai natar*' in local language, using a group of local buffaloes is a common method of farming, used by traditional farmers to grow lowland rice. The method is also known as the '*rencah*' system and is widely used in other remote areas of East Timor (Viegas, 2003). Rainfall and its distribution determine the outcome of agriculture production, as irrigation systems are almost nonexistent. With rain becoming increasingly erratic over the years, variation in output tends to be larger, putting food security at risk. Several research so far in the field of Agricultural sector have stressed that the agricultural sector of Timor-Leste needs to reduce poverty, provide food security and promote economic growth in rural areas

and in the whole nation, growth in the agricultural sector will also promote rural development. Meanwhile there exist a private sector providing goods and services, but poverty, malnutrition and lack of food security is considered a national domestic issue. (Molyneux, 2012).

The main challenges faced by the government of Timor-Leste include the lack of average rice production, which does not meet the domestic demand. This influence the increase of rice import to the country. To address these issues, the Strategic Development Plan recognizes that the starting point is to build social capital and improve the country's infrastructure, supported by an emphasis on management strategies. Government also focus on agriculture sector through Ministry of Agriculture and Fishery (MAF) which puts emphasis on tractors distribution, aiming to increase the paddy production (Deichert, Georg, Barros and Noltze 2009). Hence, to pursue Sustainable development, Government has taken into consideration the agricultural sector as an important sector that needs to be developed in order to reduce poverty, achieve national food security and reach millennium development goals (Lopes, Modesto, & Nesbit 2012).

In Timor-Leste where rice is the staple food it plays a very important part in food security and socio-economic development (Norman and Kebe 2006). Hence government increased policy and regulation through MAF (Minister Agriculture and Fisheries) by submitting three laws to parliament to assist the development of agriculture in Timor-Leste (Lopes, Modesto and Harry 2012). Government also increase stakeholder participation to support farmers through the cooperation and contribution from private sectors such as: The Second Rural Development Program (RDP II), the Portuguese Mission Project, and the several NGOs including World Vision International (WVI) and Catholic Relief Services (CRS) who offered assistance to help agriculture, however there is no positive result for the domestic production (Lopes, Modesto and Nesbitt 2012).

Even at this time, with the recently sixth constitutional government lead by Prime Minister His Excellency Dr. Rui Maria De Araujo, the problem of food security and or the staple food (rice) still exist even though government from the fourth constitutional have tried to increase domestic rice production, and reduce rice import. This in order to improve the economy of families and to achieve a sustainable way of living for the population. However, as studies show, it has yet to improve farmer life conditions, they have limited financial funds, and an example being that most farmer children do not attend school. The government through ministry of agriculture has offered thousands of hand tractors for the farmers, with the hope that farmers will cultivate more land, but the result still questionable.

In general, the adoption of the technology in this case tractors, have to improve agriculture systems such as rice production (Hobbs et.al, 1985). In order to achieve the Millennium development goal, government has set a development strategy in place to improve agriculture system, which emphasize on transformation of farmer from traditional system to modern system with mechanization (tractor).



Photos by: Researches Feb 22 2015

Hence to achieve the government's strategy for improving agricultural sector since 2007 to 2011 the fourth constitutional government, through the ministry of agriculture and fisheries (MAF) have supported our farmers with 2424 units of hand tractors and 315 medium tractor with the purpose to increase the domestic rice production, improve family income, and improve the living condition of the population at large to achieve a sustainable development for the country (Appendix 1 – Tractor Distribution).

4.0. RESEARCH METHODOLOGY

In this chapter we will describe our data collection methods, and why we chose them to help answer our research question. We will also describe why we believe this combination of data collection and analysis method helps us ensure research reliability and validity.

4.1. A qualitative approach

Our thesis is a case study regarding analyzing the result of introducing tractors to local farmers in Timor-Leste, we seek to gain relevant information by going directly to the field to meet with the informants, conduct interviews, make documentation and observations within the context we are studying. This in order to create an understanding regarding implementation and adaptation of technology in the region (Yin, Robert K 1981).

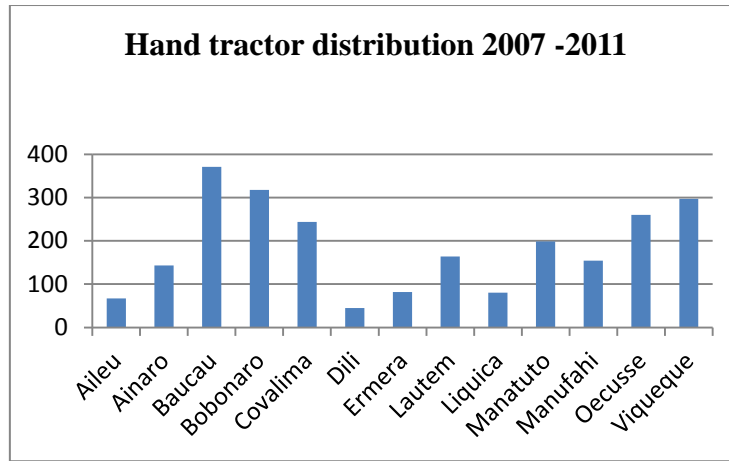
Our motivation for conducting this qualitative research project was to create knowledge about adaptation of technology and how it affects the domestic rice production in the country. Using this qualitative exploratory approach, it makes it possible to adjust to misunderstandings and ambiguities along the research process.

4.2. The process of data collection

We have several ways to initiate data collection such as: writing research letters, contact the relevant informant, and send out research letter to the selected informant before going in to the field to meet and conducting interview with them. The data collected are often qualitative and we thought that it is a very suitable method to apply when to explore the problem formulation and to learn the respondents' understanding and to use the concepts. The secondary data regarding with the distribution and use of hand tractor in Timor-Leste were taken from the ministry of agriculture and fisheries (MAF) Timor-Leste and farmers in the selected area with the head of the village and extension worker. To conduct an interview we used the following instrument, recorder, note-book and pen, and camera to make documentation of the research.

4.3. Study Area

The research area was in Dili the capital city of the country and we interviewed informants from Government side, and three districts such Baucau, Bobonaro and Manatuto as the main areas where we conducted interviews with the farmers (Appendix 2 – Research Area). The reason we selected these three districts is that they are considered as the most producing districts of four in terms of rice production in the country (TLNDSP 2011-2030). Those three districts were selected as research sites for two reasons. First, they are the most rice producing districts, and second, hand tractors have been distributed within these regions.



Source: Minister of Agriculture and Fishery (MAF) Timor-Leste

Meanwhile the method of selecting farmers is based on main staple rice production from East and Western part in Timor-Leste, and consists of 5 villages (Vemmase, Natarbora, Atabae, Ritabou, Cailaqu), who received tractors, and those who want to receive tractors but they didn't get it (Appendix 2- Research area).

4.4. Interview Guide

In this part we will present the reason of why we have chosen the informant for our research, where, when and how long the interview took (can see interview questions in Appendix 3). Following are those informants we have interviewed:

1. To answer this interview question: 'what is the purpose of giving away tractor to the farmers?' We conducted an interview with the General Director of Service and Corporate, Sir. Lourenco Borges Fontes, in MAF, Dili, on February 19, 2015, where the interview was last in 20 minutes.
2. To answer the question of 'how tractor's influence in farmer rice production?' we conducted an interview with his Excellency general director of agriculture and livestock, sir. Januario Marcal in MAF, Dili, on February 17, 2015, where the interview was last in 30 minutes.
3. To get rice production data in tons, cultivation area and harvesting area in (ha) with government support on tractor to the farmer (Appendix 4 – Rice Productivity), we also conducted an interview with National Director of Agriculture and Horticulture, Sir.Amaro Ximenes in MAF, Dili, on February 16, 2015, where the interview was last in 24 minutes.
4. To answer the question of 'who selected the farmer, and control over tractors from government?' we conducted an interview with Director of mechanization, Sir.Agapito Da

Costa Ribeiro in MAF, Dili, on February 16, 2015, where the interview was last in 27 minutes.

5. To know deeply and get the real information on these questions below, we conducted interviews with a few farmers who got tractor from government in different places, started on February 23rd to February 28th, 2015, where the interview would last an average of 18-46 minutes.

- ✚ How did you get this tractor?
- ✚ What did the government ask you how to use tractors?
- ✚ How do you usually use it? What are you using your tractor for?
- ✚ Did you meet any challenges/problems while using it?
- ✚ How did the tractor change your rice production? And your family income?
- ✚ Did you increase your cultivation area when you got tractor? Did tractor help you to increase it?
- ✚ Now you know what we are interested in, do you want to tell me anything else about these tractors and your experiences with them?

6. Not only this, we also conducted interview with few farmers from the selected area to know what challenges they face when it comes to ploughing, the interviews started on February 23rd to February 28th, the interviews lasted from 17 to 40 minutes.

7. Lastly, to gain knowledge on the head of the village perspective towards adopting this new technology (tractor) and how the extension worker cooperation with farmers worked, we conducted interview with the heads of the village in the four selected villages and two extension workers in one of four selected areas.

4.5. Validity and Reliability

This stage we provide information concerning how we exploring the data. The method of interview based on the interview questions however to get relevant information we also explore the questions which link to the research question. In other side to strengthen data we also collect secondary data to support our statement in this thesis.

The interview data was utilized with a tape recorder to record the information from the informant, after we transcribed the data in the local language and then translated it to an English version. To translate the interviews into English we hired a well renovated English interpreter as translator, then both of us independently reviewed the transcription and the translation and discussed until an agreement on the few occasions where the interpretation or

translation could be improved. As many of the informants do not speak English we did not send them the transcribe file for correction and even some of farmer cannot read and write. Hence, we tried to compensate for this by adding more interviews instead, but their limited vocabulary also limited our research. Afterword to build an analysis of the paper we selected the relevant idea from the informant which link to the literature review to clarify our finding in theory development.

4.6. Weakness and strongest in our method

Weakness in our method:

- ✚ More time consuming to collect the data
- ✚ Difficult to make quantitative prediction
- ✚ Data analysis is taking longer time
- ✚ Difficult to understand the informants idea with local language because local language does not necessarily contain words we need
- ✚ Taking time to transcribe data into text and
- ✚ Taking time to do translation

Strongest part in our method:

- ✚ Data we collected based on the informants own categories of meaning
- ✚ Easy to develop our interview questions
- ✚ We can study dynamic process as a researcher
- ✚ We can described in rich detail the phenomenon as they are situated and embedded in our local context
- ✚ Provided understanding and descriptions of participant`s personal experience of the phenomena.

4.7. Research Challenges

During conduct research we faced challenges from government side such as don't timely or skip the appointment so we have to spend two days per interview, furthermore our research at the same time on Government reshuffle so we don't get good enough secondary data such they provide as data on different period years. In other challenges which we faced is the unconditioned road access to the district to meet the farmers in villages and Sub-District.

5.0. ANALYSIS

Data analysis is the interaction between raw data and the procedure used to interpret and organize data and emerging findings with the aims to extract relevant information from the collected data. The analysis aims at presenting findings which will enhance our knowledge and create a meaningful insight to introducing new technology to traditional farming in underdeveloped countries. Hence, in this part we will reveal our findings, which sorted by our theories using our theoretical framework and underpin our analysis with direct cite from informants. First of all we presented about sustainable point of view, second we continue with the Institutional and last end up with Resources based theory.

5. 1. Sustainable Agriculture

In this part of analysis we will discuss food and fiber production for the people, based on government support incentives, the production caused by the use of government support (tractor) and last with the innovation in agricultural farming system.

The purpose of government support is to help increase more production of rice to achieve national self-food sufficiency, reduce number of poverty and improve the economy of the farmer to achieve a sustainable life. Sustainable agriculture as a practice that meet current and future societal needs for food and fiber, for ecosystem services, and for healthy lives (Hasna and M 2006). This is achieved through maximizing the net benefit for society when all costs and benefits of the practices are considered. We can see that the government support for farmers to increase rice production is still not enough because rice import is still increase every year as stated by General Director of Service and Corporative:

“The consumption of rice by Timorese people encounters more or less one hundred or one hundred twenty thousand tons a year and we are still below this target, so we do need to import more rice because our suppliers are not being able to cover our own national domestic needs.

On other side sustainability in agricultural sector needs more than new technologies and practices, it needs agricultural professionals willing and able to learn from farmers and other stakeholders; such farmers need the government support on provide training, and facilitate the agriculture so they can adopt new technologies in an efficient way. This will benefit the farmers and the nation in the long run. Hence, the government is in the process of supporting farmers in the use of tractors and provides the professional assistant to offer training for farmers on how to operate these technologies. This results in the farmers being able to plow and exploit more and new land for farming. This will again increase rice production and

reduce food import to the country. Commenting on this the General Director of Service and Corporative, MAF stated:

“In order to increase rice production to achieve self-food sufficient and reduce rice importation to the country in coming future, MAF has a plan to mobilize farmers to produce and grow more rice and also we have to train and increase capacity of all farmers to achieve a sustainable agricultural future”

Meanwhile, sustainability from an innovation point of view, means how the farmer adopts new technology and learning something new, traditional to modern or a new idea and/or activity that is being perceived as new by the adopter (Aiken, Michael and Hage 1971). Concerned with this idea, the government of Timor-Leste look at the cultivation system by farmers in the whole country, which mostly use traditional system, government tried to support those farmers with technology or modern system, as stated by National Director of Agriculture and Horticulture, MAF:

“In order to increase rice production and achieve a sustainable agriculture sector, government supports our farmers in the country with mechanization or called tractor to bring our agriculture from traditional system to modern system”.

In other social impact an external factor which influences farmer’s activity on working with the land is Government subsidy (Fearnside 2002; P. 9). Which consider such a main factor in Timor-Leste agricultural issue to increase the production because with the subsidy farmer easily to buy cheap rice import instead of cultivate which take a long time to harvesting and more costly. As informant from the government part (General Director of DNAH) mention;

“Farmers who has land and get tractor from government also buying rice import, because biggest subsidy from the country or social care such as veteran, senior citizens, crippled and vulnerable killed the initiatives of the farmers to grow more rice; more or less subsidy should be stop. The reason it’s those farmers who get the subsidy they have possibility to buy cheap rice import instead of harvesting with the high cost and take long time to cultivate land”

5.2. Institutional Theory

In this part of analysis part we provide relevant information from the informants regarding to what extent institutional environment influence farmers on adopting tractors to the rice cultivation system in Timor-Leste, which in this Institutional part are combine Legal and Social point of view.

5.2.1. Legal point of view

From the government side, the method of providing tractors is based on several criteria. In order to get access to a tractor the farmers needs to allocate themselves in to groups of 15 members, where their land is geographically close to one another, and the land has to be a flat area.

The farmers have to utilize the tractor in an efficient manner for rice production, the tractor has to be managed and maintained by the farmer himself. Research shows that the governments are not controlling these criteria. As shown in this case, the farmers lack knowledge and experience to operate and maintain their tractors. There are also incidents where people who did not have access to appropriate land received tractors. As the distribution of tractors in the Dili capital (see appendix 1), where there are no rice-fields in production. There was a lack of leadership and control in the tractor distribution channels, and resulted in tractors being allocated at the wrong places. A local leader from western part (Cailaku) and farmer (Atabae) states:

“Since government provide tractor without any recommendation from leader local, I can say the process of giving away tractor was influences political decision because people wanted to create mass, hence the distribution of hand tractor some based on party and racism. As we know when parliament approves state budget for buying hand tractors, everyone would like to make proposal even they don’t have rice field to use tractor for, and also ministry of agriculture no any verification team that could verify all proposal and he worst thing is some farmers who don’t exist a land also get a tractor, so after while they sell it out to get money”

The lack of management control in the allocation of tractors from the government, the reason is known to be lack of funds for correctly allocating tractors in the country. There was also a lack of maintenance funding, resulted in tractor downtime. As informant from the government part (General Director of DNAH) mention;

“Honestly, on government state budget, we don’t have budget to help farmer on hand tractor maintenance we aware about it even most of the farmers in the whole country also know about it as a one of main issues that they faced in the field”

In other side the lack of market condition to protect domestic rice production such as barriers to improve farmer life condition even discourage farmer to produce as importing rice is less time consuming and cheap. Hence most of the farmer including those who got tractor from the government desire to buy imported rice (Pinto, 2009), instead of producing their own rice which take longer time and is more costly, as General Director of National Agriculture and Horticulture (DNAH) mention:

“The domestic rice price in market \$25/25 kg, but rice import only \$12/25 kg. Meanwhile the price of domestic rice production \$1/kg to \$1.25 cent/kg, however rice import only \$0.45-0.60 cent, based on that hence our farmer prefer buy the rice import instead of ploughing”

In the Timor-Leste agricultural system there is no existing contract between farmer and government or from private sector to help farmer to sell their product. As well as no government or company who is willing to buy the production. This is a big challenge for the farmers as one of the interviewed farmers from (Atabae) States;

“Since we got tractor we don’t have any contractor or company to buy our product. And in other side, to maintaining tractor they enquire us, to manage those tractors by our self, maintaining our self and take a look in good way to increase our production”

The adoption of tractor help farmers increase their production in some areas, however it does not help them to transform the produced rice to financial income. As the main issue for farmers is that their rice is not a competitive product in the market (as imported rice is cheaper). As farmer from Eastern part (Baucau) who also got tractor from government reported:

“We have a high expenditure in over year, so we have to spend money to hire in order to plough our land and in other side our production not really valuable in the market as you know in here everyone have a rice, which means rice it’s not competitive in our place and in other side we don’t have any contractor or company to collect our product. We sold cheap possible which; per can USD 4, 50 or 5 USD. However the money that we got isn’t sufficient because we have to save it to pay again for the tractor maintenance cost, and the rest allocate to our child in school”

Meanwhile one of the other requests from the government is that the tractors have to be used in the right way. The tractor is meant to be used in the rice field, while it's known that farmers use them during dry-season for transportation of water, planting of vegetables in order to help their families. In Timor-Leste farmers have a possibility to plough and cultivate twice a year, however because the lack of irrigation support, tractor mainly utilize in rainy season and in dry season farmers use tractor for other non-rice activity to get some benefit to satisfy family necessity. Such as farmers from eastern part (Baucau) who get a tractor, and Leader local from western part (Natarbora) mention;

“We cultivate depending on the irrigation support. So currently we just harvesting once a year which based on rainy season and in dry season tractor just parking at home and some utilize for other activity. In other side tractor really help our farmer however lack of control there is some farmer use tractor in inefficiency way which tractor utilize for transportation which unrelated with the agriculture activity. And we have some case that tractor had accident which hit motorcycle. The chronology of the case is at the time, tractor didn't drive by farmer but drive by local security, and he was not included in the group member”

Irrigation is an important element in agricultural sector (Coward, E. Walter 1980), however in Timor-Leste because the insufficient of irrigation support, mainly tractor utilize once a year especially in rainy season, and in dry season the farmer use tractor to transport water to cultivate vegetables. Indeed based on law and regulation its seems misused tractor which tractor have to working in the field of rice, however if we look back on social advantage, the context of tractor transport water in dry season it's the way utilize efficient way to improve life instead of misused, because farmers can produce other products in dry season to earn some money while use to produce rice in rainy season. It can be considering the adoption of modern farming also make farmer stressed (Willock, Joyce, et al 1999), which influences decrease labor requirement to cultivate. As Farmer from western part (Atabae) clarify;

“When the rainy season some group members have to wait long time to use the tractor, until other farmers who have a big size of land end up the cultivation. The reason is we just have only one tractor, at the same time a short of rainy season some group members of farmers have to skip cultivation if they don't get possibility to use tractor”.

5.2.2. Social point of view

In general because the difference of plot area among group members of farmers, such a one of barriers for the agriculture which difficulty to adopt technology to utilize tractor in efficiency way. Means there is a big issue which some farmers working with tractors have to

work for the landowner which has a big size of land. Based on that some farmers obtain the motivation to maximize the potential of a given technology was reduced (Ali, Mubarik 1995) because a portion of the reward of such effort went to the landlord. Such a chief group of farmer from western part (Natarbora) states;

“Even we got a tractor, but some member groups of farmer don’t have enough land, so to get rice they have to working for the landowner in the same group. Means that land owner does not work so much in the rice field but they just expected of the retaliation from other farmers who working for them and sometimes the worker worked more for the landowner than for their own and in the end they have to divide the result of paddy into 50%.

On the other hand, the lack of tractor management control causing a conflict among farmers regarding the adoption of tractor which some head group of farmer utilizes their power to dominate and use tractor for their personal interest. In this case through the possibility of power they use tractor to make another business to earn money for their personal interest. Based on that the group member of farmer suffering on adoption tractor due to price maintenance, which considering destroying a traditional way of life (Olmstead, Alan & Rhode 2001). Leader local from western part (Cailaqu) mention;

“Chief of group used tractor to do business which they utilize tractor for ploughing in other place to get money instead of tractor working for the group member. So when the hand tractors get broken head of the group have responsibility to maintaining and even resulting some farmer suffering and skip cultivate when tractor parking for long time at the moment with the short of rainy season”

The tractor management control falls on the farmer himself or the group of farmers sharing a tractor. Often within these groups, some members did not contribute to the maintenance deposit. The reason for this was the difference in land size, as some members did not get to utilize the tractors as much as others did. Farmer from western part (Atabae) mention;

“The management of tractor within group, each group member deposit 1 USD, however it’s not enough to maintain tractor because the expensive of equipment and in other side other member of group didn’t contribute for the deposit because they were thinking that they have different land size and tractor mostly working for the member group who have a big land instead of small area.

In other social issue which group of farmers faced is concerning the distance of field of rice as barriers which difficult manage tractor among them. And the long distance of plot area

also challenges for the farmers to transport the tractor from one area to another area, which influences some farmer delay to plough their land on rainy season. As leader Local from western part (Cailaku) mention:

“In our villages, rice field of each member not in the same plot, which located in a long distance to transport tractor. whilst rain comes once at the same time and it takes time to transport tractor from one area to another which influences some farmer`s late to plough”

5.3 Resourced Based View

As we have mentioned on our theoretical framework in the beginning that in this section of resource based theory concerning with the government support for sustainable development of rice production. We will divide this section into two parts, human capital and asset, which we considered as the main factor which contributed to sustainable development of rice production in Timor-Leste.

5.3.1. Human Capital

In the developing country like Timor-Leste, human capital is the key factor for its development, where government is considered as the key for national development and need to take into consideration and invest more to guarantee development in the future. Thus we look at the development of agricultural sector; rice production in Timor-Leste, human capital is the main factor of increase or decrease of rice production. Commenting on this an informant stated that;

“The Government of Timor-Leste continues invest in capacity building for our farmers with budget approved by national parliament of Timor-Leste”

Education influences productivity by affecting farmer`s ability to comprehend the production system and complicated information related to modern technology and to adjust quickly to farm management practices (Ali, 1995). On commenting on the idea of education and the ability to adopt technology, informants stated that;

“We did not get any information regarding how to use this hand tractor and even we did not get any capacity building as well”

Lack of education or ability in use the tractor in American farms in latter part of the 20th century leads to increase number of death on farm as shown on a research in 1998 (Myers, M. L, 2002). Timor-Leste as a developing country also suffers the same situation as it was going on in American farm and even in this case of Timor-Leste caused accident which damage the tractor used, saying informant;

“Timorese farmers never had tractor before, of course in order to operate hand tractors, there are problem that they face, some cannot be able to operate and caused accident but we are sending our operators to help them operating the tractor”

In another part, lack of ability in using tractor caused high cost production, as farmers who have no operator they have to hire other operator to plough their land with the cost paying given, commencing on this informant stated that:

“We don’t know how to drive the tractor, so we used to hire a driver or operator with the cost decided by our negotiation between me and the operator”

Instead lack of ability to drive the tractor, some farmers in the group working, all group members knew how to drive it, but the problem is they just know how to drive to plough the land and they do not know how to fix when its damaged or broken whilst ploughing their land as an informant informed;

“The problem that we always face with this hand tractor is sometimes when its working and ploughing our land and suddenly stops or stuck in the middle way, so we need to call another people who know about it to come and fix it or we do call the technician from MAF in district to come to do operation for the tractor before continue working”.

Thus farmers reduce uncertainty overtime by acquiring good experience, modifying the innovation and become more efficient on its production. Hence, the economists have defined final adoption at the farm level as the degree of use of new technology in long run equilibrium when the farmers have full information about the new technology and its potential (Mercer and Evan, 2004). Concerned with this government of Timor-Leste through the ministry of agriculture and fisheries has tried in several ways to deliver full information to the farmers on how to use the hand tractor and how increase rice production in order to achieve the sustainable life and reduce rice importation. But these efforts still consider as limited capacity building provided by government part. This stated by informant that:

“The Government of Timor-Leste support some staff of MAF to attend training abroad then come back and provided training for extension worker and then train member of the group on how to maintain and operate the tractor but this is a small effort of capacity building as not for every group in the country its only for one or two group in a district but then they have to transmit information to each other, but whether they transmitted to each other or not that the competent of district director to control them, however in some places there are still lack of

knowledge on how to operate the tractor which caused accident overturned of the tractor and tractor became broken”

However, Mercer and Evan, (2004) concluded that farm size, risk uncertainty, human capital, labor availability, credit constraints, and tenure were the most important factors determining the adoption of technology. The impact of farm size depends heavily on the technology and institutional setting as its often surrogate for a large number of another factors such as access to credit, risk bearing capacity, wealth and access information.

Therefore in future government think to give more training for farmers in order to guarantee sustainable development of agricultural sector as stated by General Director of service and corporative, MAF:

“What we may do in future to improve the development of agricultural sector is we have to train farmers, train and capacity them and then send them more abroad to see the result of how farmers in other country dealing with rice, then after they comeback can do implement it and also provide more training for tractor maintenance, operation of tractor all these should be done”

5.3.2 Asset

Here we will present the asset of a farmer rice production. First of all tractor and land are the supplement factor of one each other in the modern time, because if we have land but we have no tractor, our cultivation area of course will not increase and vice versa, if we have tractor but we have no potential rice field to use hand tractor then nothing to do with the hand tractor, perhaps we have to hire it out, therefore to achieve a sustainable development of rice production we do need both tractor and land as our sources for increasing rice production in the country.

Tractor is known as the most important power sources in agriculture and the effect of tractor power on agriculture is significant, which is the use of modern technologies during recent decades resulted in a rapid growth of the farm productions and tractor and farm machineries are really important examples of this modern technology (Ghadiryafar, M., et al. 2009). The government of Timor-Leste considered tractor as the main factor for increasing rice production and reduce rice import. This brings farmers from traditional system to modern system with the tractor, because lack of tractor caused our farmer produced less, commenting on this the informant says;

“Lack of physical capacity caused our farmer produce less; hence we support them with mechanization.

Mechanization in this case is about tractor, where government supports farmers in the whole country with 2424 units of hand tractor during period 2007-2011. The purpose of giving away those tractors is as following state by general director of service and corporative of MAF:

“The objective of buying tractors and distributed those tractors to the farmers is to empower them to plough the land that they cannot be able to plough and after tractor we see that farmers have more land used, without tractor they can used limited land to grow rice or corn, but with tractor they grow more and produce more”.

Related with this Ghadiryanfar, M., et al. (2009) stated that power availability on the farm is positively correlated with the productivity of potential unit farm power. Commencing on this the farmers is really looking forward to getting a hand tractor to help them to increase their productivity and increase the income of their family as stated by an informant from Vemasse:

“I really need to get hand tractor from government to help me to plough more my land and increase my rice production, because right now even I don't have my own tractor but I used to hire a hand tractor to plough part of my land and I do sell the result of my production to government every year although with the small amount of paddy, therefore if I get tractor from government of course I will produce more and sell more for the government to help me improve my life”.

Regarding with the needs of the farmers to get a hand tractor from government, the director of mechanization of MAF stated that;

“ We have plan to increase number of tractors for farmers to help them to plough more land and increase the rice production in Timor-Leste to achieve self-food sufficient in food in future because tractor that we have provided since then not sufficient for all farmers ”

Despite of the influence by hand tractor, this agricultural vehicles or tractor is operating under a variety condition of land (Lindgren and Hansson, 2002). Therefore the tractor distribution by government in Timor-Leste is based on the criteria set and the rice field of the farmers is located in the area that easy accesses by hand tractor, commencing on this an informant from national director of agriculture and horticulture state:

“Before we give away tractor for a farmer, first we have to look at the topography of the land a farmer has, does the land they have is easy to access a hand tractor or not, for instance if a farmer has big rice field but its located between rock with the small size of the ploughing area, then if we give tractor, that tractor will not work at that condition of the land, so it’s not make sense at all”.

However, size of the land is one of the most important factors for the adoption of technology. Farm size could have several effects on the rate of adoption depend on the characteristics of the technology and institutional setting, therefore, the capital for adoption technology may be more focused for large farms, so that all farms may wish to adopt, and may increase short run profit by adopting (Gershon, Just, Zilberman, 1985). Concerning this, the government support in Timor-Leste is different with the idea of (Gershon, Just, Zilberman, 1985), because government support for farmers to adopt technology or tractor is sometimes not based on the size of the land but it is more focused on condition of the land where tractor can goes through to do the operation in as stated by National Director of Agriculture and Horticulture, MAF following:

“For the farmers who have rice in the area that easily access with tractor we can easily give them a hand tractor to plough their land, an example in Seixal, Vemasse, they only have one or two hectares more or less but the condition of the land permitted tractor to get in to do operation then we need take into consideration and have a look at it”.

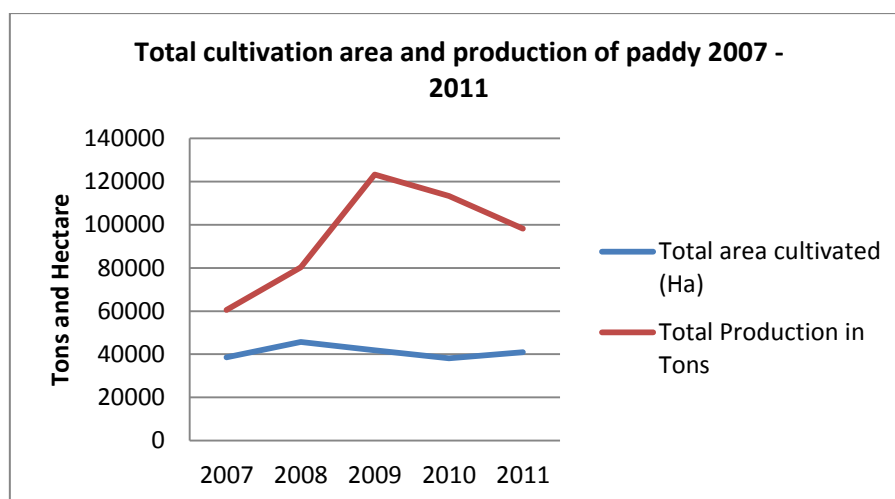
6.0. CONCLUSION

In this last chapter the research question raised in our introductory chapter is answered in short, based on the outlined empirical findings and analysis. This research attempts to describe Government Support for Sustainable Development of Rice Production in Timor-Leste, which to be more specific it seeks to provide answers to the following research question;

“How does the introduction of tractors influence farmer’s rice production in Timor-Leste?”

To answer this question, we used sustainability theory, institutional theory and resource based theory to discuss and interpret our findings.

In East Timor the agriculture sector, from the farmer’s point of view tractors are economically attractive, but they do not guarantee increased crops and yields (Pedersen, Jon, and Arneberg 1999). As shown on the figure below, the production of rice has not changed significantly and area utilization has decreased by the introduction of hand tractor.



Source: Minister of Agriculture and Fishery (MAF) Timor-Leste

Regarding the figure shown above, the government support of tractor for farmers has not significantly influenced the farmer’s production. In 2007 the cultivation area was 38596 and paddy production was 60573.74 tons. In 2008 cultivated area was 45635 ha, with paddy production at 80317.6. In 2009 cultivated area was 41791 ha with paddy production at 123233.68. In 2010 cultivation area was 38069 ha, with paddy production was 113298.8 and in 2011 cultivation area was 40963 ha with paddy production at 98148.36. The reason is because in the first three years 2007-2009, there was a lot of farmers willing to work in rice fields as tractor was newly introduced. However, they did not have enough skill and experience of using the tractors properly. But in 2010-2011 the paddy production and land

cultivation decreased due to various problems such as: lack of maintenance, lack of irrigation control systems, lack of market access, lack of infrastructure and lack of access to rice fields.

6.1. Sustainable Agriculture

According to our research we have found that all government support to increase rice production is complicated, and are influenced by several factors. Lack of training due to limited human resources from MAF, and lack of systems set in place to manage the implications of technological advances for traditional farmers in the country. The government supply of tractors is not enough to secure a sustainable development for the farming industry, due to lack of experience and knowledge in handling this equipment. The goal of producing enough to meet national domestic food needs have yet to be reached.

Meanwhile, in our research we also have found out the irrigation control system in the country cannot support farmers to produce more rice with the tractor given by government. Lack of irrigation system control limits the farmers to only harvesting crop once a year (and not twice which could be possible with the right irrigation systems). Agricultural productivity could be increased by the influence of government expenditure of physical infrastructure and human resource development. A proper irrigation system provided by the government would benefit the overall rice production in the country (Binswanger, Khandker and Rosenzweig, 1989).

Another external factor which influences inefficiency in agricultural system is the subsidy from the government. For short term subsidy help farmers to sustain a better way of life, but in the long term perspective the subsidiaries are proven not to reach the wanted standard (Pagiola Stefano 1996; P. 256). One can argue that a better subsidiary possibility could be the traditional buffalo instead of tractors. This due to the experience embedded in farmers on how to maintain and use this traditional tool. However, subsidy reduce incentive of the farmer to working in the land even influences land speculation and land tenure security can override expected effects of subsidizing (Fearnside 2002; P. 9).

6.2. Institutional Theory

The analysis of institutional theory is separated into two parts as written on theoretical framework, hence the conclusion here will based on the finding from each part in analysis.

6.2.1. Legal

In general the process of providing subsidiaries through allocating tractors in Timor-Leste, it was executed without a supply chain system, such government through Minister of

agriculture provide tractor directly to the farmer without any contractor and/or leader or local participation on distribution process.

This made the adaptation of tractors challenging for traditional farmers.

In the future, government should seek to improve the distribution process and transmit information flows through supply chains which local leaders, Non-Governmental and private sectors working together (Clark Louise 2006). Together they can identify the farmers who show potential for adopting new technologies such as tractors. In this case, government obtains the power to change regulations in order to make the country self-sufficient when it comes to food production. It is known that adoption of new innovations is strongly influenced by the power holding entities (Baldrige and Burnham 1975). The government should improve distribution methods through political influences. Providing tractors is not effective, there need to be an overall system for handling the implementation of such technological innovations (Binswanger 1989; and Renkov 1994).

The farmers need to be stimulated and encouraged to use tractors in their rice production (Orden, David 1996), which help their product to become more valuable in the current market.

Government has to attempt to enable a quota import system to reduce the amount of imported rice, this can be done through price regulations. Domestic rice producing farmers need to be able to provide competitive prices in the current domestic market (Jayne and Muyanga 2012), which shows the need for market power establishments aimed at reducing the amount of imported rice and to set standards for a sector of economic activities.

In other side to help farmer to cultivate and improve rice production in long term perspective the state have to implement contract system to benefit farmer (White 1997) and improve management control of tractor which can improve rice production in Timor-Leste, that contract can be introduced to improve rice market condition (Nielsen, Chantal Pohl 2003). This means farmers have to enter into contract with a designated cooperative to produce a specific level of output on their land, meanwhile it also has the advantages for the farmer to increase value of their product in the market and stimulating domestic rice market in term the price regulation setting (Lin, Justin Yifu 1992).

The main point in this study is how government can attempt to improve farmer life condition through the transform their production into the money, based on that idea the establishment of domestic rice market is important, through contract farming it can benefit both the farmer

and consumer (Hill and Ingersent 1982). On a macro-economic level, contracting can help to remove market imperfections in production and protects the producer (Murphy, Sophia 2006). It can also improve coordination of local production activities which often involve initial investment in processing, extension and can reduce transaction costs (Grosch 1994; Key and Runsten 1999).

In response to the issue related to land access, and farmers not being able to obtain a tractor. The government should create a new strategy for developing traditional farming. This could be done by subsidizing the traditional buffalo in order to increase efficiency where tractors cannot be used (Ali, Mubarik 1995). The farmers who are not eligible for tractors is where the land is in a slope area, or there is no road access to the farming area. These areas are currently only suitable for using buffalos as harvesting tools. Government should contribute with a cost management system for keeping and using buffalos providing an overview of feeding costs and increase training on working with buffalos (Noltze, Martin, & Qaim 2012).

However the trend of the social issues in this thesis is the lack of water supplies which influences farmer on inefficiency (Perkins and Yusuf 1984). Hence governments should build irrigation infrastructure to help improve rice production in sustainable manner which in this case the water is a main source to help farmers increase rice production (Coward, E. Walter 1980). Irrigation support help farmer to utilize tractor in an efficient manner, and means one can harvest crops during dry-seasons as well. This will also stimulate more workers as their seasons becomes less limited and weather dependent.

Meanwhile the National government through the minister of agriculture should obtain control mechanisms for monitoring utilization of tractors and individual labor connected to the use of tractors. This will reduce mismanagement connected to adaptation of new technologies. As mentioned, the provided tractors are often used for personal interest rather than rice production.

6.2.2. Social

From a social point of view, most farmers don't have right to land, which means they spend time working for landowners, and some farmers are uncomfortable with this situation. This due to the fact that landowners benefit more from the land without working the fields. To solve this issue and encourage continuing cultivating of land in a long term perspective, the state has to provide land for those farmers (Fujimoto Akimi 1996). Or a possibility could be to establish formal contracts between farmers and landowners which specify sharing rules for

inputs and outputs (Klein 1998; P. 474). In doing so, they pull enforcement costs by making both the farmer and the landowner residual claimants.

Another aspect of the social problems is that the government has to improve the decision making criterion for providing tractors. Focusing more on land size instead of group of farmers. This can reduce discrimination and disputes among farmers regarding management of tractor maintenance costs. If costs are divided by land-size it will be easier to manage the costs connected to each tractor, as they can be divided based on who owns the most.

We have identified a need of local leadership in order to identify land ownership and land size in order to avoid disputes among the farmers (Yoder, Laura S. Meitzner, et al. 2003). Government should participate at a local level and based on cultural customs (Vaughan, Sarah, and Tronvoll 2003; P.74). Local and national government should cooperate regarding the land reformation system in order to stimulate rice production in an efficient manner. Land reforms and farm restructuring appears to be associated with better agricultural sector performance

(Giovarelli, Renee 1998). Even village governments have primary responsibility for farm reorganization and land and property share distribution even the regional government has the possibility to withdraw land and to allocate a different land plot to the farmer this reduces further the certainty of ownership (Wegerich, Kai 2000).

Meanwhile in rice cultivation process farmer faced challenges to transport tractor from one area to another during the rainy season, as farmers sharing a tractor could be divided by long distances. There need to be set in place a logistics system in order to support transportation of tractors to local destinations (Yifu, Justin 1999). Another possibility could be to have geographically allocated tractors in order to make the use and transportation of it more effective.

6.3. Resource Based View

Resource based view here is divided into two sections as we have written on our theoretical framework, therefore we will draw a conclusion based on the finding from every section in the analysis part

6.3.1. Human Capital

Human capital is the key factor for a sustainable development of agricultural sector, therefore when we look back at the government support for a sustainable development of agricultural sector in Timor-Leste, there is lack of information sharing between farmers and government.

Especially regarding how to use and manage a hand tractor, lack of capacity building for farmers in order to guarantee maintenance. Tractors could increase farming costs when technical personnel needed to be hired in.

6.3.2. Asset

Tractor and land are the supplement factor for one another in Timor-Leste today. Land without tractor will not be able to increase their production. Having a tractor but no land, than the tractor becomes obsolete. To obtain a sustainable development of rice production in the country these two assets needs to be in place.

After conducting this research project we argue that the implementation of tractors in Timor-Leste is not sufficient in order to achieve a sustainable agricultural sector. Even though the project seems promising, the results are not. Domestic production of rice has decreased, and the governments have not recognized critical success factors such as: proper training in use of tractors, dividing tractors between farmers in a sufficient manner and/or encouraging farmers for the use of tractors. Only providing the technology without sufficient management and control systems set in place for utilizing it is not enough. Hence we argue that the government should further develop a support system for farmers in order to increase the use of tractors for rice production.

7.0. IMPLICATION, RECOMENDATION AND FUTURE RESEARCH

7.1. Implication

As discussed above, one of the major issues connected to utilizing tractors was a lack of experience with the technology. However, the government has remained passive with this issue, and it also important to state that providing tractors cannot be identified as sustainable, as this technology can operate only as long as fuel is available. Some of the farmers cannot afford fuel and, in this case, tractors become useless.

One of the governmental goals has been that the country becomes self-sufficient for rice. The problem is that local farmers cannot meet the market price on imported (maybe, exported) rice. At the same time, due to the lack of some infrastructure like roads, local farmers have not access to the market. Together with not being able to geographically access market due to lack of infrastructure such as road access. The government should seek to deal with both the price on imported (maybe, exported) rice (as to make it more financially beneficial to be a local rice producer) as well as developing the national infrastructure.

Timor-Leste has been developed into a petroleum dependent country during the recent years. 89% of its GDP and 94% of government revenues come from petroleum extraction (Neves and Nicolau, 2006). If the government continuous to provide tractors for farming, with the same market control systems set in place today, local farmers will not produce more rice and the import of rice will enhance. The government expenditures will rise as they need to import more rice as well as contributing with tractors. The issue of decreasing oil prices is important for Timor-Leste as an oil dependent country. With less investment in the oil sector the country will go into default and will not be able to sustain expenditure in the country.

Another issue to be discussed is the replacement of old tractors in the future. Farmers start believing that this will not be the case, and without continuity in the project failure is more certain to happen. The outlook is that farmers will not produce rice until the market conditions are appropriate, the tractors used now are sold, and the goal of self-food-sufficiency will not be reached.

Therefore, to be sustainable in the future, the implementation of quota import and increase tax on rice is necessary, because, implement of quota import and tax on rice is to stimulate farmers to increase their productivity.

Another way to be sustainable is that the government has to decide and looks over the land condition to see whether farmers deserve to get a hand tractor to plough their land or

buffaloes. For farmers who have small size of rice field and the rice field that no condition for tractor to goes in they deserve to get buffaloes. The using of buffaloes is more preferable as they regenerate themselves. For instance, if a farmer has two buffaloes, sooner or later they will get one more. He also will not spend much money for only to plough his piece of land because there are no extra costs for the maintenance of buffaloes as long as animals in Timor-Leste are live for free. Buffaloes are cheap and buffaloes will never gone in 3-5 years coming as long as they regenerate themselves.

It is worth adding that tractors are expensive and farmers need to earn extra income from rice cultivation in order to repair hand tractors imposed coercively by the government. Tractors need fuel and farmers need to get a new tractor when it is getting old due to the tractors' expiry is about 3-5 years.

At the same time, if farmers have a large rice field in a flat area, they are able to deserve to get hand tractors. For instance, this is for a farmer who has 5-10 hectares of a rice field. The reason is that it is easier for farmers to manage a hand tractor in a good way as long as the area of rice field is not more than capacity of a hand tractor to plough in a year and it will be more better if the government implements the quota import on rice. In this case, it will give an opportunity to farmers to earn more money in order to repair hand tractors and even save money to buy a new tractor by them-selves. It will also reduce the transportation distance. For instance, a farmer will have a chance to build an own warehouse for a hand tractor and other agricultural machines close to the rice field area.

7.2. Recommendation

In this part we will draw some recommendation for the relevant part, Government and Farmer based on our research finding in order to improve the development of agricultural sector in the nearest future

7.2.1. National Government

There are number of initiatives that the national government should consider in order to become self-sufficient in terms of rice production.

First, when it comes to the criteria of giving out tractors, they need to be evaluated. Today, the number of members in a group is a main criterion, while we propose that number of hectares owned by farmers should be taken under consideration. Farmers need a better education/information or access to maintenance of their hand tractors in order to extend the life of these tractors. Some areas of rice productions are not suitable for use of hand tractor and other forms of aid can be considered in order to enlarge the rice production. As an

example, buffaloes can be offered, due to their lower cost, better possibility and sustainability. An important addition is that buffaloes are traditionally used and do not need additional training and education as in case of hand tractors.

In addition a better contract of the approved ways of use of hand tractors should be formulated and consequences of breaking the contract should be highlighted. The rules and obligations of farmers and government should be stated as well. A regulatory body should be established in order to supervise and control the contract fulfillment.

Secondly, the problems of accessibility should be addressed. Infrastructure and logistics, road conditions are poor and it makes it difficult to deliver the hand tractors to remote region with high potential production of rice as collect the excess of rice production and give access to market for farmers. In addition, in areas with higher potential rice production the absence or poor irrigation system hinders farmers from growing the rice twice a year. Such infrastructure projects require large capital and at this time is only the power of national to conduct.

Thirdly, there is a need to organize in cooperatives or with help of NGOs in order to provide an arena of learning, information, communication, cooperation and problem solving between farmers, government authorities and other interested parts as well.

In Timor-Leste agricultural system National government and local government have to enhance regarding the land reformation system to stimulating rice production in agriculture sector through the changes of farm collective. Which could be facilitated gains and efficiency in production furthermore land reform and farm restructuring appears to be associated with better agricultural sector performance. This land reformation was been successfully implement by Kyrgyz Government and also in China which the main cause of China's increase in production is following collectivization was due to the change from collective to individual tenure. Means in this land reformation system the Village governments have responsible for the physical aspect of the on-farm restructuring (Giovarelli, Renee 1998). Village governments have primary responsibility for farm reorganization and land and property share distribution even the regional government has the possibility to withdraw land and to allocate a different land plot to the farmer that reduces further the certainty of ownership (Wegerich, Kai 2000).

7.2.2. Local and or District Government

Local and or District Government are the government people who are with farmers every day and they do know clearly who are the farmers in a district and in a village, therefore they do need to cooperate with national government to provide truth information for the farmers and

work together to do identification for the rice field of farmers and verify the proposal from farmers before hand over a hand tractor to avoid wrong distribution of the tractor and control over the farmers in the process of growing and marketing their product.

7.2.3. Farmers

For the farmers to be sustainable in the rice production they cannot just sit and wait for government to help them in everything, but they also supposed to seek for the knowledge of how to use the hand tractor in a good way, how to fix it when its broken, how to maintain it, how to influence the soil and actively participate in every training by government or by NGOs when its available.

Farmers should receive the training from government and they should ask for it and tell what do they really need to know and also can arrange training by themselves. Discuss the rules of using the tractor, talk with each other and make rules, for instance, this year Antonio use to plough first and Joao plough last, next year Antonio should plough last and Joao should be first, then discuss and decided what should do when tractor is broken, how much money should each member contributes in order to guarantee maintenance of the hand tractor, then farmers have to have an agreement between group member but as the don't know how to write, they have to include the head of the village to prepare a written document for them to obey and follow, so farmers should not just sit and wait.

7.3. Future Research

While our research discuss the features on the context of government support on a sustainable development of rice production and it is clear that our research is only focus on how is the government support influence rice production in Timor-Leste.

The need of increase rice production as an important role in agriculture sector at same time the increase of population over year, even FAO mention in United Nation report, gave an alarming prediction that the import of rice to Timor can be doubled (FAO, 2015) and it makes the problem even more acute. Learning from the neighbor countries like Indonesia, Thailand, India and Vietnam are highly appreciated as future steps for solving this dilemma.

Based on that, the requirement to reform agriculture system in Timor-Leste to be important point, which reformation thorough the establishment of contract system to changes the way of agriculture rice production (White, 1997), to improve rice market production which farmers obliged to enter into contract with a designated cooperative to produce a specific level of output on their land (Nielsen, Chantal Pohl 2003) .This contract system was been successful in Vietnam concerning reformation on Vietnam rice policy. Meanwhile contract system wills

usefully to protect domestic rice producer through market price control, and in other side contract farming was successfully improve political economy in India (Asano Tamanoi, Mariko 1988), so it's important to recognize the role of the state in encouraging and protecting the producers in contract situations, because contract farming its benefit for both famers and consumer (Hill and Ingersent 1982). Other advantage of contract farming is help market structure lead to better coordination of local production activities and can reduce transaction costs (Grosh 1994; Key and Runsten 1999). Hence through the reformation in agriculture system such as successfully example from other countries, it could be also improve rice production in Timor-Leste and develop agriculture sector to achieve sustainable goal.

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LIST OF APPENDIXES

Appendix 1 – Tractors Distribution

Source: Minister of Agriculture and Fishery (MAF) Timor Leste , Hametin Seguransa Aihan liu husi hasa`e Produsaun no
Produtividade Agrícola- Ministério da Agricultura e Pescas 2012

Tractor Distribution per district during period 2007-2011			
No	Districts	Big Tractor (Medium)	Hand Tractor
1	Aileu	6	67
2	Ainaro	15	143
3	Baucau	31	371
4	Bobonaro	31	318
5	Covalima	37	244
6	Dili	6	45
7	Ermera	13	82
8	Lautem	41	164
9	Liquica	11	80
10	Manatuto	33	199
11	Manufahi	33	154
12	Oecusse	21	260
13	Viqueque	37	297
	<i>TOTAL</i>	<i>315</i>	<i>2424</i>

Appendix 2 – Research Area in Timor-Leste



Interview Guide			Research Places			
			Villages	Sub-Districts	Districts	
<i>Item</i>	<i>Object</i>	<i>Number of interviews</i>	Vemmasse	Vemasse	Baucau District	East
FARMER	Head of Villages	4	Uma-Boku	Natarbora	Manatuto District	
	Extensions	3	Aidabalete	Atabae	Bobonaro District	West
	Farmers	10	Manapa	Cailaqu		
	Total	17	Ritabou	Bobonaro		
GOVERNMENT	MAF	4	Dili		Capital	
<i>Total</i>		<i>21</i>				

Appendix 3 – Interview Questions

Interview Questions to Government Ministry of Agriculture and Fisheries (MAF) which together General Director of Minister Agriculture and Fisheries (MAF), General Director of Agriculture and Horticulture, Director of Mechanization and General Director of Agriculture and Livestock.

1. What is the purpose of providing the farmers with the tractors?
2. What criteria should the farmer meet to be able to get a tractor from you?
3. How do you find suitable candidates?
4. Did you meet any Challenges in giving away tractors? (Trying to find suitable farmers, difficulty in delivering tractors etc.)

5. How does the use of tractors influence the Development of Agriculture sector (rice producing) in Timor?
6. What are your current results of implementation?
7. Have you any comment or suggestion in future perspective?

Interview questions to Farmers which include, Head of village, Extensions, and two categories of farmer who get a tractor from government and who don't get a tractor.

1. How did you get this tractor?
2. What did the government ask you how to use tractors?
3. How do you usually use it? What are you using your tractor for?
4. Did you meet any challenges/problems while using it?
5. How did the tractor change your rice production? And your family income?
6. Did you increase your cultivation area when you got tractor? Did tractor help you to increase it?
7. Now you know what we are interested in, do you want to tell me anything else about these tractors and your experiences with them?

Appendix 4

Area production and productivity of rice production during period of 2007-2011				
Year	Commodity - Paddy (Tons)			
	Total area cultivated (Ha)	Total harvested area (Ha)	Productivity	Total Production in Tons
2007	38596	38582	1.57	60573.74
2008	45635	45635	1.76	80317.6
2009	41791	38998	3.16	123233.68
2010	38069	36548	3.1	113298.8
2011	40963	35561	2.76	98148.36
Total	205054	195324	12.35	475572.18

Source: Minister of Agriculture and Fishery (MAF) Timor Leste , Hametin Seguransa Aihan liu husi hasa`e Produsaun no Produtividade Agrícola- Ministério da Agricultura e Pescas 2012