

**DEVELOPMENT OF CLUSTERS
AND THE SUPPLY CHAIN MANAGEMENT
OF PALM OIL INDUSTRY IN MOZAMBIQUE**

A Dissertation by

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ABSTRACT

The purpose of the present dissertation is to find out to what extent should be possible the establishment of cluster and supply chain management of palm oil industry in Mozambique. The primary objective is to examine the experience of the major palm oil producer's countries, Mozambican local condition related with the agro-ecological potential, socio-economic situation and institutional framework that could contribute to implement such industry in Mozambique.

The methodology based mainly on secondary data of published and no published documents and the Dissertation is designed to answer a series of research questions regarding the role of the cluster and supply chain framework and its linkage with palm oil industry and the Mozambique local conditions for its establishment.

The findings revealed strong evidence that allow suggesting that the establishment of cluster and supply chain management in Mozambique may bring additional economic positives effects.

As the dissertation was based on secondary data, it found limitations related to the reliability of some information not officially published and the unavailability of local public information on line.

The value of this dissertation will be the assistance it will give investors to make more informed decisions regarding the adoption of cluster and supply chain approach to the palm oil industry in Mozambique, as well as assisting policy makers in designing suitable strategies to implement this industry.

The key words used were: Palm plant, Palm Oil industry, supply chain management.

DECLARATION

I, the undersigned, hereby declare that this dissertation is my own unaided work. It is being submitted for the degree of Master of Science in Investment Promotion & Economic Development at Edinburgh Napier University.

It has not been previously submitted for any degree or any examination at any other university or institute.

ACKNOWLEDGEMENT

In submitting this dissertation the researcher wishes to take this opportunity to thank the following people for their specific and valued contributions:

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ABBREVIATIONS

CPI	Mozambique Investment Promotion Centre
CPO	Crude Palm Oil
DUAT	Land Title
DNTF	National Directorate of Land
FFB	Fresh Fruit Bunch
FDI	Foreign Direct Investment
IIAM	Agriculture Research Institute of Mozambique
PKO	Palm Kernel Oil
PKM	Palm Kernel Meal
RSPO	The Roundtable on Sustainable Palm Oil
FELDA	Federal Land Development Authority

CHAPTER 1: SCOPE OF THE RESEARCH

1.1 INTRODUCTION

Few tropical plants have become so important in today's world as the palm plant. It is the world's leading supplier of edible oils and fats. More recently palm oil has played an important role in the development of alternative fuel sources used to run machines (Fedepalma, 2006).

The origins of the African palm oil, known as *Elaeis guineensis jack*, can be traced back to the Gulf of Guinea in West Africa, where it was grown mainly along rivers. Today, out of all oleaginous plants, palm is the biggest producer of oil in the world. On average, a hectare of palm produces six to ten times more oil than other oleaginous plants. It is an important and versatile raw material for both food and non-food industries, which contributes to the economic development of the producing countries and to the diets of millions of people around the world. In fact, palm oil is part of the life of a huge number of people. It is present at home, at work, at restaurants and even cars rely on the countless uses of palm oil. In Asia, palm oil is also referred to as "gold oil" for its perfect balance of saturated and unsaturated fat acids which do not affect adversely cholesterol levels.

Products made from palm oil are found all over the world, including edible oils, food concentrate for animals, cosmetics, paints, soaps, detergents, printing inks and candles and is part of many other ingredients used today. More recently palm oil has played an important role in the development of alternative fuel sources used to run machines. Consumers choose palm oil for its health benefits and industries favour palm oil for its physical properties, including its excellent stability, which allows it to be mixed with other raw materials (Fedepalma, 2006).

The outstanding versatility of palm oil is what makes it a popular crop among farmers. Because of that versatility, a number of players are present in the production process of palm oil, being part of the supply chain management and building a long-term relationship from the source of production to the end user, with a lot of benefits such as: (1) Increasing productivity because of the good access for the employees and suppliers, better access to specialized information, institution and public goods and increase supply chain network support; (2) fast innovation cycle because of enhanced flexibility, lower risk of business failures, innovation proximity and (3) Stimulus of the appearance of new business through enhance of local market opportunities, knowledge of business opportunity and quicker identification of perceived gaps in products and services (Porter, 1990).

The palm oil industry major players can be grouped into a cluster covering upstream producers, downstream producers, exporters and importers, customers, Government agencies, other players such NGOs and other important entities for the industry. Governments where the palm oil is produced consider palm an ideal crop to create development projects, generate employment and promote alternative fuels, because of the flexibility of its functions.

This dissertation is about the analysis of factors that may allow the establishment of cluster and supply chain management of palm oil industry in Mozambique, by examining the experiences of the major palm oil producers and also clusters and supply chain management theories and applications. The study will identify the major player in the supply chain, usually grouped in clusters, from the upstream producers to the end user, and their organizational relationships and linkages.

1.2 BACKGROUND

Even before the very first civilizations appeared in Africa, the palm oil known as *Elaeis Guineensis jack* was eaten by the population living along the coast between Senegal and the Congo River basin. In Europe, palm oil became more widely used during the industrial revolution and was used as grease and to produce

soaps, candles and lubricants. In the South East Asia, palm oil was introduced during the 18th Century and was used as an ornamental plant. The first commercial palm plantations were founded in early 1900 in Sumatra, Indonesia and later in Malaysia from about 1914 and were expanded in 1955. (Fedepalma, 2006).

By the end of the 1950's, two favourable conditions had developed leading to further growth and development of palm plantations economic potential: the development of genetic materials and a huge surge in global demand for edible fats in the post-war era. As a result, production increased rapidly from the 1960's, doubling the world's supply of palm oil.

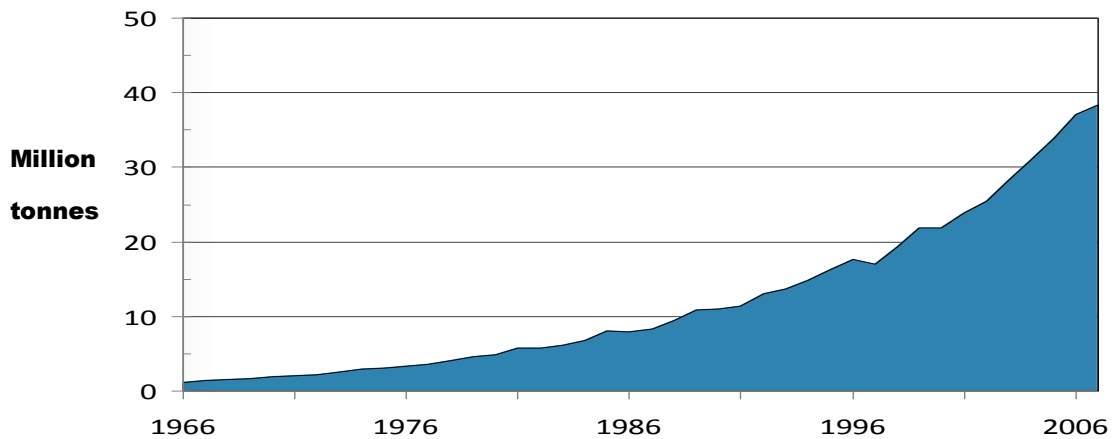


Fig 1.1: The rapid growth of world palm oil production

Source: RSPO Secretariat, Kuala Lumpur, Malaya, www.rspo.org, February 2010

The growing global demand for edible oils and animal protein in these last years resulted in a huge increase in cultivated areas, particularly of soybean and palm, and now palm oil is the world's most produced vegetable oil (RSPO Secretariat, Kuala Lumpur, Malaya, February 2010).

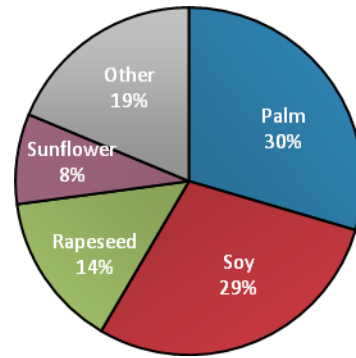


Fig 1.2: Palm oil is now the world's most-produced vegetable oil
 Source: RSPO Secretariat, www.rspo.org, February 2010

From 1990 to 2001 the world's production of palm oil doubled and reached 23.18 million tonnes or 19.8% of the total production of oils and fats. Production and export achieved an impressive growth in just a few years (table 1.1). Malaysia is the largest producer of palm oil and contributed with about 11.80 million tonnes or 50.9% of total production, while Indonesia produced some 7.5 million tonnes or 32%. Malaysia is also the world's largest exporter of palm oil, accounting for about 60.1% or 10.62 million tonnes of the total exports of 17.37 million tonnes in 2001 (table 1.2) (TEOH Cheng Hai, 2002).

<u>Country of Origin</u>	<u>1990</u>	<u>1995</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>
Malaysia	6,095	7,811	10,554	10,800	11,804
Indonesia	2,413	4,480	6,250	6,900	7,480
Nigeria	580	660	720	740	750

Colombia	226	387	500	516	547
Cote d'Ivoire	270	285	282	290	275
Thailand	232	354	475	510	535
Ecuador	120	180	230	215	240
Papua New Guinea	145	223	260	281	325
Others	786	1,097	1,339	1,699	1,1226
<u>Total</u>	10,867	15,477	20,610	21,951	23,182

Table 1.1: World production of palm oil ('000 tons)
Source: (TEOH Cheng Hai, 2002). (pg 23)

<u>Country of Origin</u>	<u>1990</u>	<u>1995</u>	<u>1999</u>	<u>2000</u>	<u>2001</u>
Malaysia	5,727	5,613	8,914	9,056	10,618
Indonesia	1,163	1,856	3,319	4,140	4,800
Papua New Guinea	143	220	254	282	320
Cote d'Ivoire	156	120	105	110	124
Singapore	679	399	292	293	259
Hong Kong	51	275	94	132	187
Others	276	790	837	909	1,063
<u>Total</u>	8,195	10,173	13,815	14,922	17,371

Table 1.2: World major exports of palm oil ('000 tons)
Source: (TEOH Cheng Hai, 2002). (pg 24)

Malaysia and Indonesia contribute the most to the increase in palm oil World production. The Malaysian government for example, established the palm oil sector as part of its development plans and consequently became today the world's main exporter, closely followed by Indonesia (TEOH Cheng Hai, 2002).

Sales are set to rise dramatically particularly in the growing economies of China and India. Consumption in Europe and USA also grew recently due to palm oil being an effective substitute for partially-hydrogenated rapeseed and soy oil and the new demand for energy from renewable sources.

The growth of palm plantations has played an important role in the configuration of a booming agro-industry that is contributing to the creation of many offshoot industries

integrated in clusters, including farming, extraction industries and business which share a global vision and follow stringent business ethic codes.

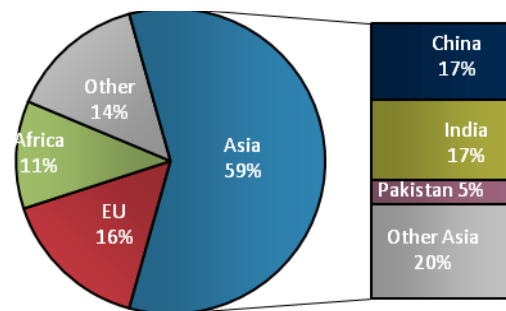


Fig 1.3: Asia and EU the world major importer of palm oil
Source: RSPO Secretariat, www.rspo.org, February 2010

Despite the vast applications of palm oil, the fact that it is entirely GM (Genetically Modified) free and that it has the highest yield per hectare of any oil or oilseed crop there are environmental pressures, particularly because palm oil can only be cultivated in tropical countries. Due to the expansion of palm plantations in the world, questions arise concerning deforestation, animal extinction and peat land destruction. Some analysts say that palm plantation and expansion are having negative impacts on environment although others argue that palm plantation is able to maintain biodiversity and preserve the flora and fauna.

The Roundtable on Sustainable Palm Oil (RSPO) is a non-profit organization established in 2004 to respond to this concern and also to promote the production of sustainable palm worldwide in a legal way, economically viable, environmentally and socially appropriate (*K.T. Tan et al, 2009*). The RSPO operates through 8 Principles and Criteria that must be fulfilled by palm oil companies in order to be certified as sustainable palm oil producers: (1) management transparency (provide adequate information regarding environmental, social and legal issues related to the company), (2) comply with local and international laws and regulations, (3) ensure long-term economic and financial viability (must have management planning and achievable financial goals), (4) the whole operating procedures

must be documented, implemented and monitored, (5) Companies must behave responsibly with regards to conservation of natural resources and biodiversity, (6) companies must support their employees and communities affected by palm plantation and palm oil mills (transparent and open methods for negotiations about compensation for land usage to enable communities to express their views and opinions and workers must be paid with no less than minimum standard salaries), (7) undertake social and environment impact assessments before establishing new planting areas and (8) commitment towards continuous improvement in key activity areas(K.T. Tan et al, 2009).

Through a traceability System, the RSPO Principles and Criteria certify that the palm oil was produced according to sustainable production criteria, and issue the RSPO Supply Chain Certification. Traceability offers the assurance that certified products have originated from certified sustainable source which ensure buyers throughout the supply chain that the product they source is coming from certified and sustainable production sources. This enables them to make credible sustainability claims to all relevant stakeholders (UTZ Certified – Traceability System Guide, 2009).

Malaysia has always been active member of RSPO with government agencies and private companies taking important roles and positions in RSPO organization. Malaysian Palm Oil Association (MPOA) and Federal Land Development Authority (FELDA) for example are the current Executive Board members of RSPO, which manage RSPO activities. Currently there are 152 ordinary members of RSPO comprising palm growers, palm oil processors and traders, consumer goods manufacturers, retailers, banks and investors, environment NGOs and social NGOs (K.T. Tan et al, 2009).

1.3 RESEARCH OBJECTIVES

The specific purpose of the dissertation is to assess whether it is possible to develop cluster and supply chain management of the palm oil industry in Mozambique. It also seeks to identify the major players in supply chain management from the upstream producers to the end user and its organizational relationships and linkage within the industry, based on the experience of the major producing countries, such as Malaysia and Indonesia.

1.4 THE RESEARCH QUESTIONS

How to implement the palm oil industry considering the agro-climate conditions and that Mozambique never had commercial plantations or industrial experience?

How the relationship between Mozambican institutional framework, agro-ecological potential and socio-economic conditions could contribute to the implementation of a palm oil industry in Mozambique?

How to mitigate negative environmental impact of palm oil development considering the concern of some organizations about damaging the ecosystem and promote the use of palm oil production in a sustainable manner based on economic, social and environmental feasibility?

1.5 METHODOLOGY AND LIMITATIONS

The dissertation is based mainly on secondary data and information that were obtained from electronic sources, plantations and industrial organizations websites, newspapers and other published and unpublished official documents. In the course of writing the dissertation, verbal communication was exchanged with some representatives of local institutions and local authorities in some remote localities of Mozambique, during

a work visit organized by the researcher company (CPI) for the collection of data on investment opportunities in agriculture and agri-business sector.

1.6 RESEARCH CONSTRAINTS

- Unavailability of public information at libraries or on line in Mozambique;**
- Difficult access to official statistics on climate and information related to palm plantation;**
- Some climate information is expensive to obtain;**
- Low reliability of some information collected by the researcher from websites because it is not officially published.**

1.7 ETHICAL CONSIDERATIONS

A request and arrangements were done, with the help of the CPI board of directors (the researcher company), in order to have a credential explaining the purpose of the research to be presented to local institutions, basically to IIAM – Mozambican Agronomy Investigation Institute and INAM – Mozambican National Meteorology Institute, in order to collect information.

The on line Government Portal was used for the collection of publicly available agriculture and crop information.

The CPI database was also used for the collection of information related with the police framework and the local industrial cluster in Mozambique. This information is available for employees and can be used for research.

1.8 STRUCTURE

The study is divided into six chapters. Chapter one is the scope of the research; chapter two reviews the literature on palm oil industry, industrial cluster, supply chain and Mozambique's potentiality for palm crop; chapter three discusses the research method and chapter four discuss the findings and makes the analyzes. Chapter five discusses the Lessons and Implications and finally chapter six discusses the conclusions.

CHAPTER 2: LITERATURE REVIEW

2.1. PALM OIL INDUSTRY FRAMEWORK

Many major plantation companies had their beginnings with rubber plantations from the colonial era, which were the case of some of the Malaysian and Indonesian companies. Malaysian companies for example planted tea and coffee before converting to palm plantations while Indonesia companies were more inclined to coconut and cacao plantations. Colombia on the other hand had a different approach. The Government endorsed palm oil development as a strategy for territorial control and paramilitary demobilization. It removed Afro-Colombian indigenous and peasant communities, expanded palm plantation in an effort to demobilize and create jobs for the paramilitaries and stimulate economic development in rural areas.

At about 1970s the palm oil production countries expanded their palm plantations with Indonesia growing an area of 5 million hectares, an increase from around 0.5 million hectares in previous year. Malaysia on the other hand doubled its palm plantation areas from nearly 2 million hectares in 1990 to 4 million hectares in 2005 (K. T. Tan *at al*, 2007), which represents approximately 5% of the land used for oilseed in the world, but producing 11% of the global vegetable oils.

The banking system gave major support and impulse to the development of this industry sector, influencing countries to make improvements in their policies. The World Bank for example gave recommendations in a major number of countries to develop palm plantations and industry such as the one to Malaysia in its 1955 mission, and funded Indonesia through the International Finance Corporation (IFC). Substantial financial backing from the US International Agency for Development (USAID) and support from the Colombian Agrarian bank and Inter-American Development Bank (IDB) were given to Colombia.

The government agencies also gave support to the establishment of regulatory and licensing bodies for the plantations and industry that had huge impact on the diversification of agriculture programs that saw the growing dominance of palm oil in agriculture production and export. In Malaysia the pressing need was to diversify the country's agricultural base (rubber). As a result tracts of rubber land were converted to palm. In Colombia, success at establishing the regulatory framework with the application of incentives, development of R&D and deeper penetration into the market, allowed the establishment of supply chain management of the industry of palm oil with a lot of positive impacts on economic development.

Indonesia was a different case. It initially decided to apply the existing laws on forest and plantations not introducing specific legislation for the palm sector. It included a number of restrictions on taxation erecting obstacles to private investment, particularly on palm oil processing. Until recent years Indonesia was exporting crude palm oil and the tax structure discouraged by squeezing processing margins and the determination of tax rates on palm oil products independent from the underlying crude palm oil price, created uncertainty about marketing margins for processors.

Although the first commercial palm plantations were founded in the early 1900s the major expansion was observed from 1955, with a huge boom in the 1970's because the price of palm oil became exceptionally high in the international markets. Some plantations became 'pure' plantation companies and others diversified their activity into resource-based manufacturing and property development where revenues and profits were generated mainly from plantation operation. Small private companies and farmers came into the business later due to processing mills and were helped by government and big palm plantation owners. Many of these players are grouped in associations that also play a very important role in defending the interests of the groups involved in the process. This is the case

of the plantations and industrial owner's interest in profitability, growth and promotion of best management practices.

In Colombia for example, initially and until the expansion phase, the palm oil business developed mainly under a model of vertical integration, through which companies owned both the crop and the palm oil mill. Later at the beginning of the 21st Century, the agro-industry experienced a shift towards a more horizontal model, made up of plantation owners, processing plants, workers organizations, small farmers making contracts and strategic alliances between themselves and building up a coordinated system of production functioning under the cluster model.

All major oil palm producers have a well established supply chain but Malaysia has a more developed one in comparison with Indonesia for example due to differences on policies applied at the beginning of the industrial development. Malaysia's Government decided to develop the palm oil industry as a strategy for the country's economic development adopting a policy favouring production and export. This resulted in a more developed and complete supply chain management and production of palm oil derivatives. That was not the case of other countries such as Indonesia where there were absence of SMEs links in the manufacturing industry because the application of more restrictive policies resulted in exporting mostly crude palm oil.

In general all big producer companies have a similar supply chain management process involving a list of linked players and other entities important for its development that include:

- **Upstream producers;**
- **downstream producers;**
- **exporters and importers;**
- **customers;**
- **Government agencies;**
- **industry organizations;**
- **Others.**

Three distinct phases are fundamental for the development of this industry: experimental phase, plantation development and expansion. Some industries, like those in Malaysia also developed the upstream operations out of the country due to availability of land for plantation development, low production cost and adequate labour supply.

2.2. INDUSTRIAL CLUSTER FRAMEWORK

A cluster is a sectorial and geographical concentration of enterprises that produce and sell a range of related or

complementary products and thus, face common challenges and opportunities (UNIDO 2001, p.9).

An industrial cluster is a set of industries related through buyer-supplier and supplier-buyer relationships, or by common technologies, common buyers or distribution channels or common labour pool (Porter, 1990).

According to Porter, clusters are viewed as encompassing an array of linked industries and other entities important to competition that include input suppliers such as components, machinery and services (*Geographic concentration of interconnected companies and institutions in a particular field*) (Porter 1998, p78).

He suggests that the immediate business environment outside a company plays a vital role in determining how a company creates competitive advantage. When firms operate in one location, the repeated interaction among them boosts competition, improves productivity, innovation and coordination, and builds trust. Companies operating in a cluster can have the advantage of scale without dealing with the inflexibilities of vertical integration or formal linkages. Clusters also extend downstream to channels and customers and laterally to manufactures of complementary products, and to companies in industries related by skills, technologies, or common inputs (Porter, 1998). A

cluster can be seen as exhibiting three broad characteristics that are proximity, core competencies and relationship and represent an alternative way of organizing a value chain (Porter, 1990).

Clusters also present opportunities for an organization to streamline and shorten its supply chain, as these sources exist in a concentrated area. It represents an alternative way of organizing the value chain that can be positioned somewhere between arm's-length markets on the one hand and hierarchies, or vertical integration on the other (Porter, 1998). Compared with market transitions among dispersed and random buyers and sellers, the proximity of firms in clusters – and the repeated exchanges between them – fosters communication, coordination, innovation, interdependence and trust. Clusters are seen as affecting competition in the following ways:

(a) Increasing the productivity of companies in the area;

(b) Driving the direction and pace of innovation; and

(c) Stimulating the formation of new business, which expands and strengthens the cluster itself (Porter, 1998)

2.3. PALM OIL INDUSTRIAL CLUSTER

The palm oil supply chain management meets most of the requirements of an industrial cluster. The four corners of Porter “diamond of advantage” are positively found in the palm oil industry development, namely: factor condition, demand condition, industry strategy and supporting industry (Porter, 1990)

The palm oil industry cluster extends from the selection of seed until the delivery of the final product allowing shared capital and risks in early stages as well as further penetration in the global market. Being part of a cluster, the palm oil industry players operate more productively by offering better access to employees and suppliers, access to specialized information, complementarities between business, access to institutions and public goods, and better motivation and measurement (Porter, 1998).

In the cluster, the plantation owners and the companies involved can reduce their recruiting cost by looking for employees into an existing pool (Porter, 1998), and draw on a skilled group for a required activity within the community, minimizing the labour requirement. The proximity may also improve the communication between buyer and seller and makes it easier for suppliers to provide support services.

The cluster also stimulates the development of local market making it easier for new market entries that benefit from established relationships. It also accumulates technical and competitive information, personal relationships and the community ties foster trust and facilitates the flow of information (Porter, 1998); operating practices are discussed, and business deals are often struck, typically with a handshake.

The collective productivity is optimized by the coordination of activities and the flows of components across companies are facilitated by the location of the cluster members. The palm plantation process for example, is totally dependent on the palm oil Mill as the fresh fruit bunches must not take more than 24 hours before processing, to avoid the rapid build-up of free fat acids and to obtain palm oil of good quality. On the other hand, to enhance productivity, the cluster plays a key role in members continuing ability to innovate, as sophisticated buyers are often part of a cluster and companies inside the cluster usually have a better view of the market than isolated competitors (Porter, 1998).

The investments by the government or other public organizations for specific and specialized infrastructure or educational programs are usually motivated by the presence of economic or

industrial agglomeration (Porter, 1998). The palm oil industrial clusters are usually represented by a considerable number of government organizations, NGOs, industrial organizations and others that may give contribution for the development of public infrastructure.

2.4. SUPPLY CHAIN MANAGEMENT FRAMEWORK

While a cluster is seen as a geographic concentration of competing networked supply chain, a single supply chain is a set of entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a custom. It may consist of a company and its immediate supplier and customer, or may extend to all organizations upstream and downstream from the raw material supplier to the ultimate customer. When the members of a supply chain operate in the same general geographic location, they gain the cost efficiencies of supply chain coordination, as well as a boost in competitive drive and innovation that comes from working together in close physical proximity (*Mentzer, et al., 2001, p4*).

Supply chain management integrates processes and builds long-term relationships among firms involved in the flow of products and services from the source through to the end-users. The performance improves for individual firms and the overall supply

chain when the inter-firm processes and relationships within the chain are actively managed (*Mentzer, et al., 2001, p4*). Key processes within and between firms are integrated in a supply chain focused on meeting customer requirements: Customer relationship management, customer service management, demand management, order fulfilment, manufacturing flow management, procurement, and product development and commercialization (*Mentzer, et al., 2001, p4*).

Supply chain management can also be thought of as the group of activities that bring about the coordinated flow of material from the source to the end customer, and ultimately build customer value. According to Mentzer, et al., (*2001, p4*) those activities are:

- integrated behaviour (i.e. incorporating customers and suppliers);**
- mutually sharing information;**
- mutually sharing risks;**
- cooperation;**
- firms having the same goal and focus on serving customers;**
- integration of processes; and**
- partners building and maintaining long-term relationships.**

The consequences of integrating processes and implementing supply chain management are lower costs, improved customers value and satisfaction and achievement of competitive advantage (*Mentzer, et al., 2001, p4*).

2.5. PALM OIL INDUSTRY SUPPLY CHAIN MANAGEMENT

The palm oil industry supply chain is made up of interrelated sectors that produce various palm products for their end-users and the sectors enjoy a long-term relationship and high degree of mutual commitment. The process begins with upstream producers and is followed by downstream producers, exporters and importers, customers, government agencies, industry organizations and others until the end users:

2.5.1. Upstream producers

This process essentially involves the cultivation phase for which it requires a hot and wet tropical climate, with a temperature ranging from 24 to 32 degree Celsius (although other analysts defend 25-30 degree Celsius), a rainfall of 1500-2000 mm with a drought period of no more than 3 months, an average relative humidity of over 75% and a high light intensity with at least 1500 hours of sunshine per year.

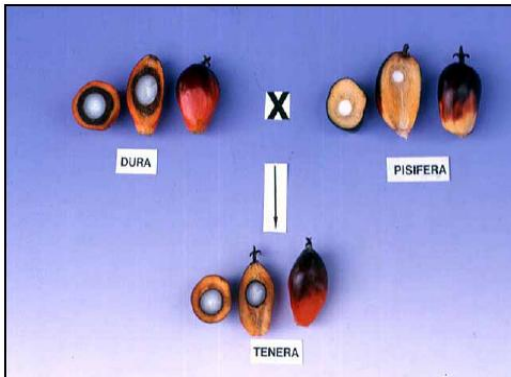


Plate 2.1: Production of *tenera*
Source: (TEOH Cheng Hai, 2002)

The quality of seed and a rigorous selection process of seedling in the nursery are very important for the palm plantation because the *Elaeis guineensis* (palm fruit) has different characteristics and pigmentation. The cultivars or

racess of *E. guineensis* can be differentiated by their fruit pigmentation and characteristics; the most common cultivars being the *Dura*, *Tenera* and *Pisifera palm* (Plate 2.1) and the last for example cannot be exploited for commercial planting because it is predominantly female sterile. It is used for crossing with the *dura palm* to produce the *tenera*. They are classified according to endocarp or shell thickness and mesocarp content.

Dura palms have 2-8mm thick endocarp and medium mesocarp content (35%-55% of fruit weight), the *tenera* race has 0.5-3mm thick endocarp and high mesocarp content of 60%-95% (Fig 2.2) and the psifera palms have no endocarp and a mesocarp of about 95% (TEOH Cheng Hai, 2002).



Plate 2.2: Cross section of FFB
Source: (TEOH Cheng Hai, 2002)

The palm tree reaches maturity in three to four years, when it is about 2 meters high. Thereafter it continues to grow by another 70 centimetres per year and can reach a height of more than 10 meters (Plate 2.3). Its life continues until it reaches the age of 20 to 25 years, with peak production between the sixth and tenth year (TEOH Cheng Hai, 2002).



Plate 2.3: Palm tree

Each palm can produce from 8 to 15 fresh fruit bunches (FFB) per year weighing about 15 to 25 kg each, depending on the planting material and age of the palm (Plate 2.4). Each FFB contains about 1000 to 1300 fruitlets; each fruitlet consists of fibrous

mesocarp layer, the endocarp (shell) which contains the kernel (Plate 2.2).



Plate 2.4 Palm plant and FFB
Source: Business Study Research Report

Present day planting materials are capable of producing 39 tons of FFB per hectare and 8.6 tons of palm oil. Actual yields from good commercial planting are about 30 tons FFB per hectare with 5.0 to 6.0 tons oil (TEOH Cheng Hai, 2002).

Harvesting commences about 24 to 30 months after field planting, depending on the soil type and agronomic and management inputs. Harvesting is done manually, using a chisel in young palms and a sickle mounted on a bamboo or aluminium pole in taller palms (Plate 2.5).



Plate 2.5Harvesting of FFB
Source: (TEOH Cheng Hai, 2002)

Various systems are adopted in field collection of FFB and transportation to the palm oil mill. With the increasing shortage of workers in some countries as well as the need to increase



Plate 2.6 Tractor mounted 'grabber'
Source: (TEOH Cheng Hai, 2002)

worker productivity, mechanized approaches have being adopted by plantations, an example being tractor-mounted 'grabber' (Plate 2.6:).

For the production of fresh fruit bunches (FFB) key sub-processes are involved in the development of plantation as shown in figure 2.1 below:

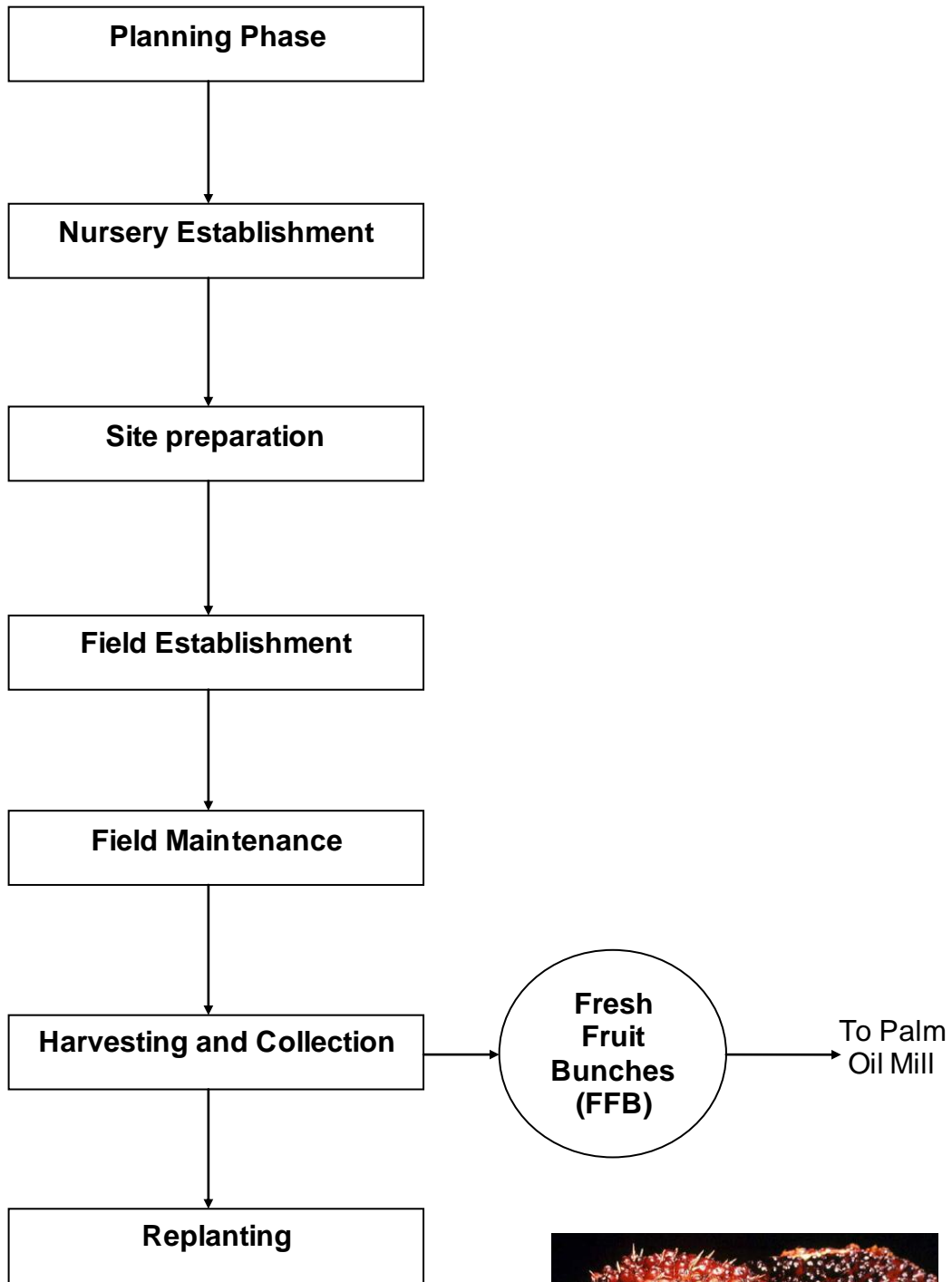


Figure 2.1: Processes in production of Fresh Fruit Bunches



Plate 2.7: Fresh Fruit Bunches (FFB)
Source: (TEOH Cheng Hai, 2002)

2.5.2 Downstream producers

After harvesting, the fresh fruit bunches must be processed as soon as possible preferably in less than 24 hours, to avoid the rapid build-up of free fat acids in the harvested fruit and on the other hand to obtain palm oil of good quality. This means that the processing mills have to be located close to the production sites, with every cluster of oil palm plantation needing its own CPO mill, to facilitate timely transportation and effective processing of the fruit. The palm fruit looks like a plum. The outer fleshy mesocarp or pulp gives the palm oil, while the kernel (which is inside a hard shell) gives palm kernel oil (Plate 2.2).

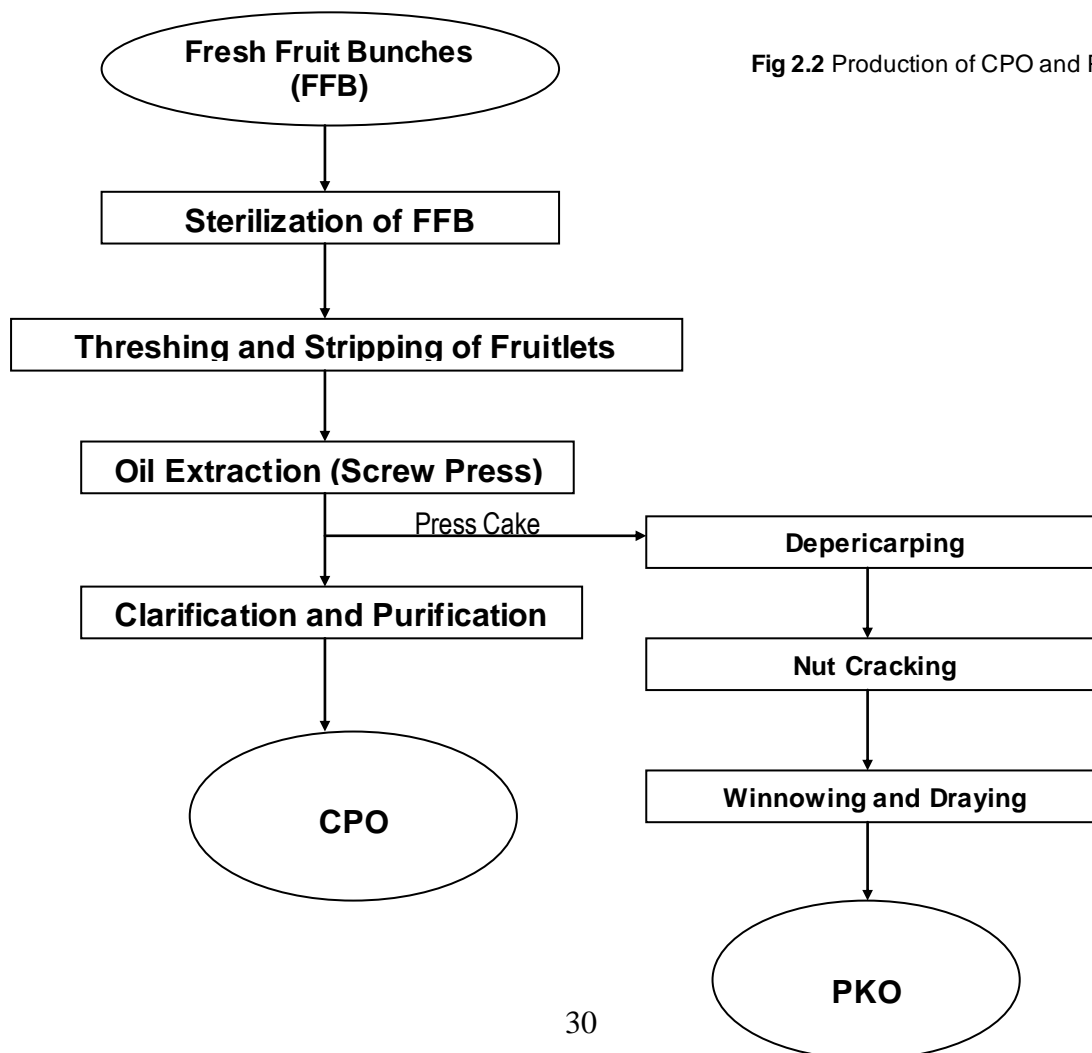


Fig 2.2 Production of CPO and PKO:

In the CPO mill, the fresh fruit bunches are sterilized, the flesh of the palm fruit mechanically separated from the kernel, and mechanically pressed to extract the CPO, a yellow-red liquid that is then clarified and purified (Another type of mill digests the fruitlets and presses to extract the CPO and then separates the nuts from the fibers).

The palm kernels are crushed in crushing plants, which can be located in either producer or consumer countries, resulting in palm kernel oil (PKO) and, palm kernel meal (PKM), a by-product which is used as an animal feed. A large fraction of the fibres and much of the shells are utilized as fuel to generate process steam and electricity in the palm processing mill itself. The fibre are also used as a fertilizer in the palm oil plantation (Orathai Chavalparit, 2005)

Palm oil and palm kernel oil have a wide range of applications. About 80% are used for food application while the rest is feedstock for a number of non-food applications (TEOH Cheng Hai, 2002), (fig 2.3).

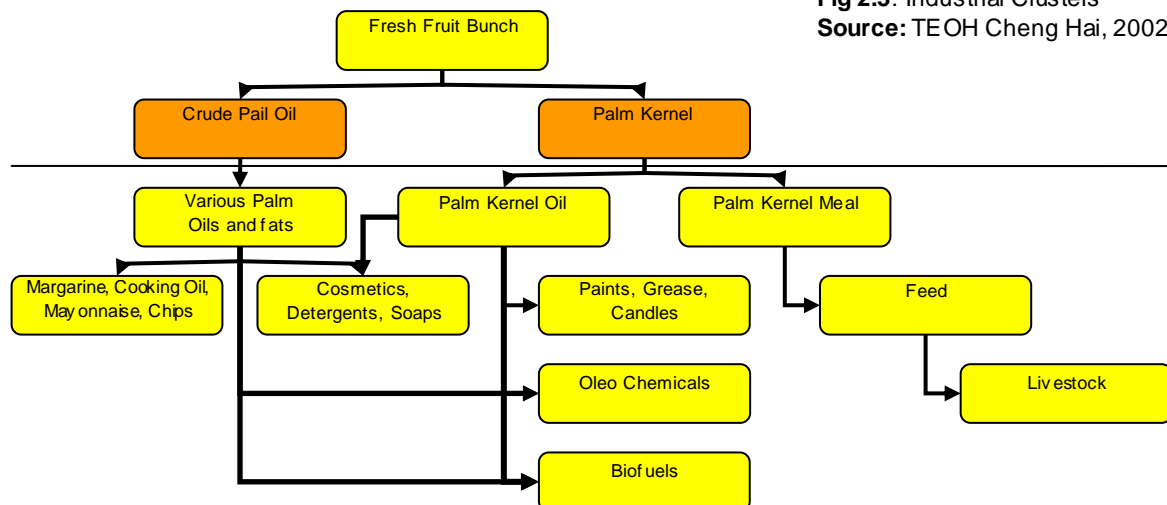


Fig 2.3: Industrial Clusters
Source: TEOH Cheng Hai, 2002

Palm oil is used in the production of a variety of edible oils particularly margarines and fats and also in cakes, biscuits, soups, sauces, in condensed milk, powdered milk, non lacteous cream used in coffee and ice-cream (Plate 2.8). Palm oil is also considered one of the best oils for frying.



The palm kernel meal, a by-product of palm oil, is used in the production of animal feed and as a supplement in animal nutrition.

The palm kernel oil, even though it comes from the same fruit, is very different from the oil obtained from the rest of the fruit. It is semi-solid or solid at room temperatures and when eaten it produces a soft sensation in the mouth, similar to cocoa butter. This makes palm kernel oil popular among chocolate lovers (Fedapalma, 2009). It is also used as a substitute for cocoa and fats found in milk, in cream made from sugar, biscuits, cakes and margarines and is found in ingredients used when baking cakes, croissants and bread, giving the products added volume, a soft texture and making them last longer.

Plate 2.8 products based on palm oil
Source Fedapalma, 2007

Palm oil is also used on non-edible products such as soaps and detergents, candles, cosmetics, grease lubricants, drilling mud

for the petroleum industry, in plastics, in printing inks, biodiesel, steel cold rolling processes, tinsplate rolling, lubrication acids and others. Its trunks can be used to make furniture.

2.53 Export and import

In general, plantation companies involved in downstream production and manufacturing companies of palm-based products are also exporters of palm oil products in various forms. In Malaysia for example due to the taxation regulation, there were low volumes of export of crude palm oil until the last few years when the Malaysia government has allowed selected companies to export certain quantities of crude palm oil without any export duty. Indonesia had a different history. Initially the taxation structure discouraged the local processing encouraging the export of CPO but in recent years, about 1998, it banned the export of CPO for some years and then established a high CPO export tax in an attempt to stimulate products based on palm oil and get equilibrium between production and export.

2.5.4 Customers

Traditionally customers are seen as the end users of palm oil, be they institutional buyers or retail purchases. The purchasing policies and decisions are based largely on price, quality and delivery with minimal considerations given to environmental aspects. With growing awareness on the need to source raw materials and products that have been produced in a sustainable

manner, it is envisaged that the institutional buyer may incorporate environmental conditions into their purchasing policies.

Investors and funds managers can exert significant influence on the supply chain through their shareholding in plantation companies, even if they are not involved in the physical product. Institutional investors are usually the substantial shareholders in the plantation companies (TEOH Cheng Hai, 2002).

2.5.5 Government agencies

In general Government plays a major role introducing diversifying policies and promoting the palm plantation and industry through the creation of instruments with a specific mandate to develop better conditions for industry. In Malaysia one of those instruments is FELDA (Federal Land Development Authority) with a mandate for developing plantation land for the rural poor and the landless. The Colombian experience is quite similar as the Government created the National Federation of Oil Palm Growers (FEDAPALM) for the creation of optimum conditions for the development of agro-industry on a national scale, competitiveness, commercialization and exploration of new frontiers. Although Indonesia did not develop a similar authority, it established a scheme called “Nucleus Estate Scheme” to help farmers grow palm, providing assistance and financing.

The government also has the responsibility of research, regulatory rules on environment and other regulation related to the activity on both upstream and downstream production.

2.5.6 Industry organizations

The diverse interests of upstream and downstream producers of palm oil and palm-based products and their derivatives are usually formally represented by a number of industry organizations. In Malaysia for example, there are a number of organizations representing interests of several sectors: On the Upstream production, the Plantations are represented by the Malaysian Palm Oil Association (MPOA), an integrated organization representing the industry in several government and statutory bodies and with a voice in international organizations on oil and fats; Planters are represented by The Incorporated Society of Planters-ISP responsible for the organization of workshops, seminars, training courses and conferences on various aspects of palm oil research;

On the Processors and Downstream producers there are the Independent palm oil millers represented by Palm Oil Millers Association of Malaysia-POMA, fighting for independent palm oil mills and mediating the disputes among members or between them and suppliers of FFB; The Palm oil refiners are represented by Palm Oil Refiners Association of Malaysia-PORAM, looking after the interests of members involved in the palm oil refining and processing industry; Edible oil manufactures are represented

by the Malaysian Edible Oil Manufactures' Assn-MEOMA, responsible for palm oil refining, and the production and packaging of oil for the retail consumer; and oleochemical manufacturers represented by Malaysian Oleochemical Manufacturers Group-MOMG, involved in production of basic oleochemical manufacture. Joint-venture companies and Palm oil promotion are represented by the Malaysian Palm Oil Promotion Council-MPOPC with the mandate to spearhead the promotional and marketing activities of Malaysian palm oil. (TEOH Cheng Hai, 2002).

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Characterization of the Research Area

3.1.1 Background on Mozambique

Mozambique is situated on the eastern coast of southern Africa, has a land area of some 800 thousand km² and stretches 2,500km along the coast of sub-Saharan Africa (PARPA II, 2006).

36 million hectare of its land is arable, of which approximately 10% is under cultivation (FAO, 2007). Because of the country's fertile land and favourable climate, Mozambique is attractive for agriculture which employs 80% of the estimated 8.8 million labour forces (African Development Bank, 2008, 3). The remaining 20% is involved in the industrial, transport, communication and service sectors (World Bank, 2009).

Mozambique is one of the fastest growing economies in sub-Saharan Africa, with a growth of around 7% per annum since the early 1990s (World Bank, 2008). It is still among the world's



Fig: 3.1 Source: www.sadc.int

poorest countries, although the poverty rates have dropped from 69% in 1997 to 54% in 2003 (M. Schut et al., 2010). On the August 2007 U.N. Human Development Index (USAID, 2009b) it ranked 172 out of 182 countries, the lowest among the 14 Southern African Development Community (SADC). Average income levels are low, with a GDP per capita of US \$364 in 2007 (World Bank, 2008).

The population is about 22 million inhabitants with an average life expectancy of 42 years at birth (World Bank, 2008), and the malnourishment in total population was 44% between 2002 and 2004 (FAO, 2008a, 17). The Human Development Index for 2007 indicated adult literacy rates of 44% for population of 15 years and above (UNDP, 2009). 35% of population is highly vulnerable to food insecurity.

Mozambique has benefited from political stability, following the end of civil war in 1994. This allowed the Mozambican government to focus attention on measures to promote macroeconomic stability, achieve rapid economic growth and alleviate widespread poverty. As a developing country, Mozambique faces similar problems for economic and entrepreneurial growth as other countries in Africa, characterized by limited infrastructure resources.

The uneven opportunities promoted by the colonial systems and other forms of segregation have limited the creation of local entrepreneurs. The 16 years national armed conflict, uprooted social networks and destroyed most of Mozambique's commercial and transport infrastructure, educational and health system. This has resulted in weak business culture. In Mozambique the growth of local entrepreneurs was furthermore restricted after independence in 1975, since the political system was based on a centrally planned economy. Since 1994 Mozambique has seen an economic transformation process introducing a market economy.

The availability of low cost labour and cheap sources of energy (hydro-electricity, solar energy and natural gas), the safety and legal protection of business development and investments, and the provision of numerous tax incentives have made Mozambique an attractive venue for investment. The government, aided by private investment, has also redirected expenditure towards improving infrastructure: telecommunications facilities, roadways and port facilities.

3.1.2 Agriculture and oleaginous context

About 80% of the Mozambican population lives in the rural areas and practice agriculture as the basic source of income, using low level of technology. In fact the majority of those populations are

still using hoe and in a minor scale ploughs pulled by animals. The level of the utilization of animal traction is very low and only about 5% of farmers uses improved seeds and fertilizers. In spite of the efforts the country is still a long way from reaching satisfactory levels.

In the oleaginous context, the oil actually consumed in Mozambique comes almost totally from the external market, although there is a small internal production. In the past, huge companies were involved in the oil production of girasol, copra, cotton, coconut and other cultures. The existing deficit is about 50 thousand tons of oil and there is not a short term perspective for oleaginous production in Mozambique although there are a lot of initiatives for its production (Plano de Produção de Alimentos, 2008-2011(Food Production Plan)).

Presently the country is identifying alternatives and develops actions for the production of oleaginous particularly girasol, soya and cotton with the objective of assuring the production of raw material for the food oil industry. Studies by the Agronomy Investigation Institute of Mozambican (IIAM) on the oleaginous chain, has been developed involving the research and testing of seed varieties adapted to the zones of production, for subsequent agro-processing.

3.1.3 Climate and Palm Oil context

With a warm tropical climate, the average temperature is around 28°C and the weather along the coast is sunny and warm even in midwinter. Summer, from October to April, is rainy, humid and very hot and the high light intensity is more than 2500 hours of sunshine per year. Temperature and rainfall patterns vary greatly between the regions of the country. The regions along Mozambique's north-eastern coast are hottest and the most humid in the country, while the high-altitude regions in Nampula and Niassa provinces in the north are the coolest. Conditions along the coast can be oppressively hot and humid while inland the cooler nights relieve the heat of the day. The country's centre and northern parts receive about twice as much rainfall as the southern provinces, where severe and prolonged droughts have occurred. The rainy season runs from October to March in the south, but it starts and ends six weeks later in the north (IIAM).

Only a few samples of palm plantation were officially identified in the North of Mozambique. In 1948 during the Portuguese colonization, two Portuguese researchers (Pedro and Pedrogão) have noticed the existence of palm trees in one Mozambican province – Nampula, Larde locality. Since then no work were done until now around the research and development of this crop, according to IIAM. Some people also have informally declared

that in some parts of the country the palm plants can be found at rural level and people uses it to produce oil through rudimentary methods for their consumption.

Although it is unlikely to find together large areas in Mozambique with the ability to produce oil palm, the dates from the Mozambican National Meteorology Institute (INAM) show the existence of zones with suitable micro climate conditions to develop the oil palm crop (Fig 3.2). In the north and central provinces of Mozambique, the climate is modified by altitude suitable for palm oil production where it rains almost the whole year with an interruption of about 3 months. In some regions the water comes from the mountain and just flows and irrigates the soil by gravity (IIAM).

Nampula province - Larde locality in the north of the country is the only province where palm plant sample was officially found in Mozambique according to the IIAM. The precipitation distribution in the zone where the palm plant samples were found, vary between 1,100-1,200mm, less than the level of 1,500 mm appointed by researchers as optimal for the oil palm plantation. However, the optimal precipitation for the palm plantation, defined as more than 1,500mm can be found in other provinces as seen in the map (Fig 3.2), such as Niassa, Cabo Delgado, Zambézia, Tete and Manica.

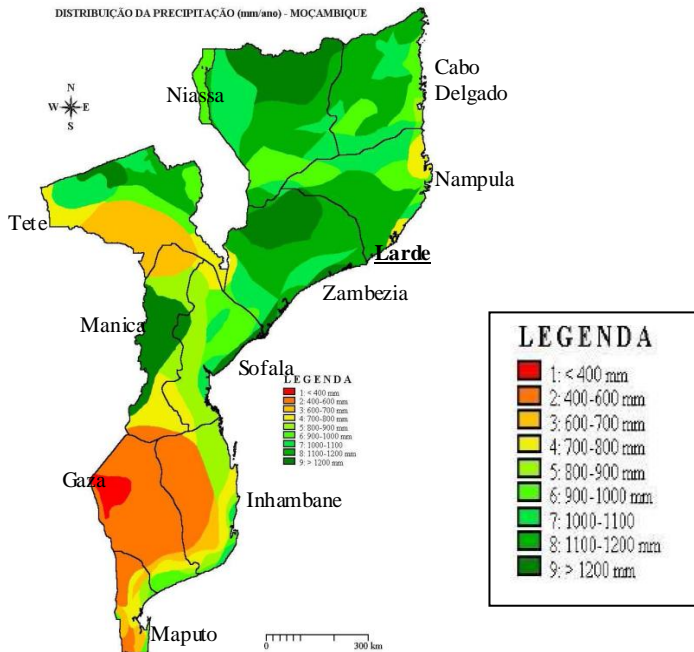


Fig 3.2: Precipitation Distribution

Source: IIAM

The humidity is more than 75% and the precipitation occurs all over the year excluding about one to three months. The potential evaporation-transpiration is less than 1,300mm.

3.2 Theoretical framework and methodology

Growing global demand for edible oils and animal protein in the last quarter of the 20th Century resulted in a huge increase in areas for oil crop cultivation, particularly of soybean and oil palm, palm oil being now the world's most produced vegetable oil (RSPO). The increase of palm oil output was mostly triggered by continued worldwide expansion of palm planted areas. This was more apparent as palm oil has been featured as an important

socio-economic crop in most producing countries. In the year 2,000 there were about 6.6 million hectares of matured palm land globally as compared with only 3.5 million hectares in 1990. This implies an annual increase of 6.6% per annum. (Palm Oil and its Global Supply and Demand Prospects). Palm oil has played a positive role in the world supply of oils and fats largely due to its techno-economic advantages and versatility as well as some of the developments in the world in relation to security of supply, health and environment.

Mozambique can be transformed into one of the promising African Countries for palm oil production, as it has a suitable climate, abundant and unexploited land and water resources. However, the production of palm oil in Mozambique will depend on the other drives that may determine how and where palm oil production could be successful.

According to the Regional Economic Planning and Finance (REPF) discipline of MSc Investment Promotion & Economic Development from Edinburgh Napier University, the differences between places plays a critical role in determining the localization of an economic activity, financial investment decisions and the nature and operation of consequent economic activities and processing. The availability or the absence of particular resources, infrastructure, pools of skilled people and

the nature of the physical environment etc. can seriously encourage or deter a firm from establishing operations in a particular area.

The Unit 5 of this discipline – Economic Development and the Regional Question, emphasizes that in addition to economic, physical, infrastructural, transport, human and historical attributes and processes, less tangible processes also have a key impact on regional development. One of the key determinants of the way in which a region develops is the nature of the ‘institutional’ structures present in the region, which shape and guide the way in which changes occur or are restricted. Those institutions can be formal or informal:

- The formal ones consist of rules, laws and organizations, which can include government bodies, private sector organizations such as Chambers of Business and market organizations, social organizations such as clubs and societies, educational system, the local knowledge base, published journals and media, ONGs and religious organizations. These organizations can guide and determine the behaviour of firms, individuals and society through laws, decrees, membership requirements and beliefs and values which they impact.**
- The informal or tacit institutions include individual habits, group routines and behaviours, social norms and values,**

embedded routines, local conventions of communications and interaction, reciprocity and trust.

The various institutions, according to the REPF discipline, provide a sense of order and stability in an economy, within the general context of economic uncertainty and limited information, by helping to restrict and guide choices, ensuring consensus and guiding individual action. Control is exerted through laws, established practice, belief, social norms and/or values.

Based on Stohr (1987), regions develop as a result of various dependent factors, as mentioned above and considering that the palm oil industry development should be an emerging sector in Mozambique, it is important to understand and analyze the variables which would dominantly drive the direction of palm oil industry development.

This dissertation analyzes the factors that may allow the establishment of cluster and supply chain management of palm oil industry in Mozambique, through the experiences of major palm oil producers and also clusters and supply chain management theories and applications. The motivation was based on the importance of palm fresh fruit bunch as a cheap source of protein in curbing malnutrition especially of children in rural areas and the high cost of animal sources of protein (meat, eggs and fish), while alternative and cheap protein sources could be obtained from palm fruit bunch. The relative low production

cost and the substantially high production results in relation to the other crops were also a great motivation. The country's high agro-ecological potential for increasing palm cultivation, the opportunity to contribute to poverty eradication and create employment as in other countries and the demand for raw palm oil by companies for processing in food and non food palm oil-based products, was also important in carrying out the study.

The dissertation shows how dynamics between institutional frameworks, agro-ecological potential and socio-economic factors need to be understood to explain the establishment of the palm oil industry in Mozambique.

To reach that objective, the dissertation is mainly based on secondary data. A Literature review was undertaken to analyze multiple types of data: Scientific reports and papers on palm oil potential, palm oil policy documents, palm oil related market documents, theories on cluster development and supply chain management and related examples, Mozambique institutional data, agro-climate, agricultural and socio-economic data.

The data were collected from electronic sources, websites, newspapers and other published and no published official documents. Verbal communication was exchanged with some local institutions representatives and with local authorities in some remote localities of Mozambique during a work visit

organized by the researcher company (CPI) for the collection of data on investment opportunities in agriculture and agri-business sector. The Mozambican investment data was also analyzed including the land law requirements for the establishment of business based on agriculture. The existing geographical mapping was analyzed to check the ability of the land to sustain the culture in Mozambique. The Mozambican on line Government Portal was used to search the information publicly available and the CPI database was also checked for information related with policy framework and local industrial clusters.

CHAPTER 4: INSTITUTIONAL FRAMEWORK

For the establishment of an environment conducive to economic development and foreign investment, the Mozambican government implemented a strong economic and structural reform after the civil war ended 16 years ago. By opening up the economy to competition, the government has been encouraging private investment in most sectors of the economy and has sought to eliminate discrimination between foreign and domestic investors as the law provides equal treatment for both.

This section identifies and discusses the principal elements of institutional environment related to agriculture production and processing in Mozambique. It emphasizes how established incentives and restrictions can influence the development of the palm oil industry.

4.1. Institutional environment

The institutional environment composed by legislation, political systems, traditions, behaviour, regulations, explicit or tacit rules, may influence the establishment of the palm oil industry in Mozambique.

In Mozambique, it is not so easy to do business because of dilatory and expensive procedures. Small and medium agro-

explorations find difficulties to get a Company Registration Certificate. According to the Mozambican Ministry of Commerce and Industry, 361 days are necessary to get a license, two times more than in South Africa (Júlio António, 2009). An institutional environment with too much regulation does not encourage the realization of business particularly by small producers. Mozambique is still using a large number of administrative and normative actions for agro- business. The table 4.1 below shows the rules that regulate the business sector in Mozambique, which are considered the cause for many small businesses choose to work in the informal sector:

Norms and Regulations
Investment Law 3/93 of 24th June, Regulation of Investment Law 43/2009 of 21 August, Code of Fiscal Benefit 4/2009 of 12th January
Land Law Legislation 19/97 of 1 October
Regulation on Environmental Impact Assessment – Decree 45/2004 and Environment Law 20/97
Regulations of Production, Commercialization, Quality Control and Seed Certification – Ministerial Diploma 184/2001
Regulation for Licensing Commercial Activity – Decree 49/2004 of 17 November
Commercial Code – Decree-law 2/2005 of 27 December
Regulation for Commerce and Industry Inspection
Regulation for Phytosanitary Inspection and Vegetal Quarantine – Ministerial Diploma 134/92

Regulation for Healthy-Sanitary on Production, Transport, Commercialization, Inspection, and Food Fiscalization – Decree 15/2006 of 25 June
Regulation for Registration of Legal Entities – Decree-law 1/2006 of 3 May
International Agreements
Sanitary and Phytosanitary Agreement – n.º 31/94 of 20 September
Code of International Conduct – Codex Alimentarius
SADC Protocol – Resolution 44/99 of 28 December
Development Strategies and Policies
Green Revolution Strategy in Mozambique (2008)
Rural Development Strategy (EDR) (2008)
Commercial Policy and Strategy
Mozambican Strategy for the SADC Regional Integration Process
Taxation
Licensing of Commercial Agents in Rural Zones – Decree 29/2004
Code of Corporate Income Tax (IRPC) – Decree 21/2002 of 30 June
Code of Personal Income Tax (IRPS) – Decree 20/2002 of 30 June
Code of Value Added Tax (IVA) – Decree 51/98 of 29 September
Code of Autarkical Tax – Decree 52/2000 of 21 December
Annual Tax Related to the DUAT – Decree 77/99 of 5 October
Fiscal Regime Incentives on GPZ (Zambeze Valley Cabinet) context – Decree 16/98 of 16 April
Simplified Taxation for Small Contributors – Law 5/2009 of 12 January

Table 4.1: Laws, Regulations and International Agreements

Source: (Júlio António, 2009)

4.2. Land Law

The Mozambican Republic Constitution says that all natural resources in Mozambique, including land, belong to the state. Land acquisition procedures are governed by the Land Law (Law n.º 19/97 of 1 October 1997) and its regulation (Decree n.º 66/98 of 8 December 1998). One can apply for and get a 50-year renewable lease in the form of “Direito de Uso e Aproveitamento de Terras (DUAT)”, meaning land title. Article 3 of the Land Law states that: “Land is the property of State and cannot be sold or otherwise alienated, mortgaged or encumbered”, and establishes three means of acquiring land:

- 1. Through existing occupation established by customary norms and practices (Land Law Article 12 and Regulation of the Land Law Article 9). This includes used and unused (fallow and common) lands that a rural household needs to have access to and control over for a certain period of time.;**
- 2. Through existing occupation ‘in good faith’ (Land Law Article 12 and Regulation of the Land Law Article 10) when people have occupied the land for at least ten years without challenge, which aims to protect the rights of displaced persons that settled in lands (during the civil war) that were formerly owned by colonial powers; and**
- 3. Through a formal request to the State (Land Law Article 12 and Regulation of the Land Law Article 11).**

Article 13 of the Land Law and article 27 of the Regulation of the Land Law state that formal requests to the State must be accompanied by a community consultation, which seeks to ensure that community rights are taken into account and provides an opportunity for community to negotiate some element of compensation or benefit with investors. Land Law Article 11 and Regulation of the Land Law Article 18 require that foreigners have an approved investment project in order to apply for DUAT.

According to Regulation of the Land Law Article 24 (2) and Article 26 (1), Land requests submitted to the government are evaluated initially by relevant government departments that oversee the activity at provincial level. For an area greater than 1,000 ha, the evaluation is done by the relevant government departments at national level (no longer at the Provincial level), and requests have to be authorized by the Minister of Agriculture ((Regulation of the Land Law Article 26 (3)). If the project requires more than 10,000 ha or an investment amount greater than US\$100 million, it has to be submitted to the Economic Council (comprised by the key Ministries involved in the social and economic sector) and to the Council of Ministers (Land Law Article 22 (3)) for approval. Provisional DUATs are issued for two years to foreigners and five years for nationals, after which

definitive DUATs are allocated, subject to review by the government once production plans have been fulfilled

4.3. Investment Law

The basic legal framework for investment in Mozambique is established by Law n.º 3/93, the Investment Law of 1993. The regulation, approved by Decree n.º 43/2009, defines the procedures for project evaluation. The Government's Investment Promotion Centre (CPI) is the entity responsible for the implementation of the Investment legislation. All investment proposals have to be signed off by the Minister for Planning and Development, which oversees CPI.

The investments carried out under the scope of the Investment Law are entitled to fiscal benefits defined in the Code of Fiscal Benefits (Law n.º 4/2009 of 12 January, 2009). This Code is part of the Investment Law and establishes measures that exempt or reduce the amount of tax to be paid in order to benefit activities that have recognized public interest as well as to encourage the economic development of Mozambique. For investors located in less-developed provinces, two location specific incentives are granted:

- Investment tax credits for five years are provided, equal to 5% of total realized investment in Maputo City and 10% for other provinces. A greater distinction is made in relation to the**

designated “rapid development zones”, which benefit for a period of five years from an investment tax credit equivalent to 20% of the total investment realized. The rapid development zones are geographical areas which have “great natural resource potential but which are lacking in infrastructure and have a weak level of economic activity” (Code of fiscal Benefits). Those zones include the Zambeze valley zone (which covers all districts in Tete province, most of the districts in Zambézia, Manica and Sofala provinces), Niassa province, Nacala district in Nampula Province and, Mozambique and IBO Island. (Code of fiscal benefits)

- **Deduction of expenditure on infrastructure undertaken by the investor, equal to 110% of expenditure for projects located in Maputo City (the capital of the country) and 120% of expenditure for projects in other provinces. No additional benefit is granted for the rapid development zones.**

Regarding the cluster concept, Mozambique does not use and diffuse it widely. However, the Code of Fiscal Benefits establishes especial incentives for megaprojects, a generic terminology used for Industrial zones/park, Large Dimension Projects and Special Economic Zones. One that represents a special category of industrial zone and the country is intensifying its promotion in the last 10 years is the export processing zones. The Large Dimension Projects are those that exceed an

investment of US \$500 million, as well as investments in the public domain infrastructure carried out under concession regime. Concerning the Special Economic Zones, the government approved the creation of Nacala Especial Economic Zone in Nampula province, with the objective of promoting the quick economic development of the country particularly in the sectors of agro-industry, industry, commerce, tourism, and services and stimulate the promotion of national and foreign investment flow as well as improve the country balance of payment.

The only existing industrial park in Mozambique is the “Beluluane Industrial Park” approved by the government in 1997 and located in Maputo, capital city of the country. It surrounds an export possessing company producing aluminium that benefits from special incentives (duty free import of material, equipments and intermediate goods, duty free export, tax reduction) considering that 70% of the total production is exported. This industrial park offers a good quality public infrastructure, water, electricity, telecommunications and other facilities to investors established there. It provides factories for rent and land for investors to build their own facilities and is operated by a public private partnership. Actually it carries out specialized service companies and suppliers that basically serve the export processing Aluminium Company located there. One of the objective of the establishment and development of the first industrial park by the

government was to use it as model to replicate in other parts of the country and function as a pivot in the region where it is established, generating a spillover effect by improving FDI (Foreign Direct Investment), job creation, introducing new skills and technology, stimulating competition, the introduction of new technology and new infrastructure development.

Although the cluster concept is not widely used and defused in Mozambique, most of the megaprojects in fact foster the creation of clusters as they allow the geographical concentration of companies benefiting from all the agglomeration effects. The presence of these projects generally attracts certain infrastructure, labour and specialized services and a number of related socio-economic effects.

4.4. Land Law and Investment Law Linkage

The process of evaluation of requests for land title, and the linked evaluation of investment proposals changed substantially in the last 5 years. Those processes used to be separated with the land title process concentrated mainly on the administrative steps under the Land Law and its Regulation, while investment proposals were evaluated by CPI.

Recently, because of the increase in expressions of interest for large extensions of land, the government made the following changes on the review and analyzes procedures:

- **Strengthened the link between the processes for awarding land titles and approving investment proposals. From 2007 Investment and land-requests are submitted together to the Council of Ministers, with the two processes being launched simultaneously, instead of the approval of investment project by the Council of Ministers, independently of the land process (Circular No. 009/DNTF/07 of 16 October 2007). Additionally, the provincial governor submits an evaluation of both the land request and investment project.**
- **Through the Resolution 70/2008 from 2008, the Council of Ministers approved the introduction of Investment Guidelines applied to large-scale projects requiring more than 10,000 ha of land. This guideline establishes the type of information required for the presentation of project proposals to the government through the CPI and land department. It also represents the legal basis for the evaluation of large scale agrarian projects.**

4.5. Seed production, commercialization, quality control and certification

The related regulation is implemented by Ministry of Agriculture and establishes norms for the production, commercialization and quality control, importation certification, transit and exportation of seed.

In particular the regulation establish that the introduction of new types of cultures is submitted to the Ministry of Agriculture under the National Committee for seeds; the producers and processors of seed must be registered; the field of seed reproduction must be registered; norms of quality control and certification must be observed; sampling, sealing and labelling of lots of seeds and related importation must be accompanied by *Field Inspection Certificate, Orange International Seed Lot Certificate* and additional declaration saying that the seed is not genetically modified (Júlio António, 2009).

The regulation ensures to the owner of new type of seed the protection rights for the reproduction of material or commercial multiplication in the national territory. If the type of seed that a producer wants to reproduce is not in the official list of the registered variety, the request must be made to the local Provincial Direction of Agriculture for its inclusion in the list. Then, the propagation of seed variety through sale or commercialization needs the authorization of the owner of the protection rights (Júlio António, 2009).

The registration of property rights must be requested to the National Direction of Seeds and Vegetal Sanity at the Ministry of Agriculture which is responsible for the inspection. This process can take from a few weeks to some years depending on the availability of such a variety in neighbouring countries. The importer must request an importation license from the Ministry of

Industry and Commerce, annually renewable, in a process that may take 8 weeks (Júlio António, 2009).

4.6. International Agreements

Mozambique is a signatory to several trade agreements that establish the terms and conditions for access of Mozambique's potential.

One of the instruments that guide the regional integrated process in Mozambique is the Commercial Protocol of SADC, signed in August 1996 by 12 countries (Botswana, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia, Tanzania and Zimbabwe) out of the 14 State Members. This protocol came into force on 25 January, 2000 and is being implemented since January, 2001 with the objective of creating the Zone of Free Commerce (SADC). The implementation of SADC protocol involves: i) the free circulation of goods, services and production factors between the countries by the promotion of duty free and no tariff restriction and any other equivalent measure to the circulation of goods; ii) the establishment of a common external tariff and the adoption of commercial policy common to third parts (States or groups of States), as well as the coordination of positions in regional and international economic-commercial forums; iii) the coordination of sectorial and macroeconomic policies between State Members – of external commerce, agricultural, industrial, fiscal, monetary,

cambial and capitals, services, customs, transport and communication and others- with the objective of assuring adequate conditions of competition between States-Members; and iv) the compromise of State-Members of harmonization of their legislation in relevant areas (SADC).

The other example is the Cotonou Agreement, the most comprehensive partnership agreement between developing countries and the European Union (EU). Since 2000, it has been the framework for EU's relations with 79 countries from Africa, the Caribbean and the Pacific (ACP). The partnership is centred on the objective of reducing and eventually eradicating poverty consistent with the objectives of sustainable development and the gradual integration of the ACP countries into the world economy (Art. 1 of Cotonou Agreement)

4.7. Agro-climate Potential for agriculture and oil palm

Mozambique has unexploited natural resources, favourable agricultural conditions and abundant labour that gives it enormous economic potential for overcoming the present state of underdevelopment (*M. Schut et al., 2010*). The most recent exercise that summarizes Mozambique's agro-ecological potential on a national scale is the agro-ecological zoning carried out between October 2007 and May 2008, coordinated by an inter-ministerial working group. The National Institute of Agrarian

Research (IIAM) identified the agro-climate suitability of different areas, and the National Directorate for Land and Forest (DNTF) assessed land availability. The zoning was carried out at a scale of 1:1,000,000, capturing areas of more than 1,000 ha. Sustaining this exercise there are a number of existing studies, including a national forestry inventory, soil and climate data and maps of agro-climate sustainability for different crops. Land availability was determined by excluding existing DUATs (community or private), mining areas, projects submitted for approval, and projects “in the pipeline”.

From the 36 million hectares of arable land, the land zoning exercise identified only 7 million ha being available for large scale agricultural, forest and livestock activities (IIAM and DNTF, 2008). The table 4.2 shows the distribution of land available per province.

While the land zoning exercise provides an important basis for guiding government in its land allocation decisions, several concerns exist in relation to its reliability and usefulness, as the current scale is too large to allow for more than a broad overview of land availability. The accuracy of the land availability data has been called into question. A random locality in Mozambique identified as available based on 1 km² satellite databases turned out to be extensively utilized and inhabited when viewed at the finer resolution provided by Google Earth (*M. Schut et al., 2010*). A

more accurate land zoning exercise is currently being carried out on a scale of 1:250,000.

Province	Total available land (ha)	% of total available land
Zambézia	1,365,300	19.6
Niassa	1,220,400	17.5
Inhambane	1,071,660	15.4
Gaza	866,780	12.4
Nampula	709,160	10.2
Tete	661,730	9.5
Sofala	408,650	5.9
Manica	381,950	5.5
Cabo Delgado	269400	3.9
Maputo	11,000	0.2
<u>Total</u>	<u>6,966,030</u>	<u>100.0</u>

Table 4.2: Available land per province according to agro-ecological zoning exercise

Source: (IIAM and DNTF, 2008)

4.8. Socio-economic factors

This section focuses on the availability and quality of the labour force, and access to infrastructure and services and describes

the socio-economic factors that may influence the palm oil industry development in Mozambique.

The population density per province is an indicator of potential labour force. Mozambique has an average population density of 20.1 people per km² (*M. Schut et al., 2010*). In 2000, population rates per km² were highest for the Mozambican provinces of Nampula, Maputo and Zambézia. The lowest population density was found in Niassa and Tete provinces (Table 4.3).

Quality of labour can be expressed in literacy rates, Net Enrolment Rates (NER) and achievement levels of formal education. According to the Mozambique Household Survey 2002-2003, adult literacy rates are around 50%. There is evidence of large differences in literacy rates between rural households (27%) and urban households (66%). Manica, Maputo province and Maputo City achieved much higher literacy levels than the national average while in most other provinces, adult literacy rates were below the average, with Cabo Delgado and Nampula at the lower end. In rural areas, an average 80.7% of adult residents did not have any formal education (*M. Schut et al., 2010*). In Nampula, Zambézia, Cabo Delgado and Tete between 70% and 82% of the population had no formal education, and between 10% and 20% had only achieved primary education. Looking at current school enrolment figures (NER) 80% of children between 6 and 18 years of age are enrolled at school. The difference between

provinces is noticeable, with Maputo, Maputo city, Gaza, Inhambane and Manica amongst the highest, and Nampula, Tete, Sofala, Cabo Delgado, Niassa and Zambézia at the lower end (Table 4.3)

Province	Population density/km²	Literacy rates (%)	NER (%)
Maputo city	Not included	77	93
Nampula	37.8	32	69
Maputo	35.6	67	94
Zambézia	28.1	40	77
Sofala	19.1	47	71
Cabo Delgado	16.4	28	72
Inhambane	16.4	52	86
Manica	15.6	60	84
Gaza	14.0	53	90
Tete	11.3	45	70
Niassa	6.2	49	74
<u>Average</u>	<u>20.1</u>	<u>50</u>	<u>80</u>

Table 4.3: Population density, literacy rates and Net Enrolment Rates (NER) per province

Source: Coughlin, 2006, 6; Castanheira Bilale, 2007, 77

Most of Mozambique's social and physical infrastructures were destroyed and uprooted by armed conflicts. Cooperatives and unions were systematically destroyed and service provision, such as access to agricultural inputs and extension, disappeared. Access remains poor and patchy between provinces, despite the sustained recovery since peace was reached in 1994 and efforts to improve infrastructure and distribution networks. In 2002, the highest level of communities with access to improved seeds, fertilizers and pesticides were found in Manica, Sofala and Inhambane provinces, while Tete was the lowest. Access to extension services was low in every province with an average of 1.3 extension workers per 10,000 inhabitants (*M. Schut et al., 2010*).

The density of the road network is the lowest in southern Africa, at only 32 kilometres per km², despite recent investments in roads (*M. Schut et al., 2010*). “Under the Portuguese colonial government, roads and railways were mainly laid to facilitate the exportation of agricultural produce from Malawi, Zambia and Zimbabwe”. The deep-sea ports of Maputo, Beira and Nacala are still used by Mozambique's neighbouring countries to export and import a substantial part of their commodities. These ports have storage facilities and are well accessible by road. Poor north-south infrastructure makes transport by road inside the country

more costly than exporting from the nearest port (*M. Schut et al., 2010*).

Effort to provide electricity is mainly concentrated around urban centres, development corridors and along the coast. There are plans for the building of a 1,000 km north-south power line, linking hydro-electric, coal and gas power station in central and northern Mozambique with the main consuming areas in the south (*M. Schut et al., 2010*)

CHAPTER 5: ANALYSIS OF FINDINGS

5.1. Oil palm varieties and yield

It was found that officially there are no varieties of palm plants in Mozambique. Although it is likely to find some palm plant in some provinces of the country, the research showed that only a few plants were officially found by two Portuguese researchers (Pedro and Pedrogão) in Larde, a district of Nampula Province. No additional research was done by the government since then. Although, it was found that the palm oil fruit (*Elaeis guineensis*), has different characteristics and pigmentation the most common being the *Dura*, *Tenera* and *Pisifera palm*. In the event that the Mozambican government decides to initiate plantation, the fruit must be subject to a rigorous selection process as it might be mixed with other varieties. Under ideal conditions the palm has different yields. The study found that present days planting materials are capable of producing 39 tons of FFB per ha and 8.6 tons of palm oil. In Malaysia for example, the average of FFB yield in 2001 was 19.14 tons while palm oil productivity was 3.66 tons per ha. The reasons for comparatively low yields were reported to be poor production and management techniques by some farmers.

5.2. Adaptability and effect of day length for oil palm plant in Mozambique

As literature has documented, the palm plant is adapted to specific ecological conditions: Hot and wet tropical climate, temperature ranging from 24 to 32 degree Celsius, rainfall of 1,500-2,000 mm with drought period no longer than 3 months and at least 1,500 hours of sunshine per year. The study showed that Mozambique has suitable agro-climate conditions for palm cultivation in some provinces in areas with the proper micro-climate. Mozambique has no problems with sunshine. The country is closer to the equator, where the difference between the longest and the shortest day (day and night hours) is not very significant and so the day duration will not affect the palm plantation.

5.3. Land availability

According to our research, Mozambique has about 36 million hectares of arable land and, the zoning exercise identified only 7 million ha being available for large scale agricultural, forest and livestock activities. According to our study approximately 10% of the 36 million ha is under cultivation and there are still available for use about 3.4 million ha. The study also found that in Mozambique according to the law the land is the property of

the State and cannot be sold or otherwise alienated, mortgaged or encumbered. In the case of investments, the investors must submit a formal request to the State accompanied by a community consultation that seeks to ensure that community rights were taken into account and provides an opportunity for the community to negotiate some compensation elements or benefits. This law is in accordance with the principle number 6 of the RSPO that states that companies must use transparent and open methods when negotiating about compensation for land usage, to enable communities to express their views and opinions. The law also protects indigenous people from expropriation of their land considering that, as shown by the study in Colombia, Afro-Colombian indigenous and peasant communities were removed to expand oil palm.

5.4. Seed production

During the study it was found that the quality of seed and rigorous selection process of seedling in the nursery are very important for the cultivation of palm plantation, because one of the common cultivars, *Pisifera palm*, cannot be exploited as commercial planting because it is predominantly female sterile but is used to cross with the *dura palm* to produce the *tenera*. The study also referred that the Mozambican government established norms for the production, commercialization and

control of quality, certification of importation, transit and exportation of seed.

The IIAM is responsible for seed testing in the field and for evaluating culture behaviour in the selected agro-ecology conditions and also for sharing research experiences with other countries and realize essays in the field.

5.5. Palm oil plantation strategy

For many palm producers' countries, the palm plant was not part of their culture from the beginning. The study showed that in South East Asia, the palm plant was introduced during the 18th Century and was used as an ornamental plant. The first commercial palm plantations were founded in early 1900 in Sumatra, Indonesia and later in Malaysia from at about 1914 and were expanded in 1955. From then some countries identified specific strategies for the development of palm plantation and industry and Malaysia for example is one of the countries that established a strategy for the development of the palm oil industry. With the development of genetic materials and a huge surge in global demand for edible fats by the end of the 1950's, Malaysia decided to develop the palm oil industry as a strategy for the country's economic development adopting a favourable policy for production and export, resulting in more developed and

complete supply chain management and production of palm oil derivatives.

Considering the actual high development and the huge experience of some producing countries, Mozambique should adopt a strategy that takes advantage of learning from them starting from the seeding acquisition and testing to the palm oil production. For example, the Mozambican government published recently, in May 2009, a national biofuels policy and strategy (Resolution 22/2009), partly based on a study of the technical, economic, social and environmental feasibility of biofuel production in Mozambique (*M. Schut et al., 2010*). The Resolution aims to contribute to the energy security and sustainable socio-economic development by exploring agro-energetic resources through stimulation of the diversification of the energy matrix, thus contributing to the well-being of the population and promoting socio-economic development, particularly in rural areas (Government of Mozambique, 2005, 15). The policy and strategy describes several measures intended to promote biofuel production while limiting potential negative impacts on society and the environment. The biofuel industry is expected to generate substantial macroeconomic benefits, including the reduction of oil imports and the creation of approximately 150,000 direct and indirect jobs (Government of Mozambique, 2009, 17-18).

Based on this Mozambique should develop the tools for the establishment of a suitable strategy for the development of the palm oil industry, taking into account that the world's production of palm oil had doubled in last years and will continue to play a positive role in global supply chain and market of the palm oil industry.

5.6. Palm oil industrial cluster and supply chain management

As mentioned in the study, the palm oil supply chain meets most of the requirements to be considered an industrial cluster and it extends from the selection of seed until the delivery of the final product allowing for shared capital and risks in the early stages as well as in later stages. Although Mozambique has not yet used widely the cluster terminology, it already has experience of the development of clusters through industrial and export processing zones. On the agriculture and forest sector, the big projects usually request to be located in the Special Economic Zones approved by the government (Decree 76/2007) to benefit from the incentives of this regime or also apply for free zone status for the processing. Mozambique in fact has the conditions for the establishment of a cluster in the palm oil industry.

5.7. Socio-economic factors

As literature has documented, the palm plantation usually requires an increasing extent of land. The example of Malaysia showed an increase from 2 million hectares in 1990 to 4 million in 2005 and that millions of people are dependent on palm oil (RSPO Secretariat, February 2010). The research also showed that the palm FFB harvest is usually done manually using a chisel in young palms and a sickle mounted on a bamboo or aluminium pole in taller palms, and that some companies have been adopting mechanized approaches in plantations, such as the tractor-mounted "grabbers". In Mozambique, 80% of the estimated 8.8 million labour force is employed in the agriculture sector, where the level of literacy is low compared with people in other sectors of activity like industry, commerce and service. In some countries, to help people in agriculture, the government created agencies with the mandate to develop plantation land for the rural poor and landless. The literature documents the cases of FELDA in Malaysia, FEDAPALM in Colombia and Nucleus Estate Scheme from Indonesia. The initiative to create associations of the upstream and downstream producers of palm oil, for a formal representation of producer's interests could be the way to protect the local households from poor conditions.

5.8. Sustainability

The conditions for the establishment of palm oil industry projects in a sustainable manner have been established. According to the literature, the RSPO, a non-profit organization was created to respond to concerns related with legal and economical feasibility issues, environmental, social and operational sustainability problems. The RSPO operates through principles and criteria that must be fulfilled by palm growers, oil processors, food companies, retailers, NGOs and investors in order to certify that the palm oil product was produced according to sustainable production criteria. Mozambique is in a position to avoid situations experienced by the first producing countries, such as Indonesia for example where environmental and socially sustainable requirements and actions to address climate changes, like avoiding to plant on *peatland* and burning of forests were not entirely observed. Today non-profit organizations and even the World Bank are aware of the environmental and social concerns associated with the palm oil sector in Indonesia and are making efforts to promote sustainable practices in the sector to preserve biodiversity and benefit the poor population.

5.9. Advantages

According to the literature, one single palm oil plant can produce from 8 to 15 FFB per year and present day planting materials are capable of



Plate 5.1: Palm Plant bunches
Source: RSPO Secretariat, www.rspo.org, February 2010

producing 39 tons of FFB per ha and 8.6 tons of palm oil, giving to the palm oil industry production a large advantage over all other edible oils produced in the world.

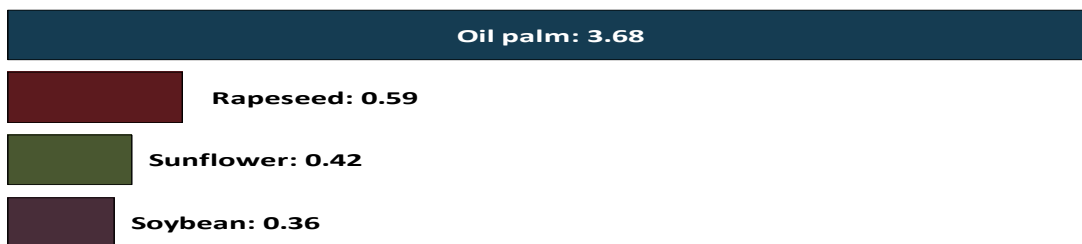


Fig 5.1 : Average yield per year in Malaysia (tonnes of oil per hectare)
Source: RSPO Secretariat, www.rspo.org, February 2010

Mozambique is now busy implementing its agricultural strategy to increase soya production, introduced by the 2008-2009 campaign under a national pilot program. The processing sector is still weak and the companies responsible for production of poultry feeds are few. A formal source from a district direction of agriculture declared that in the past soya beans were mainly grown for export markets but now the trade is not well organized and small amounts of production go to neighbouring countries

informally, with producers selling their production by themselves. Although soya production has a guaranteed market in Brazil, China, EUA and other countries, the palm oil industry market has been more attractive because of the versatility of its products that brought impressive growth in production and export in a few years. Even for the production of animal feed, compared to soya oil, palm oil has a higher amount of saturated fats that makes it more stable and less prone to oxidation at high temperatures. On the other hand, while soya plantation must be done every year, the palm oil is planted once in about 25 years, allowing a cost reduction in developing its industry which could bring comparative advantages for Mozambique when considering production of other edible oils.

5.10. Challenges for palm plant research in Mozambique

The principal challenge is the limited knowledge in relation to this crop and the cost for its research. According to the IIAM, the main reason why this institution doesn't follow the research of the identified palm plants by the Portuguese researcher is lack of means to go to the field. In fact according to a verbal communication with technicians from IIAM, the macroeconomic advantages of the palm oil production are not known in the country and the allocation of financial resources to go deeper in the investigation of this culture is not seen as a priority.

CHAPTER 6: CONCLUSIONS

Findings from this study indicate that palm oil has relative advantages among the vegetable oils for use in food and non food applications and will continue to play a positive role in the global market of oils and fats. High yield and low production costs are two of the factors that make this vegetable oil economically and environmentally attractive.

It was also found that there are good conditions to introduce the palm oil industry cluster and supply chain management for the development of the livestock sector in Mozambique. This in turn will create employment, raise farmers and communities incomes, introduce new technology, and stimulate competition and new infrastructure development.

A major issue to consider when planning the palm oil industry cluster and supply chain management in Mozambique is to create awareness and knowledge among Mozambicans about the meaning and consequences of a palm oil supply chain, the utilization of palm oil as a versatile product, the importance of oil in food and feed for animals, and its utilization as a fertilizer in the palm plantations. Another issue is to encourage and attract investments to this area.

The current study provides insight regarding the benefits of concentrating supply chain participants in one location and building strong inter-firm relations. As one Mozambican objective is to replicate the model of the industrial park recently

constructed, these findings could be used to help that replication of the industrial cluster in the centre or north of the country.

A multi-ministerial/institutional approach will be needed where Ministries of Agriculture, Planning and Development, Transport and Communication, Trade and Commerce, Local Government, private sector, farmers and technical institutions will join efforts to design an integrated strategy in order to maximize the potential of this important industry. The government might formulate policies that facilitate the initiation of the palm oil cluster industry in Mozambique. In addition, a stronger focus will be necessary to improve investments on Research and Development of palm seed and its adaptation to Mozambican land and to market palm oil both within Mozambique and Overseas.

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