MASDAR

MINISTRY OF FOOD AND AGRICULTURE

MASTERPLAN STUDY ON THE OIL PALM INDUSTRY IN GHANA

FINAL REPORT

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We hope that the information in this report is useful to industry stakeholders, and that we have presented a practical and achievable strategy for the growth of the industry over the next fifteen years.

Acronyms, Abbreviations and Glossary

ADB	Agricultural Development Bank
AFD	Agence Française de Développement
AMEEN SANGARI	Ameen Sangari Industries Limited
AOPA	African Oil Palm Association
bn	Billion
BOD	Biological Oxygen demand
BOPOP	Buabin Oil palm Out-grower Project
BOPP	Benso Oil Palm Plantation Limited
C	Celsius/Centigrade
Ca	Calcium
cal	Calories
CAO	Office of the Compliance Advisor/Ombudsman
cm	Centimetre
COD	Chemical Oxygen Demand
CPO	Crude palm oil
CSIR	Council for Scientific and Industrial Research
EFB	Empty Fruit Bunches
EIA	Environmental Impact Assessment
EU	European Union
FAO	United Nations Food & Agricultural Organization
FDI	Foreign Direct Investment
FFA	Free Fatty Acid
FFB	Fresh Fruit Bunches
FMO	Netherlands Development Finance Company
g	Gram
GDP	Gross Domestic Product
GEA	Ghana Employers' Association
GIS	geographical information system
GNIWG	Ghana National Interpretation Working Group
GOG	The Government of the Republic of Ghana
GOPDA	Ghana Oil Development Association
GOPDC	Ghana Oil Palm Development Company
GSS	Ghana Statistical Service
H2O	Water
ha	Hectare
HIPC	Heavily Indebted Poor Country
hr	Hour
IFC	International Finance Corporation
ITSPM	Intermediate Technology Small Scale Palm-Oil Mills Project
Independent Smallholder	A grower who produces oil palm fruit from the land, either his own or rented land, who does not have any contract to supply any particular miller and is entitled to sell his fruit bunches to whoever he sees fit
ISSE	Independent Smallholder Services Entity
JUABEN	Juaben Oil Mills Company Limited
K	Potassium

KfW	Kreditanstalt für Wiederaufbau
KIIs	Key informant interviews
km	Kilometre
kva	Kilovolt-Amps
MCC	Millennium Challenge Corporation
Mg	Magnesium
mm	Millimetre
MOFA	Ministry of Food and Agriculture
MOP	muriate of potash
MOTI	Ministry of Trade and Industry
mt	Metric tonne/ton
Na	Sodium
NIB	National Investment Bank
NIWGs	National Interpretation Working Groups
NORPALM	Norpalm Ghana Limited
NPK	Nitrogen Phosphorus and Potassium
Nucleus Estate	An oil palm plantation equipped with a processing mill owned and managed by a company
OER	Oil Extration Rate
OPRI	Oil Palm Research Institute
Out-Grower	A grower operates on land not owned by the plantation / milling company. However, the grower and a particular plantation and milling company sign a contract whereby the plantation and milling company supplies inputs and extension services on credit. The grower is contracted to supply all his fruit to the mill.
Pers. Comm	Personal communication
pH	Acidity
PK	Palm kernel
PKO	Palm Kernel Oil
POME	Palm oil mill effluent
PSI	President's Special Initiative
RMTF	Road Maintenance Trust Fund
RSPO	Roundtable for sustainable palm oil
SEIA	Social and Environmental Impact Assessment
SHE	Safety, Health and Environment Policy
Smallholder	A grower is allocated an area of land on land owned by the plantation/milling company. He/she must supply the same plantation/milling company with all fruit from the land allocated to him/her
sq km	Square kilometer
SSE	Smallholder Services Entity
SSNIT	Social Security and National Insurance Trust
t	Ton/tonne
TOPP	Twifo Oil Palm Plantation Limited
tph	Tons per hour
TSOPP	Twifo Smallholder Oil Palm Plantation
WAIFOR	West Africa Institute for Oil Palm Research
WB	World Bank
WD	Water deficit

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CHAPTER 1: OIL PALM PRODUCTION IN GHANA AND THE WORLD MARKET

1.1 HISTORICAL BACKGROUND

1.1.1 Overview

Palm oil production, based on small-scale production, was a leading foreign exchange earner for Ghana from about the mid-nineteenth century to the beginning of the twentieth century. The then colonial government believed that the indigenous small-scale farming system was more resilient economically than exotic, large plantations and, as a result, plantations did not make much impact on agricultural production during the colonial period in Ghana[1].

1960 signified the beginning of a serious effort by the Government of Ghana to promote the oil palm industry. This was guided by various Government policies and programmes that were formulated and published in 8 national development plans and strategy documents (see text box 1).

Text box 1: Eight national socio-economic development plans and programmes implemented from 1959 to date:

- Five-year plan: 1959-64 (abandoned in 1961)
- Seven-year plan:1964-70 (abandoned in 1966)
- Two-year plan: 1969-71(abandoned during 1971)
- Five-year plan:1975/76-1979/80
- Structural Adjustment Programme : 1982-1992
- Vision 2020 (abandoned in 2001)
- Ghana Poverty Reduction Strategy I
- Ghana Poverty Reduction Strategy II

[1] Edwin A Gyasi: The environmental impact and sustainability of plantations in Sub-Saharan Africa : Ghana's experiences with oil-palm plantations.

Promotion of the oil palm industry meant:

a) Finding the right strategies to transform small-scale village oil palm farming and palm oil production into more commercial and sustainable cultivation and production;

b) Accelerated production of FFB to attract industrial investment;

c) Expansion of milling capacities following implementation of programmes which increased FFB supply;

d) Improvement in productivity of oil palm plantations and mills of all sizes;

e) Improvement in FFB and palm oil quality for edible and industrial consumption;

f) Improving competitiveness of Ghanaian palm oil in the domestic and international markets;

g) Generating regular employment and income through the rapid expansion of the industry;

h) Diversification of the structure of the economy which relied on cocoa, gold and timber exported as primary products and raw materials to greater contribution from exports of industrial goods and services. This included import substitution and self sufficiency in vegetable oil production;

i) Growth and development of the capital goods manufacturing sector.

The oil palm industry in Ghana has always been dominated by small-scale producers and processors who contributed about 93% of total production in 1960. They are still dominant actors in the oil palm industry and are currently contributing over 80% production of FFB and palm oil in the country.

A common theme that has run through all national development plans implemented over the past 50 years is the emphasis placed on trying to attract foreign investment to expand the oil palm industry. During the 60s only two foreign companies namely Lever Brothers and Ameen Sangari Industries took up the opportunity to establish soap manufacturing factories at Tema and Cape Coast respectively and neither of the two was attracted to invest in the production of palm oil until the 1970s.

Failure to attract foreign investment into the oil palm industry within the first decade after independence and subsequently has encouraged the state to spearhead investment in this area. The latest policy measure formulated to attract foreign investment under the Growth and Poverty Reduction Strategy 1 & 2 was the President's Special Initiative on Oil Palm which began ambitiously in 2003 only to end up in disappointments to the majority of beneficiary farmers in 2010 who did not receive funds for plantation maintenance, seedlings to complete their farms and the Government attracting foreign investment as promised to establish processing mills for them.

The starting point of the state promoting the establishment of large scale plantations for production of palm oil was the acquisition of Sese Oil Mills in 1960, the only large scale oil palm estate remaining from the past. Sese Oil Mills became the first oil palm estate of the State Farms Corporation. Public and private investment in the industry within this period was about ¢18 million[2] with the public sector accounting for 75 % of this investment.

1.1.2 Achievements

Key developments in the Ghana oil palm industry over the last 50 years are covered in this section. Apart from the narrative below, timelines when important developments occurred are captured in Figure 1.1.

The first major state intervention in the oil palm industry was the cultivation of 9,413 acres [3,765 hectares] in 1962. Following the launch of the 7-year development plan in 1962, further oil palm developments were carried out in 1963 by the Ghana Farmers Council which distributed oil palm seedlings to members to establish 3,000 acres [1,200 ha] of oil palm plantation whilst the State Farms Corporation put 6,413 acres [2,565 hectares] under cultivation[3]. In 1962 out of five small vegetable oil mills completed only one was established by the State Farms Corporation for palm oil production. This was at Asesewa in the Eastern Region of Ghana[4]. By the end of 1987, the State Farms Corporation had established four state-owned and state-operated oil palm plantations and palm oil mills at Prestea, Sese , Kwamoso and Asesewa and also a palm kernel oil mill at Asesewa in which the government invested a total of £24,688,000.[5]

In 1969 state policy encouraged its businesses to produce export commodities for the world market as against production solely geared towards satisfying the domestic market. The Government therefore granted the State Farm Corporation credit at Pretsea to establish 3240 hectares of oil palm plantation and to upgrade its mill capacity from 3-9 metric tonnes of fresh fruit bunches processed per hour as a contribution towards meeting the objectives of this new policy direction.

An increasing trend to import vegetable oil, which occurred between 1964 and 1974, was reversed by the Government following implementation of the five-year [1975/76-1979/80] development plan. This plan laid the firm foundation for the successful revival of the oil palm industry[6]. As a result of this plan three new large scale oil palm plantations or estates equipped with processing mills viz. Benso Oil Palm Plantations Limited [BOPP], Ghana Oil Palm Development Corporation [GOPDC] and Twifo Oil Palm Plantations Limited [TOPP] were fully established between 1976 and 1990. These estates contributed significantly towards the expansion of Ghana's area under oil-palm cultivation from 17,000 ha in 1970 to 103,000 ha in 1990 (Gyasi

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[2] Exchange rate: [1960-66: 1.00 US$=¢ 0.70] [1967: 1.00 US$=¢ 0.80] [1968-1970 1.00 US$= ¢ 1.00] Source: 2006 Budget Statement & Economic Policy of the Government of Ghana page 377.

[3] Ghana Economic Survey-Central Bureau of Statistics 1963

[4] Ghana Economic Survey-Central Bureau of Statistics 1962

[5] Second development plan 1959-64

[6] Five-year development plan 1975-1980

1992a). The attractiveness of the oil palm industry was further enhanced during the structural adjustment policy era (1982-1992). The oil palm emerged as a major commercial crop rivalling cocoa and has served as the basis for stimulating the expansion of downstream palm oil manufacturing industries. As part of the 5-year development plan, the State Farms Corporation established plantations at Jukwa, Okumaning, Assin Fosu, Akwanserem, Nkwanta, Pretsea and Samreboi of estimated size of 45,000 acres [18,000 ha]. Rehabilitation and expansion of the oil palm plantations were carried out by the State Farms Corporation at Pretsea, Kwamoso, Huhunya, Juaso, Okrakwadwo and Morikrom. The plantations at Jukwa and Assin Fosu were equipped with 3 metric tonnes per hour processing mills. In 1985, the state oil palm asset at Pretsea/Sese under the State Farms Corporation was incorporated as National Oil Palms Limited and was managed as a commercial business entity, with the Government of Ghana as the sole shareholder until it was privatized in September 2000. The 1980s therefore witnessed consolidation of oil palm models implemented in the 1970s which created BOPP, GOPDC, TOPP, NOPL and several state farms with partial or full Government ownership.

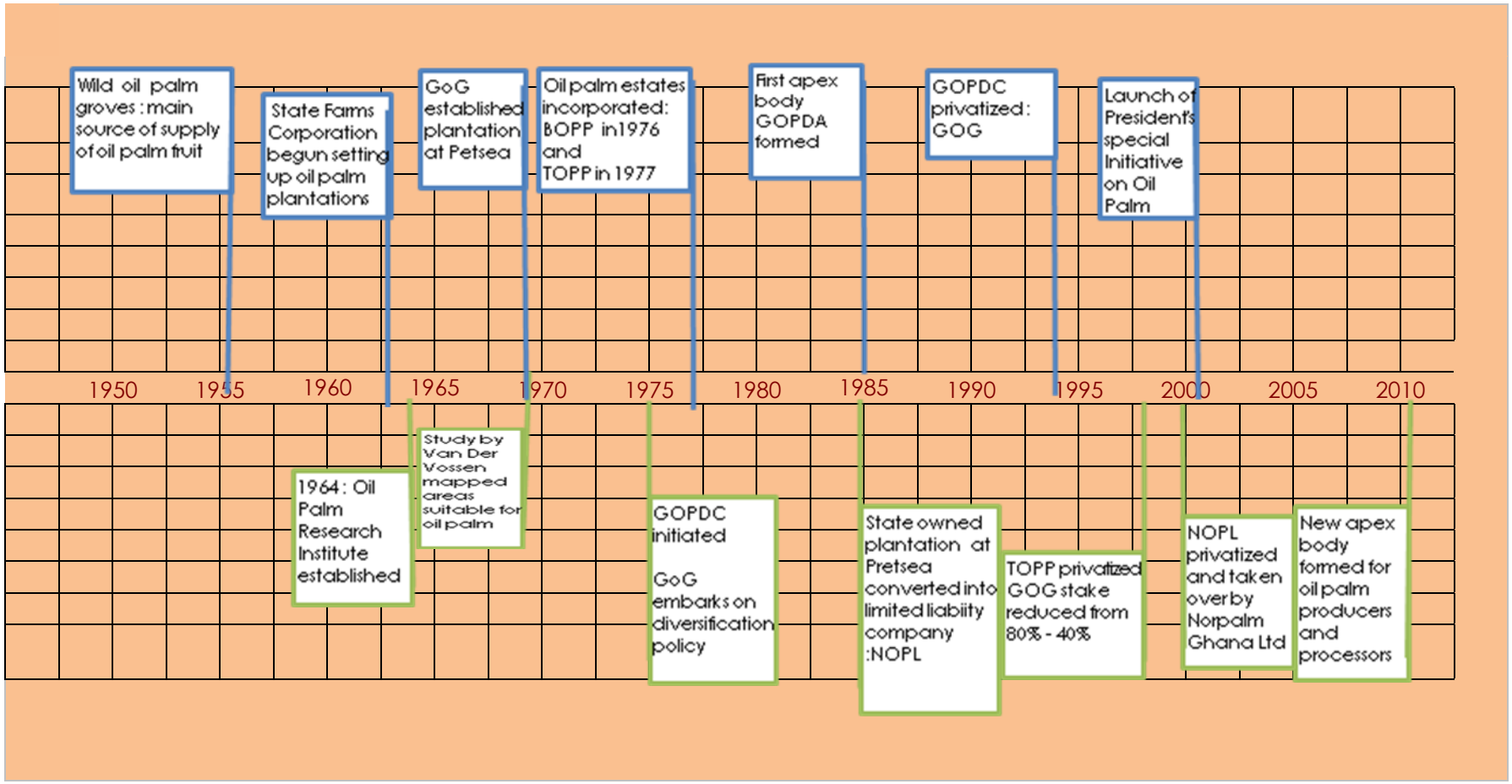
In the 1990s and 2000s the state divested its interests in most of its oil palm assets to reduce Government participation in the industry and to give practical meaning to the creation of a vibrant private sector. The state divested its interests in nearly all oil palm plantations from 1993-2007 under the State Farms Corporation, Food Production Corporation and the large scale oil palm estates GOPDC, BOPP, TOPP and NOPL.GOPDC acquired the Okumaning State Oil palm plantation in 2002 and has since developed 5,000ha as part of its nucleus plantation. Ashanti Oil Mills which operated under the State Farms Corporation was the last oil palm asset belonging to the Government of Ghana and was divested to the Appiah Menkah Complex Limited in 2007. Self sufficiency in palm oil production continued to elude Ghana because of the increasing tendency of large users such as Unilever Ghana Limited, Ameen Sangari, Appiah Menkah Complex and PZ Cussons to import palm oil or its substitutes such as tallow for the production of soap and detergents to supplement locally produced palm oil –thus making Ghana a net importer of palm oil. With this increasing trend in palm oil imports, the Government took a bold step to address this shortfall by embarking on the ambitious oil palm development programme launched in June 2003 under the President's Special Initiative (PSI).

1.1.3 Funding

The National Investment Bank (NIB) and the Agricultural Development Bank (ADB) have served as the backbone of the oil palm industry in Ghana. In addition to providing resources directly, they also channelled Government and external funding they sourced to the oil palm industry. Ecobank Ghana Limited, Barclays Bank Ghana Limited, Merchant Bank Ghana Limited and Social Security and National Insurance Trust (SSNIT) are the key financial institutions which have provided internal financial support to the oil palm industry over the past 50 years. While Ecobank and Barclays Bank still provide working capital support to the industry, SSNIT since 1993 acquired equity participation in GOPDC and is the second largest shareholder in GOPDC after Siat (Ghana) Ltd . External donors and agencies which have funded development of the oil palm industry in Ghana are:

Commonwealth Development Corporation, European Union, World Bank, International Finance Corporation, African Development Bank , FMO (Dutch Financing Company) and Agence Française de Développement.

Figure 1.1: Timeline of key developments in Ghanaian Oil Palm



1.1.4 Development of improved processing facilities for small-scale palm oil production

Local entrepreneurs took advantage of the growing importance of the oil palm industry and the enabling environment created by the Government of Ghana in the 1970s and 1980s to manufacture simple processing equipment to transform production of palm oil from home based production using rudimentary utensils to micro/artisanal mills that employ semi-mechanized operations in factory-like organization – generally referred to as "Kramer" after the engineer who promoted their use.

Notable programmes implemented under the small-scale machinery manufacturing industry project were[7] the Intermediate Technology Transfer Centre under GRATIS , and the Technological Consultancy Centre under the Coordination of National Board for Small-scale Industries. Institutions and firms which have contributed immensely towards mechanizing small scale palm oil production in Ghana are Department of Agricultural Engineering of the Kwame Nkrumah University of Science of Technology (KNUST) which manufactured digesters; Farmers Technical Services and Training Centre which manufactured soap extruders, soap blenders, hammer mills and palm oil expellers; Metal and Motors Engineering Co. Ltd. which manufactured a palm nut cracker and Agricultural Engineers Limited who manufactured palm nut crackers and palm oil processing plants.

Currently, the main manufacturers of equipment and machinery for palm oil production are GRATIS (at Tema, Kumasi and Takoradi) and FATECO in Accra. The use of semi mechanized mills was popularised in palm oil producing districts such as Assin, Twifo Hemang, Lower Denkyira and Kwaebibirem Districts and through other leading oil palm areas following assistance given to farmers to own and operate such mills on a cooperative basis from 1991-1996. Under the Agricultural diversification project of the Government of Ghana funded by the World Bank, over 60 small scale mills were installed across the country for groups of farmers for the production of palm oil. Back in 1987, TechnoServe ran a programme where they assisted an oil palm farmers cooperative to establish a pilot palm oil processing plant in the town of Ntinanko in the Ashanti region. This pilot project, alongside similar projects, led to TechnoServe's involvement since mid-1991 as the implementing agency for the Government of Ghana's World Bank financed Intermediate Technology Small-Scale Palm-Oil Mills Project (ITSPM). This was a five year programme which established 60 farmer-owned and operated small-scale palm oil mills in moderately food-insecure areas of the country. In operating the programme, Technoserve collaborated with the Ministries of Agriculture, Trade, Mobilization and Social Welfare (Department of Cooperatives), and the Agricultural Development Bank.

[7] Report on capital goods sector study- Technology Transfer Centre (CSIR) Accra, Ghana, 1990- UNDP/TTC Doc.5

1.1.5 Constraints

(i) Productivity

A major policy goal of various Governments of Ghana has been to raise agricultural productivity. Productivity in the oil palm sector which has been very low is no exception and oil palm yields worldwide vary widely from country to country and from plantation to plantation. The world average production of fresh oil palm fruit bunches is 18 mt/ha, 3.6 mt of palm oil and 0.8 mt for palm kernel. However, plantations in Malaysia are known to yield fruits in excess of 30 mt/ha, compared with an African high of 25 mt/ha in Cote d'Ivoire and only 15 mt/ha high in Ghana which has similar favourable soil and climatic conditions like Cote d'Ivoire. The potential to increase productivity in Ghana is therefore possible. Unsatisfactory palm nutrition, moisture conservation, planting material, fragmented nature of the industry and agro-management practices are the factors contributing to these sub-optimal yields.

(ii) Land

Land acquisition for oil palm plantation development remains problematic for all sizes of plantations. For most independent smallholders, implementation of tenancy agreements whereby the harvests are divided into three parts, two parts for the tenant and the third portion for the landlord is often a source of friction between the tenant and the landlord. For medium–large scale plantations multiple land ownership gives rise to protracted disputes over boundaries. Also some plantations such as Norpalm Ghana Limited (Norpalm) and Twifo Oil Palm Plantations Limited have experienced delays in the transfer of title to the estates they acquired. The land used in establishing TOPP, GOPDC and BOPP were compulsorily acquired by the Government of Ghana and in the past there have been agitations for the return of the land to its rightful owners especially when compensations had not been fully paid.

Norpalm Ghana Limited

Part of the land currently occupied by Norplam Ghana Limited at Sese was first acquired on leasehold by Alexander Cecil Goff in the early 1900s. Ownership of this land and operation of an oil palm estate, the Sese Oil Mill, changed into other private hands until it was finally acquired by the Government of Ghana in 1960 and was incorporated as part of the State Farms Corporation. Other portions of the land including where the processing mill is now situated were offered to the state without any financial considerations by the Chiefs and people of Ahanta and Wassa Mpohor in response to the call by the government of the day for land owners to release land for the establishment of industrial concerns towards the rapid economic development of Ghana. The status of these remaining parcels of land which were not properly acquired remains a source of litigation between the landlords and NOPL (now Norpalm Ghana Limited[8]). Despite being part of the sales and purchase agreement Government of Ghana has failed to transfer ownership of NOPL lands to Norpalm Ghana Limited to date and no compensation has been paid to the landlords 50 years after its acquisition.

8 Report of the Committee of Enquiry on lands occupied by the National Oil Palms Limited

Twifo Oil Palm Plantations Limited

In 1975 the Commonwealth Development Corporation [CDC] under request of Government of Ghana conducted feasibility studies into oil palm development in areas of land situated at Twifo-Praso, Twifo-Mampong and Twifo-Hemang all in the Central Region of Ghana. The feasibility studies were approved in 1975 and consequently the lands at Twifo-Praso, Twifo-Mampong and Twifo-Hemang were compulsorily acquired under the Hemang lands (Acquisition) decree 1975 "NRCD 332" of February 21, 1975. GOG acquired 10,000 hectares of land which included 1,200 hectares for a Smallholder Scheme. Compensation for the lands was paid to the Landlord to close the chapter on litigation among the Chiefs and people of Twifo only in 1998, 23 years after the land was acquired.

(iii) Planting materials

Some farmers have been planting oil palms of doubtful origin which generally generate low yields primarily because improved planting materials are either too expensive[9] or not easily accessible to them or out of ignorance.

(iv) Technology

The technology employed by small-scale farmers and processors are highly labour intensive and also low in oil extraction. With increasing labour costs profitability of these businesses suffers.

(v) Roads

In some cases there are no access roads where oil palm plantations are established and during periods of peak crop production which normally coincide with high rainfall seasons, fruits get rotten leading to loss of income to the farmers. During the rainy season some areas become inaccessible because the roads are unsurfaced or are under construction or abandoned over several years.

(vi) Credit

The majority of small-scale farmers and processors are operating on the fringes of the Ghanaian economy and hence no financial institutions have shown keen interest in developing them. Operators here lack capital to expand their businesses. Where credit is available the cost is too high and unsuitable for agribusiness of this kind.

1.1.6 Current system of development

Currently, there are three identifiable types of small-scale farmers: the smallholders organised under smallholder schemes; outgrowers organised under outgrower schemes; and independent smallholders which do not operate under any schemes.

[9] Oil palm seedlings are noted as being sold in Eastern Region for US$4 per seedling instead of US$ 2 sold at Oil palm Research Institute at Kusi-Minister of Agriculture visits GOPDC- Ghanaweb General News of Tuesday, 24 August 2010 Source: GNA

The smallholders and outgrowers do receive supplies of seedlings from the nucleus plantation that supports the schemes. Such seedlings generally are high-yielding and of good quality. Due to the relatively high cost of good quality, high-yielding seedlings the independents source their seedlings from various sources some of which may not be credible. With the President's initiative, small-scale farmers have now adopted the practice of cultivating improved oil palm as a mono crop, intercropping only during the first three years after establishment. Large scale plantations continue to plant oil palm as a mono crop with the following cover crops *Peuraria phaseoloides* and *Mucuna bracteata.* New plantation development is now required to follow RSPO principles and criteria if palm oil produced is to be certified which sooner or later will become a requirement of major industrial users.

1.1.7 Qualities of palm oil produced in Ghana

Palm oil produced in Ghana is classified by free fatty acid content (FFA) into three types. The first type which accounts for over 90% of palm oil produced by village small scale mills and in the home by women in Ghana, is ranked higher in FFA (5-12%) and is associated with a moisture content of up to 10%. It is the most popular vegetable oil used in preparing food in Ghana and by most people of African descent around the globe. The second type of palm oil which is produced in commercial quantities by small-scale producers is used in manufacturing the local soap popularly known as *alata samina* or *amonkyi* and has the highest FFA content (12% or more) and a moisture content in excess of 10%. Indigenous soap manufacturers from Burkina Faso and Niger also source this grade of oil because of its relatively low price. The third kind of palm oil which is of international quality is low in FFA (less than 5%) and moisture (less than 0.4%) is mainly produced by medium-large scale mills and is used by industrial firms to manufacture 3 main products - soap, cooking oil and margarine.

1.2 THE PALM OIL MARKET

1.2.1 World-wide share of Africa and Ghana

Global production of palm oil has grown tremendously over the last three decades, with Indonesia overtaking Malaysia as the largest producer in 2006. Global production of palm oil is estimated by USDA at 50.28 million mt in the crop year ending September 2011.

The share of Africa in global commercial palm oil production has dropped from about 27% in 1980[10] to about 3% estimated for 2011. West Africa dominates palm oil production in Africa and it involves a number of large foreign companies (see Text box 2).The production is currently insufficient to cater for the growing domestic demand in Africa and most African countries are therefore net importers of palm oil. In 2008, local production constituted 55% of the domestic consumption of 6.3 million

[10] Proceedings of the international seminar for market development for palm oil products 23-27 January 1984 Palm Oil Research Institute of Malaysia

mt[11]. Domestic demand is projected to grow in 2011 to 6.7 million mt and even to about 13 million mt while local production of only 3.7 million mt is projected. Multinational companies attracted by several African countries have committed US$ 6 billion[12] into oil palm industry expansion programmes and are achieving higher palm oil production and improvement in efficiency but cannot meet local demand. These African countries include Benin, Cameroon, Ghana, Ivory Coast, Nigeria, Democratic Republic of Congo, Uganda, Gabon, Angola and Tanzania. Typically there is a partnership of national stakeholders mainly with European or Asian capital and expertise.

Text box 2: Foreign actors involved in the production of oil palm in Africa

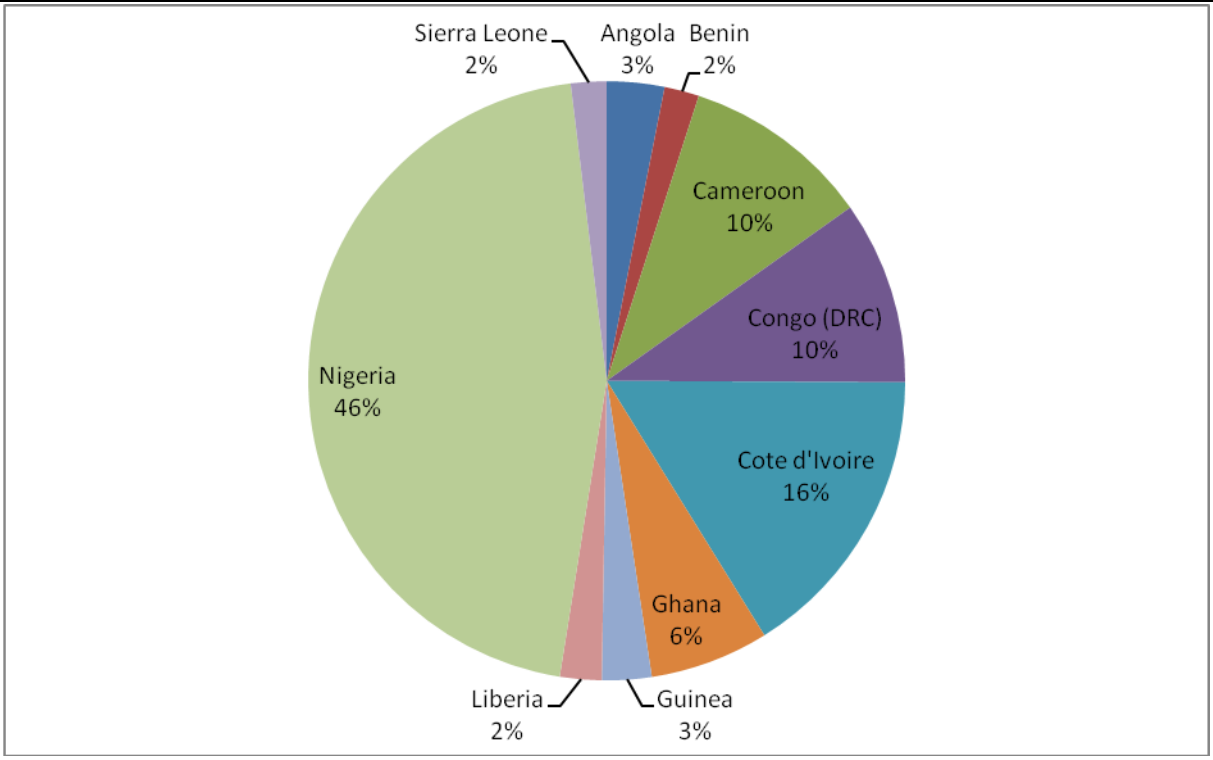
1. **Angola:** Grupo Atlântica (Portugal), ENI (Italy) and Petrobras (Brazil)
2. **Benin:** Unspecified groups from Malaysia and South Africa
3. **Cameroon:** French Group Bolloré
4. **Cote d'Ivoire:** SIFCA (France), Wilmar International and Olam International (Singapore), SIPEF (Belgium)
5. **Congo, R.:** Aurantia (Spain), ENI (Italy), Fri-El Green (Italy)
6. **Congo, D.R.:** TriNorth Capital (Canada), ZTE Agribusiness Company (China), Blattner Group (Belgium/USA)
7. **Gabon:** SIAT (Belgium), Olam International (Singapore)
8. **Gambia:** Mercatalonia (Spain)
9. **Ghana:** SIAT (Belgium), Unilever (UK-Netherlands), Wilmar International (Singapore), NORPALM (Norway)
10. **Liberia:** Sime Darby (Malaysia), Equatorial Palm Oil Company (United Kingdom), Golden Agri-Veroleum (Indonesia).
11. **Madagascar:** Sithe Global (USA), Cultures du Cap Est (India).
12. **Nigeria:** SIAT (Belgium), Fri-El Green Power (Italy),Socfinco (Belgium),Wilmar Intl(Singapore)
13. **Sao Tome and Principe:** Socfinco (part of the French Bolloré group)
14. **Sierra Leone:** Sierra Leone Agriculture (United Kingdom), Quifel group (Portugal), Gold Tree (United Kingdom).
15. **Tanzania:** TM Plantations Ltd (Malaysia), Sithe Global Power (USA), InfEnergy (UK), unidentified group (Malaysia), African Green Oil Limited, Tanzania Biodiesel Plant Ltd, Inf Energy Co.
16. **Uganda:** Oil Palm Uganda Limited (owned by Singaporean company-Wilmar in association with BIDCO)

[11] Sub-Sahara a growing market for palm oil in Malaysia Palm Oil Fortune journal volume 2 2010

[12] A growth story for Africa in World Agriculture Report by Hardman & Co. June 2011

West African countries collectively produced 1.63 million mt of crude palm oil in 2010[13]. This represents barely 4 percent of the global output of the commodity. In contrast to other regions where palm oil is produced, independent smallholders who often produce crude palm oil from wild groves, dominate the production base in West Africa (Soyebo, Farinde and Dionko-Adetayo, 2005). In Africa, Nigeria accounted for about half of the output, 16% for Cote d'Ivoire, Cameroon and DRC 10% each and Ghana accounting for 6% as major producers. The other producers are Guinea (3%), Angola (3%), Liberia (2%), Sierra Leone (2%) and Benin (2%) (see Figure 1.2).

Figure 1.2: African Supply of CPO in 2010 (percentages)



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Major developments contributing to growth in demand of palm oil in Africa are:-

a) Rising prosperity and population increase in Africa;

b) WHO recommending palm oil in food fortification programmes across Africa where vitamin A deficiency is prevalent;

c) Greater awareness created among Muslims world-wide to patronise halal food and non-food products which are made from palm oil. The impact of

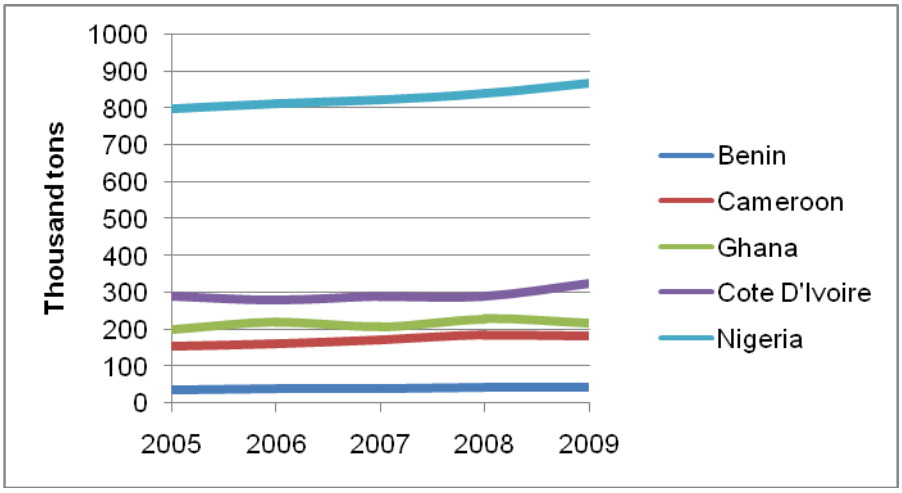
[13] Hardman & Co (June 2011) World Agricultural Report -A growing story for Africa :

consumption of palm oil by African Muslims alone is very large, estimated at 24kg per capita.[14] This translates into consumption of about 6 million mt/ annum of palm oil through its use in manufacturing halal products for up to 240 million Muslims in Africa or about 30% of the 800 million population of Sub-Saharan Africa.

d) Rising demand from consumers across the emerging economies and from the bio-fuel sector globally.

CPO produced in Africa (by implication West Africa) increased from 1.68 million mt in 2008 to 1.75 million mt in 2009, a 4.1 percent increase over the previous year's production (see Figure 1.3). However, output growth in West Africa has been extremely low compared with other CPO producing regions such as Asia and Latin America. Most of the CPO produced in Africa comes from independent smallholders and even in Cote d'Ivoire, where there is a vibrant industrial plantation culture, only a quarter of the 200,000 ha of oil palm are directly operated under industrial plantations. The 36,500-oil palm outgrowers supply two-thirds of the fresh fruit bunches (FFB) processed into CPO (SIFCA, 2010).

Figure 1.3: CPO Output in Africa ('000 mt), 2005 - 2009



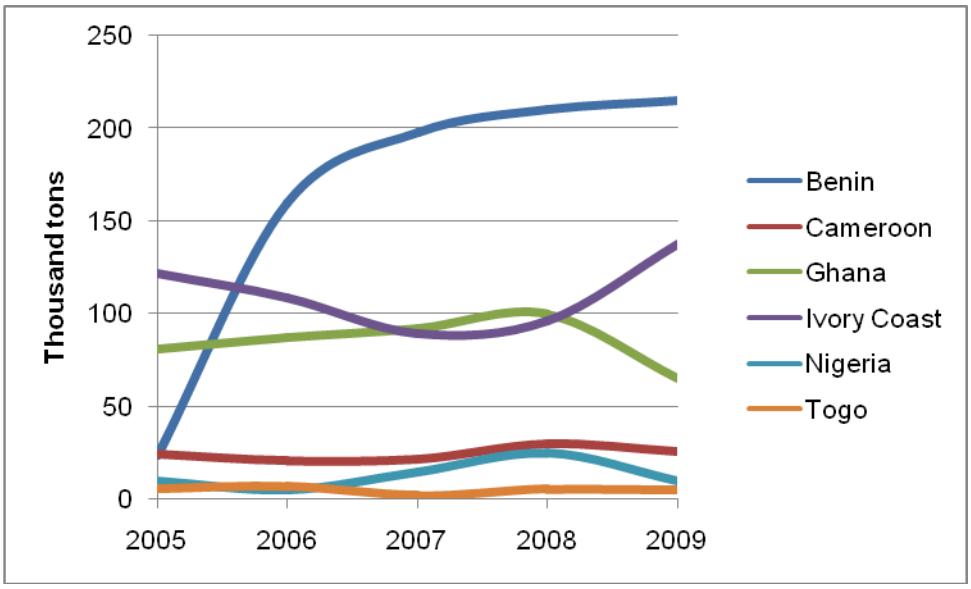
Source: Oil World Annual, 2010

[14] 24kg per capita consumption of palm oil in15 June, 2011 – Herakles Farms, a New York-based agriculture company, is planning two commercial-scale sustainable palm oil plantations in Cameroon and Ghana.

Exports

The largest exporter of CPO in Africa is Benin which is surprising considering its low production (Figure 1.2). Benin CPO imports from Malaysia have been growing over the years. Malaysian palm oil exports to the region have doubled from 517,000 mt in 2003 to 1.1 million mt in 2009 and with the right strategies and more marketing efforts, the figure is expected to rise further. Among major palm oil importers in the region are Benin and Togo, which also serve as transfer hubs to the Nigerian market.[15] Cote d'Ivoire is indeed the only net-exporter of CPO in Africa. In the case of the Cote d'Ivoire the recent civil war caused exports to plunge from 122,000 mt to 89,000 mt but have since picked up in 2009 to 138,000 mt. The third biggest exporter has been Ghana (Figure 1.4). Cameroon exported between 21,000 mt to 30,000 mt of CPO per year over the past five years.

Figure 1.4: Exports of CPO from Africa, ('000 mt)



Source: 2010 ISTA Mieke GmBH, Oil World.

1.2.2 The Ghanaian Market

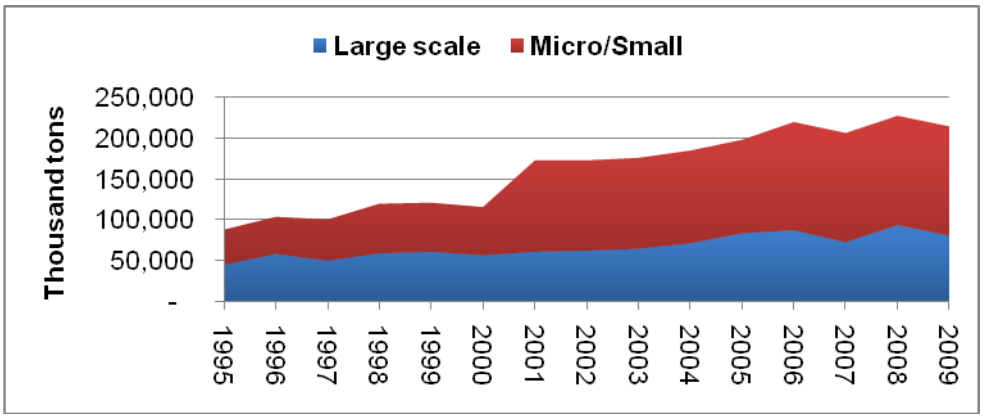
(i) Production of CPO

Independent smallholders with typical holdings of less than two hectares account for the major supply of FFB for palm oil production in Ghana. Indeed over the past decade the share of small-scale palm oil production has increased while the share of

[15] Malaysia Palm Oil Fortune Volume 2 (2010) , A publication of Malaysian Palm Oil Council

the large scale estates has fallen. For instance in 2002, the five[16] major producers of palm oil accounted for 28 percent of the total national output, this has fallen to 19 percent by 2009 (see Figure 1.5). In contrast, smallholders have increased their share of the total output to 80 percent of the total CPO production.

Figure 1.5: Sources of Crude Palm Oil Production in Ghana, 1995 – 2009



Source: Based on data from MOFA, 2010

The CPO industry in general in Ghana has not seen the kind of robust growth that has been associated with the industry worldwide. While most of the major CPO producing countries have grown their output substantially over the past decade, in some instances as much as 12-fold, Ghana has not even been able to double output over the last decade. Even the generally well-organised industrial plantation sector has largely failed to see any semblance of strong growth whether by extensification or intensification.

(ii) Demand for CPO

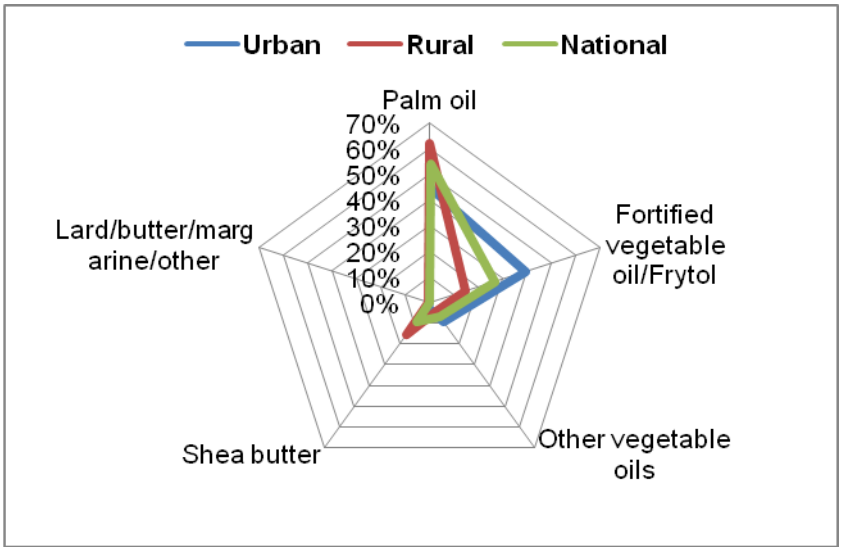
A large proportion of the CPO produced in Ghana is used as a vegetable oil in local cuisine. This vegetable oil is used widely across the country, particularly in the southern half. A recent survey (GSS, 2010b) suggests that one out of every two households (54 percent) in Ghana uses palm oil in food preparation. However, in the rural areas, the proportion of households that uses palm oil as cooking oil is even higher (62 percent), see Figure 1.6. There are also marked regional differences regarding the consumption of CPO as a vegetable oil. For instance, in the Central region, four out of five (80 percent) households use CPO in food preparation. In the case of the three northern regions, there is a very low consumption of this vegetable oil such that in Upper West less than 1 percent of households use CPO. In these areas, shea butter is used in cooking. The refined or fortified palm oil based vegetable oil is more popular in the urban areas, where two out of five households

[16] Ghana Oil Palm Development Company Limited (GOPDC), Benso Oil Palm Plantation Limited (BOPP), Twifo Oil Palm Plantation Limited (TOPP) and Norpalm Ghana Limited (formerly National Oil Palm Plantation Limited).

(39 percent) use it for food preparation. The GSS Survey also shows that CPO is used by all income groups in Ghana.

The source of CPO normally used for household consumption is the small-scale or artisanal production, while the bulk of the output from the plantations is supplied to industry. The quality of CPO produced at the village level is generally considered to be of unsatisfactory quality for industrial use but it is highly favoured for local household consumption.

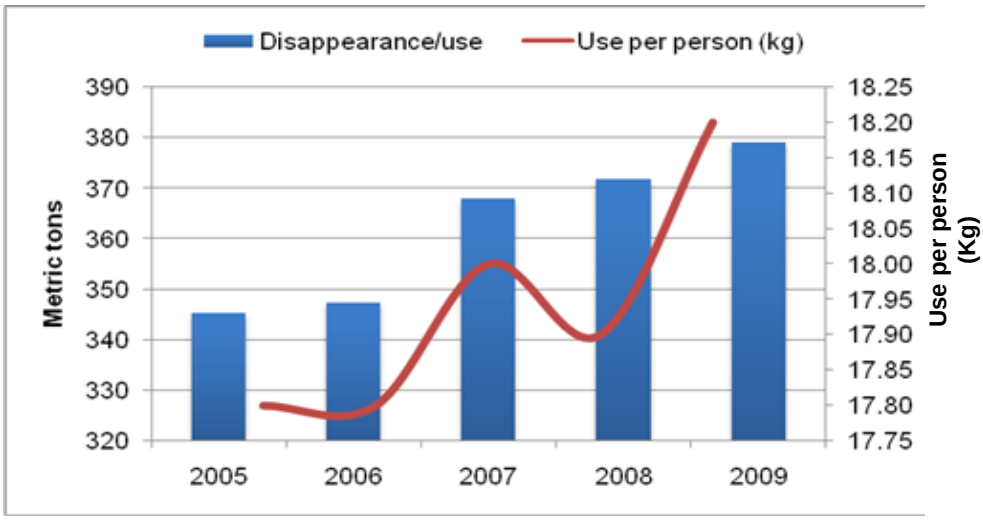
Figure 1.6: Types of Cooking Oils used in Ghana



Source: GSS (2008).

The consumption of CPO in Ghana is estimated at 379,000 mt (see Figure 1.7). Over the last five years the rate of growth has been on the average 2.4 percent per year. Thus, the increase in consumption demand has more or less moved in tandem with population growth. Average consumption per person has also registered less than one percent change year-on-year.

Figure 1.7: Demand for CPO in Ghana, 2005 - 2009

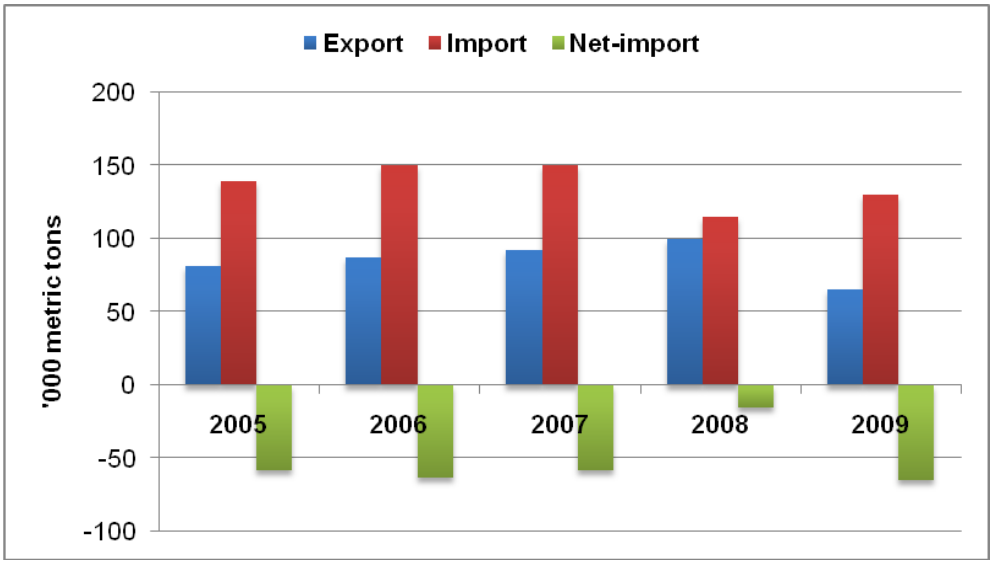


Source: Based on data from Oil World Annual, 2010

(iii) Trade

There is a considerable amount of trade in CPO that goes on between Ghana and the rest of the world. This trade is both formal and informal (unrecorded). Over the last five years Ghana has been a net-importer of palm oil each year. In 2005, the net import was in the order of 58,000 metric tons being the difference between the 81,000 tons of export and the import of 139,000 tons. 2009 saw a widening of the CPO trade gap to a five-year high of 65,000 tons (see Figure 1.8). Over the last five years the net import of CPO averaged over 50,000 tons per year.

Figure 1.8: Trade in CPO in Ghana, 2005 – 2009

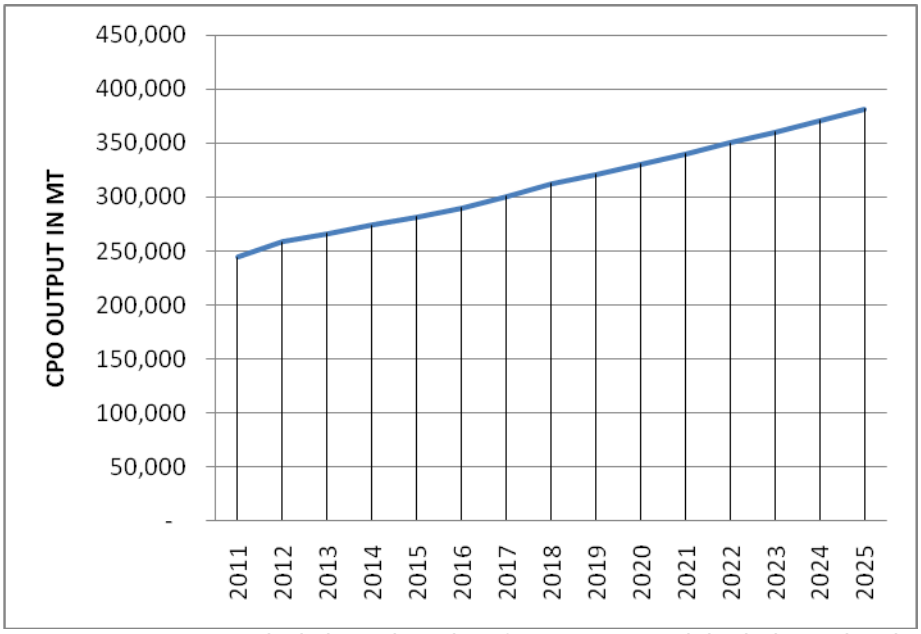


Source: Oil World Annual 2010.

(iv) Outlook for the Ghanaian CPO market

The projections[17] for domestic CPO output for the period 2010 to 2024 are presented in Figure 1.9. The forecast suggests about 3% annual increase in palm oil production if the present production trend continues without any significant and rapid intervention into the next 15 years. For example, the estimated level of production of CPO in 2011 which is put at 244,335 mt will increase to 301,000mt in 2017 and 382,000 mt in 2025.

Figure 1.9: Forecasts of CPO Supply: 2011 - 2025



Source: Team analysis based on data from MOFA and the industry in Ghana

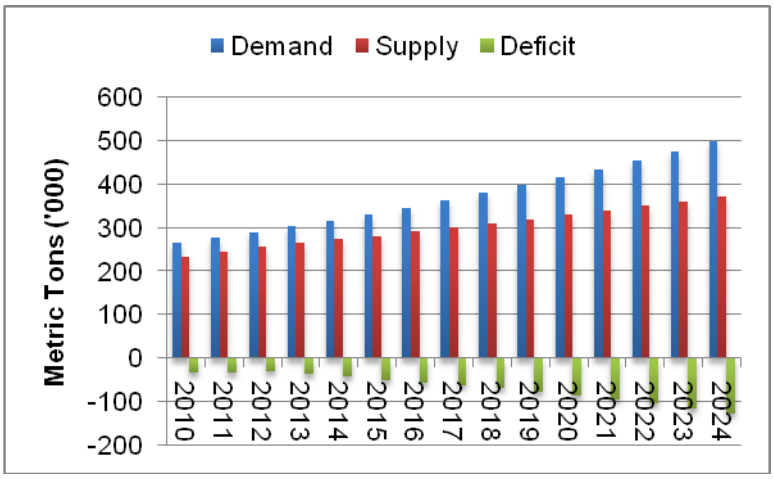
Demand outlook[18] unlike the supply forecasts were not based on time-series modelling but a simple approach based on a set of clearly defined and plausible assumptions. The estimations indicate that the present shortfall in CPO supply will continue and even grow bigger in the future. From a projected low of 32,000 mt in 2010 it is envisaged that the deficit will hit 127,000 tons in 2024 (see Figure 1.10).

[17] The projection estimates were undertaken with the aid of an Autoregressive model using STATA 11. The in-sample data is historical CPO data obtained from data files of the MOFA. These are indicative figures and hence need to be interpreted with caution.

[18] First, the verifiable net imports of CPO were added to the domestic output figures. Second, we estimated the growth rate in domestic disappearance (production plus net imports), the estimated rate of change, which was given as 4.6 percent was then used in the projections.

Note: the current supply gap for West Africa is estimated at 450,000 tons and is bound to grow at the same rate that Ghana's gap is projected if not higher- thus presenting a huge opportunity for export if Ghana increases production in excess of local demand.

Figure 1.10: Estimated supply gap of CPO in Ghana, 2010 - 2024



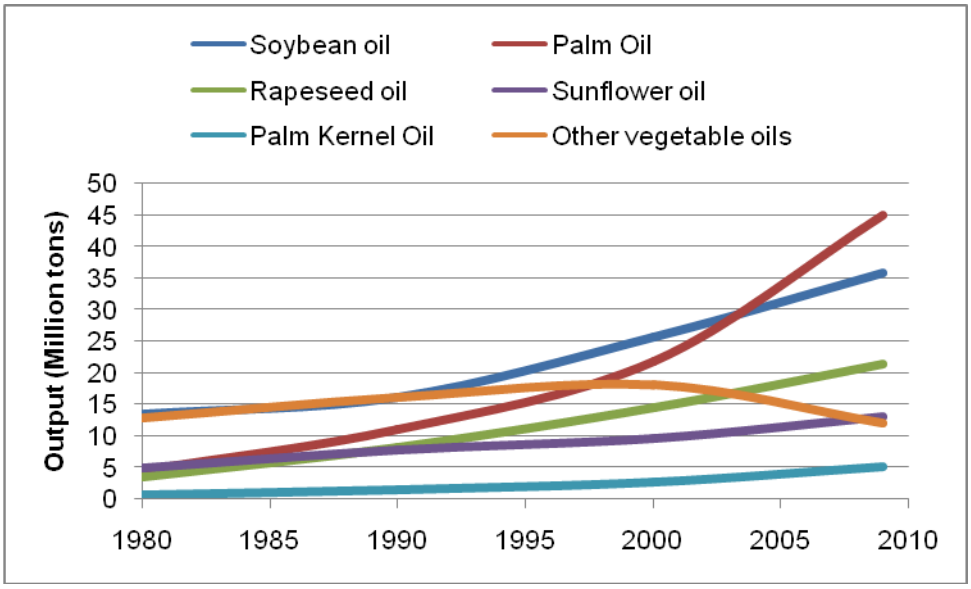
1.2.3 The Present and Future Production and Consumption Patterns World-wide

(i) Production

There are presently 17 major vegetable oils traded on the international market. Out of this number four are considered as the leading vegetable oils, these are palm oil, sunflower oil, soy oil and rapeseed oil. However, palm oil accounts for more than half of the global import and export trade of vegetable oils. The production of vegetable oils has increased more than three fold over the past three decades from about 40 million tons in 1980 to 133 million tons in 2009 (Oil World 2010).

While all the five major vegetable oils recorded massive increases in output over the period under discussion, the growth in palm oil production has been extraordinary. From 4.5 million tons production in 1980, the volume of the palm oil has more than doubled every decade since then (Figure 1.11), such that by 2008 it had increased by ten fold as compared to its 1980 level to 45.1 million tons.

Figure 1.11: World production of vegetable oils, 1980-2008

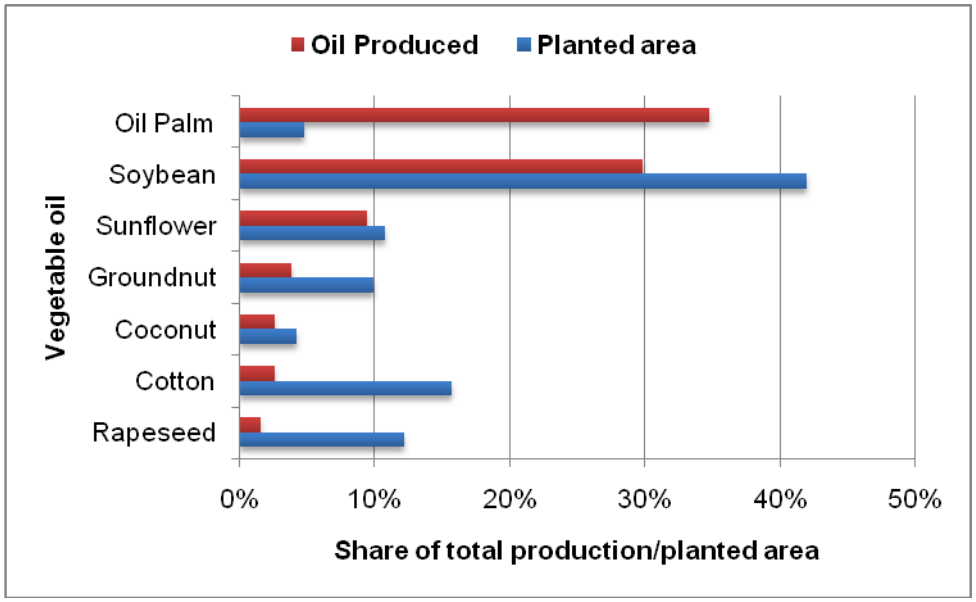


Source: Oil World 2010.

Over the last three decades palm oil has grown in importance, from 11 percent share of vegetable oil production in 1980 to 34 percent. Several reasons have been advanced for the growing importance of palm oil in the vegetable oils market. Prominent among the reasons is the massive expansion in area planted, particularly, in Indonesia and Malaysia coupled with the high oil yield per hectare compared to the other vegetable oils.

Another reason that explains the surge in CPO production is the relative low cost of production (FAO, 2006). For example, the unit cost of production of soy oil, which has the next lowest, is 20 percent higher than that of palm oil. Although the land under oil palm cultivation globally constitutes about five percent of total land devoted to vegetable oils, palm oil accounts for more than a third of all vegetable oil produced in 2007. The size of land under soya bean cultivation is estimated at about eight times that under oil palm but considerably more oil is produced from oil palm (Figure 1.12).

Figure 1.12: Area planted and vegetable oil production, 2007



Source: Oil World, Feb 2007 [based on data as cited from RSPO.org]

The favourable economic policy environment particularly in the two leading CPO producing countries, Indonesia and Malaysia has in no small measure facilitated the phenomenal growth in production of oil palm in those countries. The strong roles played by the two governments in the formative years of the industry (and continue to play), perhaps, is the single most important intervention that explains the pre-eminent role of these two countries in global palm oil production and trade. The governments provide a range of supportive measures including direct and indirect protection and incentives. This supportive policy environment largely accounts for the huge resources that have flowed into the industry from both domestic and foreign investors over the years. The industry also received immense support in the form of government investments in R&D, general infrastructure, including shipping facilities as well as processing for value addition in the domestic market. Indonesia now produces over 22 million metric tons of CPO annually (that's over 100 times the current annual production of Ghana) and the industry expansion has been phenomenal. Its growth has been presented as a case study in annex 4 as lessons learnt in Indonesia could be relevant to the future development of the oil palm industry in Ghana.

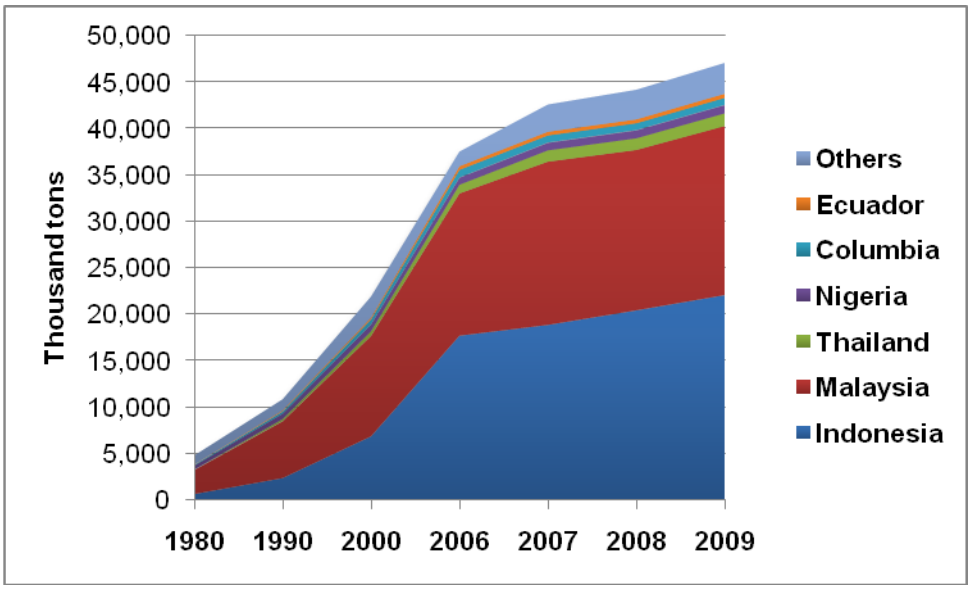
Another area of the value chain in the top producing countries that receives enormous attention is the sector-financed marketing and trade promotion programmes. In addition to the policy framework and the incentives, the two leading producers also have well defined institutions that focus exclusively on the development of the palm oil industry. For example, in addition to research institutions, Malaysia has an oil palm development board whilst Indonesia has a government department that focuses entirely on the plantation industry and commodities.

The market concentration also provides the required economic scale that supports continuous improvement in efficiency in production technology and trade of the commodity. Lastly, a unique feature of CPO that contributes to its success as a vegetable oil is that the CPO market is not in any way linked with a by-product market unlike most of the other vegetable oils.

(ii) Supply

Over the past three decades Malaysia and Indonesia have strengthened their leading positions as the top producers of CPO. The two countries accounted for 68 percent of the world production of CPO in 1980, but their share of global production peaked in 2006, when the two accounted for 88 percent of world output. Since then, their shares have reached a plateau, at 85 percent for the past three years. Indonesia in particular has recorded phenomenal growth over the past three decades, from less than one million tons in 1980 to over 22 million tons in 2009 (Figure1.13). Indonesia overtook Malaysia as the biggest producer in 2006, and has from that time widened the gap between their respective outputs, by about 4 million tons.

Figure 1.13: Crude Palm Oil Production, ('000 mt), 1980-2009



Source: Oil World, Hamburg, Germany and USDA

For most of the 1980s and 1990s Malaysia was the biggest supplier of CPO. In 1980 it produced more than 50 percent of the world output of CPO (i.e. 2.6 million mt) whilst Indonesia, the second biggest producer, accounted for about 15 percent of the output (0.7million mt). Output more than doubled in Indonesia and Malaysia between 1980 and 1990. However, growth in Malaysia though still high slowed in the 2000s, while Indonesia continued to expand at a very fast rate. Indonesia again more than doubled her output between 2000 and 2006 when it increased output from

6.9 million mt to 7.7 million mt and thereby overtaking Malaysia as the top CPO producer in the world (Figure 1.13).

Despite the considerable growth seen in the CPO industry over the past three decades there has been very little change in the structure of the industry in terms of the top six producers (Figure 1.13). The relative shares of the largest five producers have remained fairly stable, suggesting a concentration of production in a handful of countries.

While the increases seen in the production levels of Indonesia and Malaysia are huge in absolute terms the rate of growth in the output of CPO witnessed in Thailand over the past three decades is also worthy of note. Thailand moved from a production base of just around 13,000 mt in 1980 to 232,000 mt a decade later, representing a 16-fold increase. The period 1990 to 2000 also saw a doubling of output from 510,000 mt to 989, 000 mt. Thus from a low base of 13,000 mt, Thailand produced 1.4 million mt of CPO in 2009. Columbia and Ecuador, in South America have also recorded huge increases in output. The only CPO producing region where production has not seen any significant change has been the Africa region. Nigeria, the biggest producer in the region barely doubled her output over the three decades which compares poorly with the 12-fold increase recorded in Ecuador and the ten-fold increase witnessed in Columbia.

(iii) Supply outlook/development plans

Indonesia intends to bring 300,000 hectares under palm oil cultivation each year by 2020. Even though this number appears to be ambitious, the history of oil palm production in Indonesia suggests it is not impossible. In the 1980s, the country undertook a project to increase plantings by 100,000 hectares per year; this was doubled to 200,000 hectares in the 1990s. Then for the period 2000 – 2005, the country brought an additional 500,000 hectares of oil palm into production (Chandran 2010 as cited in World Bank (2010)). Currently, the planted area is growing in Indonesia at a rate of five to six percent per year. The Brazilian Agricultural Research Corporation (Embrapa) is also considering planting five million hectares of palm oil in the Amazon basin (EIU, 2010). It is envisaged that most of the new palm oil lands in Brazil will be taken from old mine lands and other degraded land. The Brazilian figures compare well with Indonesia's 5.5 million hectares of oil palm developed over four decades.

(iv) Consumption pattern

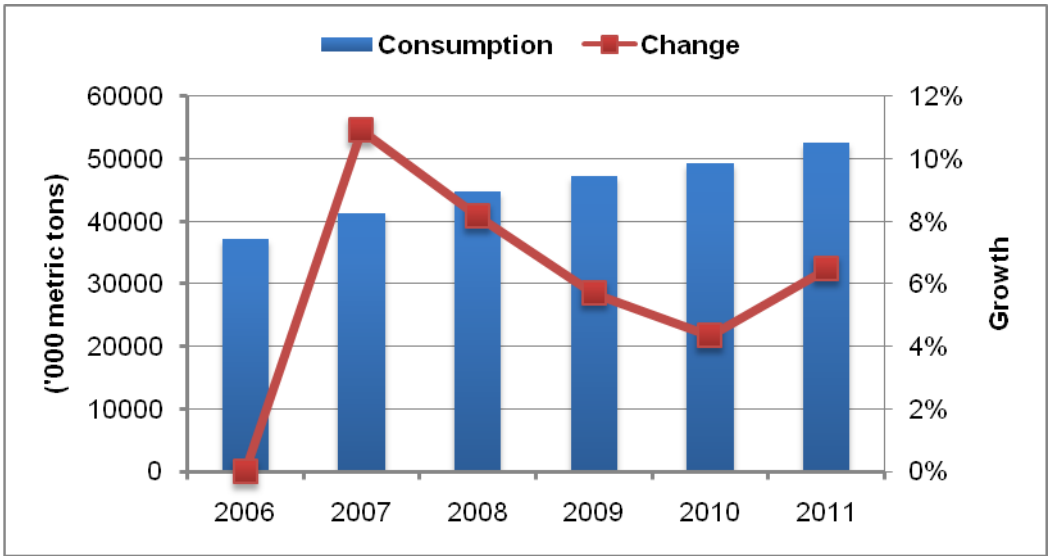
Crude palm oil is a commodity traded internationally, usually within the edible oils market. Palm oil presently accounts for a 21% share of the global edible oil market, and is therefore the second most consumed edible oil in the world, preceded only by soy oil.

Palm oil imports into the EU doubled in the years 2000-2006, mostly to substitute for rapeseed oil that was diverted from food to serve as feedstock for biofuels production. In view of its increased use as feedstock for the biodiesel industry – in

addition to its use by the food, health and cosmetics industries, it benefits from increased demand. The scope of trade in palm oil is therefore anticipated to continue growing.

Global consumption of CPO was estimated at 47 million mt in 2009. The EIU estimate that consumption will total 49 million mt in 2010 and then hit 52.5 million mt by 2011. In terms of growth rates, the changes in world demand for CPO between 2006 and 2007 stood at 11 percent and then slowed down at eight percent for 2008 and five percent in 2009. The growth is however expected to further reduce in 2011 at 6.5 percent. The slow down in demand is consistent with the slow down in the world economy (see Figure 1.14).

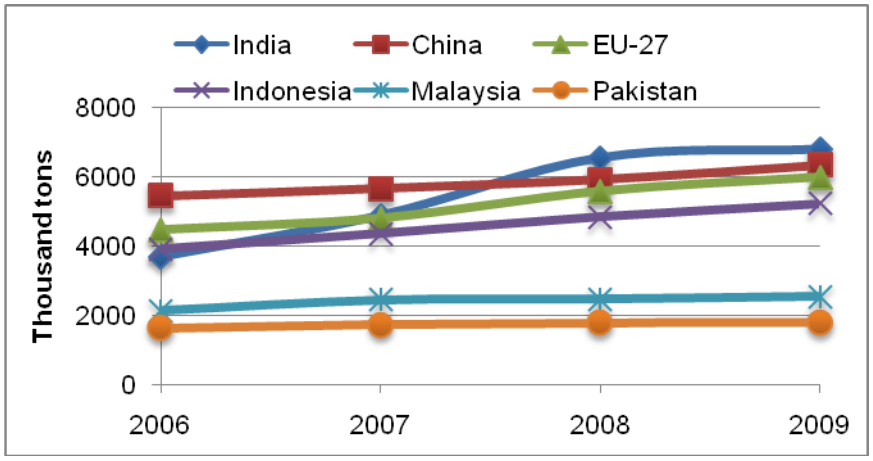
Figure 1.14: Trends in demand for CPO, 2006-2011



Source: Economist Intelligence Unit, 2010; Oil World 2010

India is presently the world's largest market for palm oil. The country consumed 6.8 million mt of CPO in 2009, representing 14 percent of the total consumption of CPO worldwide. China comes next with 6.3 million mt. The rest are: Indonesia (5.2 million mt), Malaysia (2.5 million mt), Pakistan (1.8 million mt), and with the EU-27 accounting for 6 million mt of the global demand in 2009. Nigeria and Thailand had demand estimates of over 1 million mt each in 2009. (See figure 1.15). The expansion of edible oils and fats has been attributed to increased world population, increases in consumption per person as well as the renewed desire to replace animal fats with vegetable oils in the human diet.

Figure 1.15: Sources of Demand for CPO, 2006 – 2009 ('000 mt)



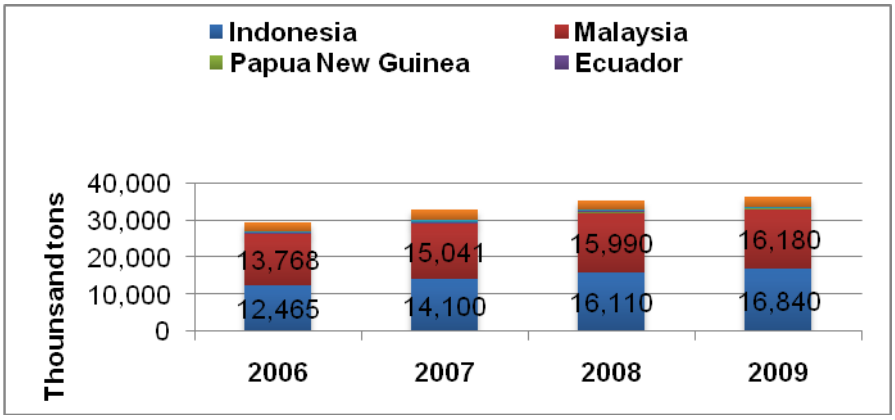
Source: Oil World, USDA.

(v) World Trade

Exports

The size of the international CPO export trade was estimated at 36.4 million tons at the close of 2009. The figure represents an increase of over 23 percent from the 2006 figure of 29.6 million mt. However, over the past five years, the volume of CPO export trade has increased at a rate of five percent per year for 2006 to 2009 (Figure 1.16). The striking feature about the CPO trade is the very high degree of concentration in the trade. For example, the two leading exporters, Indonesia (45 percent) and Malaysia (44 percent) account for nearly 90 percent of the total CPO exported worldwide. The third important player in the export market is Papua New Guinea (PNG), the country exporting 422,000 mt of CPO in 2009. Ecuador, also accounted for 189,000 mt of the export trade. While Thailand is also a key producer of the commodity, increased demand for CPO in the domestic market has led to a drastic reduction in export volumes in recent time. For instance, from an export level of 327,000 mt in 2006, the country exported only 160,000 mt in 2009.

Figure 1.16: Major Exporters of CPO, ('000 mt), 2006-2009

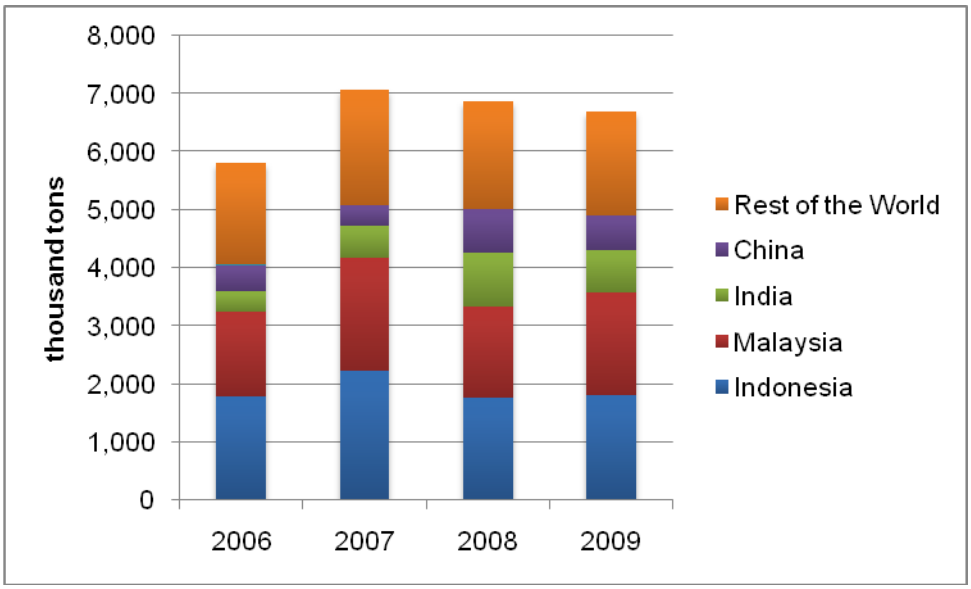


Source: Oil World, 2010.

Stocks

Global stocks of CPO increased from 5.8 million tons to 7 million tons between 2006 and 2007 but since 2008 there have been a decline in the stocks of CPO. The volume of CPO stocks amounted to 6.7 million tons in 2009, while lower than the previous year's level, it is still high when compared with the stocks held worldwide in 2006 (see Figure 1.17). Thus after the 21 percent rise in 2006 over the previous year's stocks, the stock levels fell at a rate of 3 percent per year for 2008 and 2009.

Figure 1.17: Global CPO Stocks,('000 mt), 2006 - 2009

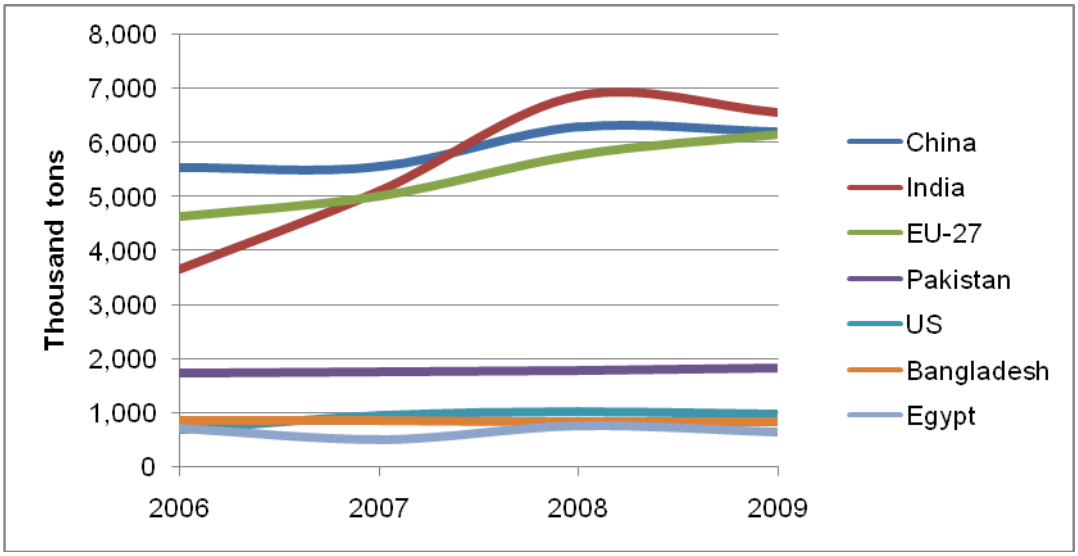


Like other areas of the world market of CPO, Indonesia and Malaysia control half of the stocks in the commodity. India and China also hold ten percent and eight percent of the stocks in CPO respectively, with the rest of the world accounting for almost one-third of the stocks (Figure 1.17). The global CPO stocks represent less than two months of global production.

Imports

The volume of CPO imported worldwide was estimated at 36.3 million mt in 2009. The figure represents a ten percent growth over the 2006 figure. The major importing countries are India (18 percent) and China (17 percent). Thus the two leading sources of import demand for CPO accounts for 35 percent of the global CPO imported. Thus they account for a third of the global import demand for CPO. The next important markets are EU as a block accounts for another 17 percent and s Pakistan (5 percent). Other major importers of CPO include the US, Bangladesh, Egypt, Iran and Japan (Figure 1.18).

Figure 1.18: Import markets of CPO ('000 mt), 2006-2009



Source: Oil World 2010.

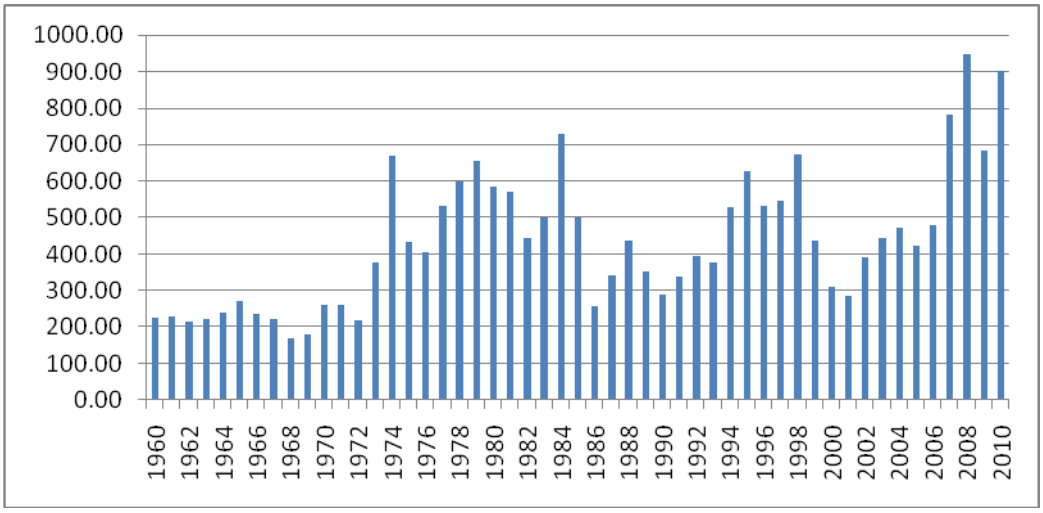
1.2.4 Past, current and future prices of palm oil

This section examines the performance of CPO price over the last five decades, 1960 to 2009. The discussion dwells on both the long run as well the short run price developments. An attempt is also made to look at the short-run volatility in the price.

(i) Long-term price trends

Two key observations can be made regarding the nature of palm oil prices over the last 50 years. First, like most commodities, the price of palm oil has followed a cyclical pattern over the years, with peaks and troughs. Second, the price of the commodity is following an upward trend despite the swings (see Figure 1.19). Currently we are on the downward side of the commodity price cycle and pretty soon we would see new and higher price hikes in the next cycle. That said, an analysis of 10-year period average price movements provides some insights that underlie the upward trend earlier alluded to. For example, for most of the 1960s the price of CPO averaged less than $200/mt. Between the 1960s and 1970s the price doubled to an average of $360/mt, however, the price growth slowed considerably in the 1980s and 1990s. For instance, from an average of $389/ton in the 1980s the price moved to $407/mt for the 1990s. The period 2000-2009 recorded an average price of $472/mt.

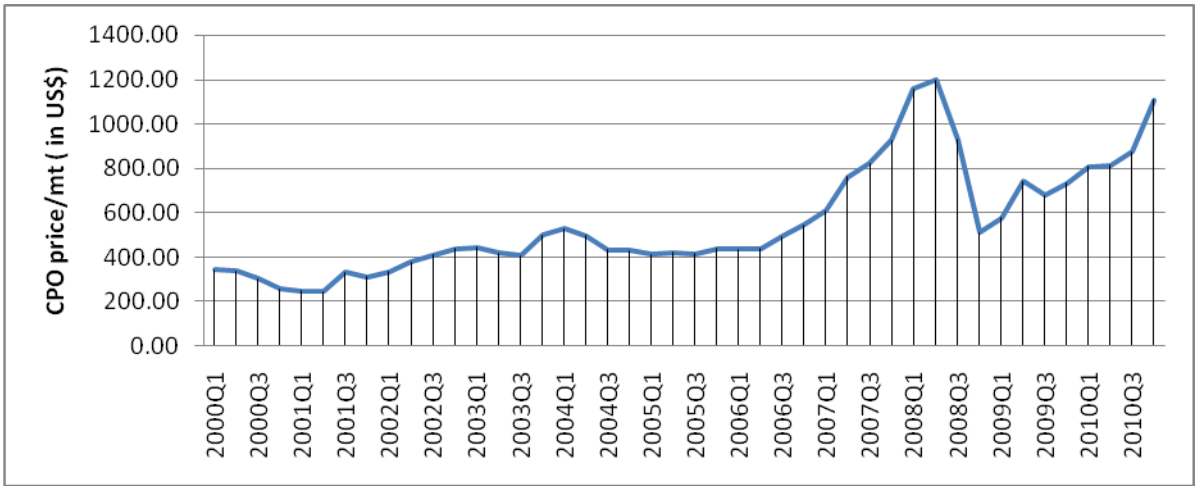
Figure 1.19: Long-term CPO historical price trend 1960-2010 (US$/mt)



World-Bank-Commodity-Trend-1960–2010

These averages notwithstanding the period under discussion have also seen some significant price spikes regarding average yearly price: $699/mt in 1974, $728/mt in 1984, $949/mt in 2008. Further analysis of price developments focusing on the medium term trends (quarter-on-quarter prices) between 2001Q1 and 2009Q3 suggest a strong upward trend despite the price corrections following the latest commodity price super-cycle. The quarterly averages reveal a much higher peak of over $1,000/mt recorded in the first quarter of 2008 (see Figure 1.20). After the dip in quarter four of 2008, prices recovered to a little over $600/mt by the last quarter of 2009 and have since risen to $ 900/mt in 2010 and in 2011 the prices have so far exceeded $ 1,000/mt mark.

Figure 1.20: Medium term historical trends in CPO Prices (US$/mt)) 2000Q1-2010Q4

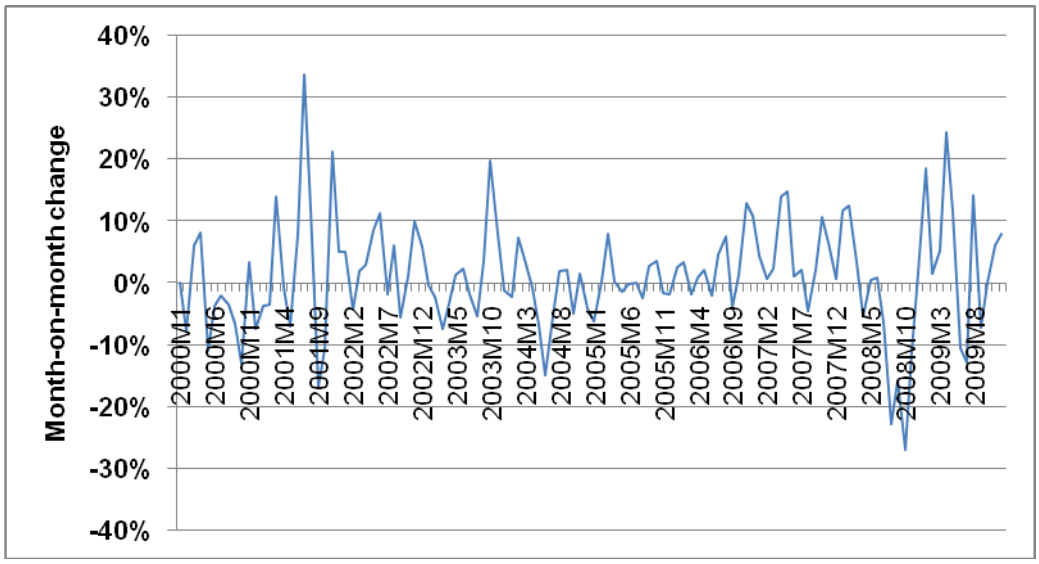


Source: World Bank Commodity Prices data updated on July 6, 2011 (Pink data)

(ii) Price Volatility

The price volatility of the CPO is examined using the monthly spot market price. As shown in the figure below, the level of price fluctuations in the late 2000s are lower than those seen in the early 2000s. Nonetheless, 10 percent price variations appear to be quite common over the period 2000M1 to 2009M8. However, it is also important to note that, there have been periods where relatively higher price spikes have been observed (see Figure 1.21). While most of these spikes have been positive a number of them have been negative as well.

Figure 1.21: Short-run price volatility (2000M1: 2009M12)



Source: Author's computations based on data from IMF (2010)

1.2.5 Palm oil-based food and non-food products

Originally used in crude form for cooking, palm oil has evolved into an international commodity with many food and non-food applications. More recently it has been promoted as a feedstock for the production of biofuels. About 80 percent of current world palm oil production is consumed in the form of food and edible products, and more than 30 percent in packaged products in supermarkets ranging from cooking oils, margarine, ice cream, cookies and chocolates to soaps, detergents and cosmetics. Global brands such as Flora, KitKat, Dove and Persil contain ingredients derived from palm oil.

Non-food uses are also becoming increasingly important, contributing to the greater demand and higher prices for palm oil. Usage in soaps, detergents, surfactants, cosmetics, pharmaceuticals, nutraceuticals and some household and industrial products has been growing because of the move away from petroleum-based products, which has opened the way to non-traditional applications for palm and palm kernel oils. The global desire to substitute at least a small portion of fossil fuel use with renewable fuels has also given rise to increased demand.

Although palm oil has a wide range of uses, in Ghana the usage thus far has been quite limited. Generally, there are more than 10 oil palm products and derivatives. These products and derivatives may be categorized into three groups of products, see figure 1.22.

Figure 1.22: Oil palm products and derivatives

Category	Product
Group I	Fresh fruit bunch
	Palm kernel
Group II	Crude Palm Oil
	Refined Bleached Deodorised (RBD) Olein (frying oil)
	Crude olein
	Crude stearin
	Crude kernel stearin
	Crude palm kernel oil
	Crude kernel stearin
	Crude kernel olein
Group III	RBD palm kernel oil
	RBD stearic oil
	RBD Palm oil

Source: IPOD, 2007.

Palm oil and its derivatives are used in the food processing industry and also in the industrial and chemical industries. In the food processing industry, palm oil is often used where solid fat is required. Palm kernel meal may also be used as feedstock for animals. Sometimes, palm oil is used together with soy, canola or other oils. At the industrial level, the commodity and its derivatives may be used as mineral oil substitute for producing lubricants, detergents, soaps and cosmetics.

1.3 PRODUCTION COSTS

(i) Main producing countries

The cost of production of palm oil in Indonesia and Malaysia, the world's leading producers and exporters of palm oil, is around $300/mt to $350/mt on average. These results are being achieved through high yields per hectare, 30mt/ha or more at peak production and then by processing the fruit through large, and highly efficient, milling facilities with oil extraction rates of 25%.

(ii) Ghana

Analysis of the financials of one of the medium sized plantation company's[19] in Ghana indicates that the cost of production of CPO was in excess of $600/mt. From

[19] Published 2005-2009 Annual reports & financial statements of Benso Oil Palm Plantation Limited

analysis of performance of small-scale palm oil mills across the country, the cost of production is $359/mt and if output is doubled then from the same quantity of FFB processed it means the small-scale cost of production will be $180/mt. Note: as size increases the level of manpower and other social responsibilities and expectations will increase the fixed costs and so $250 to $300 per mt is plausible.

1.4 CONCLUSIONS

1.4.1 Palm oil comparative and competitive advantages

- Global demand for oilseeds is booming, driven largely by rising consumption of vegetable oils, animal feeds and personal care products, and in part by demand for biofuels. Global demand for vegetable oils is forecast to grow by 40%+ over the next 10 years.
- Of the 17 major vegetable oils traded on the international market, palm oil is the most important. It accounts for more than half of the global import and export trade of all vegetable oils.
- Demand for palm oil is growing particularly fast:-
    - It is the most competitively priced vegetable oil
    - There is growing usage in a wide range of products
    - Demand is growing internationally, regionally and within Ghana
- Unlike other commodities, the global slowdown appears to have had little impact on palm oil demand
- Palm oil is 5 to 10 times more productive than other oil bearing crops and has the lowest requirement for inputs of fuel, fertilizers and pesticides per tonne of production
- About 80% of current world palm oil production is consumed in the form of food. Rising food demand coupled with growing demand for non-food uses is likely to sustain the continued rapid growth in demand for palm oil in the foreseeable future.
- With an estimated world wide population increase of 11.6 percent and a 5 percent increase in per capital consumption, an additional 28 million tonnes of vegetable oils will have to be produced annually by 2020. Palm oil is well placed to meet this demand with the lowest requirement for new land. An additional 6.3 million ha would need to be planted for oil palm; in contrast, if the increased demand were to be satisfied by soybean oil production, an additional 42 million hectares of land would need to be cultivated.

1.4.2 Rationale for developing oil palm production in Ghana

- Oil palm is indigenous to Ghana and palm oil is an important local staple food
- Projections for future supply and demand in Ghana indicate that the present shortfall of CPO supply will grow from 32,000 tons (160,000 tons of FFB, 8889ha, 35,555 direct jobs in oil palm plantations: assuming 20% oil extraction rate,18 ton/ha yields and 4 jobs/ha) to 127,000 tons (141,000 direct jobs from 564,400ha) in 2024. Thus there is a considerable requirement to fill this deficit. Meanwhile, the current supply gap for West Africa alone is about 450,000 tons per annum and is bound to increase over time – a huge export market opportunity for Ghana to take advantage of.
- World wide demand, including regional demand, is also increasing offering the possibility of exporting oil palm from Ghana
- Favourable conditions exist in Ghana for the expansion of both large-scale and smallholder oil palm production and processing
- In addition to the requirement for CPO, there is great potential for value-added and down stream activities
- The palm oil industry is an extremely important component of many Ghanaian livelihoods ranging from small-scale growers, artisanal processors to estate labourers and large-scale mill and plantation owners
- Ghana has a very competitive location for oil palm development compared to its immediate neighbours and the top global producers (see figure 1.23)
- While developing local capacity in breeding better planting material, new high-yielding varieties developed elsewhere can be accessed through government-to-government facilitation to double yields in Ghana.

Figure 1.23: Analysis of the competitive location of Ghana for Oil Palm

	Top 4 Africa Producers				Top 4 Global Producers			
	Ghana	Nigeria	Cote d'Ivoire	Cameroon	Malaysia	Indonesia	Thailand	Colombia
Availability of useable, unforested land	4	4	4	3	1	2	2	3
Year-round heat & solar radiation	5	5	5	5	5	5	5	5
Year-round rainfall	3	5	3	5	5	5	5	5
Low land leasing costs	3	2	4	4	1	2	2	3
Low labour costs	3	3	4	5	2	4	3	3
Distance from main palm area to port	5	4	5	4	4	4	5	4
Local market oil deficit	5	2	3	4	1	1	1	1
Regional trade-area oil deficit	5	5	5	3	1	1	1	3
Duty-free access to EU	5	5	5	5	1	1	1	1
Duty-free access to US	5	5	1	5	1	1	1	5
Distance to EU / Distance to US	4	3	4	3	1	1	1	5
Political stability	5	4	1	2	5	4	3	4
Low crime	4	1	2	2	5	5	4	2
Economic growth	5	5	3	4	5	5	5	4
Business environment	4	3	2	2	5	3	5	4
Evaluation Key	**5 = Very positive**	**4 = Positive**	**3 = Neutral**	**2 = Negative**	**1 = Very negative**			

Source: FAO, Aquastat

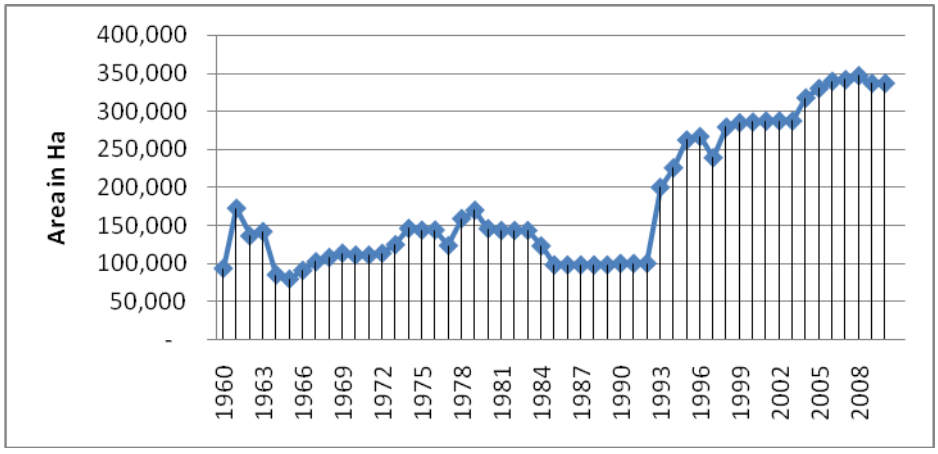
CHAPTER 2:
THE OIL PALM SECTOR IN GHANA

A. CURRENT STATUS OF THE GHANA OIL PALM INDUSTRY

2.1 TOTAL AREA UNDER OIL PALM AND ITS DISTRIBUTION

The total area under oil palm in Ghana more than doubled from 142,000 ha in 1960 to about 336,000 ha by 2010. Although there was an overall increase in area under oil palm, periods of decline in 1961-62; 1984-1990; (Figure 2.1) occurred and these declines signify more oil palm trees[1] being felled than new ones being planted[2]. The President's Special Initiative added about 20,000ha of oil palm to the national stock between 2004 and 2010. A new estate[3] began plantation development 3 years ago in the Volta region and has added about 2,000ha to the national area under oil palm.

Figure 2.1: Area under cultivation 1960 – 2010 (ha)



Source: Team Analysis

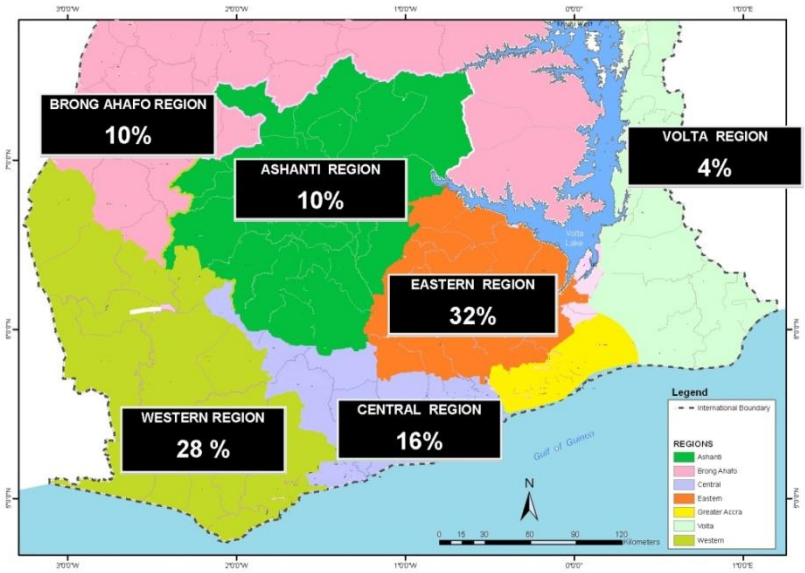
[1] The wine tapped from the oil palm trees is fermented and distilled to produce a popular alcoholic drink in Ghana. Note on decline in area attributed to tree felling: 1984-1990 (massive felling by State Farms across the country) and 1998 (massive felling by members of the TOPP outgrower scheme which ended that scheme by 1999)

[2] The President's special initiative on oil palm added 20,000 ha of oil palm plantation between 2003 and 2009.

[3] Herakles Farms is under the name Sithe Global Sustainable Oil Palm Plantation is developing an estate at Brewaniase in the Volta Region -Herakles Farms is partnered by the nonprofit, All for Africa, which funds projects focused on agriculture, clean water, community health, education, energy, environmental impact, micro-financing and skills training/livelihood creation.

Of 336,000 ha under oil palm in Ghana, Eastern region accounts for the highest area (32%), followed closely by Western region (28%) and the least development of 4% is found in Volta region (figure 2.2).

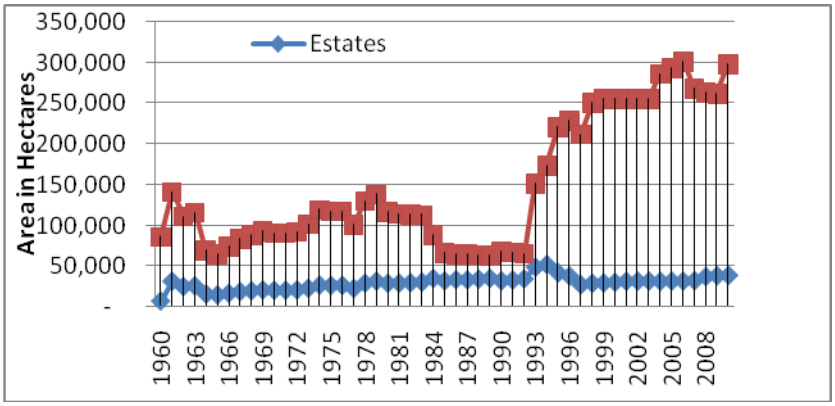
Figure 2.2: Distribution of area under cultivation by region in %.



2.2 AREAS UNDER ESTATES AND SMALLHOLDINGS

During the past 50 years the area under independent smallholdings has exceeded the area under estates. While the estates area remained the same, due to sell offs and massive felling of oil palm trees by the State Farms Corporation, the area under independent smallholdings expanded rapidly from 1990 (Figure 2.3) onwards due to an increase in local consumption of palm oil and the availability of improved planting material from the Oil Palm Research Institute of Council for Scientific and Industrial Research (Ghana).

Figure 2.3: Area under Estates and Independent Smallholdings



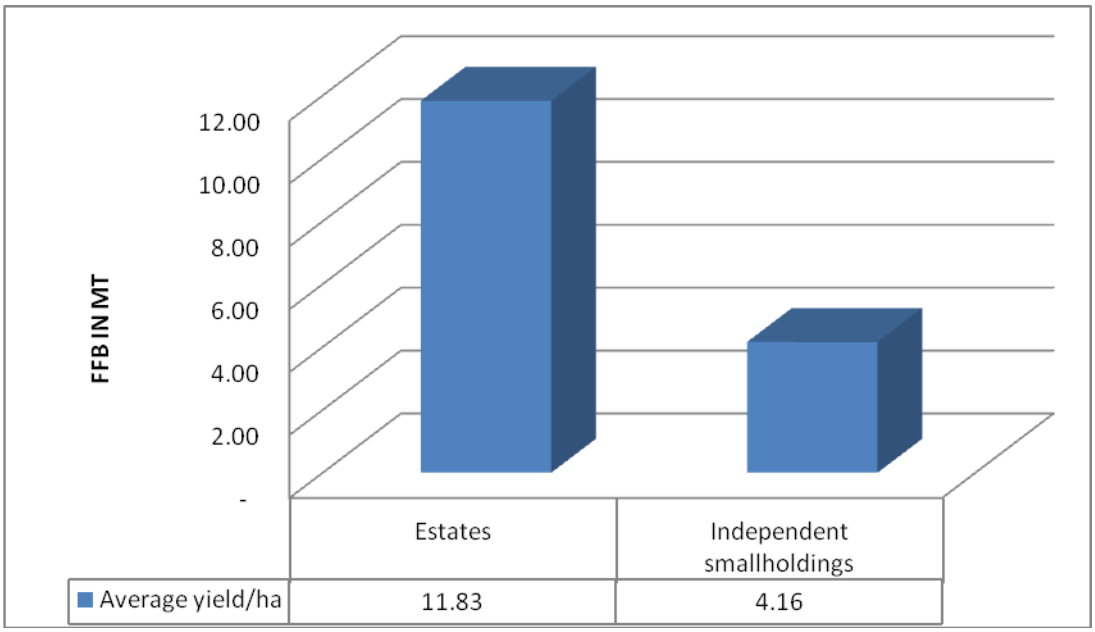
Source: Team Analysis

2.3 YIELD LEVELS AND PRODUCTION OF ESTATES AND SMALLHOLDINGS

(i) Yield levels

Yield level on the estates is 3 times higher than that on independent smallholdings (Figure 2.4) due to better planting material and husbandry practices.

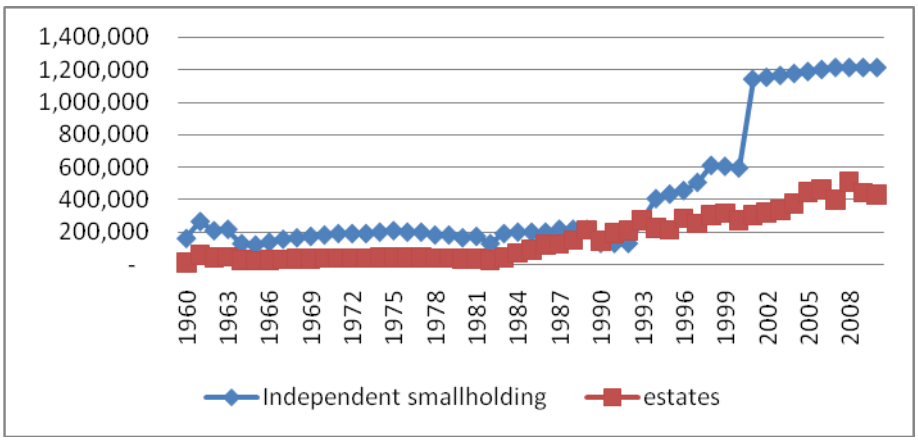
Figure 2.4 Yield comparisons between estates and independent smallholdings



(ii) Production by the estates and independent smallholdings

FFB production on the estates and independent smallholdings increased rapidly from 1990 after stagnating for 30 years (Figure 2.5).

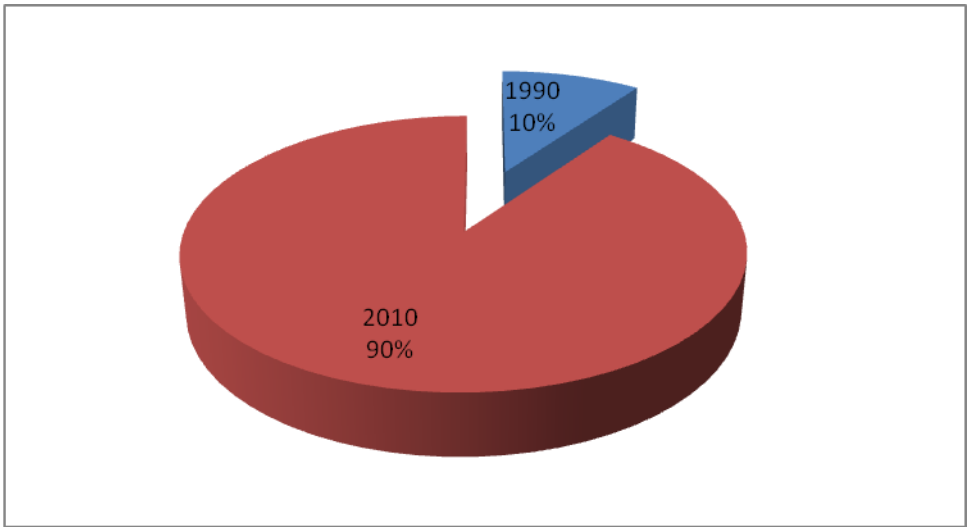
Figure 2.5: FFB production by independent smallholdings and estates 1960-2010



Source: Team analysis

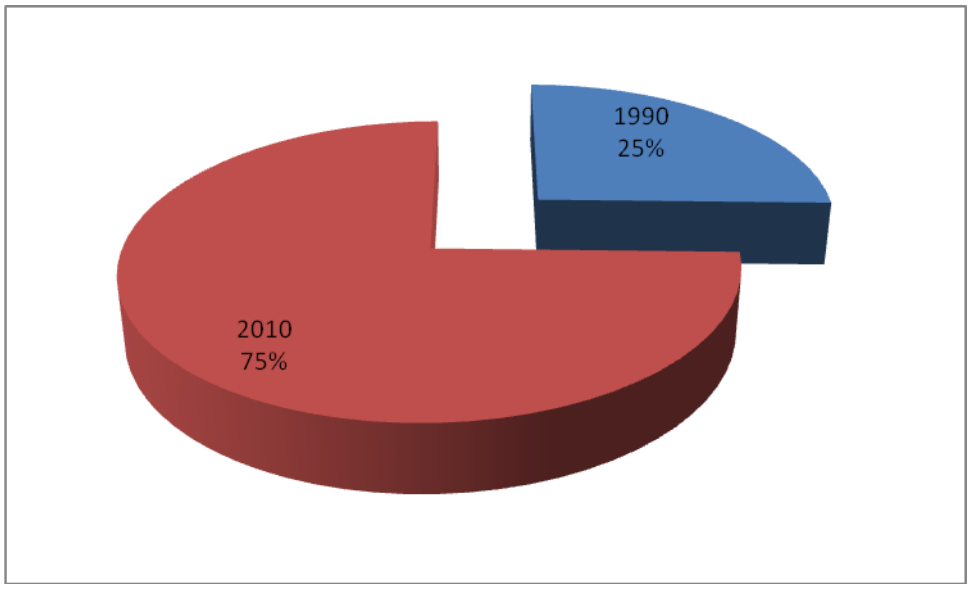
FFB production from smallholdings increased 9-fold comparing 2010 with 1990 which marked the year when rapid increase of the area under oil palm cultivation began (figure 2.6) whilst that of estates also increased but to a lesser extent (figure 2.7).

Figure 2.6: Performance of Independent smallholdings 1990 and 2010 compared



Source: Team analysis

Figure 2.7: Performance of Estates 1990 and 2010 compared



Source: Team Analysis

Although the land area did not increase the productivity of the estates increased about 3 fold comparing 2010 and 1990 FFB production.

Currently FFB produced by independent small holdings is about 1.2 million mt per annum. Note that:

i. 193,409 mt FFB was purchased by the estates from this source in 2010
ii. 239,435 mt was the total quantity of FFB produced by the estates in 2010.
iii. About 1 million mt independent smallholder fruit was processed annually for the past decade.

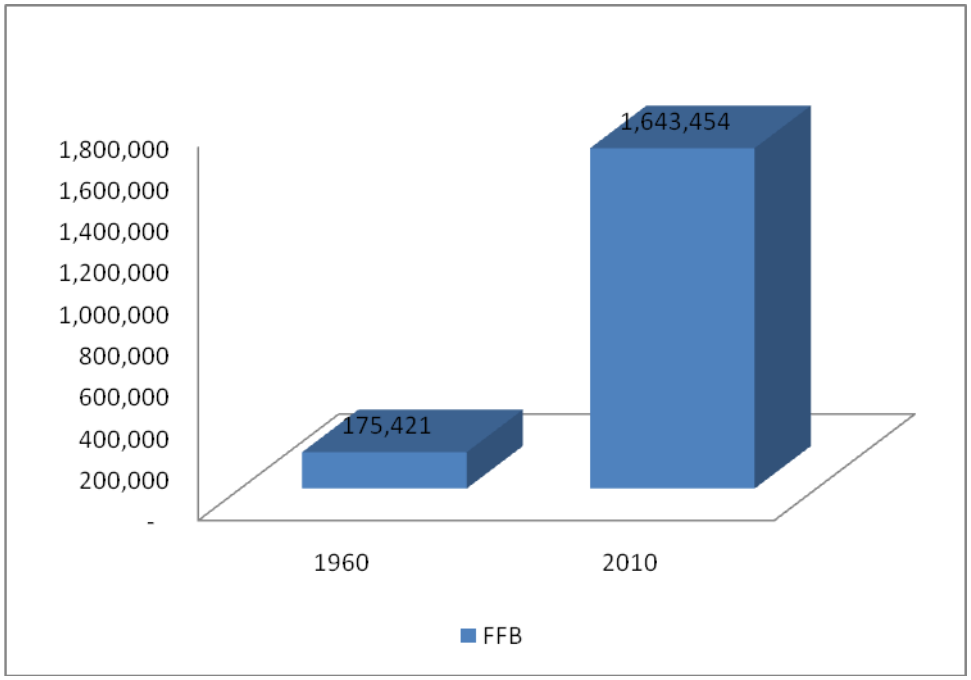
Average yield at estate level is currently highest at TOPP (12.7 mt/ha), followed by BOPP (10.0 mt/ha), then GOPDC (9.5 mt/ha) and finally Norpalm (5.1mt/ha). Overall FFB production has declined in recent years on the estates due to a higher proportion of young oil palms planted to replace over aged trees and fertilisers, which boost yields, have been applied well below industry standards.

2.4 TOTAL PRODUCTION, EXPORT AND CONTRIBUTION TO GDP

2.4.1 Total production

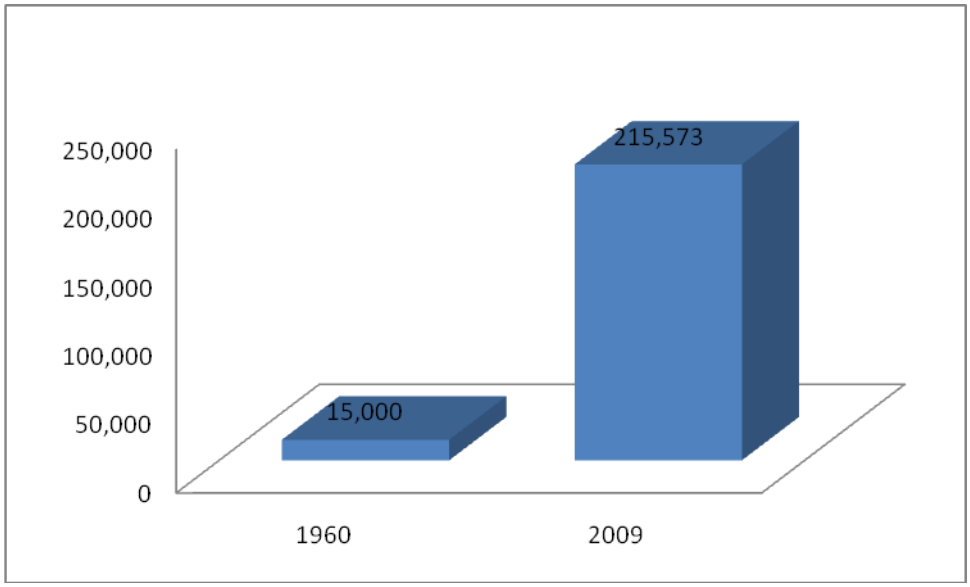
Total FFB produced in Ghana increased 9 fold in five decades from 0.18 million mt in 1960 to 1.64 million mt in 2010 (Figure 2.1.8).

Figure 2.8: Total FFB production



CPO production also increased 14 fold over the same period from 0.02 million mt to 0,21million mt in 2010 (Figure 2.9).

Figure 2. 9: Total CPO production

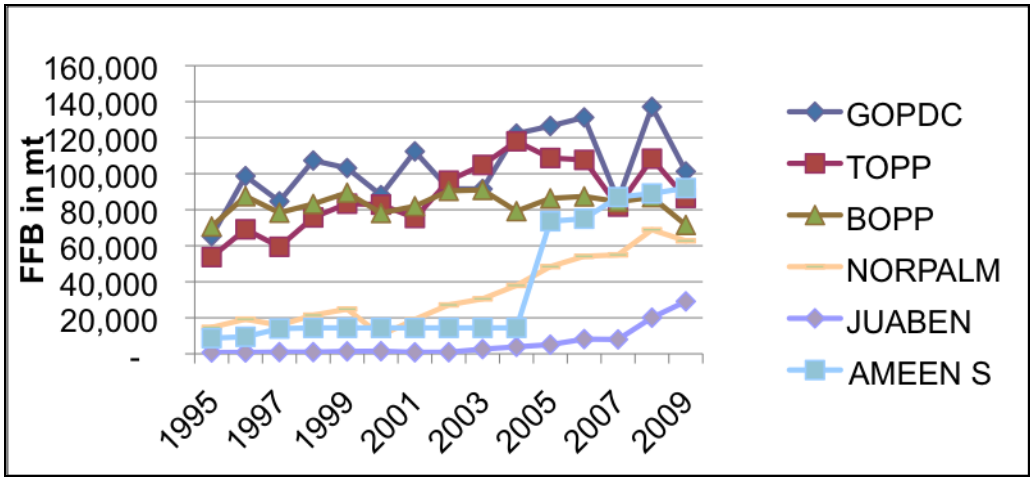


Source: Team Analysis

2.4.2 FFB processed by the plantation companies

Figure 2.10 shows the quantity of FFB processed by the major Ghanaian mills over the last 15 years.

Fig 2.10: FFB processed by medium-large mills



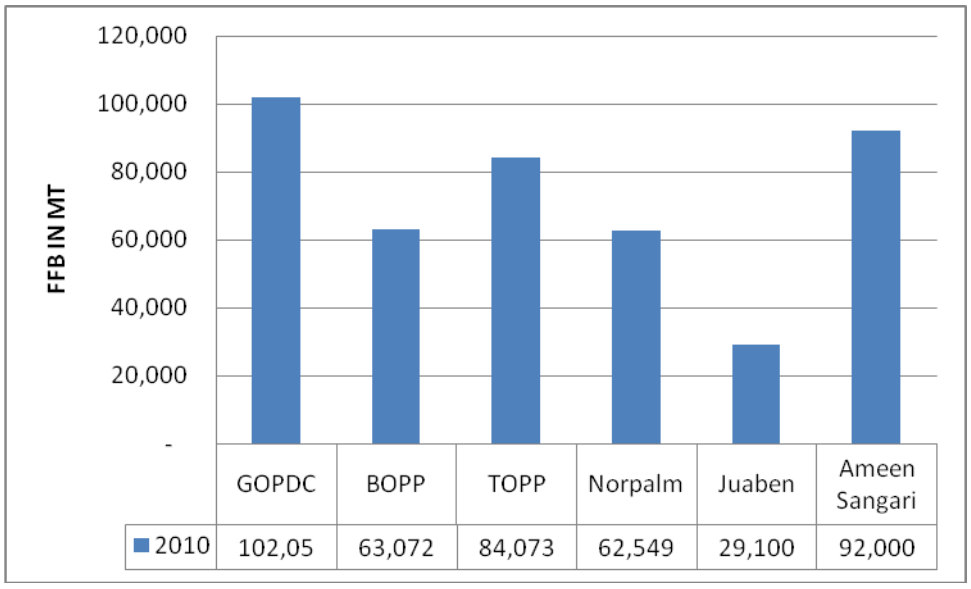
Source: Team analysis

GOPDC processed the greatest quantity of FFB over the last 15 years but output declined in 2010 due to lower than expected contribution from outgrowers. Since

2004 there has been a remarkable improvement in the total quantity of FFB processed due to extra supply of FFB coming out of the Western, Ashanti, Brong Ahafo, and Central Regions. Norpalm has increased their volume processed significantly over the past 5 years with a fully rehabilitated mill. Further reduction in total FFB processed by BOPP was caused by leaf miner attack[4] experienced on its plantations in 2007 and 2008 and reduction in FFB purchased from independent smallholders due to competition with Norpalm.

Six medium to large scale mills were operational in 2010 (figure 2.11) with an estimated combined annual throughput of 432,844 mt FFB. Ameen Sangari in Cape Coast increased their milling capacity to 30mt/hr in 2004 hence they stepped up FFB volume processed in 2010 to some 70,000 mt.

Fig 2.11: FFB processed by major mills in Ghana 2010



Source:Team Analysis

Note: BOPP's production in 2010 was the lowest in more than 15 years and was due to the over 50% replanting of the nucleus yet to come to peak production

2.4.3 Individual estates

(i) GOPDC

GOPDC was initiated by the Government of Ghana in 1975, with the objective of diversifying agricultural production through the introduction of oil palm cultivation in an area dominated by the production of cocoa and tropical wood. In 1995, GOPDC was privatised and Siat of Belgium acquired 60% of the company through Siat (Ghana) Ltd, a joint venture company with SSNIT and ATMF (Ghana) Ltd.

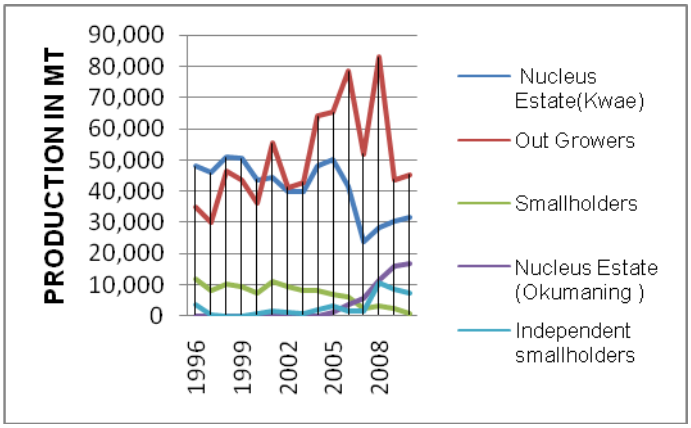
[4] Pers. Comm. - leaf miner is a beetle which destroys palm fronds by feeding on the green pigments. Leaf miner attack is known to reduce yield of oil palm totally 3 years after the attack.

GOPDC is located at Kwae in the Eastern Region. GOPDC has 4078ha of nucleus estate at Kwae and another estate of some 5,000ha at Okumaning. There are also 1200ha of smallholder palms and 14,000ha of outgrowers within a 30km radius of the mill. After privatisation, GOPDC expanded rapidly and the original mill capacity of 30tph FFB was upgraded to a 60 mt per hour palm (tph) FFB. There is a plan to further expand the mill to 80tph in 2013. It now has a 60 mt per day palm kernel oil mill, a 100 mt per day refinery and fractionating plant and there is a 2.8mw power generating plant.The company employs 250 workers permanently and over 2,000 seasonally. It is estimated that 40% of the workers are women. The management is actively involved in RSPO in Ghana and the company is working towards certification.

FFB Contribution

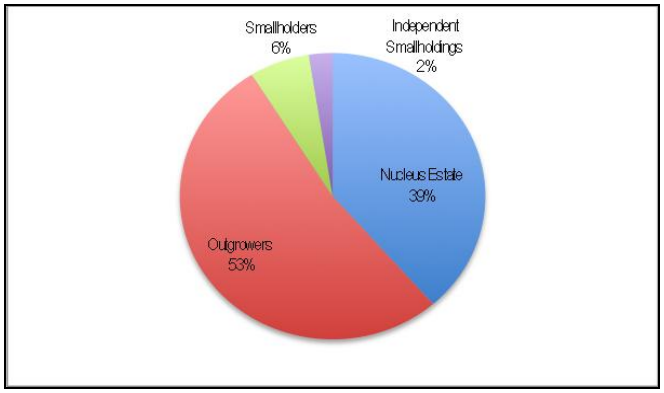
Over the last 15 years outgrowers' have contributed 53% to total FFB supply to the mill. The nucleus estate has delivered 39% with smallholders supplying the remainder (figure 2.12 and 2.13).

Figure 2.12: GOPDC FFB Supply 1996 – 2010 (mt)



Source: Team Analysis

Fig 2.13: Average FFB contribution from all sources (15 years)

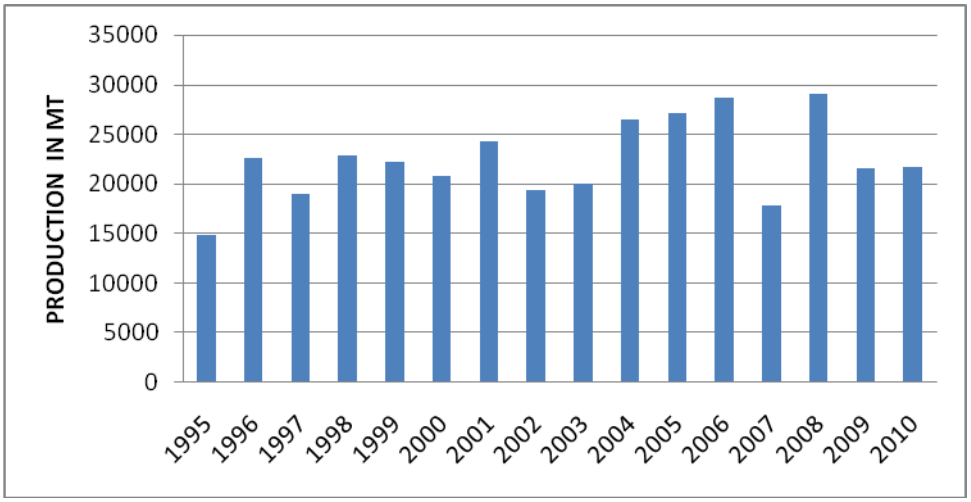


Source: Team Analysis

CPO Production

Figure 2.14 shows that in 2008, GOPDC produced nearly 30,000mt of palm oil. Production in 2010 was much less at just over 20,000mt and this significant seasonal variation is mainly dependant on rainfall.

Figure 2.14: Annual CPO Production at GOPDC 1995 – 2010 (mt)



Source: Team Analysis

(ii) BOPP

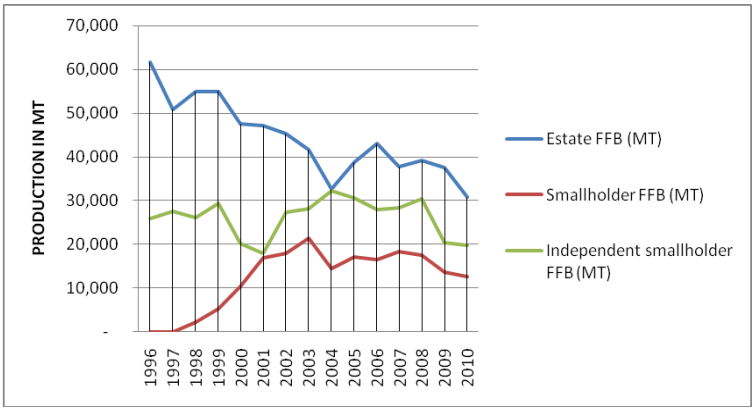
BOPP, as a joint venture between Government of Ghana and Unilever was registered as a limited liability company in 1976. The plantation programme commenced in 1977 and ended in 1990 with a total of 4,231 hectares planted. Plantation replanting began in 1998 bringing the size of the nucleus estate to 4,672 ha. BOPP began using a 16 tph mill to process FFB in 1981 which was upgraded to 20 tph in 1994 after a 625 kva steam turbine and a second boiler (13.6 tph) were installed.

A 1650ha smallholder scheme was started in 1995. BOPP was listed on the Ghana Stock Exchange in 2004. An important source of FFB for processing at BOPP has traditionally been independent smallholdings but contribution from this source dipped in 2009 because of competition from the rehabilitated Norpalm mill whose location gives it a huge advantage over BOPP.

FFB Contribution

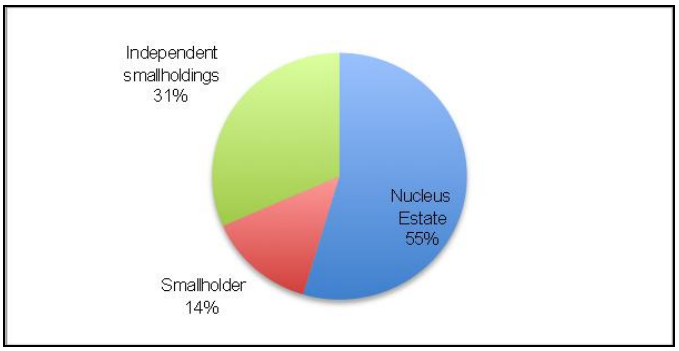
Figure 2.15 shows the FFB contribution from various sources at BOPP over the last 15 years. The nucleus estate was the leading supplier of FFB to the mill. With the estate controlling smallholder FFB, almost 70% of FFB supply to the mill is guaranteed. Fig 2.16 shows the average FFB contribution from all sources.

Fig 2.15: BOPP FFB processed 1996 – 2010 (mt)



Source: Team Analysis

Fig 2.16: Average FFB contribution from all sources

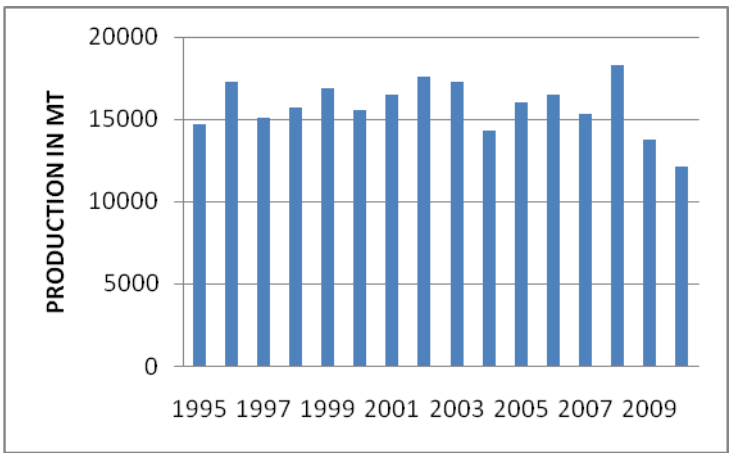


Source: Team Analysis

CPO Production

Figure 2.17 shows that BOPP had a particularly strong year in 2008, producing more than 18,000mt of palm oil. However, 2009 was not a very good year for the company and production dropped in excess of 4,000 mt to less than 14,000mt.

Figure 2.17: BOPP Annual CPO Production 1995 – 2010 (mt)



Source: Team Analysis

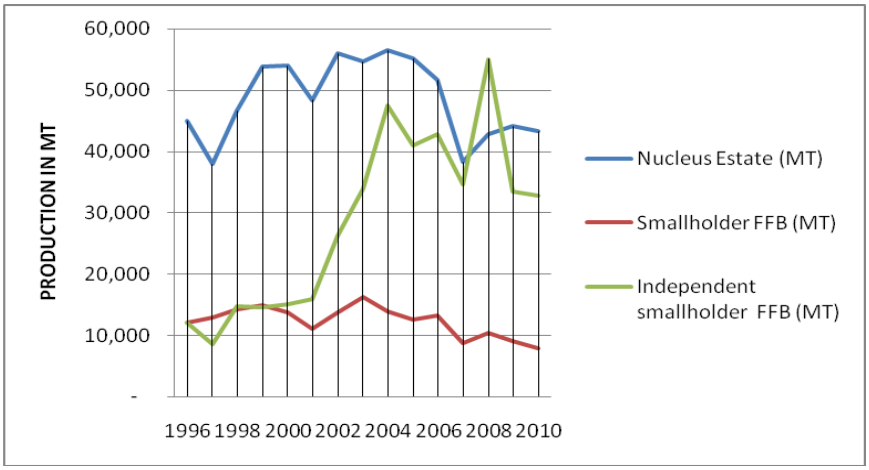
(iii) TOPP

TOPP was incorporated as a limited liability company in 1977 by the Government of Ghana [GoG], government institutions and foreign investors. It established oil palm plantations from 1979-1990 and in 1987 completed construction and commissioned a 20tph mill to process FFB. TOPP started smallholder and outgrower schemes in 1987 and 1989 respectively. The outgrower scheme was discontinued in 1998 after massive felling of new and rehabilitated plantations occurred without management approval. In 1998, Unilever acquired 40% of GoG shares in TOPP and took over management control. FFB processing capacity was upgraded from 20 to 30 tph by 2000. TOPP commenced replanting from 2003.The nucleus plantation remained the main source of FFB for processing at TOPP followed by purchase from independent smallholdings.

FFB Contribution

Figure 2.18 shows the FFB contribution from various sources at TOPP over the last 15 years.

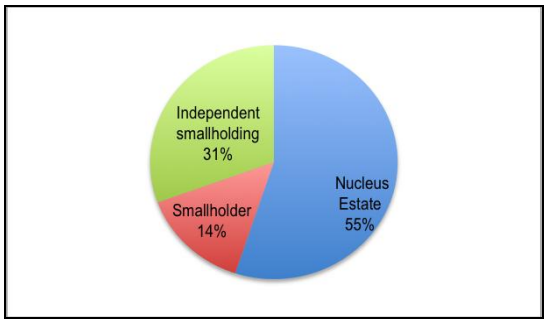
Figure 2.18:Sources of FFB processed by TOPP 1996 – 2010 (mt)



Source: Team Analysis

The nucleus estate contributed 55% of total FFB for processing at TOPP and the smallholder unit also contributed 14% bringing guaranteed FFB supply to almost 70% of total supply (figure 2.19).

Figure 2.19: TOPP 15-year average FFB contribution from all sources

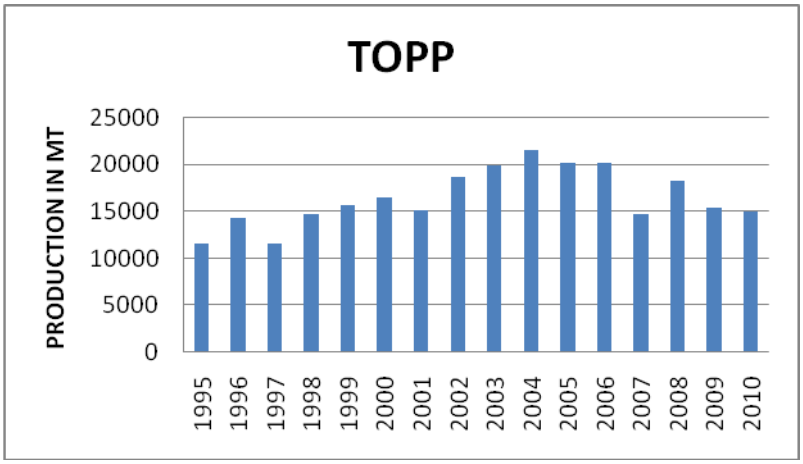


Source: Team analysis

CPO Production

Figure 2.20 shows that TOPP averages around 15,000 mt crude palm oil annually. The chart also shows that 2009 and 2010 were poor years for TOPP in terms of production of palm oil.

Figure 2.20: TOPP Annual CPO Production 1995 – 2010 (mt)



Source: Team Analysis

(iv) AMEEN SANGARI

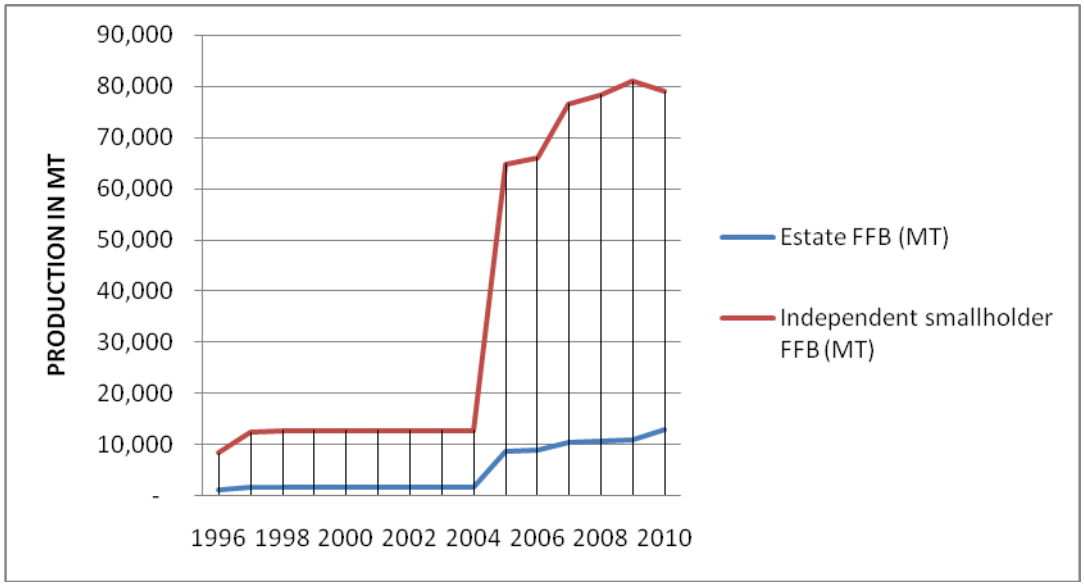
Ameen Sangari Industries Limited, at Cape Coast has been operating in Ghana as a private sector company for the past 99 years. Ameen began soap manufacturing using animal fat during the 1960s. Since the 1980s, Ameen has been using CPO and PKO as the major raw materials for soap manufacturing and currently uses 20,000-30,000 mt of CPO per annum. Ameen also sources CPO from small scale/artisanal millers to augment its supplies. Ameen established oil palm plantations from 1975 and went into processing FFB into CPO and PKO from the 1980s to part meet its raw material requirements. Farmers cultivating oil palm on independent smallholdings provided Ameen with over 88% supply of FFB for

processing. The contribution from this source has increased significantly since 2005 mainly from farmers in the Central Region who have seen the value in cultivation of oil palm.

FFB Contribution

The mill upgrade in 2004 to process 30mt/FFB per hour has enabled Ameen to process much more FFB and figure 2.21 shows the contribution from various sources over the last 15 years.

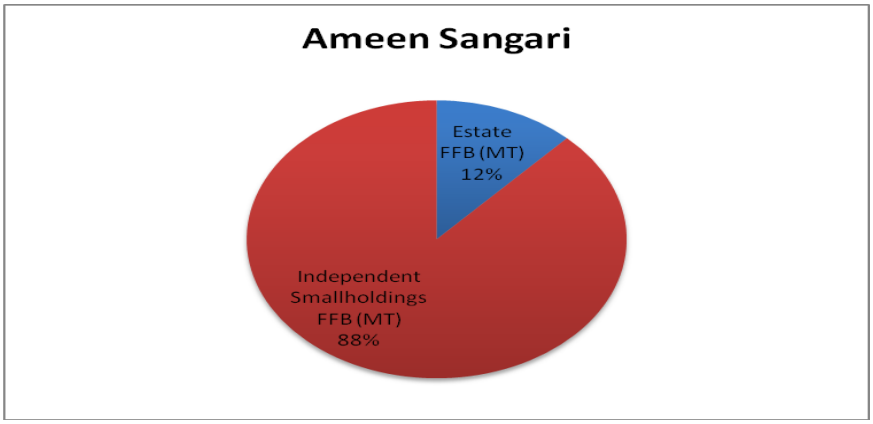
Figure 2.21: FFB processed at Ameen Sangari 1996 – 2010 (mt)



Source: Team analysis

Only 12% of FFB supply to Ameen Sangari for processing is derived from its own plantation and the remaining 88% is obtained from outside purchases (see figure 2.22).

Figure 2.22: Ameen average FFB contribution from all sources

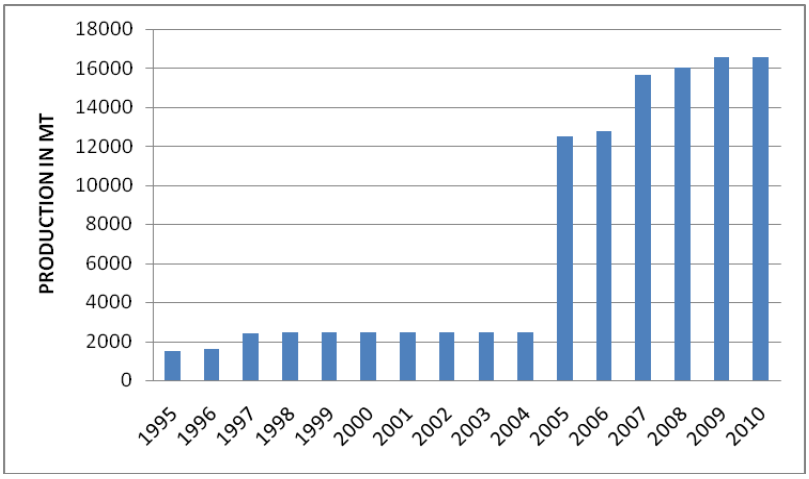


Source: Team Analysis

CPO Production

The dramatic rise in FFB processed in 2005 due to the mill upgrade has had a corresponding increase in CPO produced at Ameen Sangari (see figure 2.23).

Figure 2.23: Ameen CPO Production 1995 – 2010 (mt)



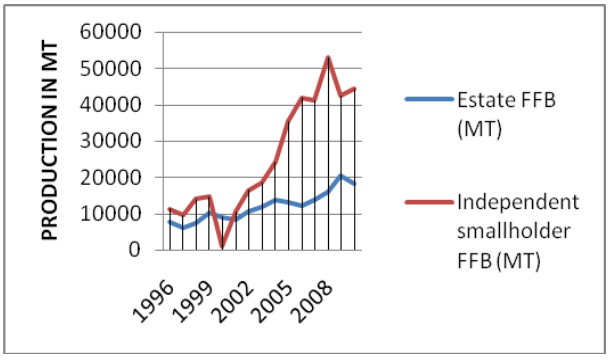
(v) NORPALM

National Oil Palm Limited, a state owned estate since the 1960s was acquired by Norpalm ASA which established Norpalm Ghana Limited (Norpalm) to operate the estate. By 2001, Norpalm brought under control the perennial leaf miner insect crisis experienced before take over. Norpalm began replanting the plantation from 2002 and rehabilitated the mill over a period of 5 years to increase FFB processing capacity from 20-30 tph.

FFB Contribution

Supply of FFB progressively increased on the nucleus plantation due to improved agricultural practices and contributions from new plantings but purchase of FFB from independent smallholdings have remained the main source of FFB for processing at Norpalm (see figure 2.24).

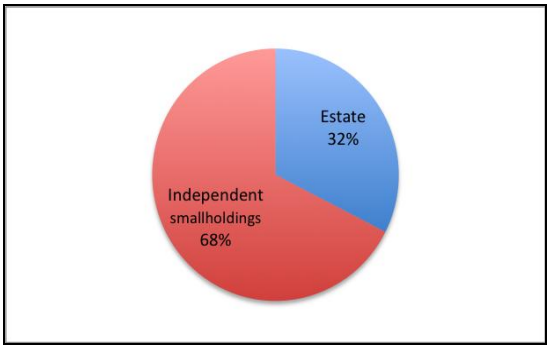
Figure 2.24: FFB processed from all sources by Norpalm 1996 – 2010 (mt)



Source: Team analysis

About a third of total FFB supply for processing is obtained from Norpalm's nucleus estate and remaining two-third is purchased from independent smallholdings (figure 2.25).

Figure 2.25: Norpalm 15-year average FFB contribution from all sources

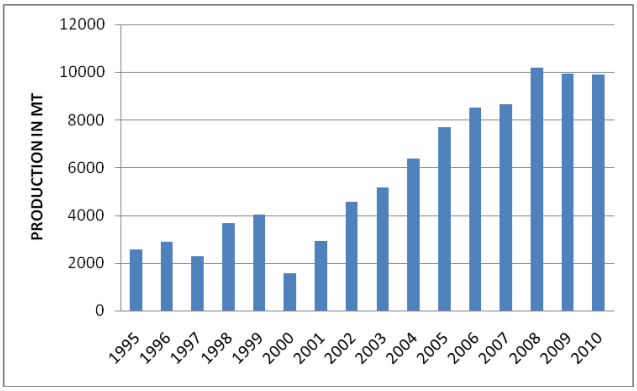


Source: Team Analysis

CPO Production

CPO production at Norpalm is shown in figure 2.26 and has averaged 10,000 mt for the last 3 years.

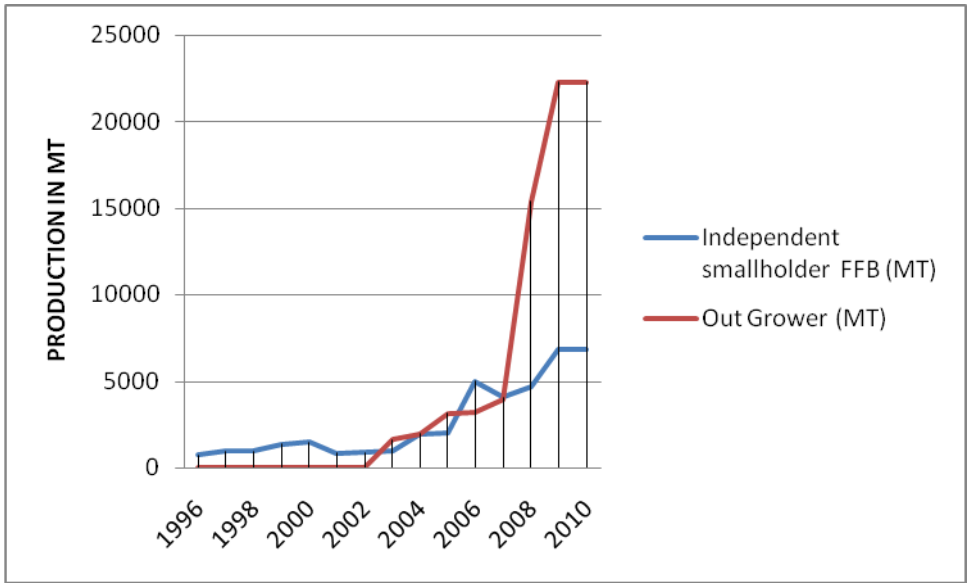
Figure 2.26: Norpalm CPO Production 1995 – 2010 (mt)



(vi) JUABEN

Juaben Oil Mills [Juaben] is a joint venture between the Juaben Traditional Council and the Juaben Oil Mills Company Limited. Juaben has an outgrower scheme, FFB processing mill, a palm kernel recovery mill, an oil palm refinery/fractionation plant and a shea butter plant. The FFB processing mill produces 50mt CPO daily. Contribution from the outgrower scheme increased sharply from 2008 and indicates that this scheme implemented by Juaben and funded by the World Bank has been very successful in increasing production (figure 2.27).

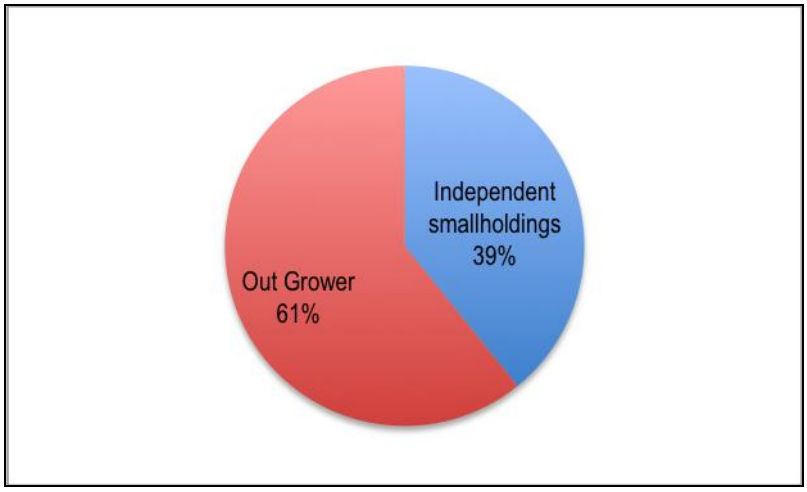
Figure 2.27: FFB processed at Juaben 1996 – 2010 (mt)



Source: Team analysis

Two-thirds of the FFB supply by Juaben is obtained from outgrowers and the remaining third from independent farmers scattered throughout the oil palm belt in Ashanti, Brong Ahafo, Western, Eastern and Central regions of Ghana (figure 2.28).

Figure 2.28: Juaben 15 year average FFB contribution from all sources

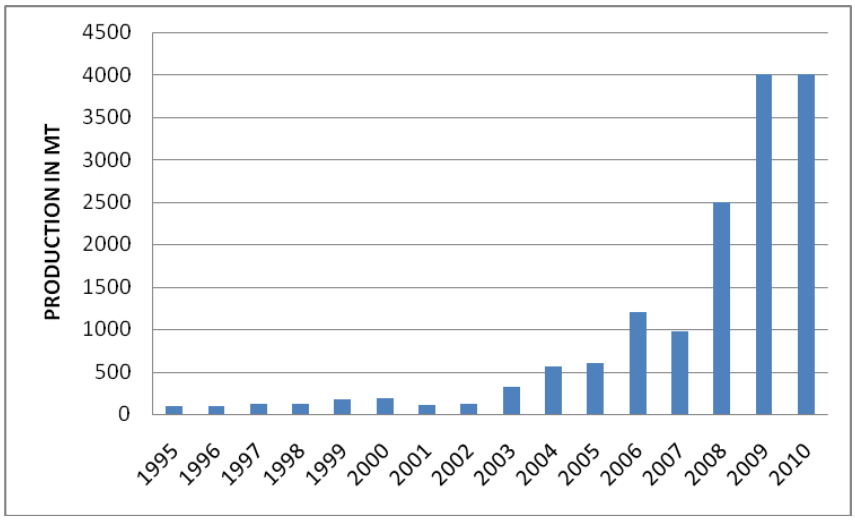


Source: Team analysis

CPO Production

CPO production has increased sharply with the increase in FFB processed over the last 3 years (figure 2.29).

Figure 2.29 Juaben CPO Production 1996 – 2010 (mt)

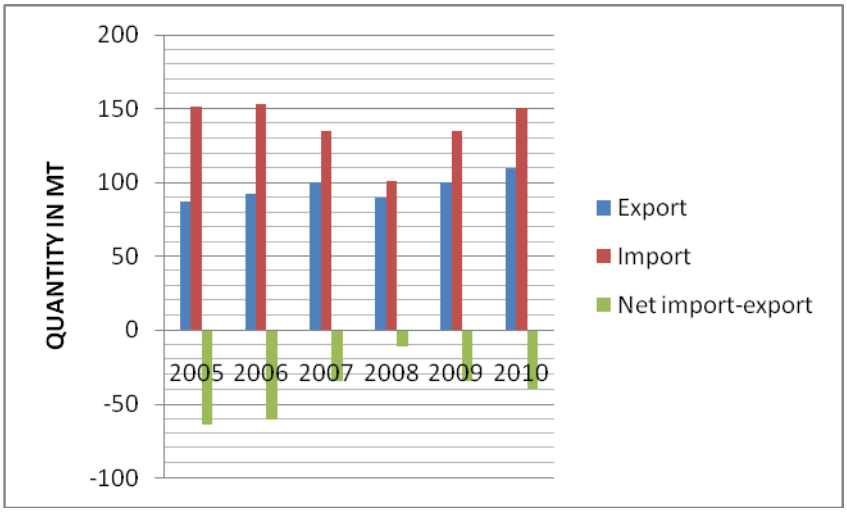


2.5 EXPORT AND CONTRIBUTION TO GDP

2.5.1 Export

There is a considerable amount of trade in CPO that goes on between Ghana and the rest of the world. The trade is both formal and informal (unrecorded). Over the last five years the country has been a net-importer of palm oil each year. In 2005, the net import was in the order of 64,000 mt, this was the difference between the 87,000 mt of export and the import of 151,000 mt. Ghana remained a net importer in 2010 of 40,000 mt (see Figure 2.30). Over the last five years the net import of CPO averaged over 41,000 mt per year.

Figure 2.30: Trade in CPO in Ghana 2005 – 2010



Source: USDA 2011.

2.5.2 Contribution to GDP

Ghana has one of the highest GDP per capita in West Africa and in 2009 was US$ 37.481 billion. The country has a diverse and rich resource base with gold, timber, cocoa, diamond, bauxite, and manganese being the most important sources of foreign exchange. In 2007, an oilfield which may contain up to 3 billion barrels of light oil was discovered. Yet, in spite of this abundance of natural resources a quarter of the population live below the international poverty line of US$1.25 a day. Smallholder production of CPO which was stated earlier as contributing 80% of the total supply in Ghana is highly labour intensive. Its contribution to GDP is therefore substantial. In 2010, the contribution of the CPO industry was estimated at about one percent of GDP. It is noteworthy that the Kwaebibriem District, the centre of oil palm development in Ghana, is the area with the second lowest poverty rate in the country. Expansion of activity downstream into the manufacture of both food and non-food products using CPO & PKO as the raw materials would substantially increase the contribution of the oil palm industry to GDP.

2.6 GENERAL STANDARDS OF MANAGEMENT AND COMPETENCE OF ESTATES AND SMALLHOLDINGS

2.6.1 Plantation management

Oil palm plantations of all sizes are organized into maintenance and harvesting units.

Medium-large estates have created special units to purchase and transport the FFB to the mills, while women who may be the wives of small scale mill owners go out to purchase FFB.

The estates are more cost effective than the independent smallholders (Figure 2.31). Independent smallholders slash their plantations at most twice a year which is inadequate and generally they do not follow good plantation practices like application of fertilizers, pruning and sanitation. The estates on the other hand apply fertilizers at levels below industry standards, though; keep weed growth under control through establishment of cover crops and regularly slash unwanted vegetation; and undertake other plantation maintenance practices judiciously to boost yields. The independent smallholder plantations are generally not harvested systematically due to weed encroachment.

Figure 2.31: Cost comparison between estate and smallholdings maintenance and harvesting operations.

Activity	Estate		Smallholding	
	No. of man days	Unit cost/ha US$	No. of man days	Unit cost/ha US$
Slashing (ha)	3	12	13	15
Harvesting (mt)	7.5	49	15	98
Total		61		149
Cost/ha in US$		61		149
Cost/mt in US$		4		50

Cost of production comparing the two activities shows the estate cost of US$ 4/mt against US$ 50/mt for independent smallholder.

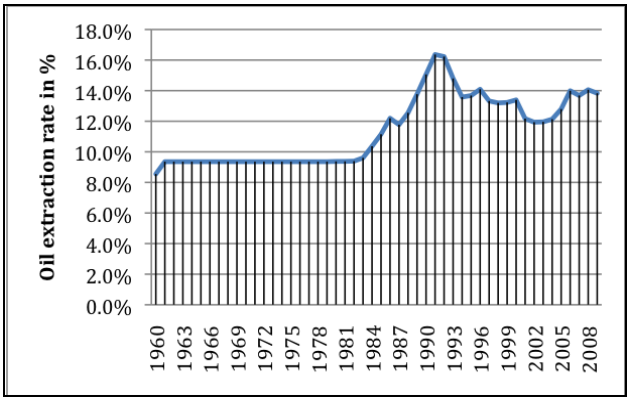
2.6.2 Processing

In production of CPO, PK, PKO and PKC, the estates follow quite good manufacturing practices while the small scale/artisanal mills do not for various reasons. The three performance indices that differentiate operations of these two groups are the oil extraction rates, level of free fatty acid (FFA) and the moisture content of this product. CPO as an international commodity traded on exchanges has predetermined quality parameters for trading that include FFA of not more than 5% and moisture content of not more thatn 0.4%.

(i) Oil Extraction rates (OER)

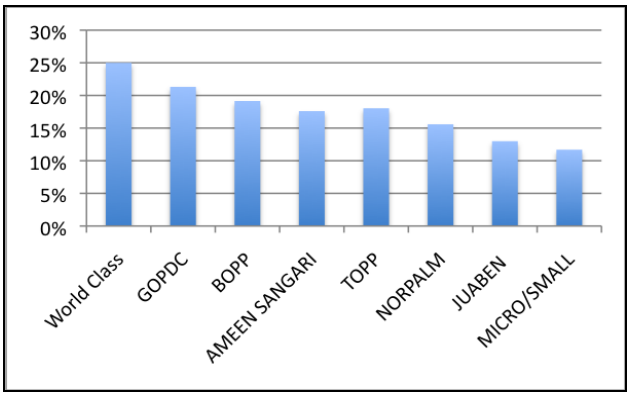
Between 1960 and1983, CPO extraction rate (OER) across the country averaged 9.3%, and rose to 10.4% in 1984, peaked at 16.4 % in 1991 before it declined to 13.8 % in 2009 (see figure 2.32). These results are far below the extraction rate of 21% achieved by GOPDC and world class performance today which is in excess of 25%! (figure 2.33).

Figure 2.32: National CPO extraction rate



Source: Team analysis

Figure 2.33: Ghana 5 year Average Crude Palm oil extraction rates



Source: Team analysis

At the other end of the spectrum are the small scale/artisanal CPO producers who only achieved an average of 11.7%

Processing methods, FFB varieties, type and state of machinery and equipment utilized and fruit quality management largely account for the large differences in the average OER's achieved by the industry in Ghana. Sourcing fruits largely from independents and traders, poor road network, and unreliable electricity supply all impact negatively on OER.

(vi) Free Fatty Acid (FFA)

As stated earlier FFA contents of CPO currently differentiates palm oil quality between estate and small scale/artisanal production. FFA level is over 5% for small scale/artisanal production, while estate level is below 5%. Treatment of FFB, CPO moisture content and storage of CPO are factors that determine FFA levels in estate and small scale/artisanal production.

(vii) Moisture Content

Due to the low level of technology employed by the small scale/artisanal producers of CPO, they are not able to vaporise a substantial portion of the moisture in the palm oil produced. It is not unusual to find moisture of 10% by volume in the CPO produced by the micro mills.

2.7 RESEARCH AND SUPPORT SERVICES AVAILABLE

2.7.1 Introduction

The Oil Palm Research Institute (CSIR-OPRI) was set up in 1964 to take over the functions of the West Africa Institute for Oil Palm Research (WAIFOR) after the latter's dissolution.

OPRI was first established as a Division of the Crops Research Institute of the Council for Scientific and Industrial Research (CSIR). It attained full institute status in 1979, with the mandate to conduct sustainable and demand driven research into

Oil Palm. In 1992, the Institute's mandate was expanded to include research into coconut in general and the Cape St Paul Wilt disease of coconut in particular.

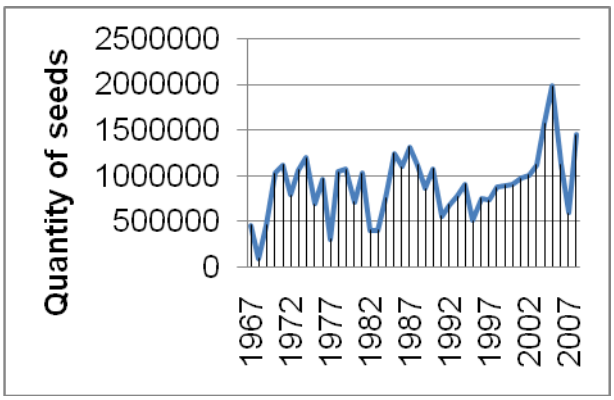
The long term objectives of the Oil Palm Research Programme of the OPRI are to:-

- Improve oil palm breeding techniques.
- Develop land use efficiency, intensify strategies to maximize yields and enhance yield potentials.
- Develop integrated pest and disease management strategies.
- Improve small-scale semi-mechanized methods of processing FFB and palm kernel.
- Develop appropriate skills and technologies for sustainable production of palm oil, palm kernel oil, downstream processing, biomass utilization and management of waste.
- Commercialise research findings through provision of consultancy and training services.
- Commercialize the production of improved planting materials.

2.7.2 Commercial Seed Production

CSIR-OPRI has been producing pre germinated oil palm seeds for 42 years in Ghana mainly for the local market and a limited quantity for export. Figure 2.34 shows the yearly seed sales from 1967 to 2009. Sales fell back in 2007 due to funding issues but recovered in 2008 with 1,450,000 seeds sold to PSI. By the end of 2009, about 7.7 million seeds have been sold to the President Special Initiative (PSI) on oil palm by OPRI[5]. Even though OPRI has the capacity to produce over six million pre germinated seeds per year demand has been sluggish.

Figure 2.34: Oil palm seed sales: 1967-2009



Sources: W.O. Danso 2010 : Report on PSI oil palm programme 2003-2009
and J. S. Addo Consultants Oil palm Industry Study [2000]

[5] W.O. Danso (May, 2010) Report on the President/s Special Initiative (PSI) on oil palm

Presently, commercial seed production and marketing has been transferred to Ghana Sumatra Limited, a new joint venture company, in which OPRI owns 55% of the shares. The remaining shares are owned by PT London Sumatra of Indonesia, which has a reputable oil palm research wing, Sumatra-Biosciences.

Ghana Sumatra Limited has increased oil palm seed germination capacity through acquisition and installation of an electric power seed germinator. The company is currently selling germinated seed nuts at GH¢ 0.35 per nut for the Ghanaian market and US$0.50 oer nut for the export market The company has taken over the purified mother palms from OPRI and their operations including preparation of pollens are now ISO certified. The company has also established that the OPRI oil palm germplasm is genetically among the most diversified in the world and claims that seeds being bred from the germplasm over the next 4 years will have attributes such as: production of 20 – 30mt FFB/ha at peak yield, fusarium disease resistance, drought tolerance and early maturing characteristics.

2.7.3 CSIR-OPRI Oil Palm Research Programme

The list of current research topics being undertaken at the Institute are:

(i) Crop Improvement

- Progeny trials and evaluation in breeding blocks.
- Field trials [progeny trials under different conditions]
- Prospecting, collecting and evaluation of wild germplasm around Ghana.
- Genetic diversity studies using biotechnology methods.
- Dumpy palm improvement: research aimed at increasing the yield of slow growing (dwarf) palms to facilitate longer economic life span.
- Mutation Breeding: Irradiation of seeds to cause mutation to generate increased genetic diversity. The F1 generation is now being analysed using molecular techniques. This work is being done in collaboration with Sumatra – Bioscience and the University of Aberystwyth, UK.
- Special crosses: This is the programme to produce elite mother palms with very high yield potential.

(ii) Crop Protection

- An integrated pest control project on the oil palm leaf miner: Coelaenomenodera minuta (Coleoptera: Chrysomelidae)
- The control of the rhinoceros beetle: Oryctes monoceros, (Coleoptera: dynastidae)

- The control of fusarium wilt through screening and evaluation of resistant progenies.

(iii) Cropping/ farming Systems

- Development of land use efficiency: intercropping and integration of sheep into oil palm plantations.
- Development of sustainable weed management in oil palm.
- Nursery pesticide and fungicide screening.
- Evolution of climate: redefining areas suitable for oil palm cultivation in Ghana
- Oil Palm Nutrient Management: Rock phosphate trials.

(iv) Molecular Biology laboratory

- At present concentrating on research into the Cape St Paul Wilt Disease of Coconut. The plan is to expand into oil palm genetic diversity studies and marker genes assisted selection.

(v) Rural Sociology/Economics Section

This is a fledgling section which has still to commence activities

2.7.4 Information Dissemination

OPRI uses the Research Extension Linkage Committees for Sustained Communication Strategy. OPRI coordinates with the Western and Eastern Regional Committees. Through the Research Extension Linkage Committees, OPRI/MOFA farmers set priorities for research and extension activities on all crops. This strategy allows for a market or client driven approach to research and for effective dissemination of research findings through extension agents. Research extension linkage committees have been established by MOFA in all 10 regions of Ghana.

2.7.5 Collaboration with Other Institutions

Seed and staff exchange programmes are being done with external research institutions notably Sumatra-Biosciences – staff orientation and exchange of commercial pisifera pollen and seeds produced and Aberystwyth University, UK for molecular characterization and genetic diversity analysis.

2.7.6 Capacity and Facilities

Capacity
Manpower is considered adequate with the exception of plant breeders. High caliber research staff especially women are difficult to attract and retain due to under developed social amenities and environment at OPRI and communities in its catchment area. Most active research is being done in agronomy. OPRI however wants to undertake research into bi-products and downstream products of CPO and PKO.

Facilities
OPRI intends acquiring a 6mt/hr FFB mill. This mill is to be used in complementing the effort in breeding very high yielding oil-to-bunch oil palm varieties. OPRI says it lacks adequate equipment and reagents in its laboratories.

2.8 MARKETING SYSTEM

The Ghanaian oil palm market consists both of an indigenous marketing system and the sale of palm oil to large scale industrial users and small scale exporters. The indigenous marketing system consists of traders who buy palm oil from the producers for onward sale to local soap manufacturers and edible oil retailers from major market centres at Accra, Kumasi, Techiman, Mankessim and Tamale. Most households and second cycle institutions use palm oil for culinary purposes and these customers are mainly supplied by small-medium scale millers and plantations. The price of palm oil is determined by the retailers at major marketing centres who sometimes pre-finance production of the palm oil by smallscale/artisanal mills.

The major industrial users are Wilmar, Unilever, Paterson Zochonis, Juaben Oil Mills, Appiah Menka Complex and Ameen Sangari Industries. Unilever purchases the bulk of palm oil supplies followed by Ameen Sangari, Paterson Zochonis, Juaben Oil Mills and Appiah Menka Complex in that order from medium to large scale mills which produce to international palm oil specifications. Since the early 1990s the palm oil price in Ghana has been influenced by the world market price and the seasonal shortages in Ghana. International quality palm oil used to be sold far above the world market price between October-February which is the local lean season (but the global main season). In the same vein, during the local main season palm oil used to sell below the world market price. With the arrival of Wilmar in the local scene the situation has changed remarkably as the company pays international market prices for its CPO and PKO purchases throughout the year. With domestic demand outstripping supply, it is only a matter of time until the other refineries and downstream industries will pay the market price for international CPO and PKO. As regards the small and micro mills the price of CPO is dictated by the forces of supply and demand and extent of pre-financing received by the small scale mills.

2.9 CURRENT ISSUES RESTRICTING DEVELOPMENT AND PROGRESS

2.9.1 Access to Land

(i) Access to land for medium to large scale development by existing estates and new investors

To accelerate development of the estate sector in the 60s and 70s, the Government of Ghana acquired large tracts of land for the establishment of the oil palm plantations, BOPP, GOPDC, TOPP and Norpalm (under Ghana State Farms Corporation). Government paid compensations to the original land owners[6] at TOPP, BOPP and GOPDC and not at Norpalm because of disputes over boundaries. Large tracts of land (as much as 50k ha in total) are potentially available in the Western and Central regions of Ghana, especially Mpohor Wassa East and Wassa West Districts for the expansion of existing businesses and for the establishment of new estates. Existing estates and new investors are generally finding it extremely difficult to acquire land to expand the estate sector because of disputes over ownership and/or absence of lawful representatives of parcels of land identified.

(ii) Access to land by Individuals for small scale development

The main hindrance encountered by individuals acquiring land to establish oil palm plantations is because of the traditional tenure system. Long term lease (50 years) is the most preferred choice followed by the modified abusa system and the least preferred is the abunu system, modified or not. Interpretation of the abusa and abunu systems has led to protracted disputes between landlords and tenants in the oil palm industry.

The interpretation of the modified abusa system is that after the tenant develops an oil palm plantation, the plantation is divided into three portions. The tenant takes two portions while the landlord takes over one portion as the value of the land and no further lease payment is made. The tenant enjoys the benefits of his portion till the trees are felled and the land then reverts to the landlord.

The original interpretation of the abusa system was that the tenant established the oil palm plantation and from the time of maturity when FFB is harvested regularly until the trees are sold, the landlord took a third of the revenue realized before the tenant deducts costs. Several disputes have arisen out of this type of abusa system.

The two scenarios described above are applicable to the abunu land tenure system but where the plantation is divided into two, the tenant taking one portion and the landlord the other portion.

[6] e.g.TOPP

(iii) Laws Governing Land Acquisition

Land acquisition in Ghana is governed by deeply rooted socio-cultural systems on one part and administrative and statutory rules enacted by the Government on the other. Communal ownership is governed by the socio-cultural systems and rules and procedures enacted by the Government. The administrative and statutory rules relate more to lands vested in the state. Lands vested in the state are acquired for specific projects in the public interest. Private ownership covers outright purchase of land obtained mainly from communal owners.

Communal Ownership

This type of land ownership is spread throughout the country. The communally owned land is held in trust by the chief or family head for the people. The chief or the head of family has the authority to allocate the land to an individual, a local or foreign enterprise, community or family members in consultation with family elders as and when necessary.

Matrilineal and patrilineal lines of descent differentiate land tenure arrangements. Under the matrilineal line of descent, the basic unit of social organization is the matrilineal clan consisting of persons claiming real or putative descent from a common ancestress through women. This tenure system is most common in greater parts of the Eastern, Western, Ashanti, Central, and Brong Ahafo regions.

In the patrilineal system, land passes from father to son. The most important unit of social organization then is the exogenous patrilineal lineage, whose members include all persons who are able to establish descent through the male line to a known male ancestor.

State Ownership

Under the Land Administrative[7] Act of 1962 (Act 123), the State Lands Act (1962), Decree (NRCD 332) of 1975 large tracts of land were acquired by the state compulsorily and in some cases the due process was followed for acquisition to establish public interest oil palm estates[8]

Private or Individual Ownership

Some individuals or families have purchased land outright from the communal stocks. Such purchases normally involve the overlord chief and/or head of the family. The land sold was not immediately occupied or utilized by community/family members and is usually not within easy reach of settlements of members or the families. Before independence such outright land purchases took place mainly in the Akim areas of Eastern region, Assin in Central region and Sefwi and Wassa areas in Western regions of Ghana for the establishment of cocoa and oil palm plantations.

[7] Five – year Development Plan 1975/76-1979/80.
[8] Ghana State Farms Corporation, BOPP, GOPDC, TOPP and NORPALM

(iv) Duration of Land Tenure

For all investment purposes the law states that no land in Ghana shall be vested in any non-citizen on a freehold basis. Non-Ghanaians shall be only entitled to land on a leasehold basis for a term not exceeding 50 years at any one time. For investments exceeding 50 years, provision in the documentation must be made for an option to renew for additional periods when the previous term expires.

(v) Procedure for acquiring land

- Identify land suitable for a specific investment.
- Approach immediate owners usually the Head of a Family of the land to begin to show interest in the land by the process termed knocking where a specified bottle of imported schnapps and GH¢ 50-500 is offered.
- Meet with the landlord with imported schnapps, and specified cash for negotiations and performance of rites in accordance with customary practice to allow entry into the land for surveying.
- Demarcate the land identified at the cost of the investor.
- Survey[9] the land and prepare a site plan.
- Prepare an indenture on the land. The indenture must specify the exact terms of the lease, commitments of each party under the lease agreement and payment of fees.
- Payment of compensation for cash crops such as cocoa, kola and rubber is made and recorded.
- Fees are based on an annual payment per acre or hectare, or a lump sum payment for the entire land over the period concerned.
- Signing of the lease document is done by the paramount chief or head of the family as Lessor, an elder or two as witnesses and the investor as a lessee together with his witnesses.
- The lease document or indenture is forwarded to the Lands Commission for registration.

(vi) Future expansion and development of estates

In many parts of the country there are tracks of unutilized or abandoned Government acquired lands. In respect of such lands, the practical suggestion is that the Government must take a proactive step in speeding up payment of appropriate compensation to identified chiefs/elders/rulers/councils or families and keep such lands as land banks.

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[9] Surveying is usually done by officers of the Survey Department or by licensed qualified surveyors.

These land banks can then be allocated to existing estates and prospective investors depending upon their choices of location and the types of enterprises they intend to undertake.

A pool of land could be acquired by government to facilitate industry development in a specific area and then subleased to the private sector for development or contracted out to professional developers before being subdivided for smallholders.

2.9.2 Previous Organization (GOPDA)

The Ghana Oil Palm Development Association [GOPDA] was first officially inaugurated in November 1985 as a member of the African Oil Palm Association [AOPA]. (United Nations Food & Agricultural Organization [FAO] established AOPA in March 1985 to get all stakeholders involved in the development of the African oil palm industry.)

Initially prices for FFB, CPO, PK and PKO were set by GOPDA on a monthly basis. GOPDA also addressed concerns of the industry with the Government of Ghana whenever the need arose. The stakeholders which participated in GOPDA were the major oil palm estates, small-medium scale palm oil & palm kernel processors, soap and cooking oil manufacturers, other users and input suppliers.

GOPDA was governed by a constitution and its objectives were:

- To promote and maintain co-operation and co-ordination among institutions in Ghana associated with oil palm production, processing and utilization of products and bi-products;
- To encourage exchange of information and experience among oil palm institutions in matters of policy, programmes and projects;
- To liaise with government on behalf of stakeholders on matters relating to inputs and other equipment necessary for the healthy development of the industry;
- To provide a forum for discussing all matters that might tend to disrupt the smooth operation of the industry.

GOPDA succeeded in establishing a pricing formula[10] for CPO and related products in 1990. The price of FFB was fixed at 10% of the CPO price at the factory gate.

[10] GOPDA CPO Pricing formula: Last day Rotterdam CPO price quoted in US Dollar + freight to Ghana is converted into Ghanaian Currency at the prevailing exchange rate quoted by Standard Chartered Bank Ghana Limited.

CPO pricing is no longer controlled but in practice the calculation used by most players today is the same. FFB pricing is now much more determined by the forces of supply and demand within the catchment areas of the large scale estates and ranges between 50% and 75% of CPO price.

Another impact of GOPDA was to get the Government of Ghana to raise the tariffs in the early 1990s on imported vegetable oils and soaps from Cote d'ivoire, the Middle East and the Far East after it was considered that imports from those countries and regions were being "dumped" and crippling local soap and vegetable oil businesses.

GOPDA began to fall apart in 1994 after GOPDC was privatized and by the time the last major estate, NOPL was privatized in September 2000, was no longer active. GOPDA remained dormant until early 2011 when it was revived.

2.9.3 The Case for a New Umbrella Body

The forces that militated against the revival of GOPDA or the creation of a new apex body included:

- The sense of autonomy of each estate earned after privatization.
- The major players in the industry are competitors and therefore cautious of sharing information.
- Risk of being accused by smallholders and independents of being in a cartel by participation in GOPDA.

However, there is still a justification for an apex industry body and indeed the original objectives are still relevant.

The most important purpose is to use GOPDA as a vehicle to engage with Government with one industry voice on a range of issues such as:

- Duties and tariffs
- Subsidies
- Taxation
- Incentives
- Employment law
- Land
- Environment
- Industry development strategy
- Sources of finance

In addition a number of industry-wide internal issues could be discussed, for example:-

- Industry training
- Health and Safety
- RSPO

The body would meet formally and routinely perhaps twice a year and other meetings could be arranged as required if issues emerged which needed to be addressed. But it is far better for the industry to approach Government with one clear advocacy voice rather than numerous voices with different requests and proposals.

2.9.4 New Apex Body Formed

In recognition of the need and the benefits of a new umbrella body, Oil Palm Stakeholders represented by oil palm estates, smallholder farmers, a non-governmental organization, industrial palm oil users and researchers met to discuss the type and form of an industry umbrella body on 24th March 2011 at Unilever Learning Centre. The stakeholders agreed to form an 'UMBRELLA BODY' to be known again as GHANA OIL PALM DEVELOPMENT ASSOCIATION (GOPDA). Formation of GOPDA as an apex body and as a private sector advocacy association falls in line with the views expressed in this study. It was agreed that it will be a private sector organization whose objectives should include:

1. The promotion of the growth and development of the oil palm industry in Ghana.
2. Advocacy for the "protection" of the oil palm industry to enable it to grow and develop on a level playing field.

These objectives have been refined as:-

1. To be the "strong institution" for the promotion of the growth and development of the oil palm industry in Ghana. Key thrusts include:
    a. Fair and painless land acquisition
    b. Market research and development – local and international
    c. Biological and technical industry and market-driven research through collaborations with institutions like OPRI and GRATIS for instance.

2. To advocate for the "protection" of the oil palm industry to enable it to grow and develop in a level playing field. Key thrusts include:
    a) Payment of the right duties by importers of vegetable oils, prevention of smuggling and rampant under-invoicing.
    b) Levying importers of vegetable oils to fund local growers and millers (outgrowers/smallholder)
    c) Subsidised agro inputs like fertiliser.

d) Research and development of better planting material and the transfer of skills and knowledge for the benefit of members/stakeholders.

3. To play a gate keeping/watchdog and peer-reviewing role in ensuring the adherence to sustainable agricultural practices as prescribed by the Round Table on Sustainable Palm Oil (RSPO) – We now have an RSPO approved set of principles and criteria (P&C) for Ghana (First of the kind in Africa).

At that meeting members were nominated to form the Executive Committee which were drawn from stakeholders across the oil palm industry. The Executive Committee of GOPDA registered the association and met with the Minister of Food and Agriculture to introduce the association to him. Going forward it was proposed that a levy will be paid by growers, millers and importers of vegetable oils at a rate per hectare or per tonne of oil produced or imported yet to be determined.

A draft communiqué on the industry was to be issued a week after the meeting and was duly presented to the Minister of Food and Agriculture on 21st April 2011.

B. CONCLUSION

2.10 STRENGTHS AND WEAKNESSES OF THE OIL PALM INDUSTRY IN GHANA

2.10.1 Strengths & Opportunities

- **Employment generation**
  The industry employs over 2 million people especially in rural areas in Ghana. It supports the livelihoods of rural communities and by extension contributes immensely to rural wealth and employment creation. The potential to increase this contribution is still huge.

- **Growing demand for CPO**
  There is growing demand for palm oil in Ghana, West Africa and around the world for the manufacture of household and personal care products, vegetable cooking oil and as a feedstock for biodiesel production.

- **Availability of downstream processing capacity in Ghana**

  - Wilmar Africa
    - Operates 200 mt/day (54,000 mt/annum) refinery in Tema in 2010;
    - currently constructing a 1,000 mt/day refinery which will be commissioned by 2012. (270,000 mt/annum).

  - Ameen Sangari
    - Operates a soap manufacturing plant and 50,000 mt/annum refinery at Cape Coast.

  - Unilever/PZ/NESTLE
    - Unilever has a state of the art 35,000 mt/annum margarine processing plant. This plant is working full capacity to supply the WA market. This is in addition to its laundry and toilet soaps production.
    - PZ and Unilever produce large quantities of laundry and toilet soaps from palm oil as the main raw material
    - NESTLE uses substantial amounts of vegetable oils in their main products like Ideal Milk and Milo

  - GOPDC
    - A new 100 mt/day refinery was commissioned in 2007 in Kwae in the Kade District. Total annual capacity is 27,000 mt.

- Appiah Menkah Complex (AMC)
  - AMC commissioned a 3 mt/hour plant in Kumasi, 19,000 mt/ annum in 2008.

- Juabeng Oil Mills.
  - Commissioned in 2007/2008, a new state of the art 72 mt/ day refinery (19,000 mt/annum) in Juabeng in the Ashanti region.

- Golden Webb Industries (GWI)
  - GWI commissioned a brand new 2 mt/hour plant in 2007. This plant is located at Ahensan-Kumasi.

- Ghana Nuts Industries.
  - Recently commissioned a new 24mt/day plant (6,000 mt/annum) at Techiman.

- BOPP/TOPP/NORPALM/GOPDC
  - They are currently generating their own power using steam turbines fed by steam boilers fired on oil palm wastes (Turning waste into wealth).

- **Growing Demand for Cooking Oil**

  During late 2007, some of the Local Producers of Vegetable Cooking Oil expanded their existing capacities/or invested in new turn-key refinery projects to take advantage of the growing demand for refined vegetable oil in the country which is growing at the rate of 10% per annum.

  Growing market demand for vegetable cooking oil but the proportionately lower levels of imports in 2010 could be attributed to Wilmar's entry into the local production scene.

  If the local production capacity is fully utilised, as assumed, there will still be room for expansion of some 42,000 metric tonnes in 2011 to about 100,000 metric tonnes by 2016

- **Land**

  Over 500,000[11] ha of land are available across the country. This includes land previously acquired by the state for oil palm development and other tree crops like cocoa, coffee and rubber, stool lands in areas not suitable for cocoa cultivation and unutilized individual parcels of land. The large local producers like Wilmar, Ameen Sangari and GOPDC in the oil palm industry have

[11] Team assessment: Land is available in the following districts: Twifo Hemang Lower Denkyira District Assin North & Upper Denkyira East in Central Region, Wassa Amenfi East, Mpohor Wassa East, Prestea Huni Valley & Tarkwa Nsueam in Western Region.

invested heavily in both machinery and plant and are ready to undertake further plantation development.

2.10.2 Weaknesses & Threats

- **CPO and Olein net importer**

  Ghana is currently a net importer of crude palm oil and olein. At the same time the potential to produce to meet local demand and also to export into the sub-region is huge.

- **Low duties**

  The right duties by importers of vegetable oils are not being paid and there is smuggling and rampant under-invoicing[12].

- **Productivity of planting material**

  Although OPRI is making the effort to develop better planting material, productivity of current planting material produced by OPRI is less than half the 30mt/ha potential achieved in South East Asia and the Pacific.

- **Lower capacity utilization of Local Producers of Vegetable Cooking Oil**

  Due to the high price of CPO and lower volumes of CPO available locally local producers of vegetable oils are using only 65% of their plant capacity which currently stands at 150,000 mt/annum.

- **FFB pricing**

  During peak seasons the supply of FFB usually exceeds the total national processing capacity and the price of FFB falls below 10% of the international market price of CPO. This situation normally affects independent smallholders who are proposing to the industry to offer them a guaranteed price. During the lean season high prices prevail leading to fierce competition for the FFB by all mills. Shortage of FFB leads the large scale mills purchasing lots of poor quality FFB especially the dura variety for production

[12] A COMMUNIQUE PRESENTED TO THE MINISTER OF FOOD AND AGRICULTURE BY THE RECONSTITUTED :GHANA OIL PALMDEVELOPMENT ASSOCIATION (GOPDA) ON 20TH APRIL 2011

of CPO which barely meets the quality requirements of their local and international customers.

- **CPO Price**

  The GOPDA pricing formula established in the 1990s has governed price determination of CPO in Ghana since then. Average world CPO price had remained at $350/mt until the food crisis which begun in 2007. This crisis led to record high food prices in 2008 during which CPO price peaked at $1,500 and PKO at $2,000/mt. in 2011. The increased prices have been hurting cooking oil and soap manufacturers which are sometimes forced to import cheaper vegetable oils into the country. Some of these imports of late 2008 led to a glut of CPO on the Ghanaian market in 2009.

  For the small scale mills capacity has so increased that during a fall in CPO and PKO prices, they carry large stocks of CPO and they virtually go bankrupt. Prices are always dictated to them by large scale buyers and they also want the industry to set up pricing mechanism for them to ensure that they receive fair returns on their transactions.

- **Extension services**

  A coordinated agriculture extension service appears to be non-existent for the independent smallholders. Independent smallholders generally have no access to good planting materials and technical advice and resort to propagation of dura planting materials for plantation development. FFB processed by the industry is dominated by dura materials which are sourced from the independent smallholders especially during the periods of scarcity which occurs annually. Most independent smallholders have two motives in investing in oil palm. These are FFB production and the sale of aged oil palm trees for alcohol production (palm wine). Despite low returns of oil palm of dura origin due to low productivity and low CPO content, the aged trees guarantee the farmer the opportunity to earn a substantial capital gain on their investment.

2.11 COMPARATIVE ANALYSIS OF DIFFERENT PLANTATION SYSTEMS

Plantation systems can be distinguished based upon FFB supply and on end products.

(i) Plantation System based on FFB Supply

The companies established by Government of Ghana with 100% shareholding GOPDC and NOPL (now Norpalm) and joint venture partnerships with foreign and

local partners TOPP and BOPP were established using the nucleus estate plantation system. The full complement of the nucleus estate system is that the company establishes its own plantation and initially equips it with a processing mill. Additional FFB supplies are obtained from smallholder and outgrower oil palm schemes.

ii) Plantation System based on end products

GOPDC and TOPP were established using a plantation system based upon full supply of FFB (Figure 2.35) initially to produce CPO and PK and later PKO now being produced by BOPP with additional supply PK sourced from TOPP.

However GOPDC has moved a step ahead of the rest and has invested in a refinery and fractionation plant as a vertical integration strategy. In the case of Ameen Sangari, Ayiem, Obooma, and Adansi Oil Mills which are private companies they have establsihed nucleus estates and procure additional FFB from independent smallholdings (Figures 2.36.-2.42). While Juaben relies on its outgrower scheme and independent smallholdings for FFB supply, Ashanti Oil Mill depends solely on independent smallholders for FFB supply. The full complement FFB supply will guarantee optimization of plant capacity utilization by large estates and generate high demand for FFB.

Figure 2.35: Types plantation systems in Ghana

		Nucleus estate	FFB is purchased from :		
			Smallholder Scheme	Outgrower Scheme	Independent Smallholders
1	Norpalm	√	√		√
2	BOPP	√	√		√
3	TOPP	√	√	√	√
4	GOPDC	√	√	√	√
5	AMEEN	√			√
6	JUABEN			√	√
7	AYIEM	√			√
8	OBOOMA	√			√
9	ADANSI	√			√
10	ASHANTI				√

Figure 2.36: FFB from 4 sources – Main Products: Crude and Refined

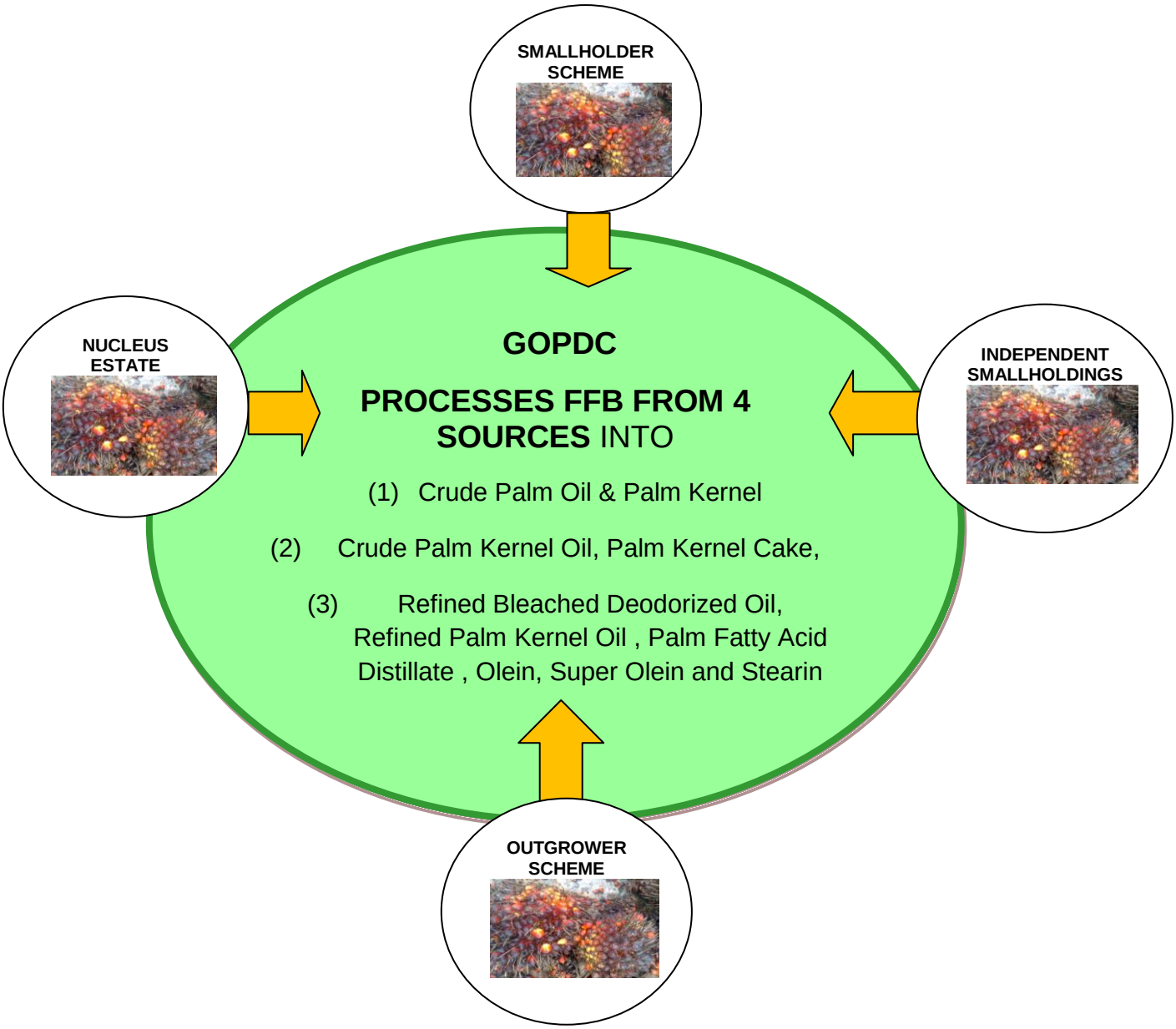


Figure 2.37: FFB from 4 sources – Main Products CPO & PKO

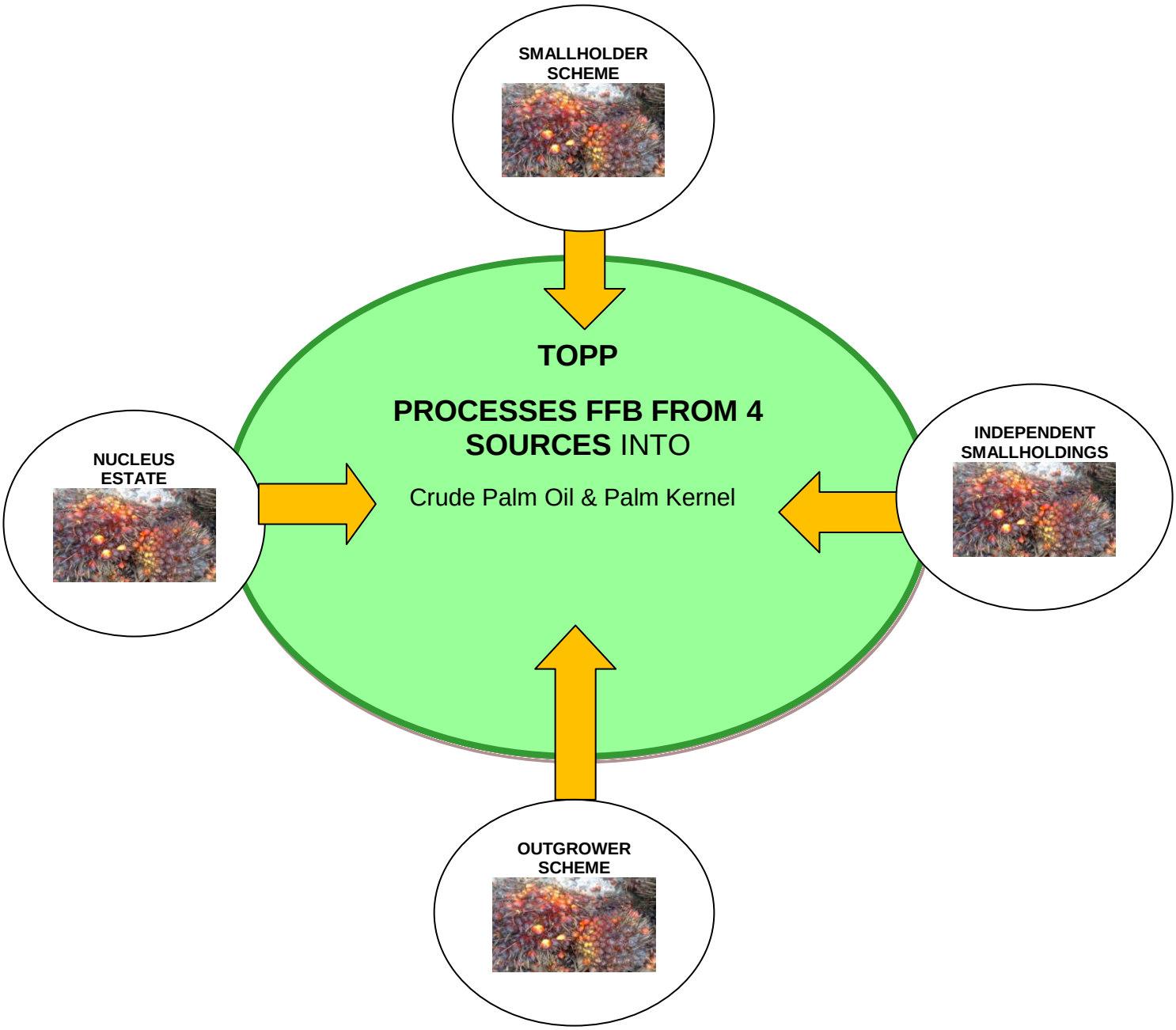


Figure 2.38: FFB from 3 sources – Main Products: Crude CPO & PKO

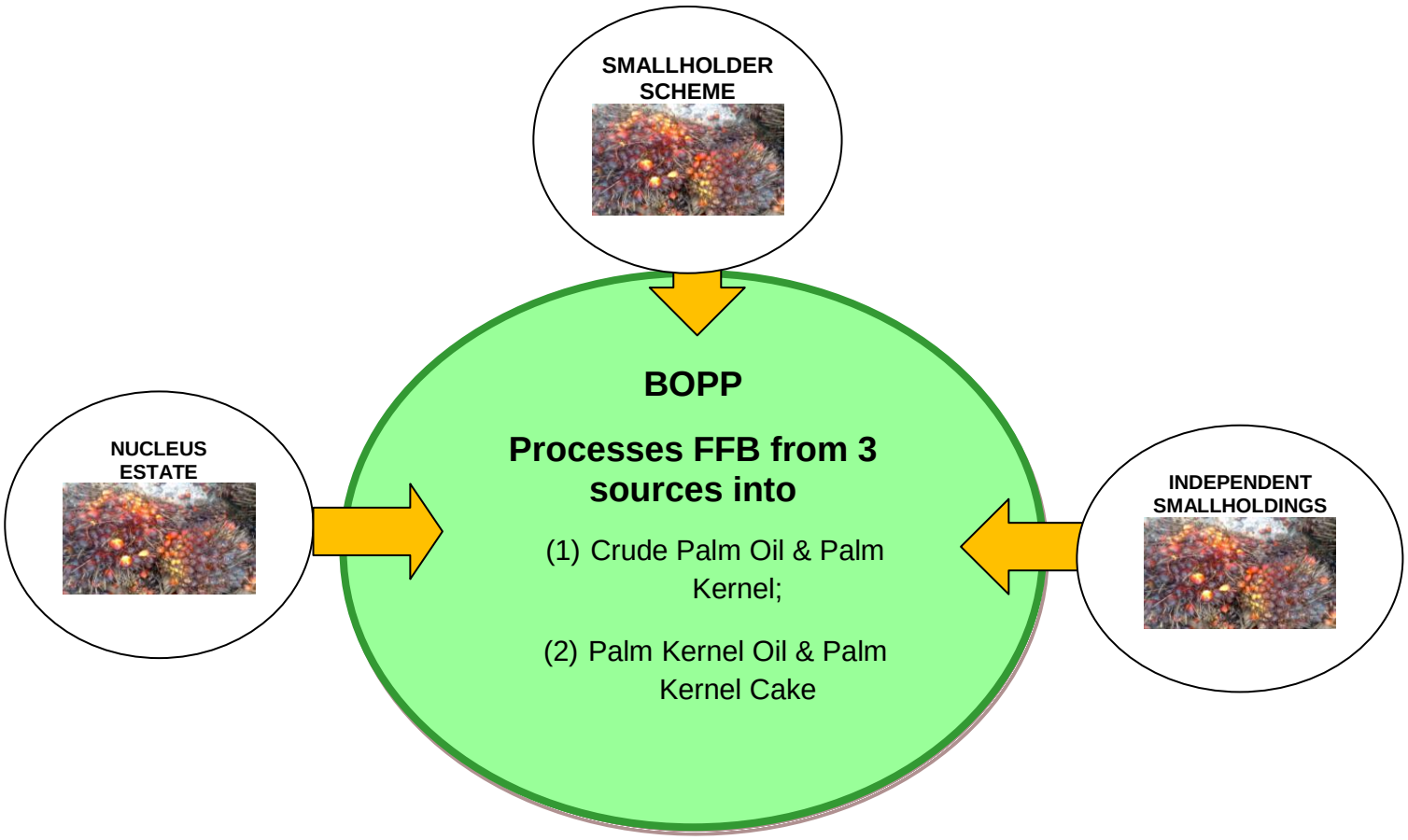


Figure 2.39: FFB from 2 sources – Main Products CPO & PKO

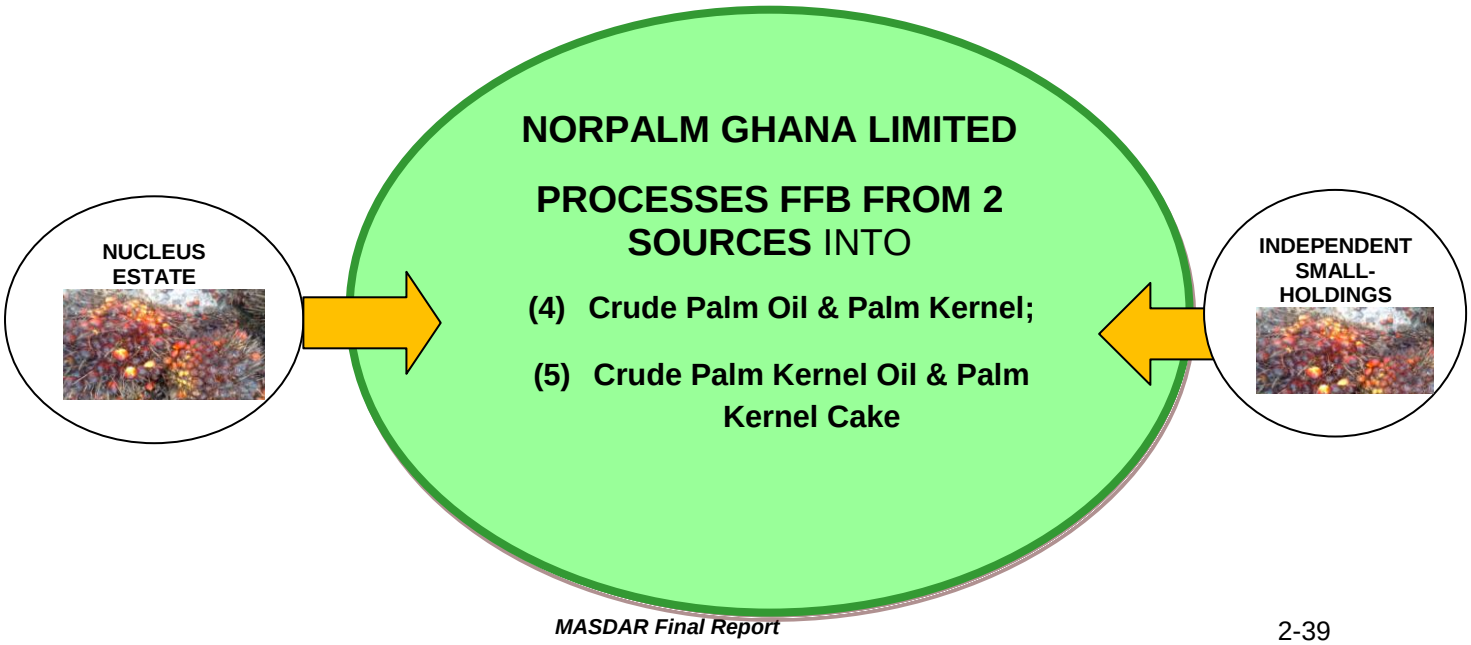


Figure 2.40: FFB from 2 sources – Main Products CPO, PKO and Soap

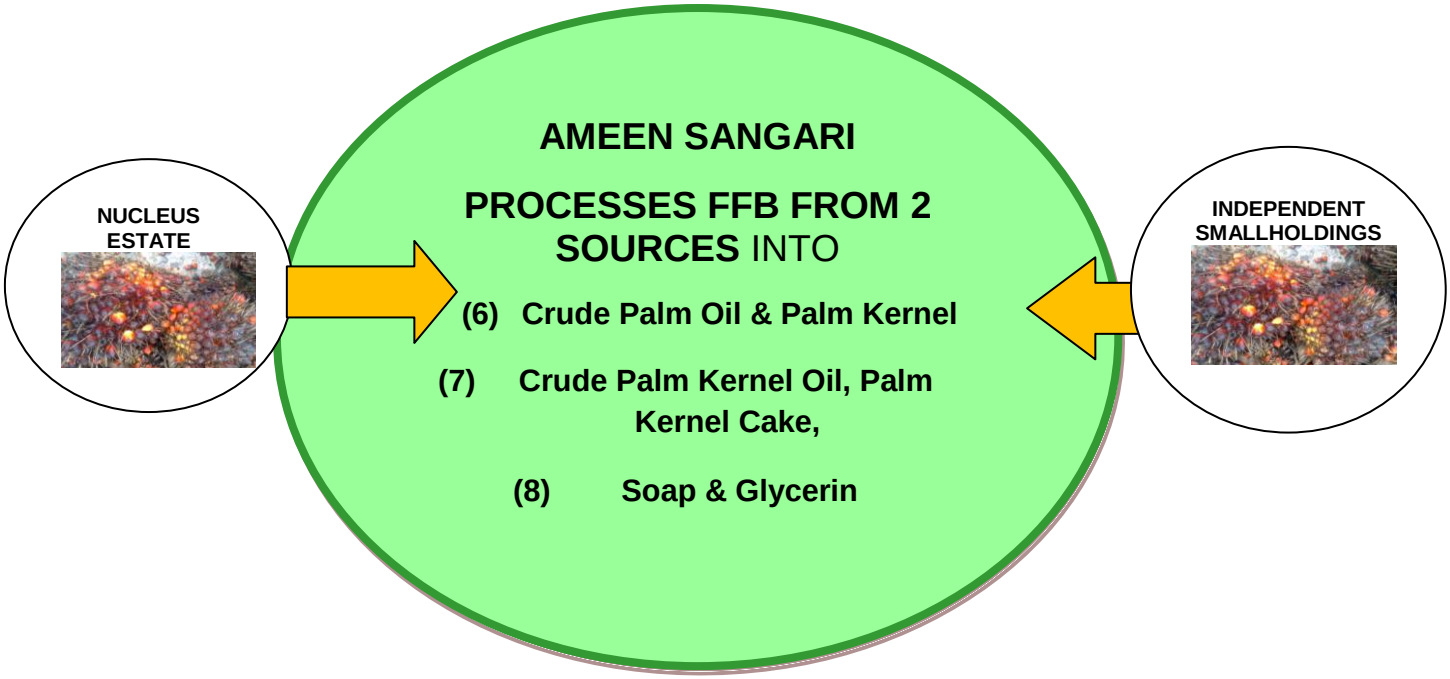


Figure 2.41: FFB from 2 sources – Main Products RBDO, PFAD and Stearin

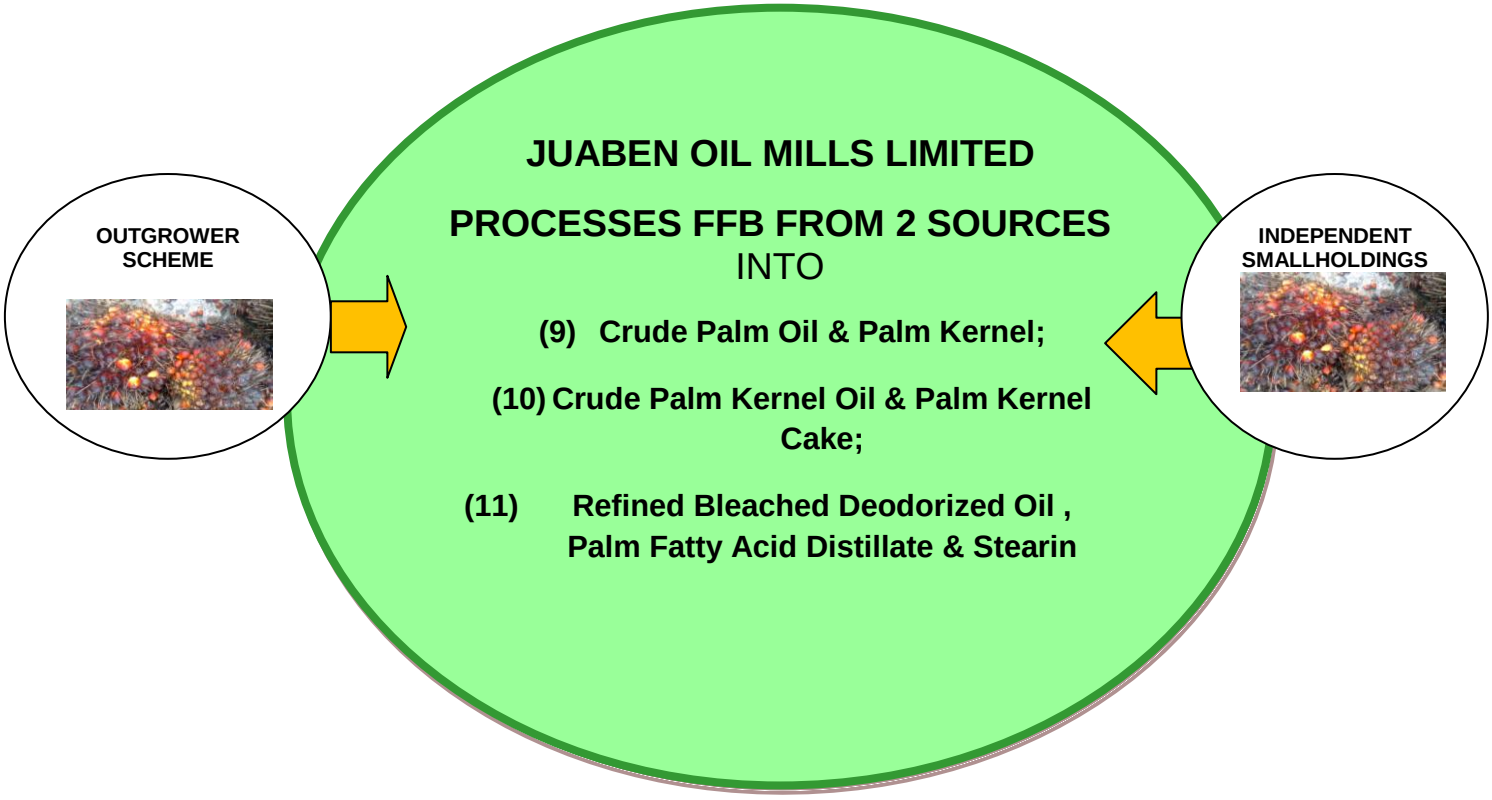
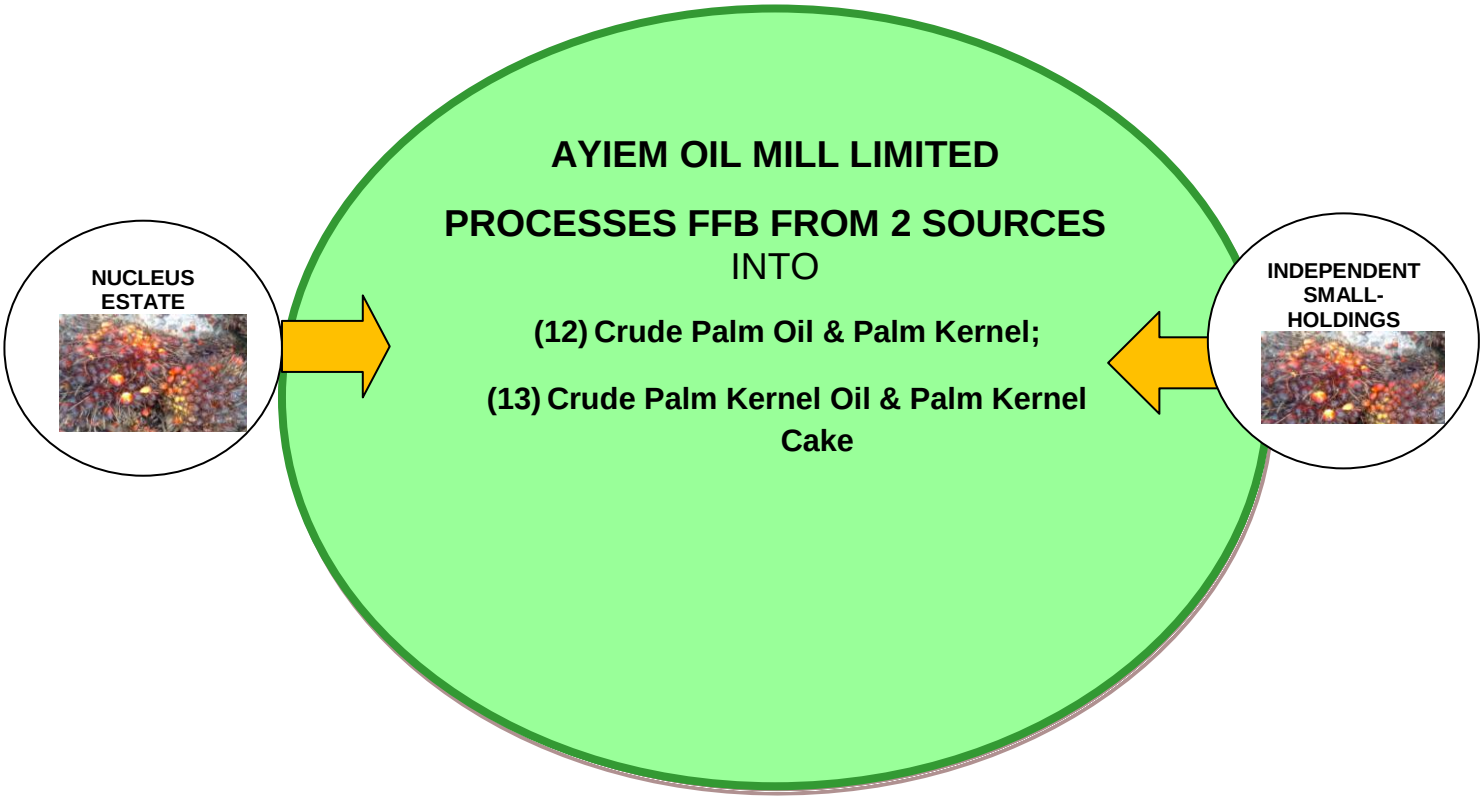


Figure 2.42: FFB from 2 sources – Main Products CPO & PKO



CHAPTER 3: AGRONOMIC AND SOCIO ECONOMIC FEASIBILITY FOR OIL PALM DEVELOPMENT IN GHANA

3.1 AGRONOMIC REQUIREMENTS FOR COMMERCIAL OIL PALM CULTIVATION

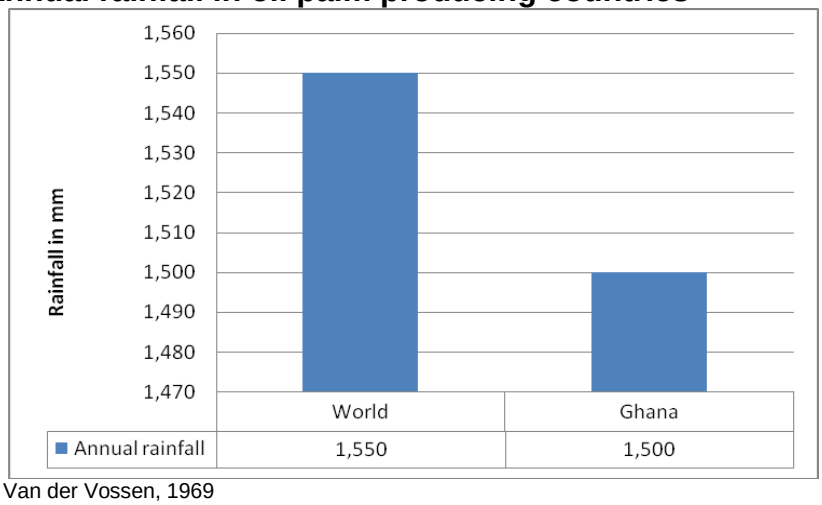
3.1.1 Climatic factors

The key climatic factors which are used to determine technical feasibility of any potential area for oil palm cultivation worldwide and in Ghana are ***rainfall, sunshine and temperature.***

(i) Rainfall

The importance of rainfall lies in the direct link between rainfall and the growth and yield of oil palm[1]. This link[2] has made rainfall the most critical factor used in assessing the technical feasibility of commercial cultivation of oil palm in a given area. Rainfall requirement is further sub-divided into annual rainfall (Figure 3.1) and water deficit (figure 3.2). Minimum annual rainfall which ensures oil palms yield of the order of 15-30 MT per ha per annum at peak production is 1,550 mm worldwide and 1,500 mm for Ghana but must be evenly distributed with no marked dry season (Van der Vossen, 1969).

Figure 3.1: Annual rainfall in oil palm producing countries



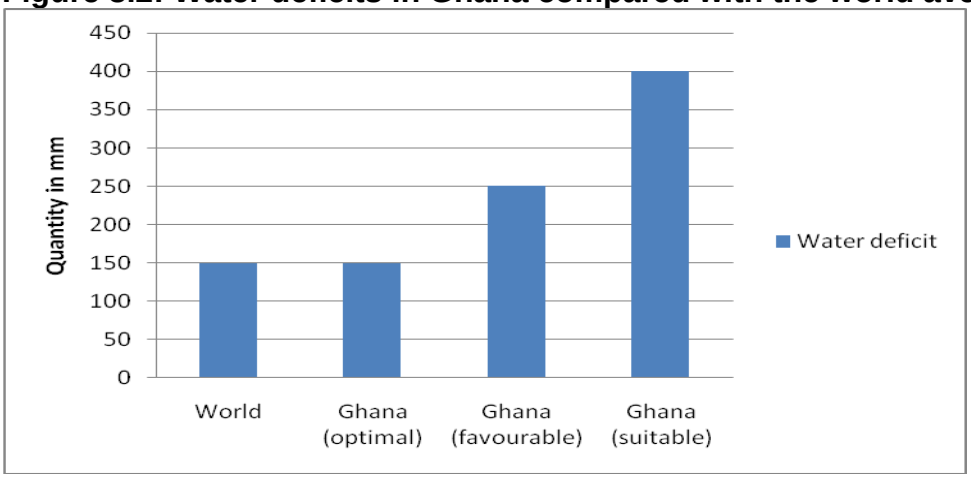
Van der Vossen, 1969

[1] G.N. Hill and M.D. Squire (December 1986): Feasibility studies-Irrigation justification analysis for conventional and micro-jet irrigations systems for oil palm plantations in Ghana

[2] H.V. Corley and Hong Theng Khong (1981)-Irrigation of oil palms in Malaysia, 1981 Conference paper read at Oil Palm in Agriculture in the Eighties

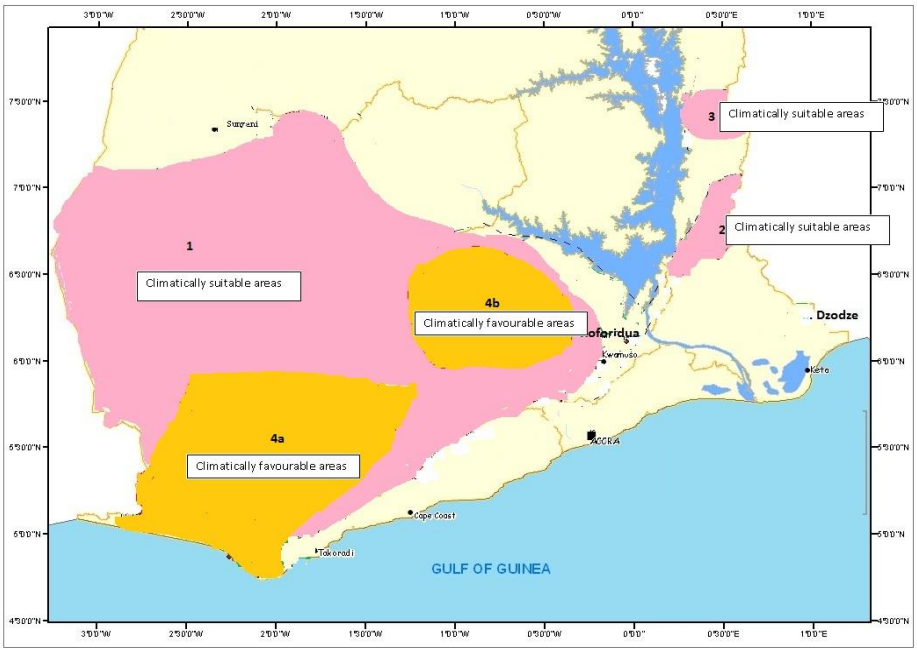
Van der Vossen used annual water deficit results computed from long term rainfall records obtained from 46 weather stations across the forest zones of Ghana to classify potential areas for commercial production of oil palm as ***climatically suitable*** and ***climatically favourable*** (figure 3.2)***.***

Figure 3.2: Water deficits in Ghana compared with the world average



Areas exceeding an annual water deficit of 250 mm and up to 400 mm were ***climatically suitable*** and areas which recorded a 250 mm water deficit and below were ***climatically favourable*** (Figure 3.3).

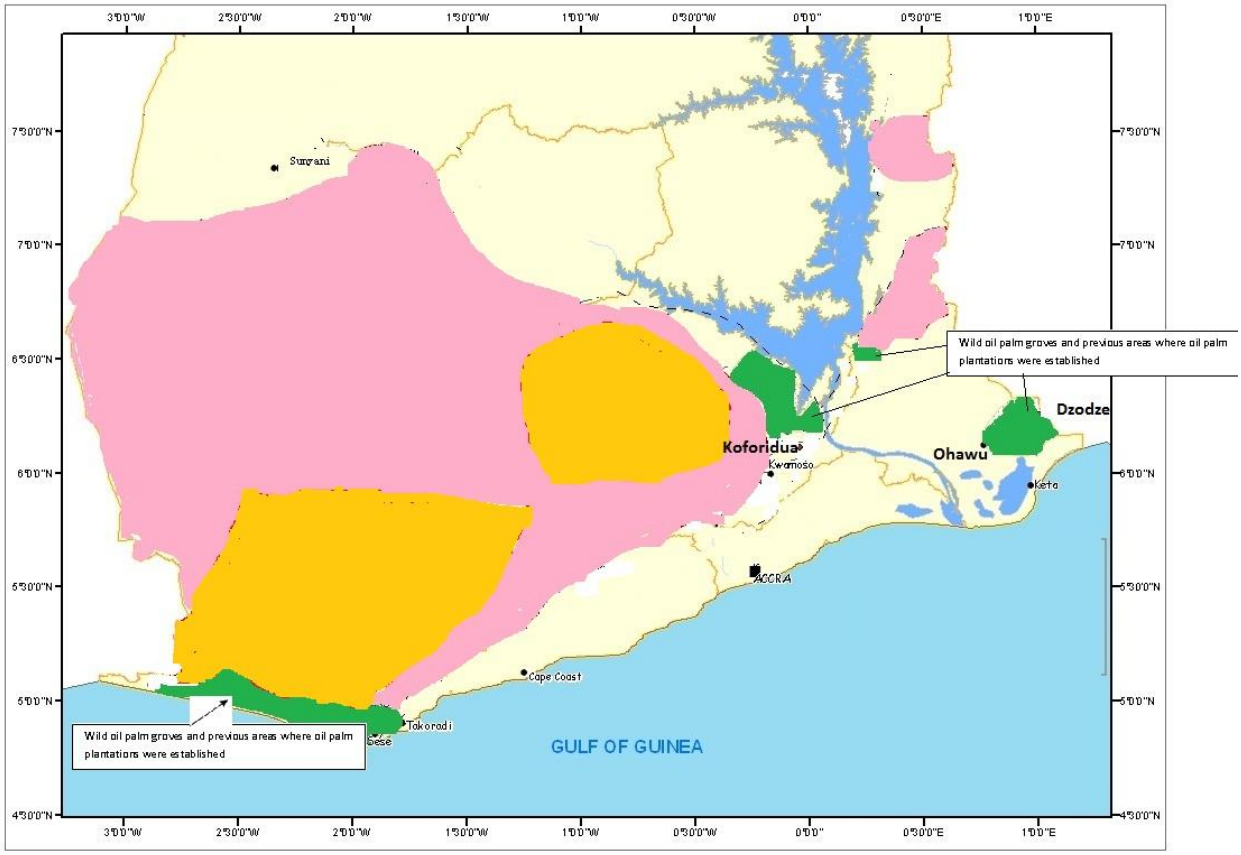
Figure 3.3 Suitable and favourable areas for oil palm (after Van der Vossen, 1969)



The suitable and favourable areas which were delineated fell within the evergreen and the moist semi-deciduous forest zones of Ghana. The ***climatically suitable*** areas labelled in Figure 3.3 as **1** include parts of Eastern, Central, Western, Ashanti and Brong Ahafo Regions and in Volta region labelled as **2 and 3**. The ***climatically favourable*** areas cover part of Eastern region (**4b**), parts of Central and Western Regions of Ghana (**4a**).

Van der Vossen's classification using water deficit excluded the once continuous oil palm belt in Ghana which consisted of wild oil palm groves and defunct industrial plantations which were established around Huhunya and Bisa in Eastern Region, part of Ahanta area in Western Region and around Dzodze and Ohawu in the Volta Region because they all fell outside the climatically suitable and favourable areas (Figure 3.4).

Figure 3.4: Location of old oil palm groves compared to suitable and favourable areas



(ii) Sunshine

The sunshine requirement for selection of potential area for commercial cultivation of oil palm is 1,500 hours of sunshine per annum. This is equivalent to 5 hours per day of sunshine in all months or solar radiation of 350 cal per cm2 per day.[2]

(iii) Temperature

A minimum and maximum temperature requirement that supports commercial oil palm cultivation is 18°C and 32°C respectively (Van der Vossen, 1969).

3.1.2 Soil Suitability

A second factor after rainfall used in determining technical feasibility of an oil palm investment is soil suitability. FAO developed a guideline which uses four (4) ratings to assess the suitability of the soil for oil palm cultivation under rain-fed conditions. The optimum condition is the highly suitable (S1), followed by moderately suitable (S2), marginally suitable (S3) and not suitable (N) ratings (Figure 3.5).

Figure 3.5: Soil Suitability Ratings

Characteristics		Land Suitability Ratings			
		S1	S2	S3	N
Drainage		WD, MWD	ID	PD	VPD
Texture	Topsoil	SL, L, SIL	LS, SCL	SC, SiC	S, C, Massive
	Subsoil	SCL, CL, S:CL	C, SL	LS, SL, SiC	S, C, Massive
Slope		0 – 5	5 - 8	8 – 15	>15
Effective Soil Depth		>120	80 – 120cm	60 – 80cm	<60
Gravel/concretions		Nil to very Few	Few	Many	Abundant

S1 – Highly suitable**; S2 –** moderately suitable**; S3 –** Marginally suitable**; N –** Not suitable;

WD – well drained**; MWD –** Moderately well drained**; ID -** Imperfectly drained**;**

PD – Poorly drained; **VPD** – very poorly drained; **SiCL** – Silty clay loam; **CL** – clay loam;

LS – Loamy sand; **SiC** – Silty clay; **SC** – Sandy clay; **S** – Sand; **C** – Clay; SL – Sandy loam; **L** – Loam; **SCL** – Sandy clay loam; **SiL** – Silty Loam.

[2] C.W.S Hartley, The Oil Palm (Third impression, 1984): First Published 1967

The FAO guideline gives rise to land suitability sub-classes which define major limitations associated with the individual soils. The limitations are designated as: **w** (drainage); **q** (concretions or gravels); **m** (moisture availability); **s** (slope), **d** (effective depth); **r** (rockiness) and **n** (nutrients).

3.2 POTENTIAL AREAS FOR COMMERCIAL OIL PALM CULTIVATION

New guidelines based on the criteria listed below have been used to determine feasibility of commercial oil palm cultivation in Ghana:

- Climatic conditions
- Soil suitability
- Population living in the studied areas
- Areas which can be reserved for oil palm cultivation according to the existing roads and distances to existing and proposed mills
- Economic development

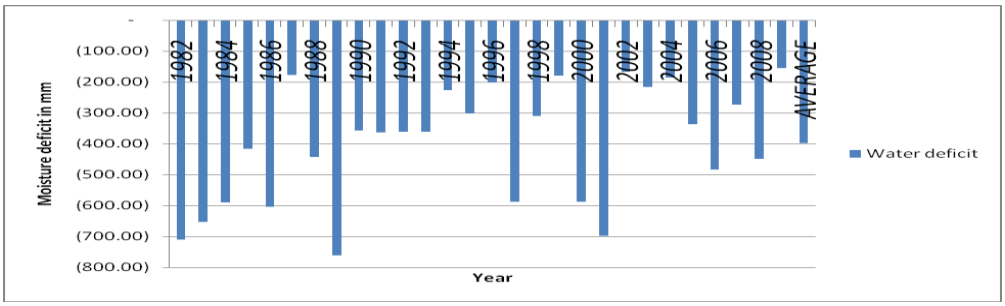
3.2.1 Climatic conditions in potential areas

Significant fluctuation in rainfall over the past 30 years has been observed from rainfall records analysed from 13 locations selected randomly across the oil palm belt of Ghana. This observation again ***confirms rainfall*** as the main climatic factor to be used in selecting potentials areas for commercial oil palm cultivation.

3.2.1.1 TOPP

Annual water deficit (Figure 3.6) at TOPP has fluctuated between favourable (250mm) and suitable (400mm) classification most often over the past 28 years and frequency of drought was 12 times or drought conditions (water deficit >400mm) occurred at TOPP every 3 years. The average water deficit has been 398.6mm confirming that TOPP is technically suitable for oil palm cultivation provided they continued with moisture conservation practices and select seeds which drought tolerant for replanting.

Figure 3.6: TOPP Annual Water Deficits, 1982 – 2009

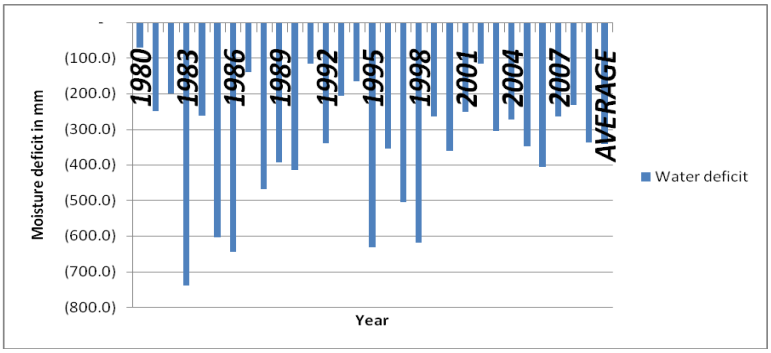


Source: Ghana Meteorological Office and Team Analysis

3.2.1.2 BOPP

Figure 3.7 shows annual water deficits at BOPP. The chart demonstrates that in 23 years out of the 30 years since 1980 has the water deficit has fluctuated between favourable (250mm) and suitable (400mm) classification. Frequency of drought observed was 7 times or drought (water deficit >400mm) occurred every 5 years. On the whole moisture deficit of 342.9 mm which confirms that BOPP is still technically suitable for oil palm cultivation but must continue with agricultural practices which conserve moisture and select seeds for replanting which are drought tolerant. .

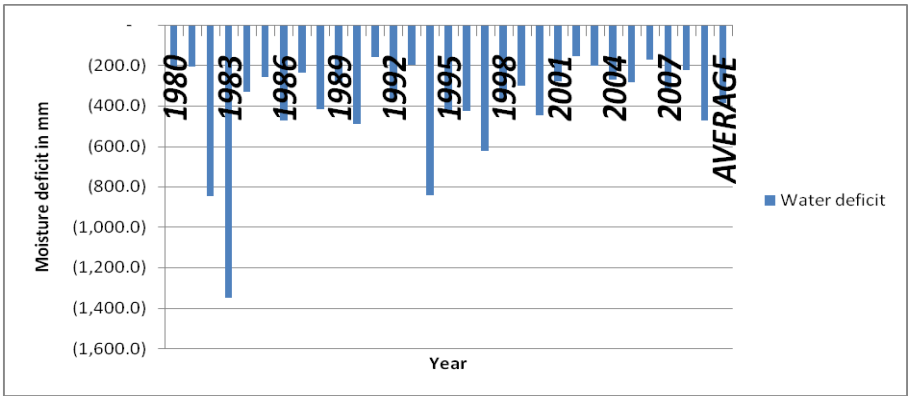
Figure 3.7: BOPP Annual Water Deficits



Source: Ghana Meteorological Office and Team Analysis

3.2.1.3 GOPDC

Figure 3.8 shows annual water deficits at Kwae averaging 388.7 mm but annually fluctuated most of the time between favourable (250mm) and suitable (400mm) classification in 24 years out of 30 years data used. Frequency of drought condition (water deficit >400mm) was 6 times or drought occurred every 5 years on average also at GOPDC. This data again confirms that GOPDC area is still technically suitable for oil palm cultivation provided it continued with moisture conservation practices and use drought tolerant seeds for replanting /or new plantation development. Figure 3.8: Annual Water Deficits at Kwae, GOPDC.



Source: Ghana Meteorological Office and Team Analysis.

3.2.1.4 Samreboi

The results below show that the average water deficit was below 250 mm during two of the last three decades but slightly exceeded 250mm during 1990-1999.

Year	Rain Days	Rainfall (mm)	EPT (mm)	Reserve b/f	Deficit (mm)	Reserve c/f
1981-1989	123	1,515.9	1,560.0	1,338.5	(216.6)	1,338.5
1990-1999	103	1,307.4	1,590.0	1,198.1	(282.6)	1,198.1
2000-2010	130	1,538.0	1,560.0	1,322.6	(193.9)	1,338.1

3.2.1.5 Enchi

Enchi previously fell below the 400mm line considered suitable and currently falls within areas favourable for oil palm cultivation.

Year	Rain Days	Rainfall (mm)	EPT (mm)	Reserve b/f	Deficit (mm)	Reserve c/f
1990-1999	108.0	1,386.2	1,560.0	1,316.7	(173.8)	1,316.7
2000-2010	155.0	1,584.0	1,530.0	1,471.8	(116.7)	1,471.8

3.2.1.6 Bunso

The analysis below still sited Bunso within the 250mm line which is an area originally identified together with Kwae, where GOPDC is located in Eastern Region as favourable.

Year	Rain Days	Rainfall (mm)	EPT (mm)	Reserve b/f	Deficit (mm)	Reserve c/f
1981-1989	124	1,515.9	1,560.0	1,338.5	(216.6)	1,338.5
1990-1999	112	1,404.4	1,590.0	1,262.2	(272.7)	1,262.2
2000-2010	130	1,538.0	1,560.0	1,322.6	(193.9)	1,338.1

3.2.1.7 Kwadaso

Kwadaso still falls below the 400mm line hence can only be planted if drought tolerant materials are used.

KWADASO	Rain	Rainfall	EPT	Reserve	Deficit	Reserve
	Days	(mm)	(mm)	b/f	(mm)	c/f
1990-1999	98.0	1,540.3	1,680.0	858.8	(176.4)	858.8
2000-2010	104.0	1,342.2	1,650.0	630.5	(307.8)	630.5

3.2.1.8 Dunkwa

Dunkwa was previously sited within the suitable area but now falls within the favourable 250mm soil moisture deficit category.

Year	Rain	Rainfall	EPT	Reserve	Deficit	Reserve
	Days	(mm)	(mm)	b/f	(mm)	c/f
1981-1989	135	1,502.5	1,560.0	1,357.5	(220.7)	1,357.5
1990-1999	143	1,419.2	1,560.0	1,331.2	(228.1)	1,350.5
2000-2010	132	1,463.7	1,530.0	1,256.3	(226.2)	1,324.1

3.2.1.9 Breman Asikuma

In the original classification, Breman Asikuma fell below the 400mm line and was thus in a suitable area. The results of current analysis have shown that from 1990 to date the area is favourable and the highest yield of 15mt/ha estimated for the best conditions in Ghana will be achievable at Breman Asikuma.

Year	Rain	Rainfall	EPT	Reserve	Deficit	Reserve
	Days	(mm)	(mm)	b/f	(mm)	c/f
1981-1989	102	1,324.4	1,620.0	636.0	(302.2)	642.5
1990-1999	118	1,478.7	1,590.0	1,068.3	(215.5)	1,172.5
2000-2010	151	1,402.7	1,530.0	1,095.1	(222.5)	1,190.3

3.2.1.10 Akumadan

Akumadan previously fell below the 400mm line but the results below show it now clearly falls outside the areas suitable for oil palm production.

Year	Rain	Rainfall	EPT	Reserve	Deficit	Reserve
	Days	(mm)	(mm)	b/f	(mm)	c/f
1981-1989	94.0	1,251.4	1,650.0	387.8	(415.4)	387.8
1990-1999	86.0	1,160.7	1,650.0	254.4	(432.3)	254.4
2000-2010	74.0	1,034.6	1,770.0	18.9	(671.2)	18.9

3.2.1.11 Bechem

Bechem previously fell below the 400mm line but fell outside the belt from 1981-1999 and the situation improved dramatically from 2000-2010. Any investment consideration there must factor in previous swings experienced in water deficit and adoption of moisture saving measures like the use of the cover crop Mucuna bracteata in the plantations.

Year	Rain	Rainfall	EPT	Reserve	Deficit	Reserve
	Days	(mm)	(mm)	b/f	(mm)	c/f
1981-1989	97.0	1,237.3	1,650.0	655.4	(412.7)	655.4
1990-1999	99	1,159.9	1,620.0	503.6	(460.1)	503.6
2000-2010	106.0	1,447.8	1,620.0	1,127.2	(263.9)	1,127.2

3.2.1.12 Jasikan

Jasikan previously fell below the 400mm line. The results below have shown Jasikan has experienced swings in water deficit and it is currently falling below the favourable line (250mm). Any potential investment in this area may have to factor in water conservation practices such as the use of cover crop especially Mucuna bracteata in the plantations.

Year	Rain	Rainfall	EPT	Reserve	Deficit	Reserve
	Days	(mm)	(mm)	b/f	(mm)	c/f
1981-1989	96.0	1,347.6	1,650.0	793.4	(359.2)	793.4
1990-1999	94.0	1,178.4	1,620.0	541.0	(441.6)	541.0
2000-2010	115.0	1,582.3	1,620.0	1,214.1	(241.0)	1,246.2

3.2.1.13 Hohoe

Hohoe still falls below the 400mm line and is suitable for oil palm production.

Hohoe	Rain Days	Rainfall (mm)	EPT (mm)	Reserve b/f	Deficit (mm)	Reserve c/f
1981-1989	99	1,306.7	1,650.0	807.4	(373.8)	807.4
1990-1999	100	1,396.9	1,650.0	1,081.3	(362.1)	1,190.4
2000-2010	108	1,619.6	1,590.0	1,285.5	(268.1)	1,285.5

3.2.2 Soil Suitability

3.2.2.1 Introduction

Soil suitability ratings for this master plan were undertaken through field sampling and laboratory analysis and previous relevant soil fertility studies. FAO guidelines supported by results of field work have been successfully used in evaluating soils for oil palm cultivation since the 1970s in Ghana. In order to select an area that can be put under oil palm cultivation the area must be **climatically suitable or favourable** (Van der Vossen's guideline) and parent rock materials underlying the suitable soils must be **uniform** (FAO guideline). In terms of uniformity, the rock formation which is found in the greater part of the climatically suitable or favourable areas for oil palm cultivation are **Birimian** and the **Tarkwaian** rock formations which stretch westwards from Eastern region, Ashanti, Brong Ahafo, Central and to Western region of Ghana.

Other areas examined were the area devastated by coconut yellowing disease and abandoned mining areas in Western region as well as in Volta region where the soils are remarkably different from the Birimian and Tarkwaian formations. The rock formations of climatically suitable and favourable areas in Volta region are the **Togo** formation and the **Buem System**.

3.2.2.2 Field work and laboratory analysis

During field work soil samples were collected in three areas which are climatically suitable or favourable for oil palm production. These were: Tarkwa - Huni Valley; Mim – Nkwanta and Hohoe – Kadjebi areas to represent the suitable soils where soil fertility status has not been established but land is available for oil palm plantation development[3];

[3] Team contacts

Results of the physico-chemical characteristics of the dominant soil series obtained from laboratory analysis in these three areas are given in Annex 6.

3.2.2.3 Review of previous soil fertility studies

A detailed review was undertaken of previous soil studies in the Tarkwa - Huni Valley; Mim – Nkwanta and Hohoe – Kadjebi areas as well as areas devastated by coconut yellowing disease and abandoned mined sites to determine their suitability for oil palm plantations. This information was consolidated with that obtained through the new survey.

UNIFORMITY OF PARENT ROCK MATERIALS OF UNDERLYING SOILS

A. Tarkwa - Huni Valley, Mim – Nkwanta areas

The dominant geological rock formations which run through the **Western, Central, Eastern, Ashanti and Brong Ahafo Regions** are the **Birimian** and the **Tarkwaian formations**. The weathered products of these formations constitute the soil parent materials in the three areas sampled for expansion of the oil palm cultivation in Ghana. The dominant rocks are:

a) Lower Birimian phyllites, greywacke, schist and gneiss;
b) Upper Birimian schist, basalts and phyllites;
c) Granite intrusions of the Birimian;
d) Tarkwaian sandstones, quartzites and phyllites.

The generalized soil associations are similar in Tarkwa - Huni Valley area (Figure 3.9) where soil samples were collected and analysed, Kade area in Eastern region (Figure 3.10) and the Kumasi area representing Ashanti and Brong Ahafo regions (Figure 3.11) where inferences were made from existing soil analysis data.

Figure 3.9: Tarkwa - Huni Valley Area

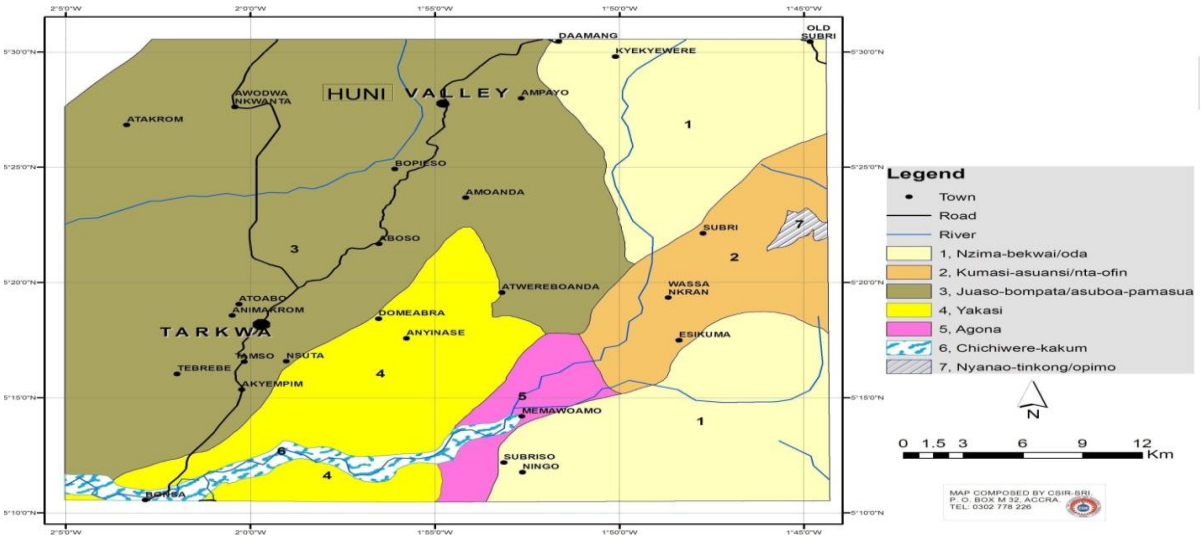


Figure 3.10: The Kade Area (Eastern)

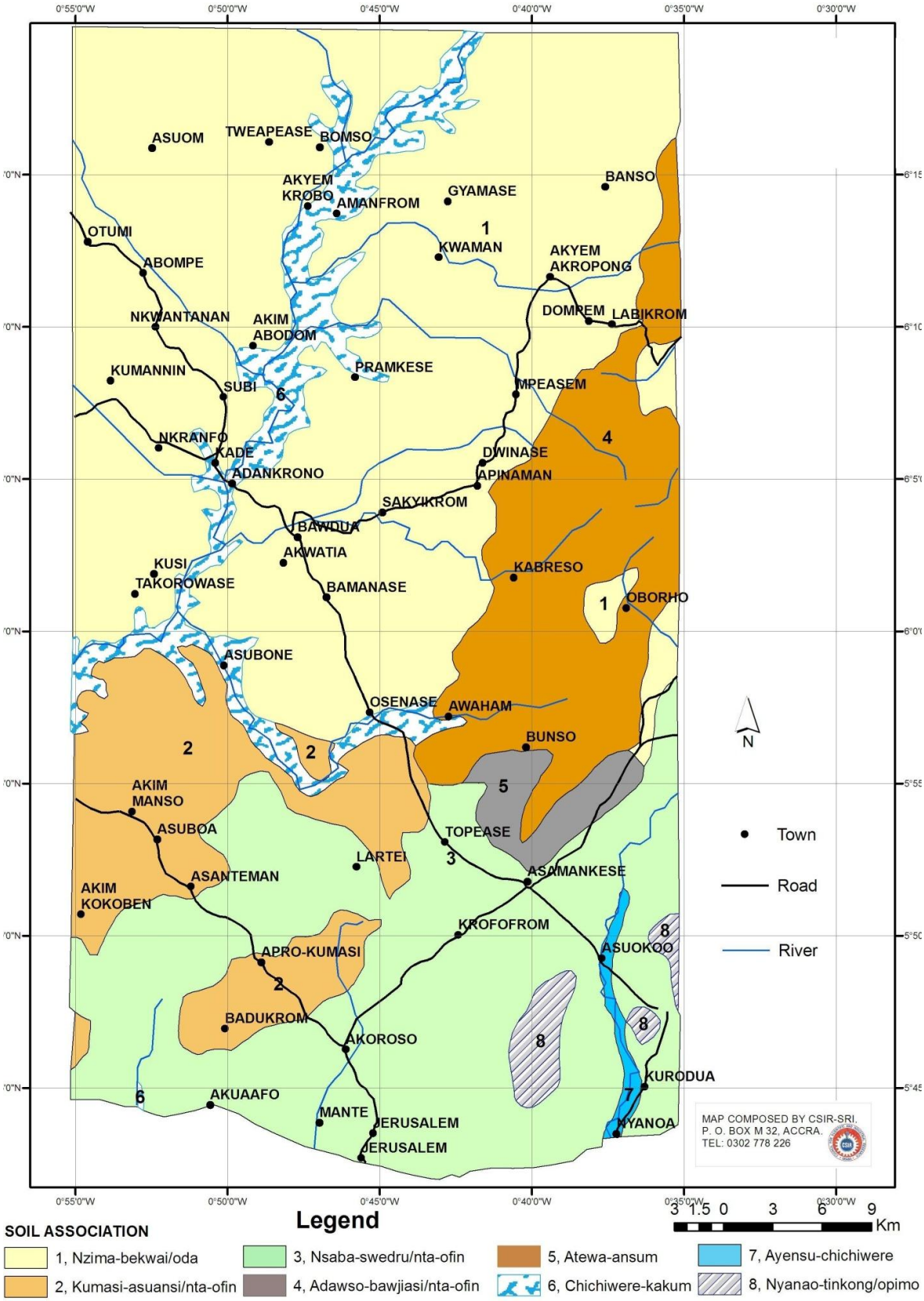
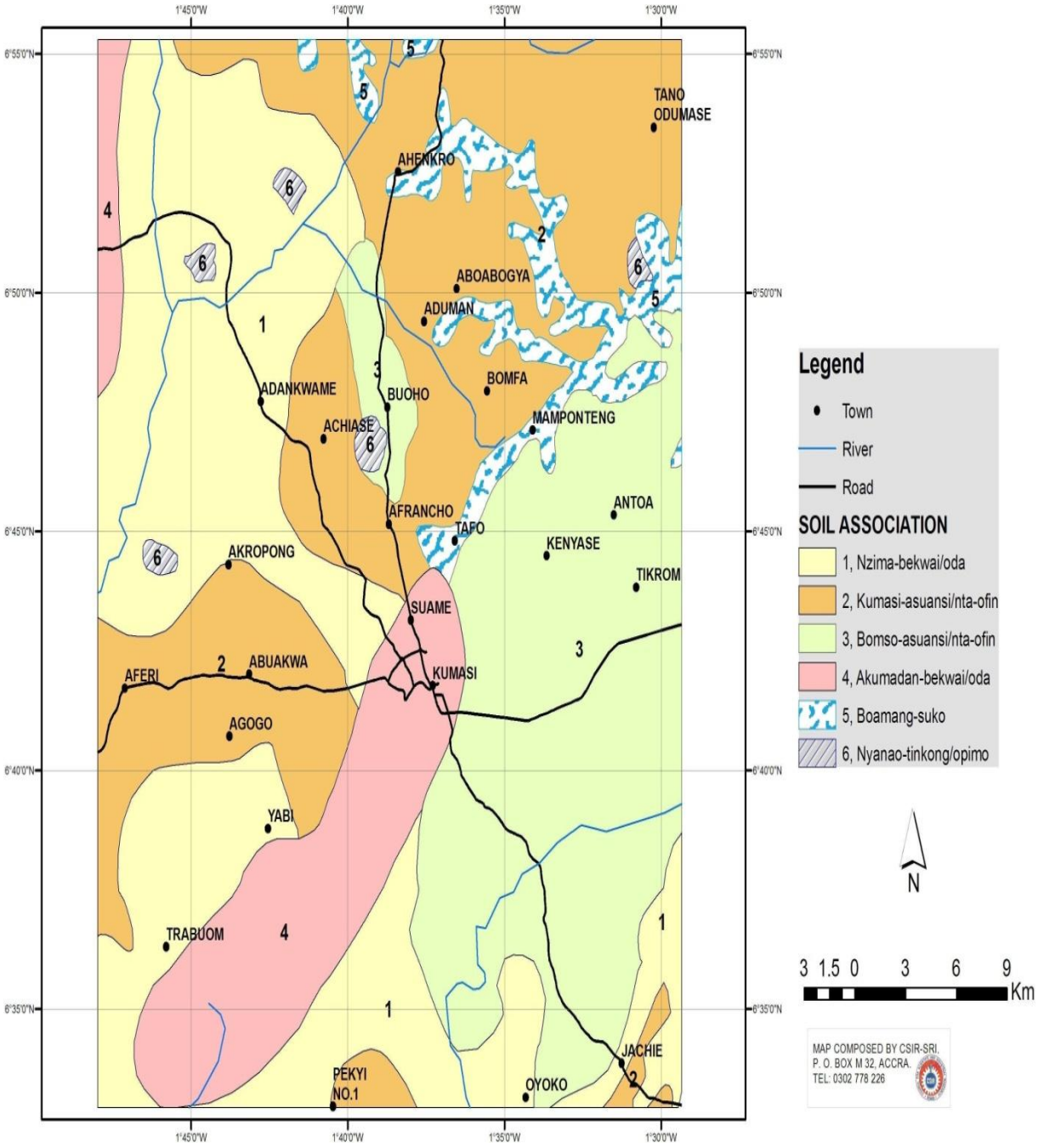


Figure 3.11 Kumasi Areas (Ashanti/Brong Ahafo)



i) Soils developed over the Lower and Upper Birimian in the three sampled areas.

The morphological descriptions of these soils are summarized from soil survey technical reports prepared by Soil Research Institute and memoirs of Obeng (1959), Asamoah (1964), Adu (1992), Amah (1970), Ahn (1961), Asamoah and Nuertey (2005) and Dedzoe and Senayah (2001).

On the summits, upper and middle slopes, within this soil association, are found red, well drained (**Bekwai series**) and brown moderately well drained (**Nzima series**) concretionary silty clay loams. On the middle to lower slopes occur the yellowish brown imperfectly drained silty clays and silty clay loams (**Kokofu series**) developed from colluviums. The valley bottoms are occupied by grey poorly drained alluvial loamy sands (**Temang series**) and clays (**Oda series**).

a) Bekwai Series (FAO: Ferric Acrisol)

These soils are developed over deeply in situ weathered phyllites and associated rocks. They are deep (> 150cm), well drained and occur on summits (0-2% slope) and upper slopes (6-12%). The topsoil soil texture is sandy loam to silty loam. The subsoil is sandy clay loam to sandy clay. The soils contain common to many iron stone concretions and quartz gravel in the upper solum. Water holding capacity is satisfactory in the wet season.

b) Nzima Series (FAO: Ferric Acrisol)

This series is developed over both in – situ weathered phyllites and from colluvial materials found on middle slopes (3 – 8%) and summits (0-2%) of low hills. It is deep (>200cm), moderately well drained. Topsoil texture is clay loam and the subsoil is sandy clay. As in the Bekwai Series, the upper solum contains common to many ironstone concretions and quartz gravel. Water holding capacity is satisfactory in the wet season and external drainage is rapid.

c) Kokofu Series (FAO: Plinthic Acrisol)

Gravel free clay loams and clays developed in colluviums over deeply weathered phyllites, schists and greywackes. They are moderately well to somewhat imperfectly drained and found on lower slope sites (2 – 6%). A layer of quartz gravel and few ironstone concretions occur at 80 – 150 cm depth in the profile. Plinthite is found at 80 – 180cm depth. The soils have effective depth of 180 cm. Water holding capacity is good to satisfactory in the dry season and external drainage is rapid.

d) Oda Series (FAO: Eutric Gleysol)

These are silty clay loams and clays developed from old alluvium on almost flat valley bottoms (0 – 2%). They are poorly to very poorly drained. Oda series are subject to seasonal flooding. The soils are deep (120 – 150cm). Many rounded quartz gravels and stones may occur at variable depths (below 35cm) in the subsoil.

e) Temang Series (FAO: Dystric Gleysol)

These are fine sands and sandy loams over silty clays or stratified sands and clays developed in alluvium found on valley bottoms (0- 2%) slopes). Temang series are poorly to very poorly drained and subject to seasonal water-logging and flooding. A few quarts and ironstone concretions are found below 100cm depth. Effective soil depth is >150cm.

f) Kobeda Series (FAO: Dystric Leptosol

These soils are developed over Upper Birimian schists, phyllites and basalts. They are very shallow loamy soils about 10 – 20 cm thick developed over remnants of inselbergs. The soils are well drained and found on summits (0-2%) and on steep to very steep upper slopes (20 – 35%) and (35 – 70%). Frequent rock outcrops occur within the series.

(ii) Soils Developed over the Granites

a) Kumasi Series (FAO: Ferric Acrisol)

Kumasi series are well drained soils developed over deeply weathered biotite granite. They occur on nearly level summits (0 – 2%) and moderately steep upper slopes (3- 8%). They have loamy sand or sandy loam topsoils. The subsoils are clay loams to clay. Frequent ironstone concretions and quartz gravels occur in the upper subsoil at 40 - 70 cm. These decrease with depth. The soils are deep (>150cm). Run-off and permeability is medium and moderate respectively.

b) Asuansi Series (FAO: Ferric Acrisol)

These soils are moderately well drained and occur on middle and upper slope sites (3 – 8%). The topsoil is clay loam and the subsoil is clay. The subsoil contains common ironstone concretions and quartz gravel. The soils are deep (> 150cm). Run-off is medium and permeability is moderate.

c) Akroso Series (FAO: Plinthic Acrisol)

These are moderately well to somewhat imperfectly drained and developed in colluviums on lower to middle slope sites (2 – 6%). The soils are moderately deep to deep (90 – 150cm) and are characteristically gravel free up to a stone line or gravelly and concretionary subsoil at a depth of 45 – 150cm. The topsoil has sandy loam texture and the subsoil has sandy clay loam to clay texture. Runoff is medium and permeability is moderately slow.

d) Nta Series (FAO: Gleyic Arenosol)

These are pale fine sands and loamy sands developed in colluviums on lower slope sites (2 -4%). Nta series are imperfectly drained with slow

internal drainage. They are deep (>150cm). Runoff is slow and permeability is rapid.

e) Ofin Series (FAO: Dystric-/Eutric Fluvisol)
These are grey sands and loamy sands or stratified sands and sandy loams 20 – 30cm thick developed on valley bottoms (0 – 2%). Ofin series are poorly to very poorly drained. They are subject to flooding and water logging.

f) Nyanoa Series (FAO: Ferric Acrisol)
These are loamy soils developed over partially weathered granite rocks grading, with depth, into fresh hard rock. The soils are very shallow (15 – 20cm) and are well to excessively drained. The soils occur on summits and upper slopes of inselbergs. Granitic rock outcrops occur within the series.

(iii) Soils Developed Over Alluvial Deposits

a) Kakum Series (FAO: Ferric Acrisol)
Gravel-free, deep (>180cm) sandy clay loams and clays developed in old alluvium on levees. Slopes are 0 – 2% and 2 – 4% and they are moderately to somewhat imperfectly drained and subject to occasional flooding. Runoff is medium to slow and permeability is moderate.

b) Chichiwere Series ((FAO: Ortho- Dystric Fluvisol)
These soils are fine sands developed in alluvium on levee sites of 0 – 2% and 2 – 4% slopes. The soils are loose, porous and moderately well to excessively drained. The soils are highly leached. Water retention capacity is poor.

(iv) Soils Developed Over Tarkwaian Sandstones and Phyllites.

Juaso – Bompata/Asuboa – Pamasua Compound Association: occurs on summits as red concretionary well drained sandy clay loams (**Juaso series**). On the upper to middle slopes occur very deep, red, well drained, non – gravelly (**Bompata series**) and very deep, yellowish red, moderately well drained (**Banso series**) sandy clay and sandy clay loams. On the less hilly areas, the lower slopes have very deep yellowish brown imperfectly drained non – gravelly sandy loam and sandy clay loams (**Asuboa series**). On the valley bottoms occur deep poorly drained alluvial loamy sands (**Pamasua series**) and sandy clay loams (**Debia series**).

a) Juaso series (FAO Ferric Acrisol)
These series are reddish brown well drained sandy clay loams developed on summits with gradients of 2 – 3%. From depths of about 12 – 80cm common to many ironstone concretions and few quartz gravels are found up to a depth of about 180cm. The soils have moderately rapid internal

drainage, moderate permeability and medium runoff. Nutrient reserves are very low except in the surface layers.

b) Bompata series (FAO: Ferric Acrisol)

The Bompata series of this soil association are developed on the summits and upper slopes of the piedmont landscape on 1 -3% slopes. They are deep (›200cm) non – gravelly, well drained reddish brown sandy loams. They are porous, freely drained, well aerated and have good tilth. Nutrient levels are very low.

c) Banso series (FAO: Dystrict Nitisol)

These are very deep (>200cm) yellowish red sandy clay loams and are the moderately well drained middle slope associates of the Bompata association. At about 130 – 150cm depth they become concretionary. Nutrient levels are very low.

d) Asuboa series (Haplic Nitisol)

These series occur extensively on the lower slopes of this soil association. Slopes are, 1-2%. They are deep (>180cm) non – gravelly, yellowish brown, imperfectly drained sandy clay loams to sandy clays developed in colluvium. Nutrient status is moderate to low. The bulk of the nutrients are concentrated in the topsoil organic matter.

e) Pamasua series (FAO: Gleyi – Dystric Fluvisol)

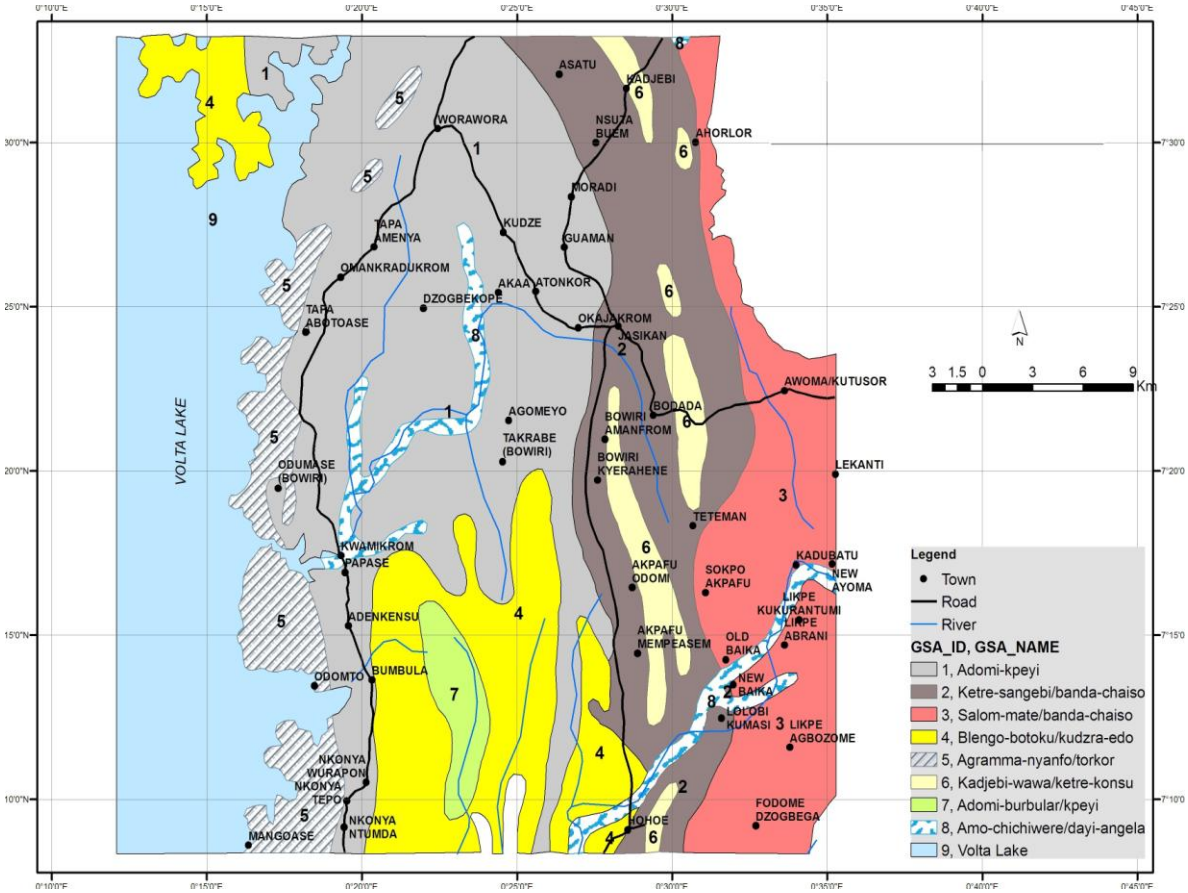
The Pamasua series are the imperfectly to somewhat poorly drained loamy sands found on lower slope to valley bottom sites. The normal profile consists of 0 – 20cm of dark greyish brown loamy sand overlying, from 20 – 120cm, yellowish brown loamy sand. They are subject to seasonal flooding. They are very strongly acid (pH 4.6 – 4.4) and nutrient status is very low.

B. Hohoe – Kadjebi. Areas

The geological formations of the Volta Region **(Figure 3.12)** are remarkably different from the Birimian and Tarkwaian systems of the Western / Central, Eastern, Ashanti/ Brong Ahafo Regions.

The main geological formations of Hohoe – Kadjebi areas where soil samples were collected are i) the Togo formation and ii) the Buem System. The weathered products of Togo formation and Buem system constitute the parent materials of the soils in the Hohoe – Kadjebi areas sampled.

Figure 3.12: Hohoe-Kadjebi Area (Volta Region)



i) Soil Associations Developed Over the Togo Formations

The Togo formation consists of over folded and isoclinally folded sediments. The rocks mainly comprised of quartzite schists and phyllites.

The main soil associations developed over the Togo rocks are Salom-Mate/Banda-Chaiso Complex Association and Abotakyi – Kitasi Association.

a) Buem System

Buem system which lies west of the Togo formations, consist mainly of feldspathic sandstones, quartzites, siltstones, shales and conglomerates interbedded with greywacke and limestone. The Buem rocks have volcanic intrusions of tuffs and basaltic agglomerates. The main soil associations developed over the Buem rocks are the Adomi-Kpeyi association and the Ketre-Sangebi / Banda-Chaiso Compound Association. The following morphological descriptions of these soil associations are summarized from Brammer (1967) and unpublished memoirs of Obeng (2003).

This complex association developed over the Togo rocks consists of an upland association of well to moderately well-drained Salom, Ayoma and Jasikan series. The lowland association comprises the imperfectly to poorly drained silty clays (Boso and Mate series) found on lower slopes and valley bottoms respectively. The Banda-Chaiso association is characterized by the presence of iron pan at 10 – 30cm depth.

b) Salom Series

The Salom series consist of shallow (31-60cm) brashy silty clays developed over phyllite. They occur on the flanks and summits of the Togo Range. Internal drainage is good to excessive. They are very strongly acid (pH 4.8 – 4.0) and nutrient status is poor.

c) Ayoma Series

The Ayoma series occur on the upper and middle slopes of the Togo hills under moist semi-deciduous forest. The top 8 – 16cm is dark brown silty loam or silty clay with little quartz gravel. The above horizon grades into orange brown silty clay containing few quartz gravel. The soils are well drained and have good moisture holding capacity. Nutrient status is low to moderate.

d) Jasikan Series

The Jasikan series are developed over quartz impregnated Togo phyllites. They consist of yellowish brown silty clays containing abundant quartz gravel in the subsoil at 13 – 40cm depth. Moisture retention is satisfactory. Nutrient status is low to moderate.

e) The Boso series

The Boso series are yellowish brown sandy clays developed in colluviums on the lower slopes where gradients are 4 – 6%. The soils are deep (> 120cm) and contain only few quartz gravels and $Mn0_2$ concretions. They are imperfectly drained and tend to be waterlogged after heavy rains. Nutrient status is low to moderate.

ii) Soil Associations Developed Over the Buem Rocks.

a) Ketre series

Ketre series are shallow (25-46cm) brashy soils occurring on summits and steep slopes of the Buem hills where slope gradients are 10 -15%. They are grayish brown, porous loams and clays containing many quartz gravel and pieces of sandstone. Internal drainage is excessive and run-off is rapid. Moisture retaining capacity is poor. Nutrient status is low.

b) Sangebi Series

Sangebi series are yellowish brown moderately deep (> 100cm) sandy clays found on middle to lower slopes where slope gradients do not exceed 6%. The sandy loam subsoil contains much quartz gravel at depths ranging from 30 to 90cm. they are moderately well-drained to somewhat imperfectly drained. Moisture retaining capacity is moderately good. Inherent fertility is moderate.

C. Other favourable areas for oil palm cultivation

i) Areas devastated by coconut yellowing diseases

Areas devastated by coconut yellowing diseases found within areas favourable for oil palm cultivation in Western region are shown in Figure 3.13.

Figure 3.13: Location of areas devastated by coconut yellowing diseases

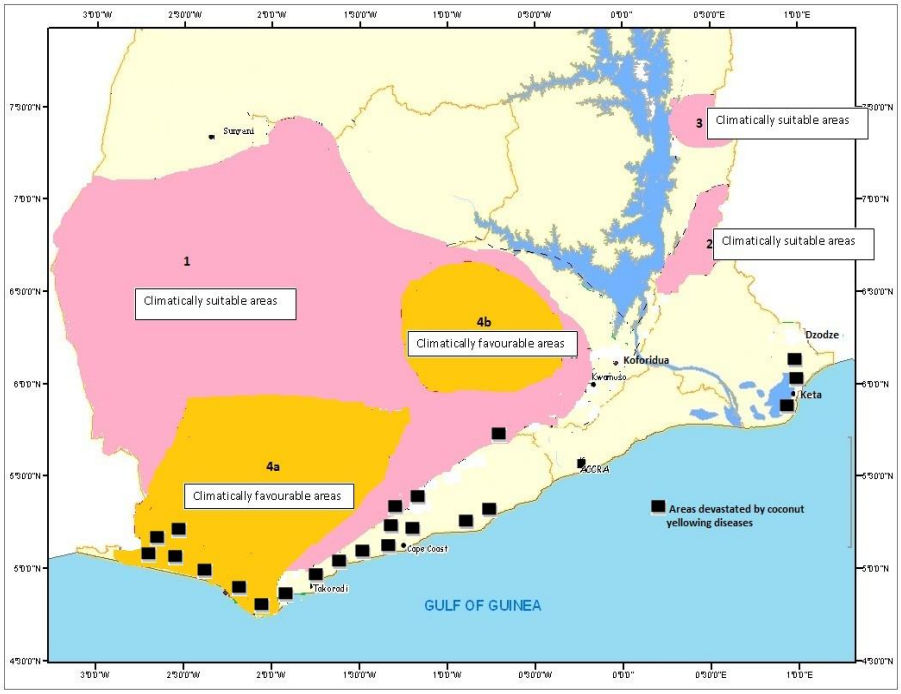
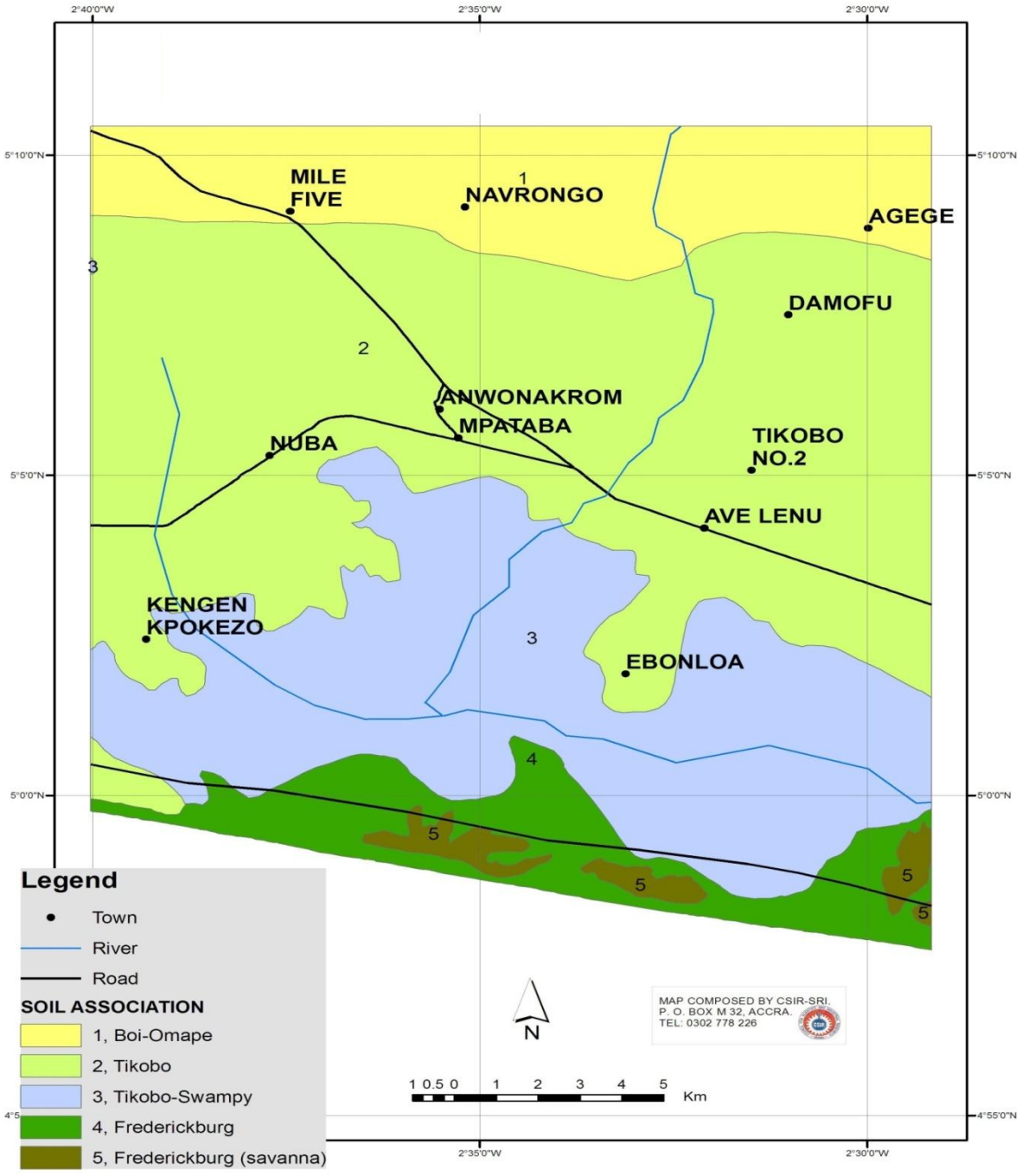


Figure 3.14 shows the main soil associations developed over the dominant geological formations in the coconut yellowing diseases area in the Western Region. The dominant geological formations, which constitute the soil parent materials in the area, are: (i) Lower Birimian phyllites with minor inclusions of granites, (ii) tertiary sands and (iii) the quaternary (coastal) sands. The morphological, physical and

chemical characteristics of the soils developed over these geological formations, in the coconut wilt disease area of the Western Region, are mainly summarized from the work of Peter Ahn (1961).

Figure 3.14: Areas devastated by coconut yellowing diseases



a) Boi series

The Boi series is found on a wide range of sites, from summit to lower slope and occupies most of the upland areas in the Boi association. The Boi series is developed in deeply weathered phyllites and associated rocks. The soil is deep (> 200cm) and has 0 – 2 % slope gradient on the summits and 6 -12 % on the upper slopes. The topsoil texture is silty clay and subsoil is clay. The soil contains common to many ironstone concretions and quartz gravel at a depth of about 20 to 40 cm in the profile. Water holding capacity is good; external drainage is good and internal drainage is moderately good. The soil is very strongly acid (pH 4.5 – 4.9) throughout the profile. Plant nutrient levels are very low due to the excessive leaching effect of the heavy rainfall regime in the region (> 2000 cm).

b) Omappe series

The Omappe series of this soil association is distinguished from the Boi series by an indurated horizon which underlies the gravelly upper subsoil.

c) Kwaben series

The Kwaben series is the alluvial sandy clay occupying the valley bottoms of the Boi association.

d) Tikobo series

The Tikobo series is the most extensive soil of the association and is found on all sites except the valley bottoms. The soil has about 15 – 20cm thick sandy loam topsoil overlying a deep uniform non-gravelly yellowish brown sandy clay loam which remains more or less unchanged for 8-10 meters or more. Tikobo series is very well drained. Internal drainage of this deep sandy soil is very rapid and no surface run-off and therefore there is little or no erosion. This soil is highly leached because of the heavy rainfall in the region (> 2000cm). The soil is strongly to very strongly acidic (pH 5.1 – 4.8).

e) Nuba series

The Nuba series of this soil association is a subseries of the Tikobo series differing from the Tikobo series only by its lighter texture. Nuba series is loamy for 75cm or more, sometimes throughout the profile. In other respects the two soils are similar. Nuba series occurs often intimately with the Tikobo series.

f) Aiyinasi series

The Aiyinasi series of the Tikobo association is very inextensive, being confined to relatively small areas in valley bottoms. It is grey sand to sandy

loam alluvial soil that is liable to occasional flooding. It is lower in nutrients than the associated upland soils.

g) Fredericksburg series

Fredericksburg series is the most extensive soil of this association. It is developed over the marine sands of coastal dunes and raised beaches. The topsoil texture ranges from sand to sandy loam. The subsoil is medium sand, structure-less and loose. The soil is deep (> 400cm). Internal drainage is excessively rapid. Rainfall sinks into the surface rapidly so that there is no run-off. Nutrient status of the series is extremely low. Soil reaction is strongly acidic (4.9 -5.1). Despite the low nutrient level this series is capable of supporting coconut and oil palm and a range of food crops due to its texture and depth which allows for easy root penetration and due to the climatically suitable conditions for oil palm cultivation.

h) Krisim series

The Krisim series of this association is developed in recent beach sand a little above the present high water mark. A high content of shell fragments gives it a neutral to slightly alkaline reaction (pH 6.6 – 7.5) which differentiates it from the other series of the association. Relatively little can be grown on this series, but it also supports some coconut.

3.2.2.4 Soil Suitability Ratings for Soils available for Oil Palm Cultivation

a) Soils developed over the Birimian and the Tarkwaian Rocks.

For soils developed on the Birimian, the summit and upper slope soils, Bekwai and Nzima series, are rated as moderately suitable, S2q and S2qe respectively; the major limiting factors being the abundant gravel and concretions (15 – 45% by volume) in their profiles. The middle slope soil, Kokofu series, is rated highly suitable, S1, because it is deep (>180), gravel free in the top 100 cm and has good texture, silty loam. The Temang and Oda series are rated as marginally suitable, S3w. the major limiting factors being its sandy texture and excessive drainage.

For the soils developed on granites, the summit and upper slope soils, Kumasi and Asuansi series, are rated marginally suitable, S3meq. The main limiting factors being the many quartz gravel and ironstone concretions (10 – 40% by vol.) in their profiles, and their susceptibility to erosion.

The middle slope soil, Akroso series, is rated moderately suitable, S2wm, main limiting factor being moisture availability during dry seasons.

Ofin and Nyanao series are rated non – suitable, Nwm and Ned respectively. Ofin has poor drainage limitation while Nyanao, developed on inselbergs, is shallow (20 cm) and susceptible to severe erosion.

The soils developed on alluvial deposits, e.g. Kakum and Temang series, are rated moderately suitable, S2wm, the major limitation being poor internal drainage. Other minor series in the three demarcated areas, Kobeda, Firam and Omappe, are rated Ne, S3wn and S2e respectively.

For soils developed over the Tarkwaian rocks, the summit soil, Juaso series, is rated moderately suitable, S2q, the major limiting factor being the many ironstone and quartz gravels in the subsoil. The upper and middle slope soils, the Bompata and Asuboa series are rated highly suitable, S1, because they are deep and non – gravelly. The only limiting factor of this soil series is their low nutrient status which can easily be corrected. The Pamasua series is rated moderately suitable, S2w, the main limiting factor being imperfect internal drainage. In general, the most extensive soils in the climatically suitable area in the three demarcated areas are good for economic cultivation of the oil palm, they are rated highly (S1), moderately (S2) and marginally (S3) suitable. With appropriate soil management practices based on the limiting factors of the various soil series, the soils can be used for economic cultivation of oil palm. The non – suitable soils (N) are, fortunately, of limited occurrence in the climatically suitable area for oil palm production in Ghana.

The Sunyani to Mim area in the Brong Ahafo Region has extensive areas covered by the Bekwai – Nzima – Kokofu association which are rated moderately suitable, S2q, and highly suitable, S1, for oil palm cultivation. It should be noted, however, that this area falls outside the Van der Vossen's climatically suitable zone. Investors going into the area should therefore consider cultivating drought resistant oil palm varieties or plan for irrigation.

b) Soils of the Coconut Wilt Disease Area

The FAO (1983) model for the evaluation of soils was used to assess the suitability of the soils for oil palm cultivation under rainfed conditions as explained in section 3.2.2.

The selected main soil associations developed over the dominant geological formations in the area are (i) the Boi – Omappe – Kwaben, (ii) the Tikobo-Aiyinasi and (iii) the Fredericksburg – Krisin associations. The Boi series, in terms of its internal drainage, effective soil depth and gradient could be rated very suitable for oil palm cultivation. However, the high gravel content (15 - 45% by vol.) at about 40cm depth, the low nutrient status and the strong acidity down-graded its suitability rating to moderately suitable (S2qn). The Omappe series of the Boi association has a further limitation of an indurated horizon below the gravel layer which impedes root penetration. Omappe series is, therefore, marginally suitable (S3qdn). The Kwaben is the alluvial sandy clay soil found in the valley bottoms and is subject to occasional waterlogging and is, therefore moderately suitable (S2w). The Tikobo series and its subseries Nuba series are very deep and non-gravelly. In terms of effective soil depth, drainage and gradient, is rated highly suitable (S1) for oil palm cultivation. The only limiting factor is its low nutrient status due to excessive leaching but this can easily be corrected. The non-extensive

Aiyinasi series is the valley bottom member of the association subject to occasional water logging. The Tikobo – Aiyinasi association is rated highly suitable for oil palm cultivation (S1).

Many highly productive oil palm plantations in neighbouring Cote d'Ivoire are cultivated on the Tikobo association where it occurs extensively. The Fredericksburg and Krisin series are similar in physical characteristics to the Tikobo association. They differ from the Tikobo by their lighter texture and extreme lower nutrient status. The rapid internal drainage of these soils is counter balanced by the high rainfall in the region. Despite their low nutrient level these soils are capable of supporting oil palm and are rated moderately suitable (S2n).

c) Soils of unexploited and abandoned mined concession

The Tarkwa-Huni Valley demarcated area has several abandoned surface mined sites. The un-rehabilitated surface mined sites have bare rocky surfaces covered by only a veneer of soil derived from slope wash of the surrounding higher rounds. Vegetation of the abandoned mined sites is mostly some scattered, stunted grasses separated by wide rocky surfaces covered by many quartz gravel and stones. The situation is different when the surface mined sites are rehabilitated. A recent PhD study of the quality of rehabilitated mined soils by Dogbetor (2010) of Department of Soil Science, Legon, found that the quality of the rehabilitated soils improved considerably, especially when the rehabilitated soils were planted with a mixture of exotic leguminous trees and indigenous tree species. The quality index of the rehabilitated soils, after six to seven years, was equal to, and in some cases better than, that of the native soils (Nzima series) which were mined. He, therefore, suggested that the rehabilitated soils, after 6 – 10 years, could be used for economic cultivation of crops, including, of course, the oil palm.

d) Soils in the Demarcated Area in the Volta Region

The Ayoma Series, in terms of effective depth, internal drainage, medium texture and rare gravel content, are rated highly to moderately suitable, S1 and S2n; the only limiting factor being their low to moderate nutrient status which can easily be corrected by application of the required nutrients. The Boso and Sangebi series are rated moderately suitable, S2w, the limiting factor being their internal drainage. The Salom and Ketre series which are shallow and brashy and excessively drained are rated not suitable, N. Such soils are restricted to the very steep slopes and are not extensive. The most extensive soils in the Volta Region are suitable to moderately suitable for oil palm cultivation. It should be noted that the suitability ratings are based on generalized soil association maps. Anyone who wishes to invest in oil palm cultivation in the Region should require a detailed soil survey of the acquired land which will delineate the boundaries and evaluate the suitability of each of the various soil series occurring on the land. This will facilitate judicious farm planning.

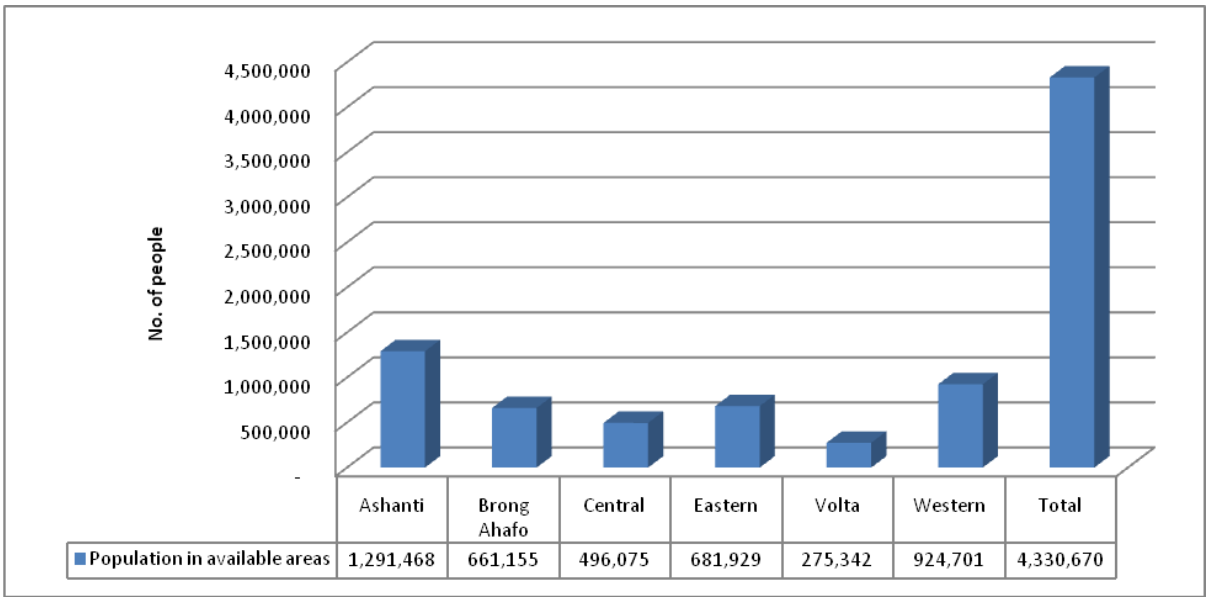
3.2.2.5 Productivity of the Soils Available for Oil Palm Cultivation

Research on the productivity of soils of the areas climatically suitable and favourable for oil palm in Ghana showed that at Kusi average yields of 10.4-10.56 mt/ha/yr, were similar for the middle to lower slope and valley bottom soils(Kokofu and Temang series), but 29% higher for Nzima series, a middle slope soil. Yields on summit and upper slope soils, Bekwai series, were lower. Long term averages were higher at 11.6, 13.3 and 12.2 mt /ha /yr – on Nzima, Kokofu and Temang series respectively. The topo-sequential trend in yield was similar for soils at Twifo Praso and Adum Banso. The yield on granite soils ranged between 8.7 and 11.7 mt/ha/yr over a 3 -15 year period (Asamoah and Nuertey, 2005).

3.3 POPULATION LIVING IN THE STUDIED AREAS

The population living in the studied areas is 4.3 million which represents about 18% of the total population of Ghana (figure 3.15). If unemployment in Ghana is assumed to be 15%, then the total number of unemployed currently in the area is 645,000 people. The Oil palm development projects proposed can help reduce this number of unemployed persons considerably over the next 15 years.

Figure 3.15: Population in the studied area



	Ashanti	Brong Ahafo	Central	Eastern	Volta	Western	Total
Population in available areas	1,291,468	661,155	496,075	681,929	275,342	924,701	4,330,670

3.4 AREAS WHICH CAN BE RESERVED FOR OIL PALM CULTIVATION ACCORDING TO THE EXISTING ROADS AND ACCESS TO EXISTING AND PROPOSED MILLS

The areas proposed to be reserved are grouped into six blocks (Figure 3.16). These areas have been chosen because:

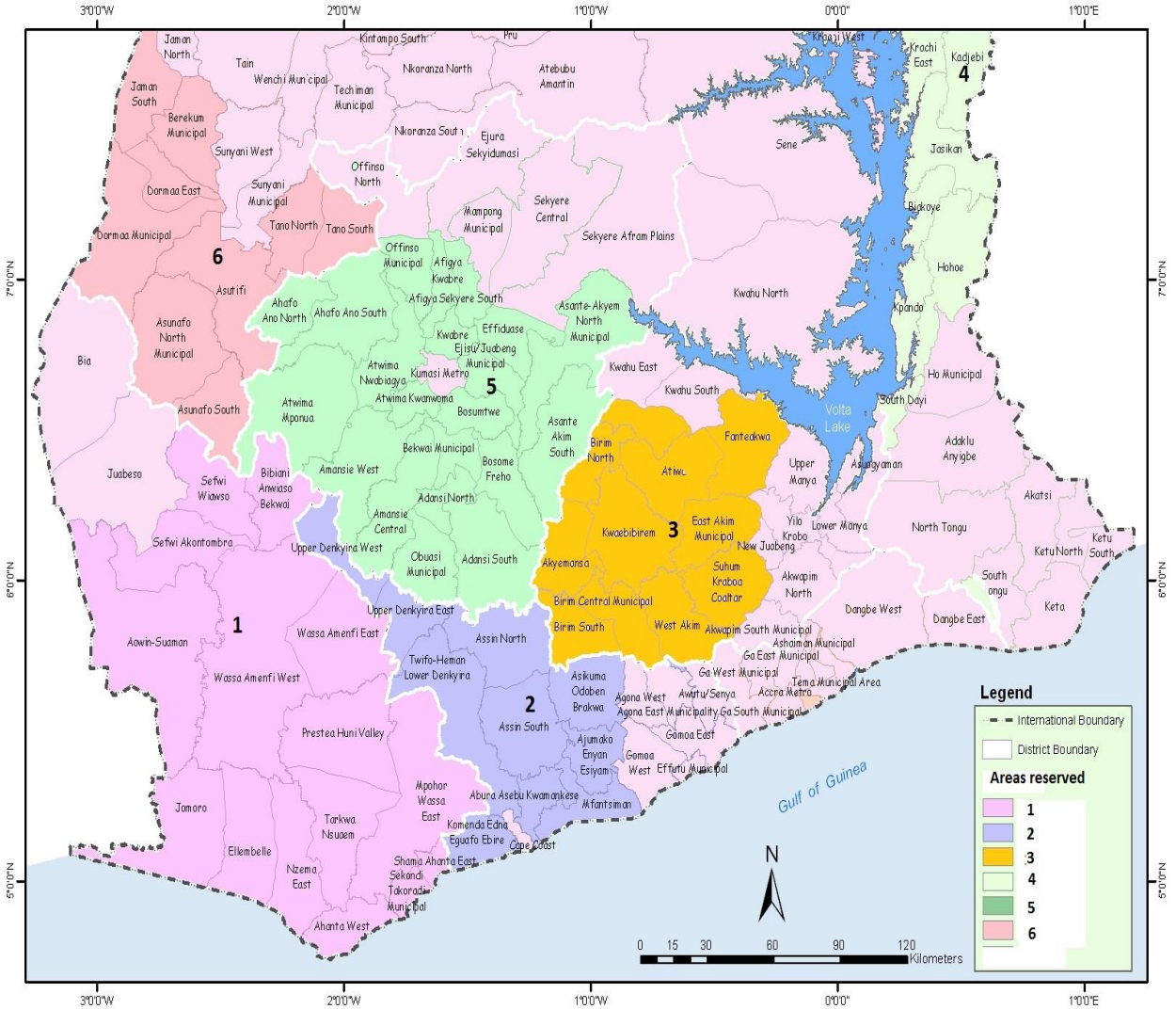
a) Large stretches of land are available;

b) They fall within climatically suitable and favourable areas where the soils are also highly suitable (S1) or moderately suitable (S2);

c) A work force is readily available ;

d) There will be economic empowerment of people to be engaged in the proposed oil palm development through regular employment.

Figure 3.16: Areas proposed to be reserved for oil palm cultivation



3.4.1 Economic development

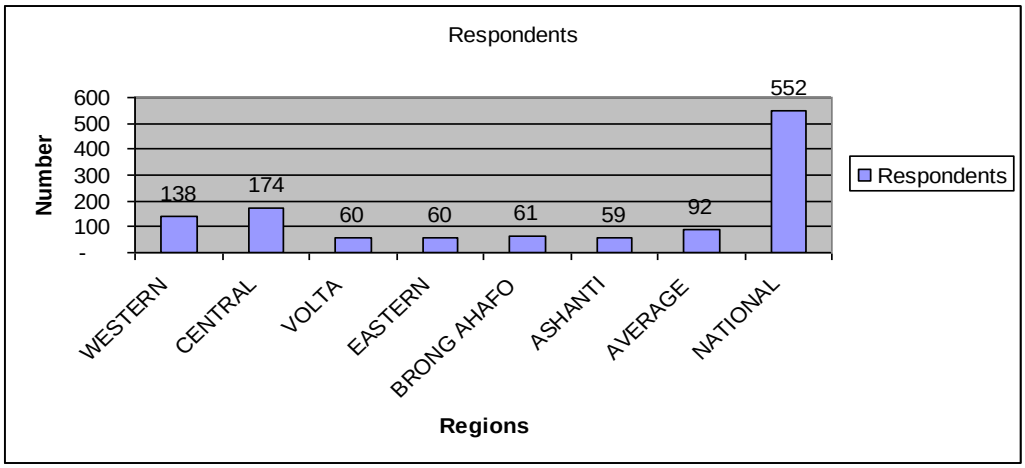
This will ensure the sustainability and balanced development of the regions involved and will have immense positive impact on rural poverty reduction, deforestation, land degradation and soil erosion. Also, the production of CPO and value-added products, and promotion of downstream activities will generate foreign exchange earnings and eliminate the imports to support the country's balance of payment. Furthermore, employment opportunities will be created in the rural areas to forestall migration of people to urban areas. Comparing the performance of oil palm sector in Ghana with countries such as Malaysia (where the crop is the number one agricultural commodity which provides major sources of export earnings and employment), it is inferred that opportunities exist for the expansion of oil palm cultivation and processing in Ghana. Apart from the production of CPO which is in high demand, the development of various palm oil-based products (butter fats, soaps, oleo chemicals, cooking oils, pulp and paper, etc.) through downstream research activities are yet to be explored in Ghana. Also the establishment of large areas of smallholder/outgrower oil palm plantations with corresponding social and industrial infrastructure would enhance the welfare of farmers and rural communities and also contribute to poverty alleviation, promote rural development, conserve biodiversity with its beneficial impact on the environment and climate change.

3.5 SOCIO-ECONOMIC SURVEY

3.5.1 Introduction

As part of the development of this Oil Palm Master Plan, a socio-economic survey was conducted in the main palm oil producing areas; namely, the Western, Central, Ashanti, Brong Ahafo, Eastern and Volta regions of Ghana. In all, 552 women and men were interviewed in 20 communities, in the six regions. Figure 3.17 gives a summary of the respondents covered during the survey. Owing to the intensity of palm oil activities in the Western and Central regions more interviews were conducted in those regions as compared to the others covered by the survey.

Figure 3.17: Distribution of Respondents



Source: July 2011 Socio-economic survey conducted by MASDAR

12 Focus Group Discussions were also held with 60 members of farmer groups, women palm oil processor groups and groups of small scale mill workers in the respective regions. This was complemented by information gathered from earlier key informant interviews held with key personnel of 35 companies and 66 women and men who were interviewed in the six regions. All of these medium and small scale oil palm mills were privately owned and some of them source FFB from both their own plantations and generally from independent farmers. Thus some of them operate a nucleus plantation system like the big companies, but on a smaller scale. An extensive desk review of relevant secondary data was also done to strengthen the information gathered from the field survey.

3.5.2 Agricultural activities

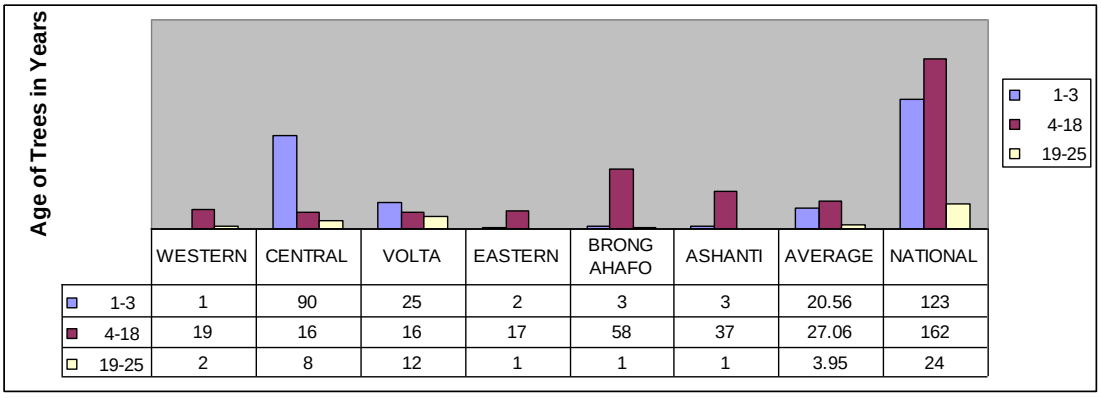
(i) Overview

According to the 2000 Ghana Census undertaken by the Ghana Statistical Service, Ghana had a population of 18.9 million with about 57% living in the rural areas. Currently, the population is estimated as 24 million. Most rural dwellers are farmers with smallholdings and they are engaged in subsistence farming using low resource technologies. Where they are not fully involved in subsistence agriculture, they tend to practice semi-subsistence since some of the produce is used for household consumption and the surplus is sold for cash. Traditional crop farming systems prevail, particularly in food production where small scale farming predominates. The majority of small scale farmers are women, illiterate and aged, and they produce the largest proportion of staple food crops. About 80% of agricultural production is from smallholder family-operated farms, averaging 2 hectares. Larger holdings tend to be used to produce cash crops such as cocoa, oil palm, rubber, and pineapples.

(ii) Oil Palm Age Profile

Out of 309 small scale oil palm plantations surveyed the majority of them (162) were aged 4 to 18 years, with 123 aged 1 to 3 years. This result is due to the intervention of the state under the PSI programme. Only 24 were in the 19 to 25 year old bracket (figure 3.18).

Figure 3.18: Age Distribution of Oil Palm Plantations



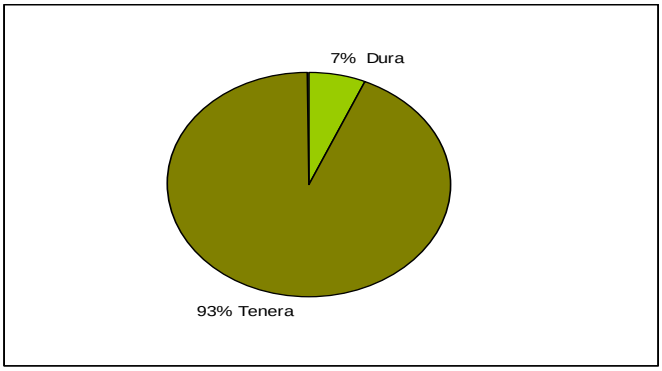
	WESTERN	CENTRAL	VOLTA	EASTERN	BRONG AHAFO	ASHANTI	AVERAGE	NATIONAL
1-3	1	90	25	2	3	3	20.56	123
4-18	19	16	16	17	58	37	27.06	162
19-25	2	8	12	1	1	1	3.95	24

Source: July 2011 Socio-economic survey conducted by MASDAR

(iii) Oil Palm Varieties

Farmers showed a clear preference for the Tenera variety of oil palm with 93% of the respondents indicating that they had planted this variety. Only 7% had planted the Dura variety. This is mainly due to the fact that the Tenera fruits yield more oil when processed (figure 3.19).

Figure 3.19: Oil Palm Varieties planted

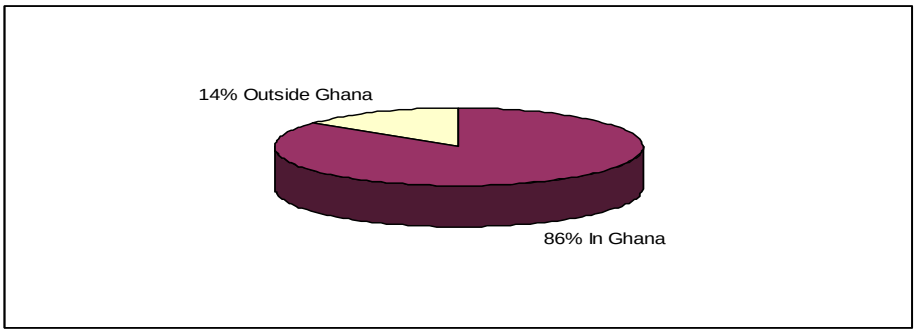


Source: July 2011 Socio-economic survey conducted by MASDAR

(iv) Source of seeds

Most of the farmers (86%) surveyed indicated that they had sourced their seeds locally, within the country, with only 14% indicating that they obtained their seeds from outside Ghana (figure 3.20). This clearly indicates that there is a good demand for locally improved seeds and oil palm seedlings.

Figure 3.20: Source of Seeds



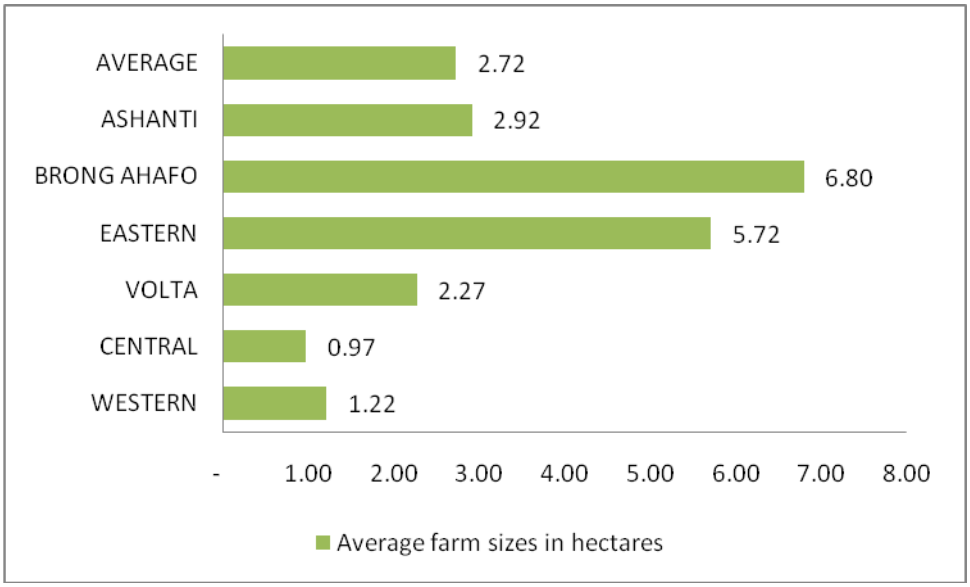
Source: July 2011 Socio-economic survey conducted by MASDAR

(v) Average farm sizes

The total size in hectares (ha) of privately owned farms of the respondents in the 6 regions stood at 1,189 ha with a national average farm size of 2.72 ha (Figure 3.21).

The Brong Ahafo region registered the largest average farm size (6.8 ha), followed by the Eastern region (5.72 ha) with Central Region registering the least (0.97 ha).

Figure 3.21 Average farm sizes in Ha



Source: July 2011 Socio-economic survey conducted by MASDAR

(vi) Local Small Scale Processing of Palm Oil

Small scale oil palm enterprises comprise small, mechanised or semi-mechanised mills, owned by men sometimes referred as artisanal millers with a number of women and young men clustered around them. The premises observed were generally poorly maintained sheds, roofed with galvanized iron/aluminium sheets or thatch grass. The floors were bare without cement or any other flooring. Processing is done in large vats, barrels and cooking pots. These drums, pots or vats are used for cooking the palm fruits and processing the palm oil over open flames.

Every aspect of the process - from waiting for the cut bunches to soften, to removing the fruit from the bunches, to removing the nuts from the pulp, to sorting the kernels from the leftover fibre and drying the palm kernels – are done on the bare floor.

Discussions with owners of these small scale or wayside mills revealed that they do not work together, even though they are seen working at the same place for a number of years. Over the years, different women processors gather around the milling facility for easy access to process their FFB into palm oil and nut and also for the nut to be cracked to recover the kernel for processing into palm kernel oil and cake. When their fruits are milled, they extract the palm oil on site and sell it from the same point. It was clear that these operations could be better organized. In sharp contrast with these poor conditions of work observed in most areas surveyed, there were some improved facilities such as the women's group in the Eastern region and other processors in groups or as individuals in Central and Brong Ahafo regions. With only 7 members, the 'Enso Nyame Ye Mmaa Fekuw' of Aboasa in Eastern

region had a better organised and managed mill. Under the leadership of their previous Assemblyman, the project was funded by the Asuogyamang District Assembly in 2007. Although some of the equipment is broken down and they have not been able to raise enough money to repair them, there is a cement floor that looked well maintained and clean. There are 2 boreholes in the town and this water is used in processing the fresh fruit bunches.

Another category of micro/small scale processors in the oil palm industry are farmers and individual women who do not have any mills or mechanisation, but process bunches from their own farms and make a livelihood out of palm oil extraction. Many of the oil palm farmers in areas where there are no mills or large plantations have to process their own bunches. Everything is done by hand and most of the processing is done within the home or family compound. Traditional oil extraction methods are used and usually local women are hired to assist with the processing. The oil is sold at the local market and to traders from other parts of the country. An example of this type of operation was a farmer at Andokope in the Volta Region. He hires people to work with his family during the harvesting season. They assist in processing the oil, which is sold to boarding schools, at the local market in Hohoe and to some traders from Accra. He estimated that he makes about GH¢3000 a year from his oil palm plantation and has used the proceeds to educate all his children; one who is a university graduate and another a nurse. During the lean season, the bunches are sold at the market for local consumption.

A female palm oil processor, who the team also met at the Hohoe market, revealed that she had her own farm but also purchased supplementary bunches from other farmers. She spoke of the benefits of the trade but also demonstrated the hazardous nature of the job by showing how one of her fingers had become deformed and was chronically painful because she was seriously pricked by the thorns on a FFB. Both small scale 'home' processors spoke of the need for mills and other equipment to improve their business. The farmer at Andokope even had plans to establish his own small mill.

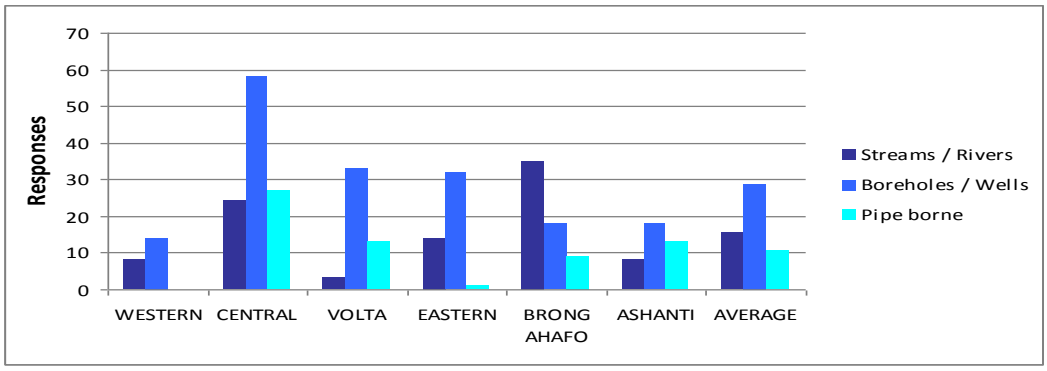
Although all 3 groups of processors bemoaned the lack of funding support and poor sales, it is clear that if the organised women's group from Aboasa approached any funding institution they could be in a better position for support because they are a more structured group and therefore more likely to be considered as credit worthy. With regard to marketing, it is ironic that in spite of their poor management, easy access and 'word of mouth' publicity seem to be a good marketing strategy for the 'wayside mills'. The team was surprised to find that there were both local and foreign traders from all over the country, Benin, Nigeria and Togo patronising their products. One woman from Benin had even settled in the community to purchase palm oil regularly for export to her country.

Water Supply

The women observed that owing to their heavy reliance on manual processes, the extraction rate is much lower than with the fully mechanised mills. In most instances,

there is no piped water and they rely on rivers and wells for untreated water for washing and processing the oil (figure 3.22). Others use water from the same streams and rivers that they use for liquid waste disposal.

Figure 3.22 Water Supply

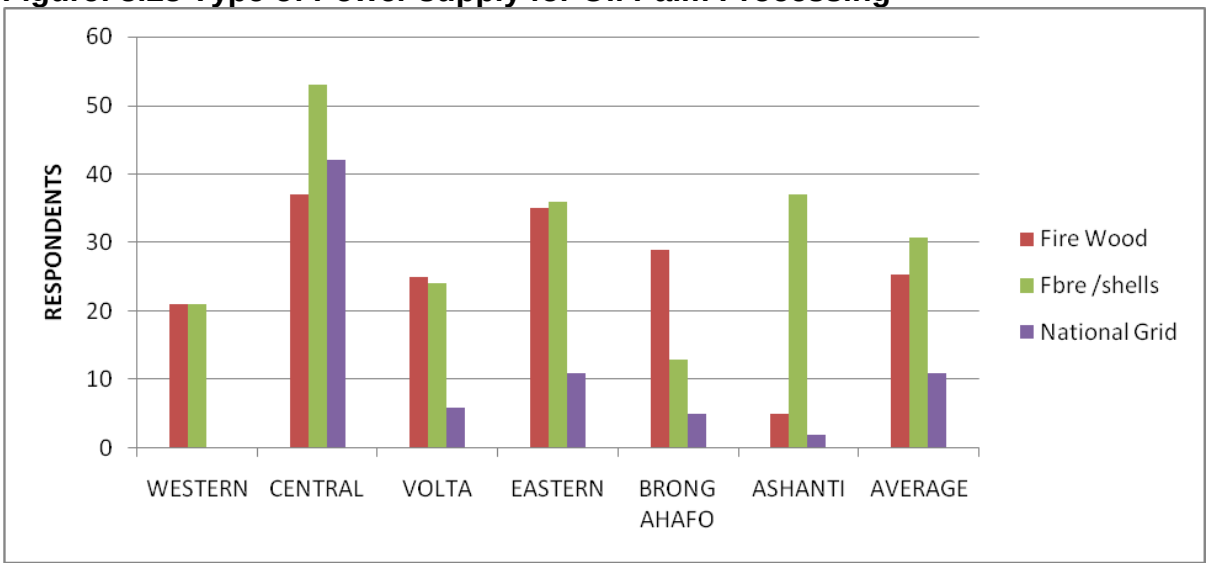


Source: July 2011 Socio-economic survey conducted by MASDAR

Power Supply

The main type of power supply available in the palm oil producing areas of the country (figure 3.23) is derived from waste products from the palm oil extraction process namely fibre and shells . Firewood was the next option, with electricity from the national grid being the least accessible and most expensive option.

Figure: 3.23 Type of Power supply for Oil Palm Processing



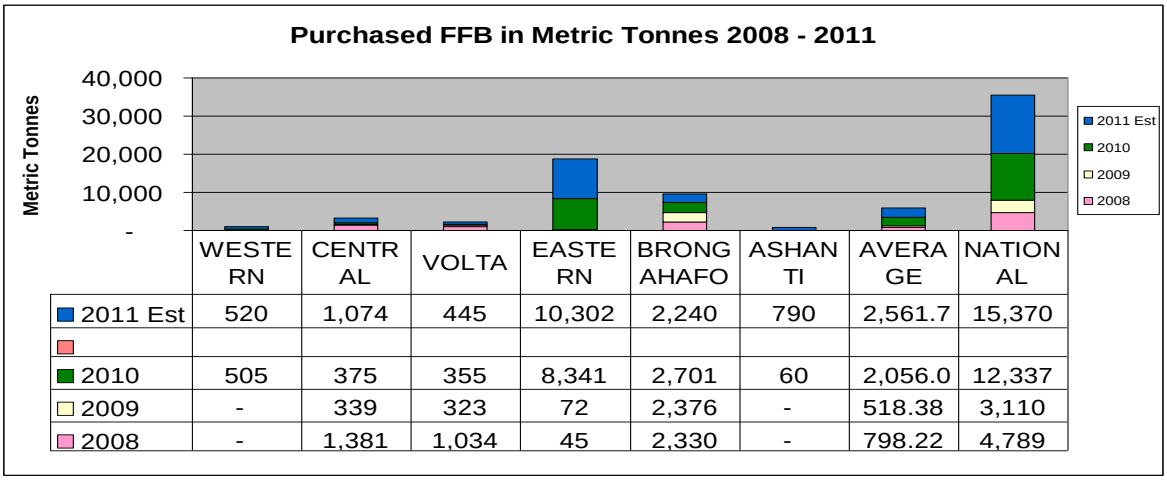
Source: July 2011 Socio-economic survey conducted by MASDAR

Purchase of FFBs from 2008 to 2011

The processors indicated that purchases of FFBs had increased over the 3-year period, under review. From an estimated 4,789 MT in 2008, private individual processors and their groups had seen a fall in the purchase of FFBs in 2009, then a

sharp rise to 12, 337 MT in 2010 (figure 3.24). Purchases were expected to rise even further to 15,370 MT FFBs this year, 2011.

Figure 3.24: Purchased FFB in MT 2008-2010 and 2011 Estimate



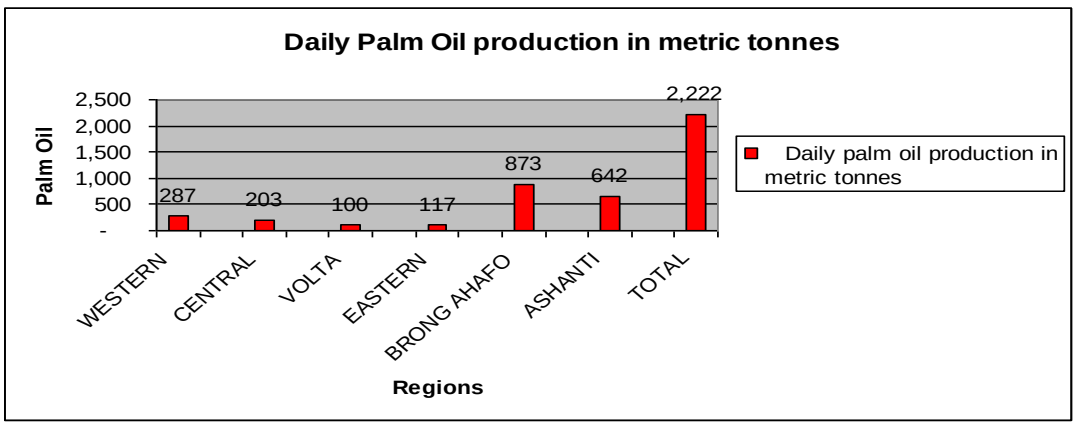
	WESTERN	CENTRAL	VOLTA	EASTERN	BRONG AHAFO	ASHANTI	AVERAGE	NATIONAL
2011 Est	520	1,074	445	10,302	2,240	790	2,561.7	15,370
2010	505	375	355	8,341	2,701	60	2,056.0	12,337
2009	-	339	323	72	2,376	-	518.38	3,110
2008	-	1,381	1,034	45	2,330	-	798.22	4,789

Source: July 2011 Socio-economic survey conducted by MASDAR

Daily Palm Oil Production

Daily palm oil production was impressive (figure 3.25), especially in the regions where there were fewer large scale plantations. These comprised the Brong Ahafo and Ashanti regions (with 873 and 642 metric tonnes) per day. The regional average daily production of the respondents was estimated at 370.30 metric tonnes.

Figure 3.25: Daily Palm Oil production in Metric Tonnes



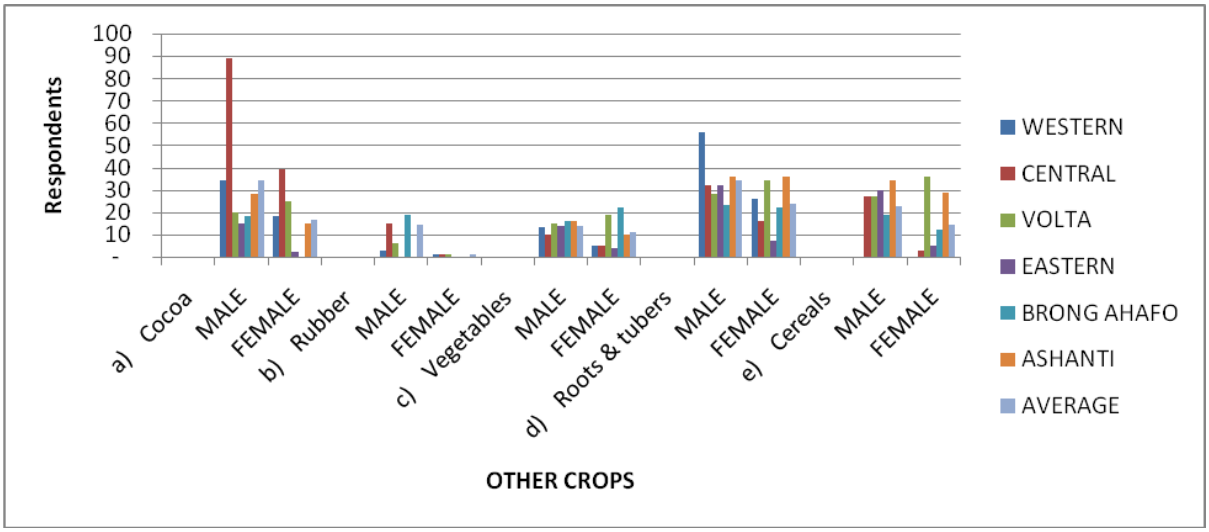
Source: July 2011 Socio-economic survey conducted by MASDAR

(vii) Other Crops cultivated

In Ghana, most oil palm farmers also grow other crops to increase their income and ensure regular food supply for their families. Figure 3.26 shows the range of other crops cultivated by the farmers interviewed during the survey. They include cocoa,

rubber, vegetables, roots and tubers as well as cereals. Cultivation of cocoa, roots and tubers are dominant in the Central and Western regions.

Figure 3.26: Cultivation of Other Crops

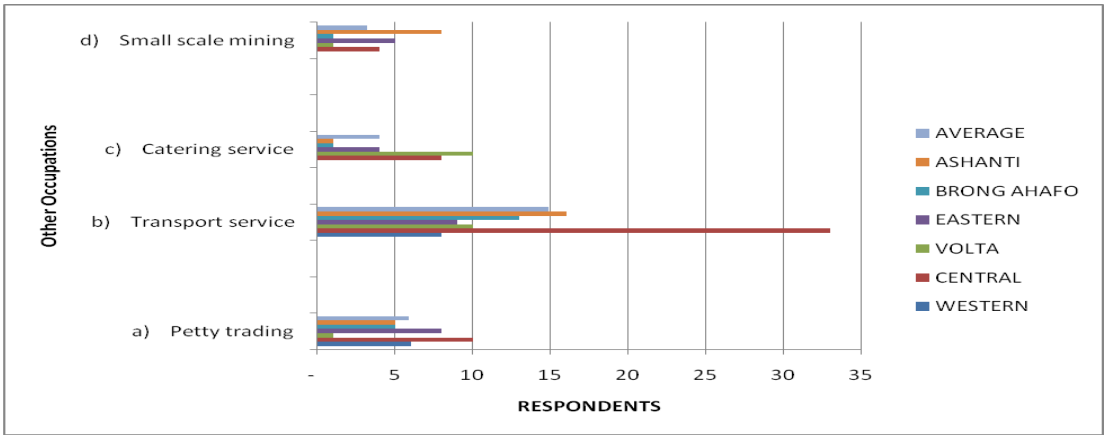


Source: July 2011 Socio-economic survey conducted by MASDAR

(viii) Other Occupations

Besides farming, the socio-economic survey revealed that the respondents were also engaged in other businesses such as small scale mining, catering services, transport services and petty trading. Figure 3.27 indicates that transport services were, by far, the most popular occupation. However, catering and petty trading of household commodities are the main stay of many small scale women farmers. In some communities, sand and gravel collection were other sources of income. Children in these communities also collect for sale sand and gravel from the main rivers passing through their communities.

Figure 3.27: Other Occupations



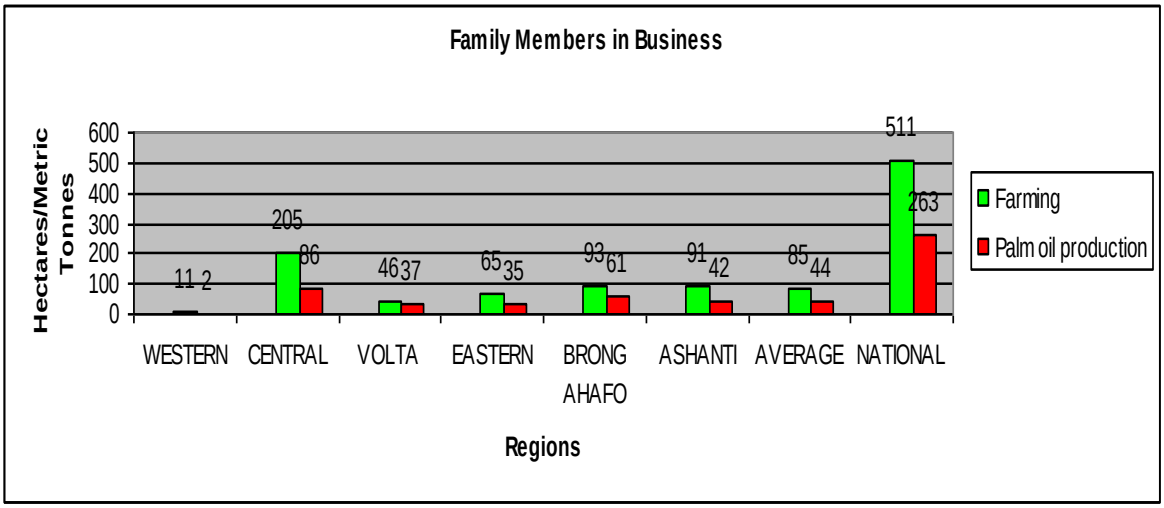
Source: July 2011 Socio-economic survey conducted by MASDAR

3.5.3 Family structure

(i) Family Members engaged in oil palm business

Almost all the interviewees responded that their family members were involved in the palm oil business either on the farm or in palm oil processing. Figure 3.28 gives an overview of the number of respondents who had family members engaged in the oil palm industry. The majority of 511 responded that family members were involved in farm work while 263 were engaged in palm oil production at the same time.

Figure 3.28: Number of family members engaged in Palm Oil business

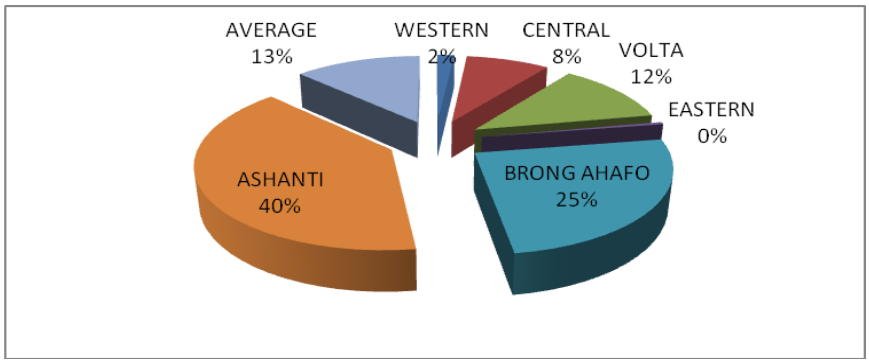


Source: July 2011 Socio-economic survey conducted by MASDAR

(ii) **Farm workers below the age of 18 years**

Farm workers who are below the age of 18 years (figure 3.29) represent 13% of total number of farm workers used by the respondents nationally. Regionally, Ashanti recorded the highest figure of 40% of farms workers below 18 years, 25% for Brong Ahafo Region, 12% for Volta Region, 8% for Central Region, 2% for Western Region and none declared in Eastern Region. This situation raises concern about their education.

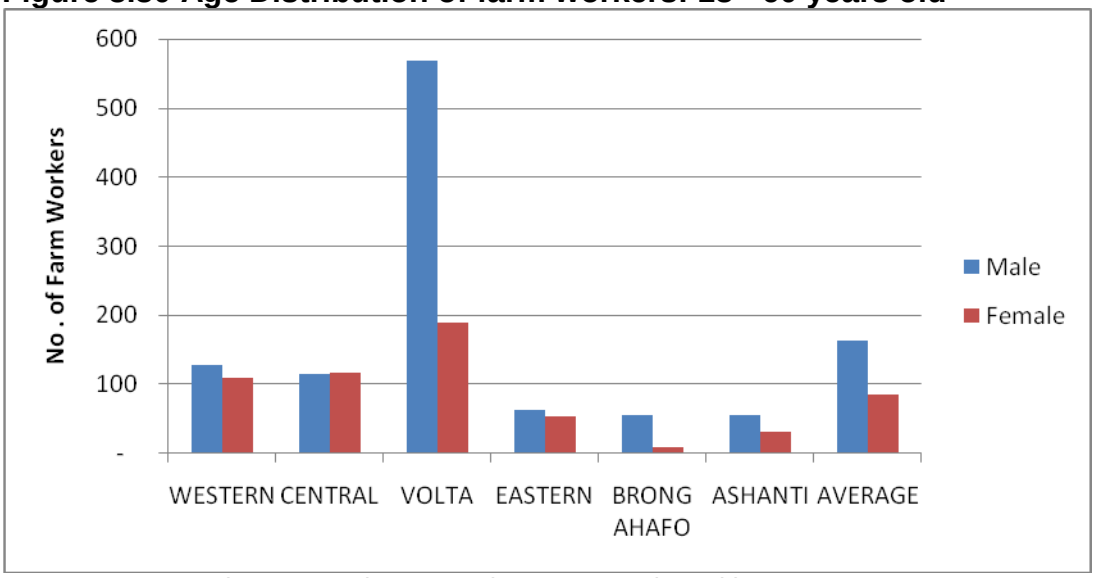
Figure 3.29: % of farm workers below the age of 18 over total workforce.



Source: July 2011 Socio-economic survey conducted by MASDAR

This survey showed that women farm workers among the most productive age bracket (18 to 60) in the oil palm industry play almost equal roles like men in Western, Central, and Eastern Regions. However, men in Volta, Ashanti and Brong Ahafo Regions play more dominant roles than women (figure 3.30).

Figure 3.30 Age Distribution of farm workers: 18 - 60 years old



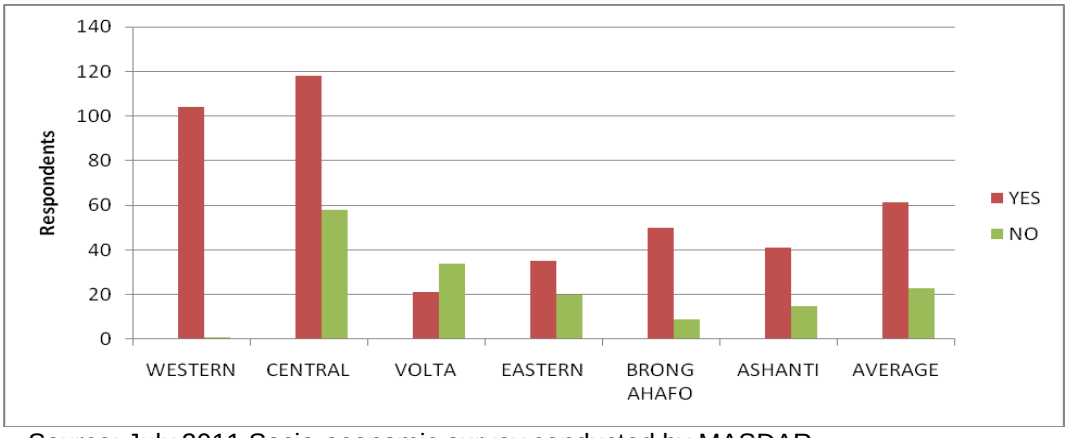
Source: July 2011 Socio-economic survey conducted by MASDAR

3.5.4 Land tenure

(i) Land Availability

Most respondents indicated that land availability for oil palm farming was not a problem. As indicated in figure 3.31, most respondents indicated that land was readily available for oil palm farming. Land was least available in the Volta region and most available in the Central region.

Figure 3.31: Land Availability for Oil Palm Farming

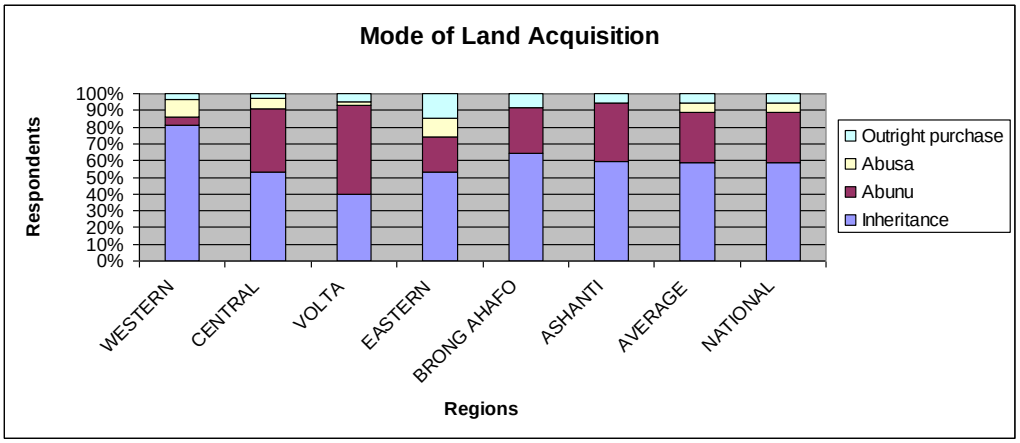


Source: July 2011 Socio-economic survey conducted by MASDAR

(ii) Land tenure system

A dominant trend of land tenure is for family elders who do not have the capital to establish oil palm plantations to give out land to sharecroppers. The arrangements involve proportional sharing of the proceeds of the plantation between the landholder and the tenant. To this end, increasing parcels of land are being transformed into plantations and most land is held under sharecrop arrangements. As a result of this trend, many young people have difficulty in securing land by virtue of family membership. However, most of the interviewees indicated that they had acquired their farm land by inheritance. This was followed by 'abunu' sharecropping (in two parts) and 'abusa' sharecropping (in three parts). Outright purchase was the least common mode (figure 3.32).

Figure 3.32: Types of land tenure system



Source: July 2011 Socio-economic survey conducted by MASDAR

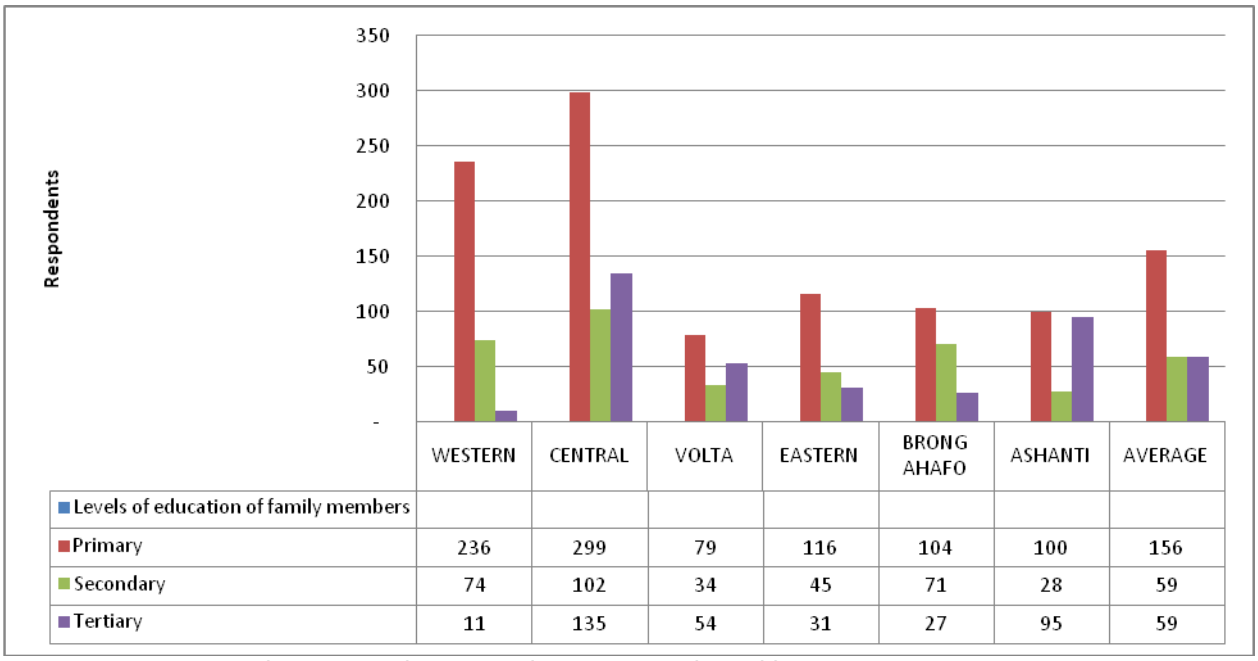
Consequently, a major concern of most landless people is the need for a more transparent system of land administration. Disenfranchisement of less powerful people within the customary land-owning group (such as youth, poorer families and women) is also a serious problem. It is expected that these concerns will be addressed in the current land reforms to reduce the challenges regarding land acquisition and the use of land for palm oil production.

3.5.5 Literacy levels of farmers

(i) Levels of Education of Family members

In terms of level of education (figure 3.33) within oil palm growing areas Central region has the highest number of family members having acquired education from primary to tertiary levels.

Figure 3.33: Educational levels of family members



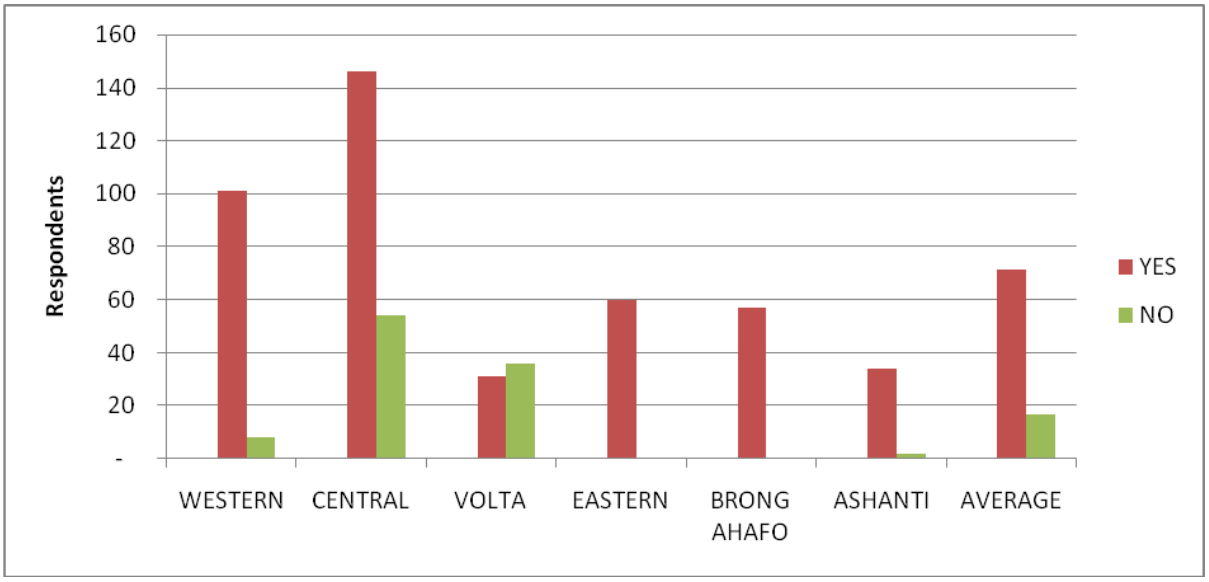
	WESTERN	CENTRAL	VOLTA	EASTERN	BRONG AHAFO	ASHANTI	AVERAGE
Levels of education of family members							
Primary	236	299	79	116	104	100	156
Secondary	74	102	34	45	71	28	59
Tertiary	11	135	54	31	27	95	59

Source: July 2011 Socio-economic survey conducted by MASDAR

(ii) Access to Educational Facilities

The Central region's highest access to educational facilities (figure 3.34) also explains the region having the highest number of family member's level of education. There is however a fair distribution of educational facilities in the other 5 regions surveyed.

Figure 3.34: Availability of educational facilities



Source: July 2011 Socio-economic survey conducted by MASDAR

3.5.6 Population distribution

(i) Overview

There are a number of official sources of demographic information about the Ghanaian population. In this section the findings of two recent, national surveys are reviewed as background information to the socio-economic survey carried out in the six regions. These are the Ghana Demographic and Health Survey 2008 (GDHS 2008) and the Ghana Living Standards Survey 2005 (GLSS 5).

The GDHS 2008 reveals that, over the years, the national sex ratio has fallen slightly from 98.5 males per 100 females in 1970 to 97.9 in 2000. However while the under 15 years proportion of the population decreased from 47 percent in 1970 to 41 percent in 2000, the proportion of 65 years and older increased from less than 4 percent to a little more than 5 percent over the same period. Life expectancy at birth also increased from 50 years among males in 1984 to 55 years in 2000 and among females from 54 years to 60 years over the same period.

Consequently, in the table below (figure 3.35), all the localities surveyed under the GLSS 5 were found to have higher proportions of females to males, whether in Accra, other urban or rural areas. Children under 15 years accounted for about 40 percent of the population, while aged persons (65 years and older) formed 4.7 percent. Based on this structure, the survey revealed a high dependency ratio of 82 - meaning that each person of working age (15-64) had one additional person to support, on average. It was observed that the higher proportion of females in the age group of 20 years and above could be due to differentials in mortality rate as men were generally found to have a lower life expectancy than women in Ghana.

Figure 3.35: Age distribution of population, by locality and sex (percent)

Age Group	Accra (GAMA)		Other Urban		Rural		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
0-4	5.3	4.7	5.4	5.4	7.2	7.3	6.5	6.5
5-9	5.0	5.0	6.0	6.5	8.0	7.3	7.1	6.9
10-14	5.3	5.4	6.2	6.9	7.0	6.5	6.6	6.5
15-19	4.9	6.3	6.0	6.4	5.8	4.9	5.8	5.4
20-24	5.7	5.7	4.4	5.2	3.2	3.5	3.8	4.2
25-29	4.9	4.7	3.7	4.2	2.8	3.5	3.3	3.8
30-34	3.9	4.7	2.7	3.3	2.3	3.2	2.6	3.4
35-39	3.5	3.8	2.5	3.2	2.4	3.0	2.6	3.1
40-44	3.1	2.6	2.4	2.7	2.0	2.5	2.2	2.6
45-49	2.5	2.4	2.1	2.4	2.0	2.3	2.1	2.3
50-54	1.8	2.2	1.7	2.0	1.7	1.9	1.7	2.0
55-59	1.5	1.1	1.2	1.1	1.3	1.1	1.3	1.1
60-64	0.8	0.6	0.7	1.3	0.9	1.1	0.8	1.1
65+	1.3	1.4	1.9	2.6	2.4	2.8	2.1	2.6
Total	**49.4**	**50.6**	**46.8**	**53.2**	**49.0**	**51.0**	**48.5**	**51.5**

Source: GLSS 2005

The Ghana Living Standards Survey 2005 (GLSS 5) results show that the three northern regions, Upper West, Northern, and Upper East had high household sizes of 6.5, 5.5 and 5.3 respectively. As indicated in figure 3.36 below, the Central, Eastern, Ashanti, and Western regions had household sizes less than the national average of four (4) while the Volta and Brong Ahafo regions had household sizes of

4.0 and 4.1 respectively. As anticipated, household sizes in urban areas were 3.5 and less than those in the rural areas, which stood at 4.4.

Figure 3.36: Mean household size, estimated population in private households, and estimated number of households, by region and locality

Region/Locality	Mean Household Size		Population in Households		Estimated number of households
	2000 Census* March 2000	2005/ 2006 GLSS 5	Projected from Census** (Millions)	2005/2006 GLSS 5 (Millions)	Thousands)
Ghana	**5.1**	**4**	**21.9**	**22.2**	**5,538**
Western	4.7	3.9	2.2	2.2	580
Central	4.4	3.6	1.7	1.9	548
Greater Accra	4.6	3.4	3.7	3.1	921
Volta	4.7	4.0	1.9	1.7	420
Eastern	4.6	3.7	2.2	3.0	802
Ashanti	5.3	3.9	4.3	3.7	963
Brong Ahafo	5.3	4.1	2.1	2.0	501
Northern	7.4	5.5	2.1	2.7	484
Upper East	7.2	5.3	1.0	1.1	200
Upper West	6.4	6.5	0.7	0.8	121
Urban	**4.7**	**3.5**	**9.6**	**8.4**	**2,392**
Accra GAMA)***		3.3		2.6	796
Other Urban		3.6		5.8	1,596
Rural	**5.4**	**4.4**	**12.3**	**13.8**	**3,146**
Rural Coastal		3.6		2.4	675
Rural Forest		4.1		6.2	1,520
Rural Savannah		5.4		5.1	951

Note: * March 2000; **Midyear 2006; ***GAMA means Greater Accra Metropolitan Area; GAMA comprises Accra Metropolitan Area (AMA), Tema Municipal Area (TMA), and Urban areas in Ga East and Ga West Districts.

Source: GLSS 5

3.5.7 Common Diseases

(i) Prevalence of Malaria

Malaria was identified as the most common disease in the palm oil producing areas surveyed. This is probably linked to the fact that most of these areas tend to be waterlogged thus encouraging the mosquitoes that spread the disease. Children under five and pregnant women have been identified as most vulnerable to the disease. In spite of the high incidence of malaria and awareness created on the prevention of malaria through the use of Insecticide Treated Nets (ITNs), it is evident that many Ghanaians still do not use these nets as an effective preventive measure. Figure 3.37 confirms this.

Figure. 3.37: Key Indicators for Malaria Prevention

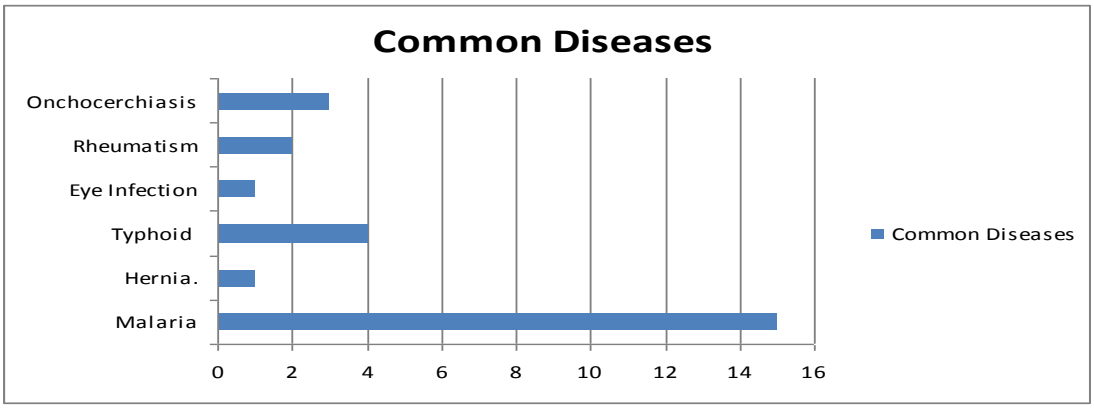
	Total	Urban	Rural
Malaria			
Households with at least 1 insecticide-treated net (ITN) (%)	33	27	38
Children under 5 who slept under an ITN the night before the survey (%)	28	24	31
Pregnant women who slept under an ITN the night before the survey (%)	20	13	25

Source: GDHS 2008

(ii) Survey results of common diseases

According to the respondents, other common diseases in oil palm growing areas identified were onchocerchiasis, typhoid fever and rheumatism. Figure 3.38 presents a summary of these and highlights the importance of malaria.

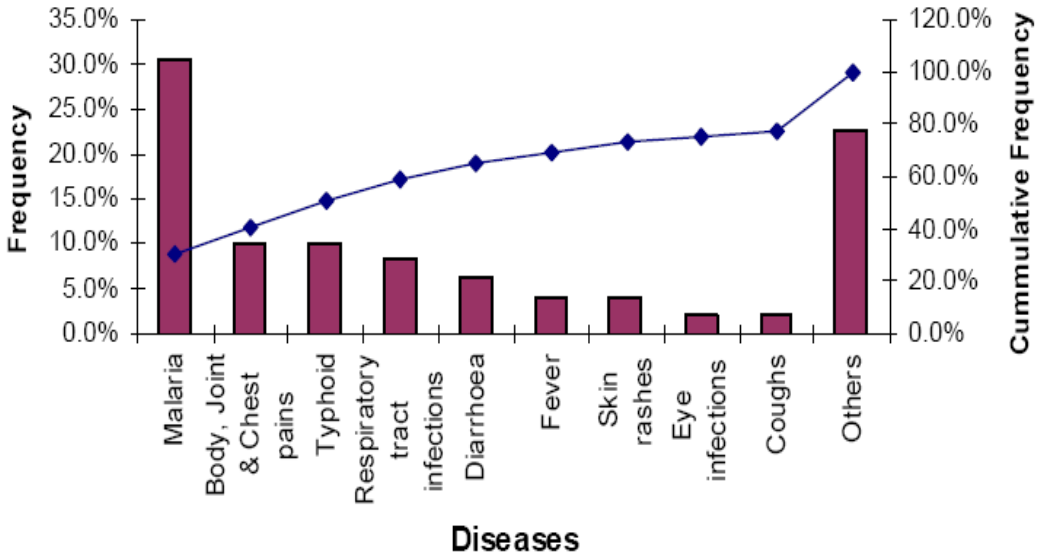
Figure 3.38 Common Diseases in palm oil producing areas



Source: July 2011 Socio-economic survey conducted by MASDAR

A GEA survey (figure 3.39) also indicated malaria as the most common disease followed by problems such as hernia, snake bites, cuts, shoulder dislocation, pricking and high blood pressure.

Figure 3.39: Other Common Health Problems/Diseases



Source: Ghana Employers' Association, 2005

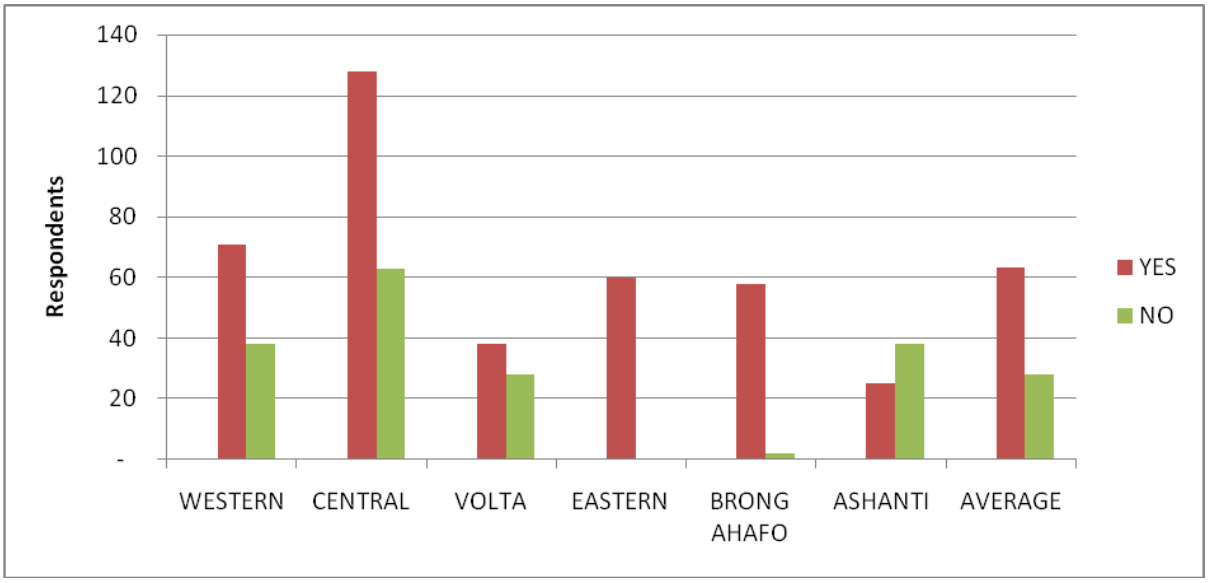
Sanitation is another major challenge, especially in the operational areas of medium and small scale or wayside mills. Waste water and other waste products and

garbage are strewn about to stagnate and decompose thereby creating breeding grounds for diseases which affect human health and contamination of the environment.

(iii) Access to Health Facilities

When asked about the availability of health facilities, many of the respondents indicated that they had ready access to adequate health care (figure 3.40).

Figure 3.40: Access to Health Facilities



Source: July 2011 Socio-economic survey conducted by MASDAR

3.5.8 Child Labour

Much concern has been raised about the issue of child labour especially in the cocoa sector and on large oil palm and rubber plantations in Ghana. Since comprehensive information relating to the extent of child labour and exposure to hazards in these plantations was lacking, in 2005, the Ghana Employers' Association (GEA) conducted a Rapid Assessment Survey in five oil palm and rubber plantations; namely, Benso Oil Palm Plantation Ltd; Twifo Oil Palm Plantation Ltd; Ghana Oil Palm Development Corporation; Norpalm Ghana Ltd, Ghana Rubber Estates Ltd. The aim was to gauge the extent and nature of child labour with particular emphasis on its worst forms, with specific reference to the girl child. The information gathered helped in devising meaningful strategies to combat child labour in these plantations.

The study identified 50 child labourers within the oil palm (45) and rubber (5) plantations who were not directly employed by the formal enterprises. It is important to note that all the 50 child labourers identified at the plantations assisted their family members to work on the smallholder or outgrower schemes on the nucleus plantations. They fell between the ages of 8 to 17 years and although children between the ages of 16 to 17 years are allowed to undertake some form of work, all the child workers between the ages of 16 to 17 years identified were classified as

child labourers because they were not able to attend and participate effectively in school, or were school dropouts.

A similar situation was found among the small scale oil processors or 'wayside mills', where mothers work with their children. This is a common form of child care where mothers take care of their children while doing their work. There is also an informal apprenticeship where children learn the rudiments of family trades/businesses from their parents by working with them, right from childhood. However, when this is done at the expense of the child's educational development, health and safety, then there is cause for concern and steps need to be taken to address this issue.

Figure 3.41 shows the age profile of farm workers as revealed by the socio-economic survey. As mentioned earlier, it is disturbing that most of the workers were aged below 18.

Figure 3.41: Age Profile of Farm Workers

AGE	MALE	FEMALE	NATIONAL TOTALS
i. Below 18	1,020	88	1108
ii. 18-60	177	525	702
iii. Above 60	888	591	1479

Source: July 2011 Socio-economic survey conducted by MASDAR

The GEA assessment observed that the child labour situation is very prevalent within the communities and plantations, especially during the peak season when even school-going children sometimes ask for permission to be absent from school. Consequently, it is very common to find older children 13 to 16 years of age who have still not completed primary school. Conditions that would allow the child labourers to stop working are adequate family income, adequate support for children's education, adequate medical/health care, availability of land for farming and increased community education on the negative impacts of child labour. It is important for the industry to take account of this in ensuring that child labour concerns are well taken care of.

3.5.9 NGOs working in the Palm Oil Industry

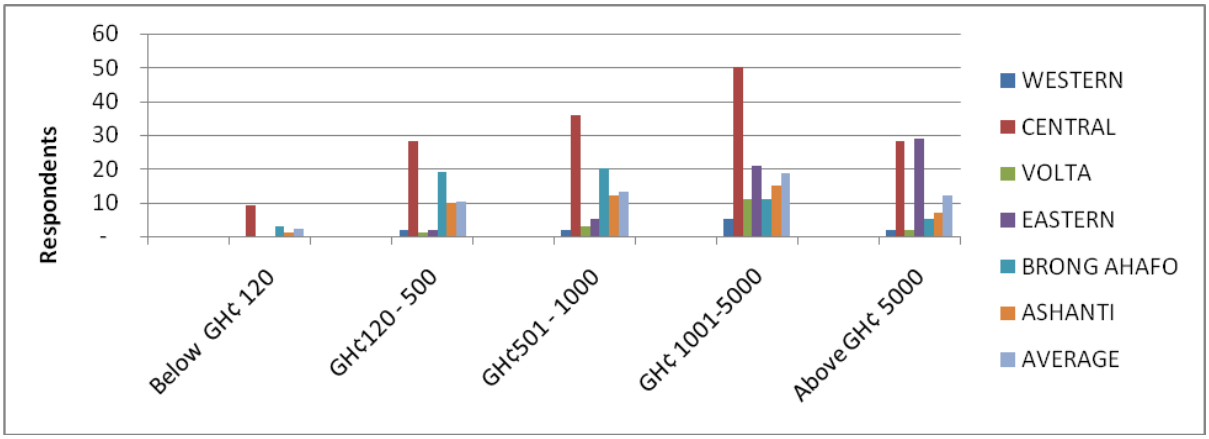
Very few NGOs were found to be operating in the palm oil industry. It was only in the Brong Ahafo region that five NGOs were operational. These were the Nature Conservation Research Centre, COPAMA, Conservation Alliance, WWF Ghana and Ghana Wildlife Society.

3.5.10 Farmers incomes

(i) Estimated Annual Sales for 2011

Most respondents indicated that they were likely to make sales in the range of GH ¢ 120 to 5000 this year (figure 3.42).

Figure 3.42: Estimated annual sales for 2011

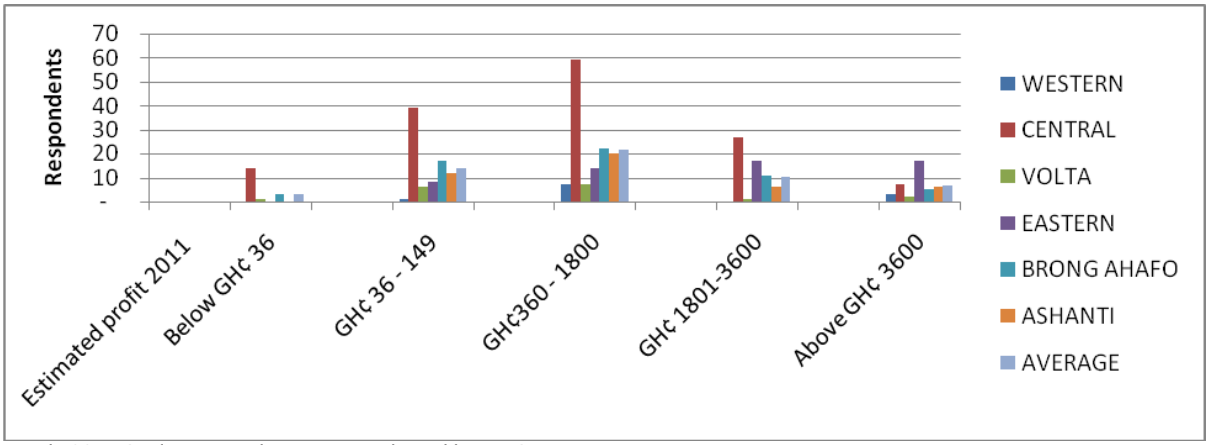


Source: July 2011 Socio-economic survey conducted by MASDAR

(ii) Estimated Profits for 2011

Linked to the question on projected annual sales, participants were asked to estimate their profits for the year 2011. As expected, respondents were reluctant to provide details, however they agreed to provide a range of money that they were likely to receive as profit for their work in 2011. Figure 3.43 indicates that most of them expected their profits to range from GH ¢ 360 to 1800.

Figure 3.43: Estimated Profits for 2011



Source: July 2011 Socio-economic survey conducted by MASDAR

Most of the farmers and oil palm processors indicated that their businesses were doing well.

3.5.11 Aptitudes and desires of farmers

Aptitudes

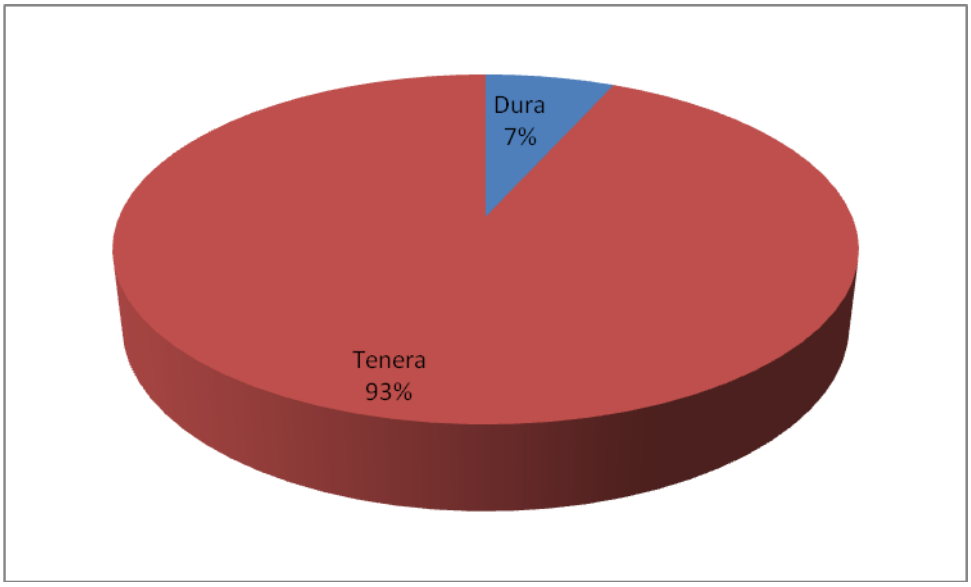
Aptitudes of respondents means their competence in engaging in oil palm cultivation.

In the survey conducted competence of the respondents was assessed in terms of whether they:

a) follow good agricultural extension advice on choice of planting material,
b) employ productivity improvement practices on their plantations,
c) have diversified their sources of income through cultivation of oil palm as a cash crop,
d) could identify constraints or challenges
e) could take steps to solve the challenges or have found solutions to address the challenges.

On choice of planting material 93% of the respondents (Figure 3.44) have planted tenera (the improved oil palm variety), a results which shows that the respondents have been following advice given by staff of MoFA, ex workers of the defunct State oil Palm Plantations, workers of the new estates viz. TOPP, BOPP, GOPDC, Norpalm and other small-medium oil plantations to enter into cultivation of oil palm.

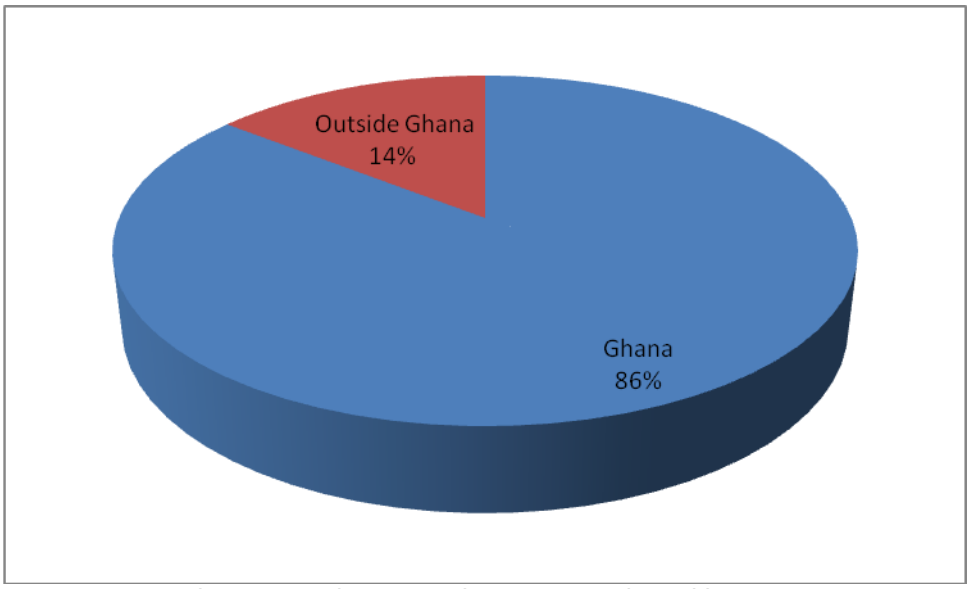
Figure 3.44: Respondents (in %) who have planted improved oil palm seed variety. (Tenera)



Source: July 2011 Socio-economic survey conducted by MASDAR

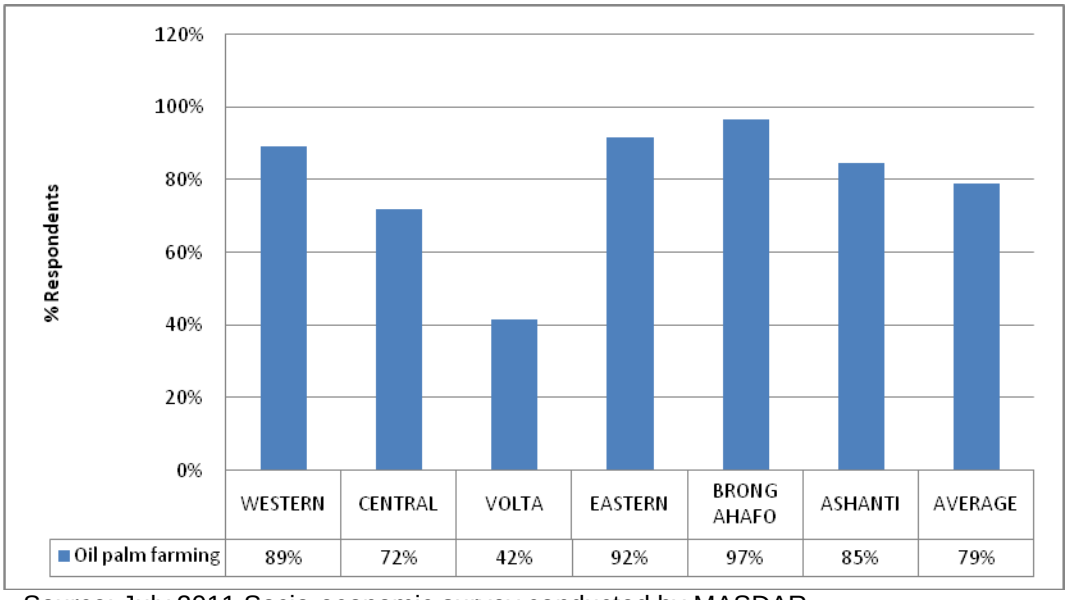
Another measure of competence of the respondents is that over 86% of them have sourced the tenera oil palm planting material (Figure 3.45) from approved or accredited institutions such as OPRI, TOPP, GOPDC and BOPP because they were aware that it is high yielding.

Figure 3.45 : Source of oil palm seed in % by respondents



Source: July 2011 Socio-economic survey conducted by MASDAR

Figure: 3.46: Respondents (in %) engaged in oil palm cultivation

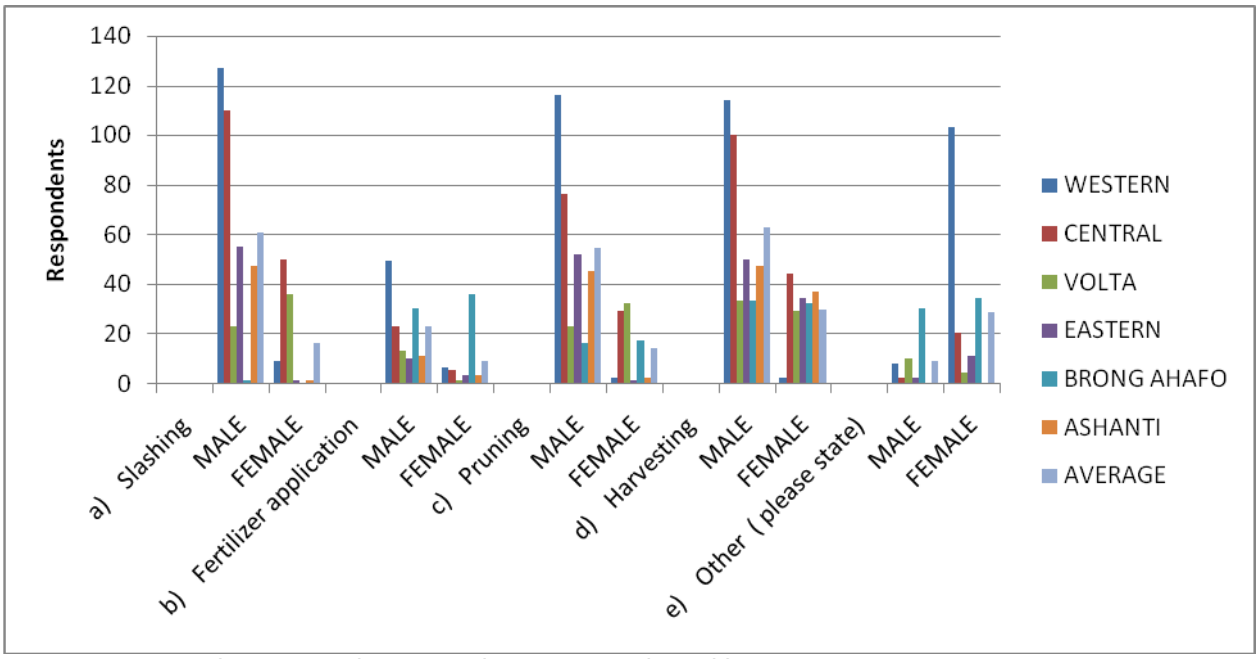


Source: July 2011 Socio-economic survey conducted by MASDAR

The results show that oil palm cultivation is a major occupation (Figure 3.46) of the respondents In 5 regions viz. Brong Ahafo, Eastern, Western, Ashanti and Central because it is their source of alternative income**.**

The respondents demonstrated their competence by stating various good agricultural activities such as fertilizer application, pruning and harvesting they have been practising on their oil palm plantations and tasks performed by males and females (figure 3.47).

Figure 3.47: Knowledge of farm practices and allocation of tasks by gender



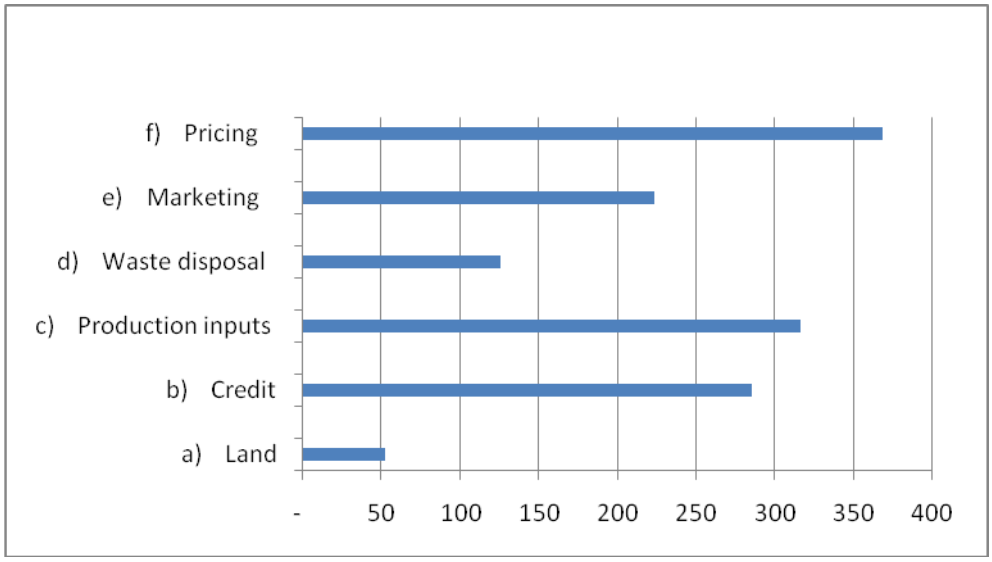
Source: July 2011 Socio-economic survey conducted by MASDAR

Desires

Discussions and observation revealed that small scale processors had many challenges with credit, waste disposal, land, production inputs, marketing and pricing (Figure 3.48). The respondents required Government intervention to price their produce on similar lines like cocoa as prices have always been dictated to them by the buyers, and to provide them loans to develop and maintain their plantations and processing mills Current government policies may have improved farmers' access to inputs however a common request from most of the farmers and processors is for increased funding. With the rise in the cost of farm inputs such as seeds, pesticides, herbicides and fertilisers as well as tools and equipment, farmers' costs have increased creating the need for increased funding. Unfortunately, many banks and other financial institutions are reluctant to provide credit to small scale farmers and millers owing to perceived high transaction costs and level of risk involved. These farmers are therefore pushed to borrow at exorbitant rates from private lenders that tend to erode their income and keep them in poverty.

The respondents also desired government to provide them with farming inputs at subsidized prices and improved extension services and to create access to market FFB and CPO they produce on sustainable and profitable basis.

Figure 3.48: Major challenges in the small scale Oil Palm industry



Source: July 2011 Socio-economic survey conducted by MASDAR

3.6 CONCLUSION

(i) Areas suitable and available for oil palm cultivation

An estimated area of 3.9 million ha of land[4] in Ghana has been described as most suitable for oil palm cultivation. Availability of land for the proposed 10,000ha nucleus estate and 40,000ha smallholder/out-grower schemes to be developed across oil palm growing areas in Ghana is feasible because only 336,000 ha of this (Chapter 2) has been utilised as at 2010.

(ii) Expectations of producers

Producers of all sizes expect availability of loans for oil palm business development at lower interest rates and downstream processors want tariff and non-tariff barriers against influx of cheap vegetable oils, toilet and laundry soaps imported into the country.

(iii) Topology of the production systems best adapted to oil palm cultivation

The nucleus estate as the lead firm concept is best adapted to oil palm cultivation in Ghana. The nucleus estate as the lead firm is the company which will establish an FFB processing mill and will require supply of extra FFB on contract basis from its

[4] P. A. Kuranchie (December 1976) Vegetable oil industries in Ghana in Ghana productivity review Vol. 6. No1: A bi-annual journal of the Management Development and Productivity Institute.

associated oil palm plantation schemes to supplement supply from its own plantations. To stimulate further demand for FFB the lead firm must invest in FFB processing mill expansion, production of PKO and PKC, refinery/fractionation plants for production of downstream products.

(iv) Main socio-economic features of each selected region

Socio-economic features across the selected regions are similar. On income generation most of the farmers derive additional source of income by engaging in other farming activities and/or any of the following businesses:- small scale mining, catering services, transport services and petty trading. There is a significant level of child labour. The majority of farm workers are usually male and are below the age of 18 years but above 15 years of age. On diseases, malaria is the most common disease. There is however a fair distribution of educational facilities. On land the dominant feature is that family elders usually give out land on sharecropping basis. Mothers work with their children in the farms and at the small scale mills and this unfortunate practice is an unacceptable form of child care where mothers take care of their children while working but the children are exposed to an unsafe environment.

(v) Systems of production and processing best adapted to oil palm cultivation

Systems of production appropriate to oil palm cultivation include nucleus estates, smallholders, outgrowers and independent smallholders. The definitions of these are as follows:-

Nucleus Estate: An oil palm plantation equipped with a processing mill owned and managed by a company

Smallholder: A grower is allocated an area of land on land owned by a plantation/milling company. He/she must supply the same plantation/milling company with all the fruit from the land allocated.

Out-grower: A grower operates on land not owned by the plantation/milling company. However, the grower and a particular plantation and milling company sign a contract whereby the grower supplies all his fruit to the mill and the milling company may provide inputs and extension services on credit.

Independent Smallholder: A grower produces oil palm fruit from land either owned of rented by him. He has no contract to supply any particular mill and is entitled to sell his fruit to whomever he sees fit.

Systems of large scale production which are best adapted to Ghanaian conditions are:

a) Initial investment which involves a company establishing its own plantations and a processing mill to process FFB into CPO and PK. The FFB is supplied from two or more of the following sources - the company's own plantations, smallholder and out-grower schemes as well as independent smallholders.
b) FFB supply is obtained from the two or more sources and processed into CPO, PKO and PKC;
c) FFB supply still obtained from two or more sources and processed into CPO, PKO, PKC, PALM OLEIN and PALM STEARIN
d) FFB supply still obtained from two or more sources and processed into CPO, PKO, PKC, PALM OLEIN, PALM STEARIN and soap.

On small scale mills there is considerable debate about what is the most appropriate palm oil mill development system. Figure 3.45 below presents a matrix of the main characteristics of the different scales of mill.

Fig 3.49: Scale of mill and characteristics

Characteristic	Large-scale Mills	Medium-scale Mills	Small-scale Mills	Artisanal Mills
Plant Capacity	30 – 60 tons/hr	5 – 15 tons/hr	1 – 3 tons/hr	100kg -1000kg/day
Annual Production (FFB in tonnes)	70,000 – 140,000	15,000 – 30,000	2000 – 5000	2 – 70
Notional Land Area	10,000ha upwards	Around 3,000-10,000ha	50 – 100ha	Village oil palm
Oil Extraction Rates (%)	16 – 23	12 – 15	12 – 13	8-10
Material Handling	Fully mechanised system in sequential processing steps	Semi mechanised system with few manual interventions	Semi mechanised system with more manual interventions	Manual process
Quality of Oil Produced **Standard < 5%**	Low FFA (≤ 5%)	High content FFA (< 5 – 8%)	Very high FFA (> 8 – 12%)	Very High FFA (10 – 15%)
Method of Oil Extraction	Uses mechanical press called 'dry' method	Uses mechanical press called 'dry' method	Uses batch system: material is placed in heavy 'cage' and metal plunger used. 'Wet' Process	Uses hot water to leach out oil from the mash called 'wet' process
Technology	Intermediate	Intermediate	Low	Very low

Characteristic	Large-scale Mills	Medium-scale Mills	Small-scale Mills	Artisanal Mills
Power Supply	Self-generated electricity	Reliance on national grid or use of diesel generating set	Reliance on national grid or use of diesel generating set	Uses firewood and palm oil waste as source of fuel for cooking processes
Potential to sell excess electricity	Yes	No	No	No
Management	Professional, multi disciplinary management team	Need managers who can embrace several part time roles	No	No
Labour	High skilled artisans and labour	Mix of skilled and unskilled labour	Mainly unskilled labour	Laborious and unskilled.
Organised training programmes.	Yes	No	No	No
Environment	Compliant with EPA regulations and members of RSPO	Non-compliant with EPA	Non-compliant with EPA	Non-compliant with EPA
Health and Safety	Compliant with Factory, Offices and Shop Act	Compliant with Factory, Offices and Shop Act	Non-compliant with Factory, Offices and Shop Act	Non-compliant with Factory, Offices and Shop Act
Medical Facilities	Yes	Unlikely	No	No
Social Facilities	Yes	No	No	Yes
Sporting Facilities	Yes	Unlikely	No	No
CSR Programmes	Yes	Ltd	No	No
Career Ladder	Yes	Limited	No	No
Outgrower credit	Yes	Unlikely	No	No

Source: Own Analysis

Comment: CPO QUALITY OF MEDIUM-SCALE MILLS IS OF INTERNATIONAL GRADE - <5%

It is wise to look at international best practice with respect to palm oil mills. There has been a rapid transition towards larger and larger scale milling operations. There are sound economic, managerial, operational, environmental and social reasons for this move as the matrix above demonstrates.

In Ghana artisanal mills have existed for decades and will likely be around for many years to come. However they are completely outside the formal economy and they

do not comply with any government legislation around employment and industrial activity. Moreover the product they make is only suitable for local consumption and in ethnic markets. The palm oil recovery is very low because the fruits have often been more dura rather than tenera as well as inefficient technology employed. The negative environmental impacts of their operations are significant.

There have been over the years a number of small scale milling businesses and indeed there are still a number in operation. During our field work we visited at least two small scale mills which were not operational for one reason or another. The evidence is that they seem to come and go and their sustainability is questionable. Our observation is that they tend not to have associated plantations and really struggle to secure a supply of good quality fresh tenera fruit and therefore produce lower quality oil. Their level of efficiency is relatively low.

There are four milling operations in Ghana which can be classified as small to medium scale. One of those is rapidly expanding. As far as the other three are concerned, their raw material supply base is weak and they are making efforts to address this problem. However their operations are some way from demonstrating best practice and they give the impression of operating on a shoe string.

Most of the larger mills have been around since the seventies when they were established by government and subsequently privatised. They have been through difficult times particularly when the international palm oil market has been depressed but they are still here and appear now to be in expansion mode. They all seem professionally managed and are embracing the RSPO initiative. They look and give the impression of reasonable places to work and live.

In conclusion, if Ghana is looking to strategically expand the oil palm sector to meet the increasing demand for industrial quality palm oil that it should follow international best practice by facilitating and encouraging the expansion of existing mills to capture all the benefits of scale as highlighted above and that any new mills ought to be in the large scale class. Artisanal mills will continue to play a role in satisfying the local market.

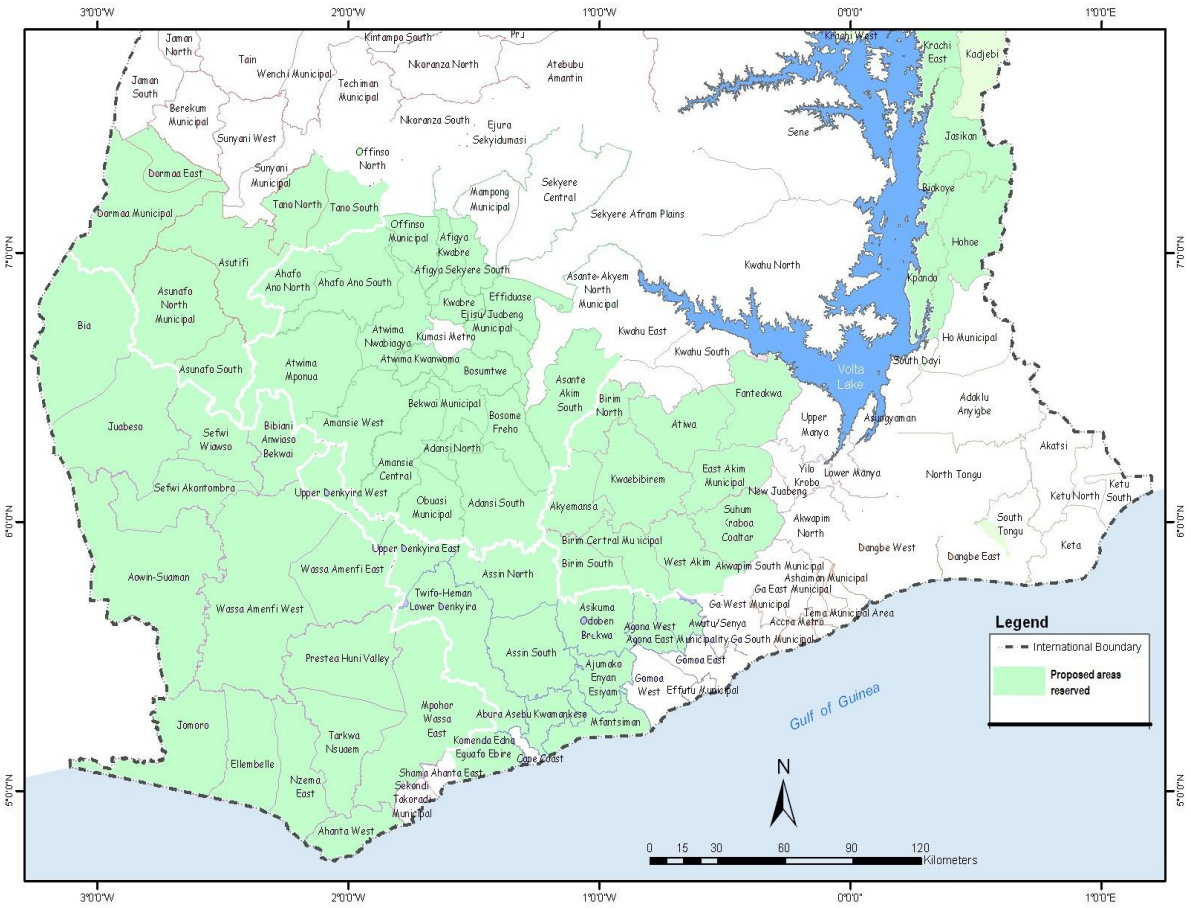
CHAPTER 4:
DETAILED DESCRIPTION OF THE PROPOSED PLAN FOR OIL PALM DEVELOPMENT

4.1 PRODUCTION

4.1.1 Areas available for oil palm cultivation

The areas available with the right climatic and soil conditions for oil palm cultivation in the 6 oil growing regions of Ghana are marked in Figure 4.1. In terms of administrative districts the areas available for oil palm cultivation cover 70 districts.

Figure 4.1 Existing and potential areas for oil palm cultivation in Ghana



4.1.2 Types of plantations

We propose that oil palm plantation development should occur in both the large scale estate sector and the small scale independent smallholder sector. In particular we propose:-

1. A 10,000 ha oil palm nucleus plantation and processing mill estate company;

2. Smallholder oil palm development associated with the above nucleus estate on a scale of 5000ha per year to a total development of 40000ha.

3. Village sector replanting programme – 110,000ha outgrower development where each independent smallholder is to be assisted to plant an average of 2ha of oil palms.

Full concept notes on these proposals are presented in chapter 7 and the project descriptions are summarised in this chapter.

4.1.3 Long term planting programmes

(i) Nucleus estate and associated 40,000ha of smallholder development.

The objective is to promote the socially inclusive development of industrial oil palm and support its competitiveness and profitability.

The purpose is to utilise sound private sector investment in a 10,000 ha oil palm nucleus plantation and mill as an Estate Company to provide the leverage and processing base to support smallholder development on a scale of up to 40,000 ha. This may also include outgrowers (farmers of more than 3 ha of palms).

The initial development of the Estate Company is projected to take place over a period of some eight years, including mill development over two phases. Smallholder development will continue beyond that period and will require incremental expansion of milling capacity.

Communities of smallholders will be assisted in programmes of 5,000 ha, with each programme providing a livelihood for up to 2,500 smallholders and their dependents. In this way each programme may directly and indirectly benefit some 10,000 or more persons. Therefore up to 80,000 persons[1] could benefit with extension of the smallholder industry by the full development of 40,000 ha.

The overall development programme for the Plantation Company and up to eight smallholder schemes of 5,000 ha each is projected in the following table:

[1] Each hectare of plantation to employ 2 workers is assumed.

PROGRAMME YEAR OF PLANTING	NUCLEUS ESTATE - Ha	SMALLHOLDER with OUTGROWER/ COMMERCIAL FARMER - Ha
0	*Mobilisation and pre-nursery establishment*	
1	*2000*	*Mobilisation of Smallholder Services Company*
2	*4000*	*Scheme 1 first phase: 2000*
3	*4000*	*Scheme 1 second phase: 3000*
4		*Scheme 2: 5000*
5		*Scheme 3: 5000*
6		*Scheme 4: 5000*
7		*Scheme 5: 5000*
8		*Scheme 6: 5000*
9		*Scheme 7: 5000*
10		*Scheme 8: 5000*
TOTAL by Programme Year 11	*10000*	*40000*

This proposal covers 10,000 ha of plantation development and the first, 5,000 ha, assisted smallholder programme with configuration of 60 mt/ hour mill processing. The capacity of the facility will be sufficient to cope with all foreseen Fresh Fruit Bunches (FFB) output from both the estate and the smallholders estimated as 300,000 mt of FFB at peak production in a year. The success of this partnership will provide the foundation for further smallholder expansion and matched expansion of milling capacity.

The direct results from this initial proposal will include permanent employment for some 2,000 employees within the nucleus estate and mill and a livelihood for 2,500 smallholders.

The output foreseen from the initial 15,000 ha development is a peak output of some 40,000-50,000 mt of Crude Palm Oil (CPO) per year and, additionally, associated palm kernel products. The respective financial model built for the nucleus estate and mill demonstrates an overall Internal Rate of Return (IRR) of 26% which makes the project bankable. The basic projection for estate development, with higher fertilizer inputs and 20% higher yields at peak than the smallholder model, provides an IRR of some 21%. However, this can be achieved for the smallholder model using land more intensively. It is projected that 5 ha of estate land can achieve or surpass the return of 6 ha under smallholder management.

With the additional 35,000 ha of smallholder development in the subsequent years, matched by modular expansion of milling capacity by the nucleus estate operator, the resulting combined planted area of 50,000 ha could yield in excess of 180,000-200,000 mt /year of palm oil on a sustainable basis at peak production. Taking into account the Master Plan forecast of the national deficit in supply widening to more than 125,000 mt by 2024, this development could help secure Ghana's self-

sufficiency in palm oil supplies and, if met, provide a springboard for further exports within the West African region and abroad.

(ii) Village Level Replanting Programme

The objective is to replant 110,000ha independent smallholder oil palm plantations over a period of 10 years with high yielding drought tolerant planting material. It is proposed that the replanting programme is done at the rate of 11,000ha per annum over 10 years starting from 2012. This programme is expected to create 110,000 jobs per year for every 11,000 ha replanted and employment for a minimum of 330,000 people per annum when the entire 110,000ha reach maturity.

This sector supplies about 195,000mt FFB/annum or 39% of total FFB processed by the estate sub-sector. The greater part of the FFB supplied is dura material which has very low oil content hence palm oil extraction rates of the estates has averaged 17.4% against 21.3% industry best in Ghana. With improved FFB which is high palm oil bearing, 8,000mt of additional CPO can be produced from the 195,000mt FFB.

The village sub-sector processes over 1million mt of its own FFB. Good quality FFB will mean better extraction of CPO. If OER of village sub-sector improves from 7% to 17.4% then production of about 58,000mt of additional CPO which will be made will contribute to plugging the 100,000mt CPO gap.

Total estimated cost of the proposed replanting programme of 110,000 ha is US$ 342.0 million over 10 years.

4.2 PROCESSING

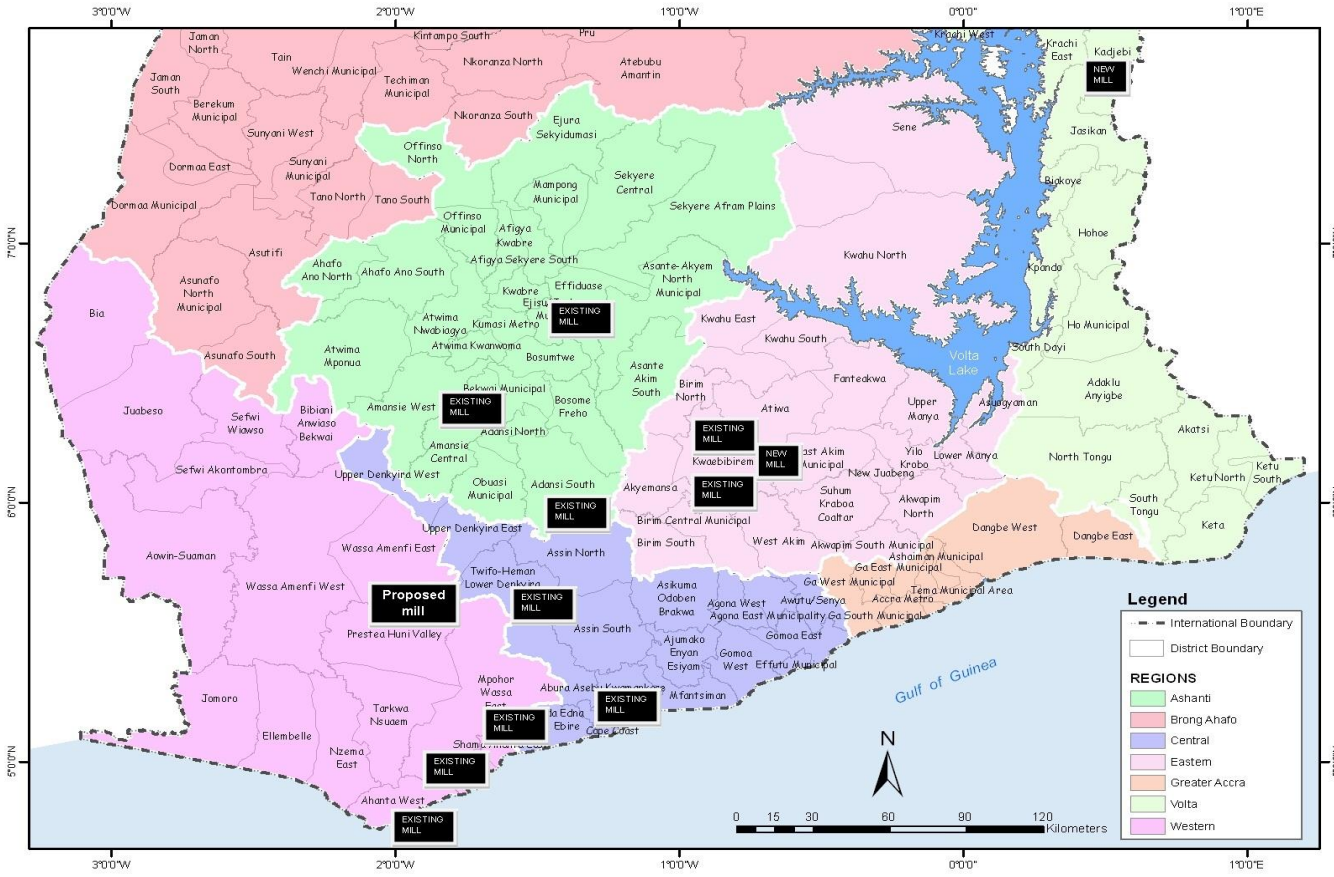
4.2.1. Fresh fruit bunch collection and processing

It is proposed that the areas of oil palm development are divided into zones where each existing company with FFB processing mill will operate. It is assumed that in each zone farmers will produce sufficient FFB to feed each processing mill.

4.2.2. Mill establishment

Figure 4.2 shows 10 existing mills and 2 new mills under construction.

Figure 4.2: Location of existing mills and those under construction



We propose additional milling support as follows:-

1. New processing mill associated with the proposed 10,000ha nucleus estate to be sited in the Prestea-Huni Valley district.

2. Village level small scale mills transformation programme. The full project concept notes on these proposals are presented in Chapter 7 and the project descriptions are summarised here.

(i) Mill establishment for the 50,000ha plantation development

This proposal covers configuration of 60 mt/ hour mill processing capacity and future expansion of capacity sufficient to cope with all foreseen Fresh Fruit Bunches (FFB) output from both the estate (10,000ha nucleus, 40,000 ha smallholders) and

110,000ha independent smallholder/outgrower plantation development. The peak output foreseen from the initial 15,000ha development (10,000ha nucleus estate and 5000ha smallholders) is some 40,000mt/year of CPO and additionally associated palm kernel products. The respective financial model built for the nucleus estate and mill demonstrates an overall Internal Rate of Return (IRR) of 26% which makes the project bankable. From the outset the mill would produce both CPO and Palm Kernel Oil (PKO). Depending upon further appraisal and review of national and regional markets, it could also incorporate a fractionation plant to produce palm olein and other oil fractions of CPO for specific industrial and food applications

(ii) Village Small Scale Mills Transformation Programme

For reasons of economics of logistics, traditional wild oil palm harvesters and producers of semi-improved oil palm in remote regions far away from large scale palm oil mills need to continue to depend upon private small-scale mills in their locality for purchase and processing of their fruit.

The proposed programme of support to 1200 small-scale mills is projected to take place over a period of some seven years, including five years of training and mill technical development over two phases and a two year consolidation period. The assistance programme will be partly modelled on the successes of earlier programmes including a TechnoServe scheme.

a) In the first phase existing mills will use new skills and methods to increase output and quality of Crude Palm Oil (CPO), be sensitized on sound environmental practices, be guided on regulating temperature throughout processing and ensure recovery of palm oil and disposal of liquid waste using improved disposal infrastructure. They will use smoke-less stoves as a measure to control release of smoke from the mills into the atmosphere.

b) The second phase will involve investment in higher capacity mills (1.5 to 3 MT Fresh Fruit Bunches (FFB) /hr) in order to prepare the industry to cope with larger volumes of FFB which are expected to be produced from replanting with genetically improved palms. It is proposed that owners of small scale mills will be encouraged to acquire 1½-3mt/hr FFB capacity mills to increase their economies of scale and profitability. Soon after completion of the first phase it is proposed that the 100 most successful small scale mills are selected based upon turnover and strict adherence to environmental, health and safety standards across the country and are assisted to set up new 1½-3mt/hr mills. Estimated cost of one 1½mt/hr FFB capacity mill is US$ 250,000 and the 3mt/hr mill equipped with steam power generation unit is estimated to cost US$ 2.5 million. It is proposed that half of the phase 2 mills to be installed will have 1½mt/hr capacity and 3mt/hr capacity for the other half.

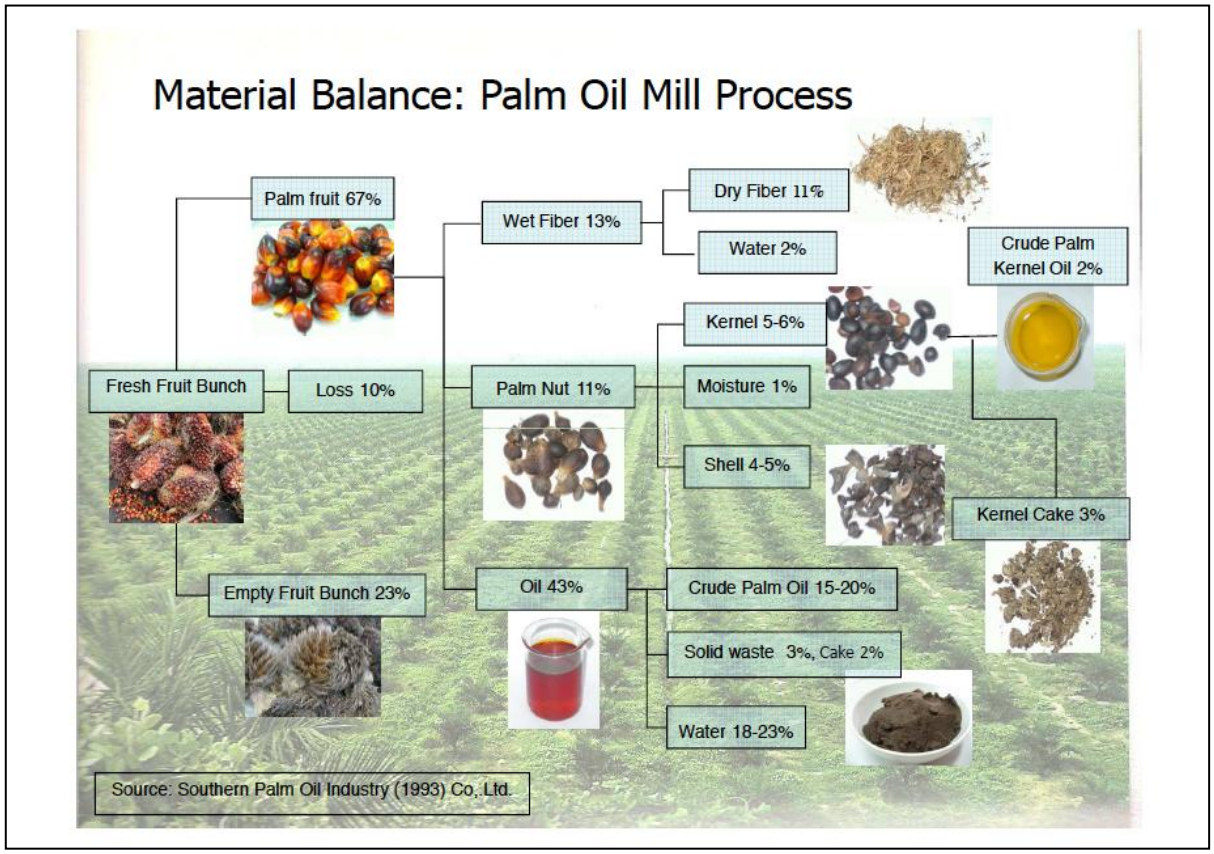
The overall results from this initial proposal will include improved turnover and profitability of up to 1,200 small-scale mills and greater job security and returns to efforts to the estimated 6,000 workers in this sector. This will also have far reaching benefits to FFB producers in the remote regions that are not served by large scale mills.

4.2.3 Development of selected oil palm based products

(i) Overview

Figure 4.3 shows material balance in processing oil palm and Figure 4.4 shows many uses of the products of fresh fruit bunches (FFB), crude palm oil (CPO) and palm kernels (PK) produced by the oil palm. Crude palm oil, when refined produces various palm oil and fat fractions.

Fig 4.3: Material Balance in Processing Oil Palm

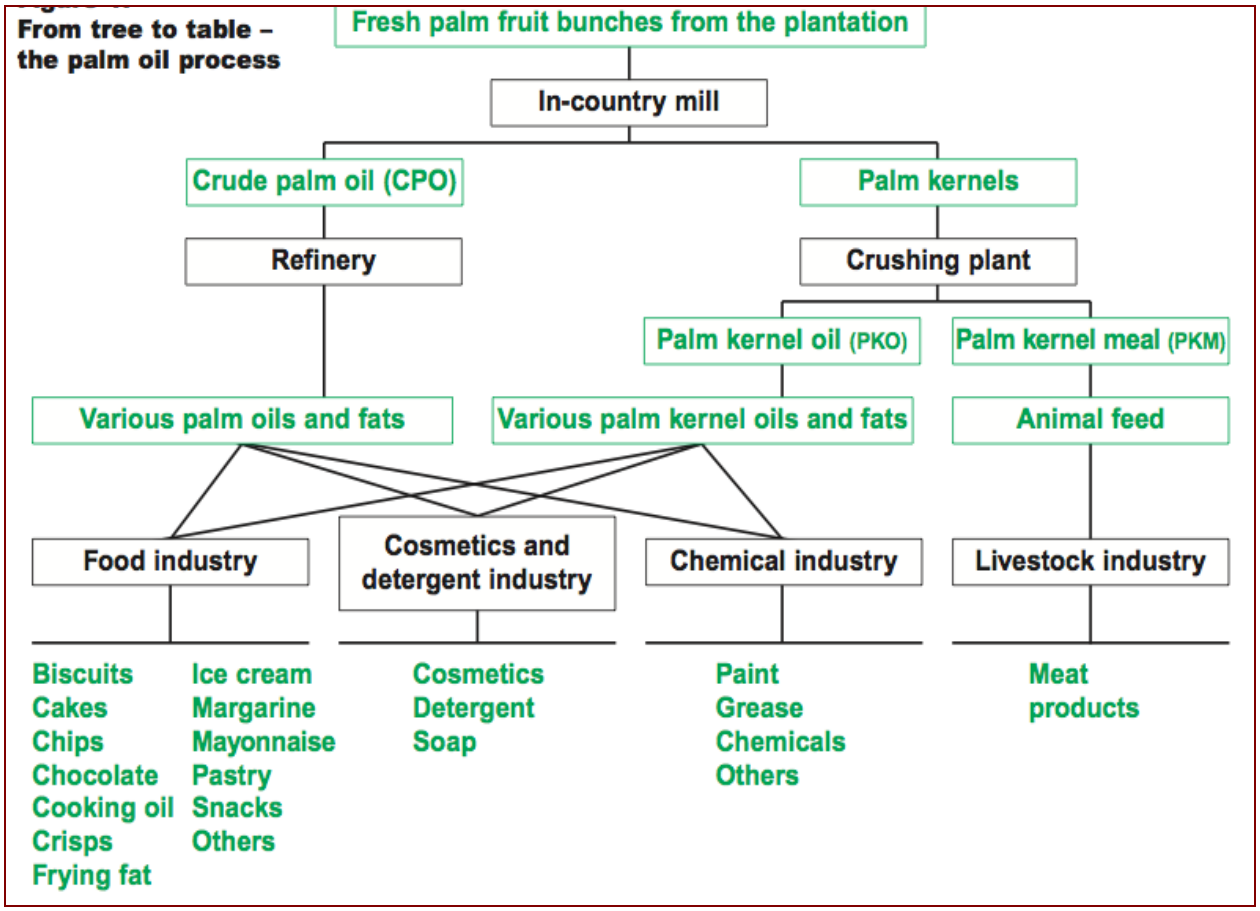


These are used in food, cosmetics, detergent and chemical industries.

Palm kernels are crushed and palm kernel oil is again used in the food, cosmetic, detergent and chemical industries. Palm kernel meal is used for animal feed in the livestock sector.

In Ghana the refiners are, Ameen Sangari Industries in Cape Coast, Appiah Menkah Complex in Kumasi, GOPDC, Juaben Oil Mills and Wilmar Africa (recently acquired the refinery in Tema from Unilever). Ameen Sangari, Appiah Menkah, Fan Milk, Indomie, Nestle, PZ and Unilever are major users of refined palms oil in Ghana across the range of aforementioned uses.

Fig 4.4: The Palm Oil Value Chain



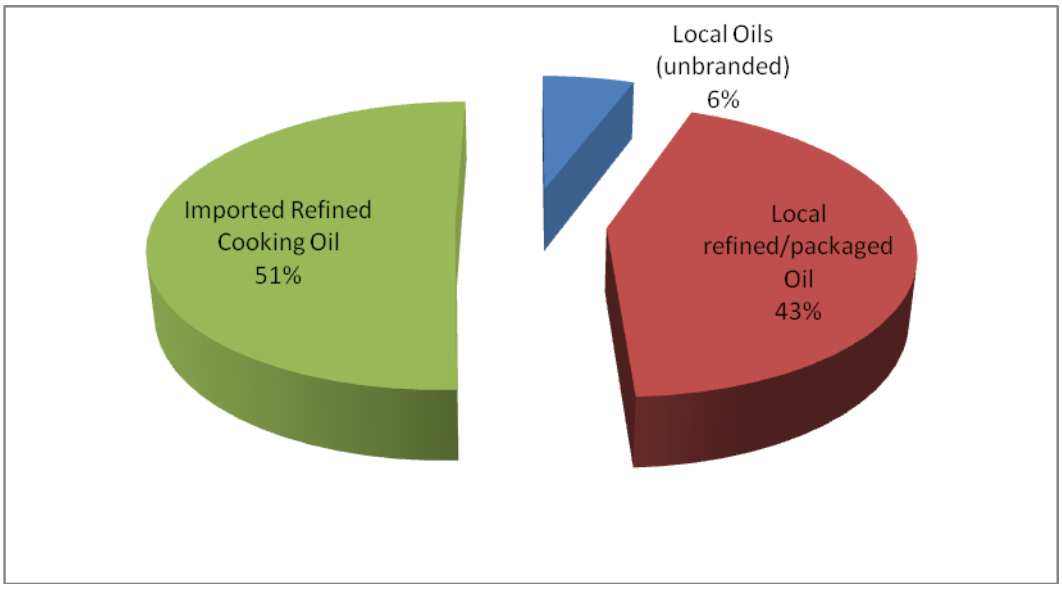
Source: MPOC

There is little doubt, as shown in our market analysis, that population growth, urbanization and middle class expansion will fuel demand for more sophisticated processed foods, cosmetics, cleaning products and chemicals and this will drive demand for industrial grade crude palm oil and palm kernel oil.

Over the past 2 years there has been phenomenal growth in the household consumption of refined and semi-refined cooking oil with a current market size of 160,000 mt. Total vegetable oil production capacity in Ghana is about 120,000 mt per annum and just about 65% capacity is being utilised. All production facilities are located in rural areas in Ghana apart from Wilmar's in Tema an industrial city of Ghana.

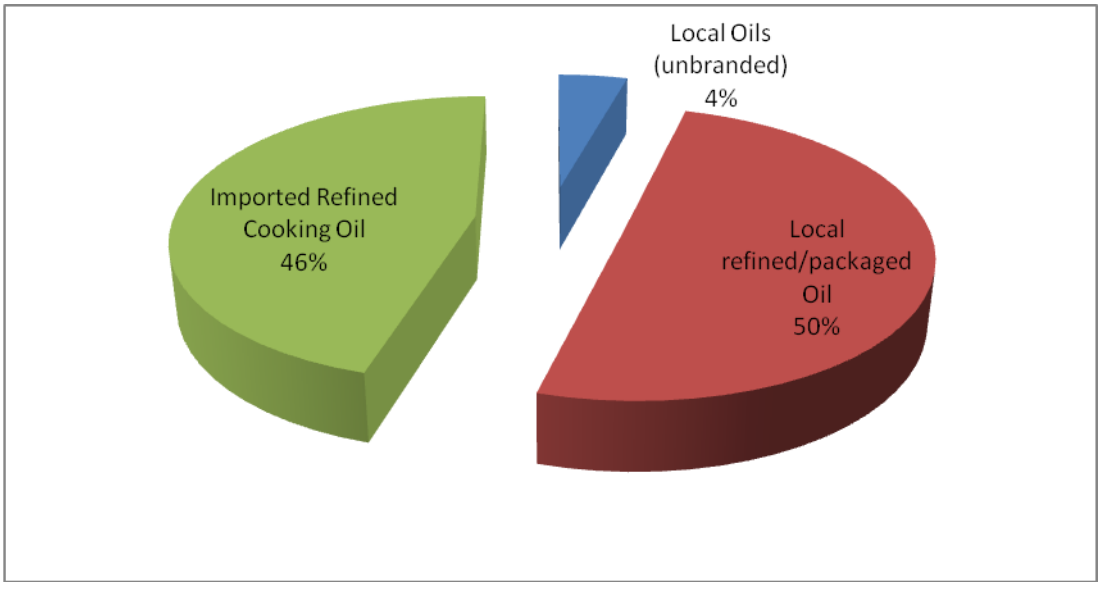
Between 2009 and 2010, the contributions of imported cooking oil to total demand decreased from 51% to 46% mainly because of Wilmar's entry into the local production scene (figures 4.5 and 4.6).

Figure 4.5: 2009 contributions of cooking oil to total local demand



Source: Oil palm industry in Ghana (2011)

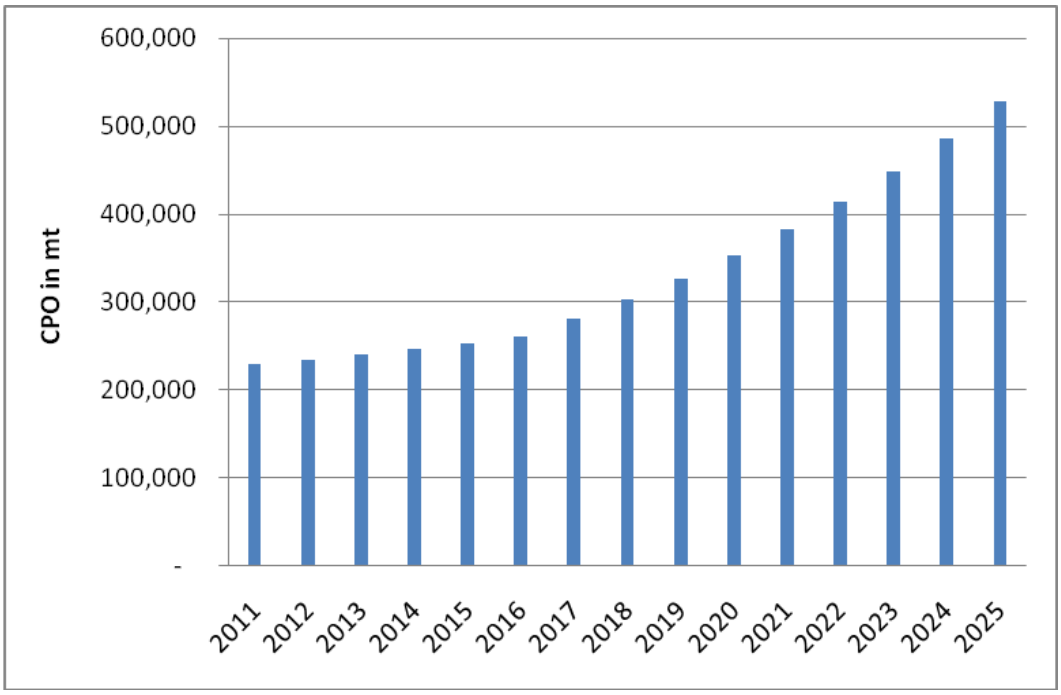
Figure 4.6: 2010 contributions of cooking oil to total local demand



Source: Oil palm industry in Ghana (2011)

Current local demand for vegetable oil is estimated at 229,633mt/annum in 2011 increasing to 253,307 by 2015 and 527,825mt by 2025 (figure 4.7)

Figure 4.7 : Vegetable oil demand forecast 2011-2025 in mt



The demand forecast covers provision made for estimated CPO requirement for culinary use in Ghana and export, refined CPO, soap, margarine consumption in Ghana and West Africa as well as synthetic lubricant manufacturing.

(ii) Processing capacity development

It is anticipated that local production will increase by some 42,000 mt in 2011 to about 100,000 mt by 2016 representing about 83% capacity utilization compared with 65% utilized currently. Expansion in the production of refined palm oil based products especially cooking oil and soap begun during late 2007 when cooking oil, beverages and personal care producing companies in Ghana increased their existing capacities or invested in new turn-key refinery projects (Text box 3) to take advantage of the growing demand for refined vegetable oil, beverages and personal care products in the country which is estimated to be growing at the rate of 10% per annum.

Text Box 3: List of refined palm oil based products companies

Wilmar Africa
Acquired Unilever's 200 MT /day (54,000 MT /annum) refinery in Tema in 2010 and is planning to expand its capacity. At the same time is looking for land to plant not less than 30,000 ha of oil palm in Ghana.

Unilever/PZ/NESTLE
Unilever has a state of the art 35,000 MT /annum margarine processing plant. This plant is working full capacity to supply the WA market.

- PZ and Unilever produce large quantities of laundry and toilet soaps from palm oil as the main raw material
- NESTLE uses substantial amounts of vegetable oils in their main products like Ideal Milk and Milo
- Ameen Sangari uses about 12,000 MT /annum of CPO to produce detergents, glycerin, cooking oil and soap but has the capacity to utilize 20,000-30,000 MT/annum.

GOPDC
- A new 100 mt/day refinery has been commissioned in 2007 in Kwae in the Kade District. Total annual capacity is 27,000 MT

Appiah Menkah Complex (AMC)
- AMC commissioned a 3 MT /hr plant in Kumasi, 19,000 MT /annum. This happened in Quarter one of 2008.

Juabeng Oil Mills.
- Commissioned in 2007/2008, a new state of the art 72 mt per day refinery (19,000 MT /annum) in Juabeng in the Ashanti region.

Golden Webb Industries (
- GWI commissioned a brand new 2 MT /hour plant in Q4 of 2007. This plant is located at Ahensan (Kumasi).

Ghana Nuts Industries (GNI)
GNI recently commissioned a new 24 MT /day plant (6,000 MT /annum) at Techiman.

(iii) Impact of development of selected oil palm based products

Employment

The companies manufacturing palm oil based products obtain most of their CPO supplies locally. Local CPO producers offer employment and income to thousands of people in rural communities in Ghana. These employment opportunities can be directly linked to oil palm plantations and palm oil factories dotted around the country.

Ready market for FFB

Local CPO producers offer a vibrant market for FFB in the rural areas. It is pertinent to mention that the prices paid to the market reflect the global CPO market price movement. Of the estimated $120 million annual revenue accruing to the major oil palm processing companies in Ghana, some $3.65 million goes to local farmers who contribute not less than 30% of the total crop processed by CPO producers.

Social amenities and rural infrastructure

Companies involved in CPO production such as GOPDC, TOPP and BOPP estates have established first class basic schools, housing and health facilities in their catchment areas. It is therefore not surprising that some students from these schools have won the Head of State awards in the not distant past. Some of the estates run scholarship schemes for brilliant but needy children in their communities. They have provided water from boreholes, helped to open up roads and extended the national electricity grid where there was none.

(iv) Selected palm oil based products for development

We propose cooking oil, soap, synthetic lubricants and margarine as palm oil based products for development because of their high demand (Chapter 1). It is further proposed that existing companies which are already engaged in manufacturing ***cooking oil, soap and margarine*** from palm oil are given tax incentives to expand their facilities especially in rural areas. Additionally to promote production of synthetic ***lubricants*** because it has captured a major market share globally it is proposed the Government of Ghana sets up a joint venture company by 2015 to take advantage of expected increase in raw material supply and international demand.

4.3 FINANCIAL ARRANGEMENTS

4.3.1 Potential Sources of Funding

Development of oil palm plantations and mills are long term in nature and concessionary funding from private, export development and investment funds (government) as well as donor agencies are proposed. Key potential donor funders are as follows:

(i) AAF

The African Agriculture Fund (AAF) is a private equity fund that reached its first closing at US$ 135 million in November 2010. The Fund operates according to a Socially Responsible Investment (SRI) Manual that features an environmental and social risk management system, guidelines for an optimal use of the technical assistance facility and, for the first time in agribusiness private equity, a Code of Conduct for Land Acquisition and Land Use in agricultural and agribusiness projects to prevent unsustainable practices.

Phatisa are the Fund Managers, which comprise a team of seasoned professionals with a depth of experience in both private equity, fund management and the agricultural sector across Africa. Phatisa has offices in Mauritius, Zambia, Kenya, South Africa and is in the process of being established in West Africa.

AAF investment primarily lies in food production, processing and distribution in cereals, livestock farming, dairy, fruit and vegetables, crop protection, logistics, fertilizers, seeds, edible oils, smallholders and agri services. To achieve optimal diversification within the sector, the Fund will invest across the value chain (from primary production to processing and tertiary services) and pan-Africa. The Fund aims to support private sector companies that implement strategies to enhance and diversify food production and distribution in Africa by providing equity funding including strengthening the management and modernisation of the agricultural sector on the continent.

The Fund will make investments of up to US$ 20 million per Portfolio Company, targeting entities with robust management and growth prospects. To enhance its impact on development, the Fund has deployed two powerful instruments: a dedicated SME sub fund of a target size of US$ 60 million (initially US$ 30 million) and a Technical Assistance Facility (TAF) of €uro 10 million, to support outgrower schemes in large companies and business development services in SMEs.

(ii) AFD

AFD or Agence Française de Développement started its operations in Ghana in 1985, marking the opening of the first AFD representation in an English speaking country. AFD has intervened in agriculture and rural development, particularly in rural water supply, perennial crops sector (rubber, oil palm), as well as food crops (rice). AFD Group's investments in Ghana are channelled through various instruments:

a) Concessional loans to the State of Ghana (AFD);
b) The group is expanding its non sovereign loan to help companies and projects to be more involved in socially and environmentally responsible issues;
c) AFD grants to finance development programmes or technical assistance, including grants from the French Global Environment Fund (FFEM) or within the Trade Capacity Building Programme (PRCC);
d) Medium or long-term loans to public companies without any guarantee from the State (AFD), as well as medium or long-term loans to private companies or public-private partnerships (through Proparco, AFD's subsidiary dedicated to the private sector);
e) Loan guarantee in local currency by AFD (ARIZ individual or portfolio risk-sharing mechanism) or Proparco;
f) Investments in equity or quasi-equity (Proparco or FISEA);
g) Training activities through AFD's training centre based in Marseille (south of France), the CEFEB (Centre for Financial, Economic and Banking Studies): professional master degree courses, short term seminars or specific training sessions and workshops;
h) Implementation of studies and strategic sector reflexions (AFD).

AFD gave an indication that €78 million was available to support smallholder oil palm development at the recent workshop on the oil palm master plan held at Dodowa on 9th March 2011.

(iii) ADB

The African Development Bank (ADB) considers private sector development as a major objective of its development activities. ADB addresses private sector development (PSD) at two primary levels:

- Assist African governments to improve the enabling environment for the private sector:
    - Improve essential physical infrastructure (e.g. power, information and communication technology, transportation)
    - Improve "soft infrastructure" (e.g. regulatory and legal frameworks, financial sector, trade liberalization)
- Create a catalytic and demonstration effects by assisting entrepreneurs with specific transactions:
    - Infrastructure (e.g. power, transportation, telecoms, water)
    - Industries and Services (e.g. mining, cement, agribusiness, hotels)
    - Financial Intermediation (e.g. banks, MFIs, insurance, leasing).

The most recent oil palm industry transaction undertaken by ADB was a loan of UA 7.14 million it granted to GOPDC in 2002 for oil palm expansion.

(iv) Databank

Databank announced at the workshop held on the oil palm master plan on 9th March 2011 an Agribusiness fund through which they will engage in equity investment in qualified companies in the oil palm industry taking stakes from $150,000-$5.0 million.

(v) IFC/World Bank

IFC is a member of the World Bank Group. IFC's vision is that people have the opportunity to escape poverty and improve their lives. In FY06, IFC committed $8.3 billion, including syndications, to 284 investments in 66 developing countries.

IFC, a member of the World Bank Group, has signed an agreement to provide financing to Ghana Oil Palm Development Company, one of Ghana's leading firms in the oil palm sector. The $12.5 million, nine-year loan represents the largest IFC investment in the country's agribusiness sector to date.

The investment will provide Ghana Oil Palm Development Company with long-term funding to complete its planting programme, improve infrastructure, and expand its working capital. The long tenor loan will also provide the company with the flexibility to invest in oil palm, trees that typically start fruiting in their fourth year of growth.

Developing the agribusiness sector in Ghana is a priority for IFC because of its significant potential to create jobs and generate income in rural areas," said Imoni Akpofure, IFC Country Manager for Ghana. "IFC is eager to support sponsors with good projects in the sector."

To be eligible for IFC funding, a project must meet a number of criteria. The project must:

- Be located in a developing country that is a member of IFC;
- Be in the private sector;
- Be technically sound;
- Have good prospects of being profitable;
- Benefit the local economy; and
- Be environmentally and socially sound, satisfying IFC environmental and social standards as well as those of the host country

4.3.2 Plantations

The total initial capital investment projected for the nucleus estate and mill is some US$42.3 million. This excludes the US$7.5 million investment in the 5,000 ha smallholder development which is the subject of a related proposal and also excludes the funding required to launch a Smallholders Services Company (SSC). The two investment sums will amount to just under US$50 million. The SSC will

additionally require funding, probably from concessionary sources that are oriented to social enterprise.

4.3.3 Small-scale farmers

Organisation and financing of further smallholder development would essentially become modular replicates of the first scheme, adapted in the light of experiences and lessons learnt under coordination by a Smallholder Services Entity (SSE) which could also administer a Road Maintenance Trust Fund. The estate company would expand its milling capacity (but not the plantation) in proportion to the smallholdings expansion by modular replication of its initial mill development but with significant economies in the use of management and central administrative and internal support services that may not need to be scaled up.

4.3.4 Small-scale mills

Project costs, returns and finance

Total estimated cost covering each week's task is US$ 7,755 with US$ 2,000 to facilitate improvements to be made in areas such as mill structures and relocation of machines to acquiring instruments like weighing scales and thermometers.

The global costs of implementation of the project are presented in the accompanying workbook "Small Scale Mills Upgrading Replanting Programme" presented in Annex 8 and comprise:

Phase 1				US$	US$
Region	No. of mills	No. of districts	Weeks	Estimated Cost Per Week	Estimated cost Year Total
Central	**370**	**8**	**40**	**7,755**	**310,200**
Eastern	**300**	**9**	**45**	**7,755**	**348,975**
Ashanti	**220**	**11**	**55**	**7,755**	**426,525**
Western	**150**	**8**	**40**	**7,755**	**310,200**
BrongAhafo	**80**	**5**	**25**	**7,755**	**193,875**
Volta	**80**	**6**	**30**	**7,755**	**232,650**
TOTAL/YEAR	**1200**	**47**	**235**		**1,822,425**
TOTAL FOR 5 YEARS					**9,112,125**

Phase 2	**Investment in US$ '000**		
Mill Capacity	Number	Unit Cost	Total
1½ MT/hr	50	250.00	12,500.00
3MT/hr	50	2,500.00	125,000.00
Total	**100**		**137,500.00**

MONITORING AND EVALUATION (7 YEARS)						
Region	No. of mills	No. of districts	**Weeks**	**Months**	Rate /week in US$	Total in US$
Central	370	8	**16**	**4**	7,755.0	124,080.00
Eastern	300	9	**18**	**5**	7,755.0	139,590.00
Ashanti	220	11	**20**	**5**	7,755.0	155,100.00
Western	150	8	**16**	**4**	7,755.0	124,080.00
Brong Ahafo	80	5	**10**	**3**	7,755.0	77,550.00
Volta	80	6	**12**	**3**	7,755.0	93,060.00
Total	1200	47	92	23	7,755.0	**713,460.00**

For the purposes of procurement of initial funding it should be noted that the total cost of undertaking Phase 1 and Monitoring and Evaluation will be US$9,825,000. Financing of mechanical upgrading of mills under Phase 2 would need to be through commercial means.

4.4 ORGANIZATION

4.4.1 The role of the private sector

Already existing private companies engaged in production and downstream processing of CPO have expanded or are about to expand their processing capacities in anticipation of increasing demand of CPO and downstream products. The Government of Ghana may have to facilitate acquisition of land and implementation of measures such as review of tariff on import of CPO and downstream products, long term concessionary funding from EDIF/donor sources for 160,000ha oil palm development proposed in this study to make investment in the oil palm industry attractive.

4.4.2 Monitoring the farmers

The development of the 150,000ha for farmers must follow a supervised credit scheme approach. This approach ensures that a lead or programme implementation company is charged to provide very close technical advice and supervision throughout establishment of the plantations and the commercial phase of the plantations. Full loan recovery is assured by this method.

4.4.3 Provision of improved technical support and services

(i) Smallholder Services Entity(SSE)

The SSE to be engaged for the development of the 150,000 ha oil palm plantations must have a proven track record for such a development. Medium- large estates have implemented smallholder and outgrower schemes successfully during the past 30 years hence it is proposed that these companies are invited under auspices of GOPDA to form the SSE to implement the 150,000ha development. The SSE proposed is a government entity to be fully funded by the Government of Ghana.

(ii) Consultants to be engaged for the small scale mills transformation programme

Two teams of consultants proposed namely the implementing consultant and the monitoring and evaluation (M & E) consultant. The implementing consultant must have several years experience in palm oil milling and will be supported by 4 technicians and a biochemist or laboratory technician. It is also proposed that the M & E team will have similar manpower mix.

4.4.4 System of pricing FFB and purchase of FFB from farmers

(iii) System of pricing

The system of FFB pricing introduced by GOPDA in the 1990s which computes the price/MT of FFB by taking 10% of Tema port landed value of CPO/MT as the price is proposed. Current month's FFB price therefore is 10% of the previous month end CPO landed value. If the landed value of CPO at the end July 2011 is US$ 1,220 /MT then 10% of this landed value which is US$ 122 will become the price/MT for August 2011. As CPO price/MT varies, the price of FFB/MT also varies.

(iv) System of purchasing of FFB

It is proposed that the 150,000ha oil palm plantation development is divided into zones which should be assigned by MoFA/GOPDA to existing and new FFB processing mills based upon their capacities. In each zone the assigned processing mill must construct FFB buying centres equipped with weighing scales, weighbridges and offices. Each assigned company will purchase FFB by weight with certified and regularly calibrated scales. Payment to be made through required bank accounts opened by beneficiary farmers. Each buying centre will be designed to handle between 25.000-50,000 mt FFB/annum. It is further proposed that each assigned mill must place all year round daily order for FFB by October of the prior year with buying centres in the assigned zones.

4.4.5 System of purchase of palm oil from small scale processors

A register of all CPO wholesalers and retailers across Ghana as well as industrial CPO users should to be compiled by GOPDA and each CPO buyer encouraged to register with GOPDA, which will in turn assign small scale mills to the CPO buyers. It is proposed that buying of CPO from small scale processors will be carried out in kilograms (20L unit, 50L and 200l plastic drums which are currently used for storage and marketing of CPO).

CHAPTER 5:
FORECASTED PLAN OF DEVELOPMENT OF OIL PALM CULTIVATION IN GHANA

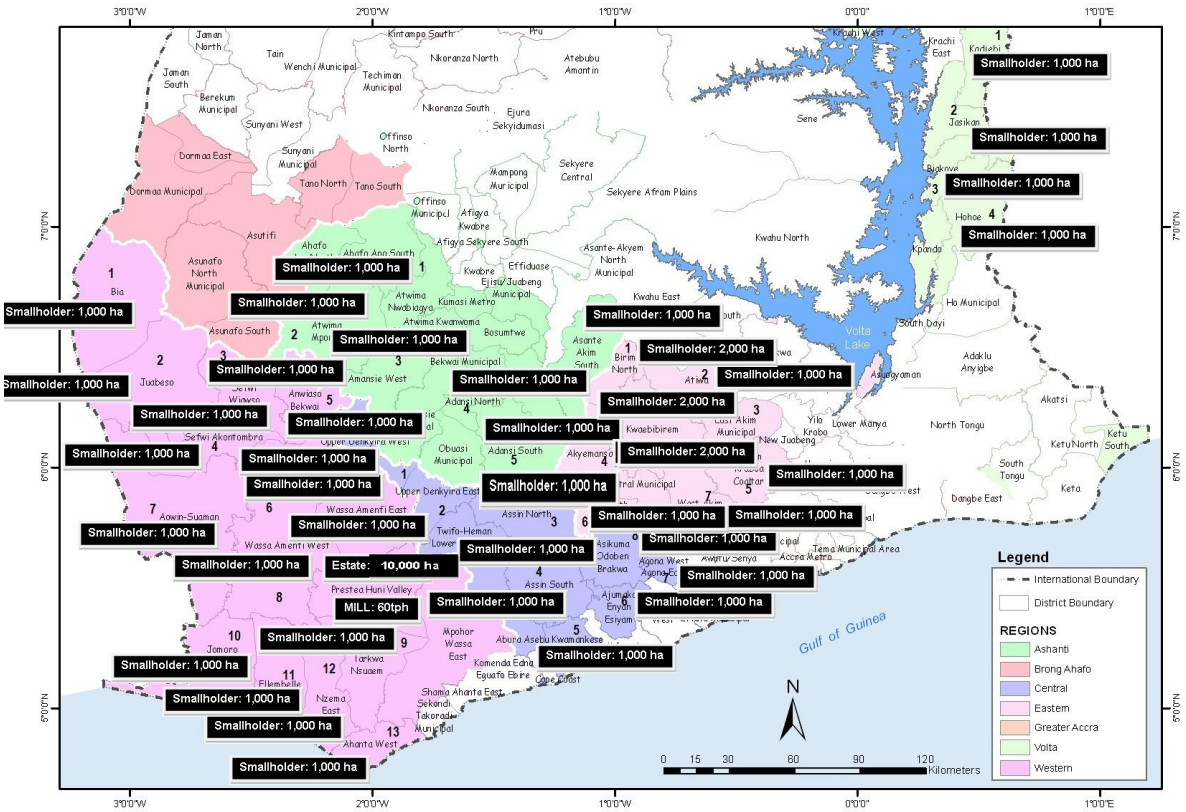
5.1 SCHEME

5.1.1 Areas of development

(i) 50,000ha new development

This consists of a 10,000 ha nucleus estate and 40,000 ha of smallholder development. The 40,000ha smallholder development is proposed to be allocated on a regional basis as follows: Western (13,000ha), Ashanti (5,000ha), Eastern (10,000ha), Central (8,000ha) and Volta region (4,000ha). The 10,000ha nucleus estate development plus a 60tph FFB processing mill is proposed for Western region within Prestea Huni Valley District (figure 5.1). The 40,000ha allocation assumes production of FFB to feed existing mills (figure 4.2) and the proposed 60tph FFB processing mill.

Figure 5.1: Areas for 50,000ha development

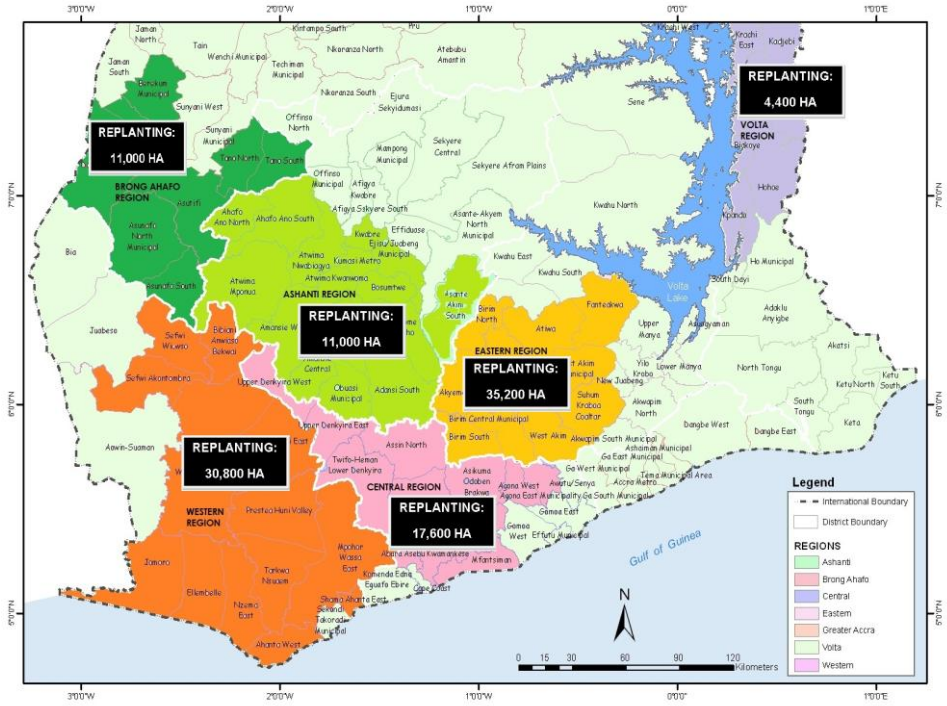


YEAR OF PLANTING	NUCLEUS ESTATE - Ha	SMALLHOLDER / OUTGROWER PLANTATION DEVELOPMENT in Ha
0		Recruitment & deployment of Smallholder Services Company
1	2000	Nursery establishment for Scheme 1 phase 1
2	4000	Scheme 1 first phase: 2000 & Nursery establishment for Scheme 2 phase 2
3	4000	Scheme 1 second phase: 3000
4		Scheme 2: 5000
5		Scheme 3: 5000
6		Scheme 4: 5000
7		Scheme 5: 5000
8		Scheme 6: 5000
9		Scheme 7: 5000
10		Scheme 8: 5000
TOTAL	10000	40000

(ii) 110,000ha replanting programme

This development is a replanting programme proposed to be carried out at the rate of 11,000ha per year for 10 years starting from 2013 and spread accross the oil palm growing regions of Ghana (figure 5.2). Strategy for replanting the 110,000ha independent smallholder oil palm plantations is outlined in Project concept note 3.

Figure 5.2: Distribution in area (ha) of replanting by region



(iii) Total national production

With the proposed 50,000ha development (10,000ha nucleus and 40,000 ha smallholder plantations) and 110,000ha replanting programmes additional production of FFB is estimated to start at 4,000mt in 2016 to over half a million mt in 2020. This increases to nearly one and half million mt in 2025 (figure 5.3).

Figure 5.3: National FFB production build up 2016-2025

PROGRAMME	AREA IN HA	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
REPLANTING	110,000	-	22,000	88,000	198,000	308,000	418,000	555,500	693,000	830,500	968,000
NEW-NUCLEUS	10,000	4,000	20,000	57,000	99,000	125,000	130,000	140,000	150,000	150,000	150,000
NEW-SMALLHOLDER	40,000	-	4,000	18,000	48,000	90,000	140,000	195,000	252,500	315,000	377,500
TOTAL	160,000	4,000	46,000	163,000	345,000	523,000	688,000	890,500	1,095,500	1,295,500	1,495,500

5.1.2 Farming methods and techniques

Plantation development will start from seedling production in nurseries, field development, upkeep, maintenance to FFB harvesting. Effective methods and techniques that must be used to establish and run the plantations are outlined below.

(i) Seeds

Seeds must always be purchased from a reputable source. Volunteer seedlings should never be used.

Important characteristics to look out for in improved seeds to be used for the proposed 160,000ha oil palm development are CPO yield per hectare, fusarium resistance and drought tolerance. These types of seeds can be sourced from OPRI-Kusi Ghana, Pobé in Benin, Binga, Congo DR and La Mé, Côte d'Ivoire. The seeds are procured as pre-heated or germinated seeds. 200 seeds should be ordered for every hectare to yield 150 vigorous seedlings to be planted out. 143 seedlings are planted in a hectare and allowance of 7 seedlings/ha are made for filling vacancies.

germinated oil palm seeds

(ii) Nursery Establishment

Oil palm seedlings are generally raised in one of two types of nurseries, the one-stage nursery and the two-stage nursery.

One-stage nursery

The one stage nursery involves sowing germinated seeds into a 16cm diameter black polythene bag. The germinated seeds emerge as seedlings after 7 days. Seedlings are regularly watered by hand or using an irrigation system. There is weekly hand weeding of the bags and also between the bags. Compound fertilizer NPK 15:15:15 and soluble micro-nutrient fertilizers are applied monthly. About 120g of compound fertilizer is applied per seedling over the 9-12 month period. The seedlings are protected against insects and fungus through fortnightly application of appropriate agrochemicals. On a weekly basis diseased and insect damaged or retarded seedlings are removed. After 9-12 months the seedlings are usually ready to be transferred to the field.

Two stage nursery

The two-stage nursery involves a pre-nursery stage and a main nursery stage. The pre-nursery stage lasts 3 months. Germinated seeds are sown in 10cm diameter x black polyethylene bags filled with top soil and kept at high density in a shaded area. Palm fronds are often used as a frond canopy over a frame to protect the emerging seedlings from direct sunshine.

Small seedlings

The shade is reduced from the 2nd month until it is completely removed 2-3 weeks before the seedlings are ready to be transferred to the main nursery. The seeds are watered daily for the first 2 months before the frequency of watering is reduced. Large size black polythene bags are filled with well drained top soil and placed in a triangular pattern 70-100cms apart. After transplanting into larger bags the seedlings are mulched usually with oil palm fibre to reduce rapid evaporation. The ground mulch also suppresses weeds.

Main nursery

5.1.3 Field Development

Blocking and infrastructure development

Areas suitable to be developed are secondary forests and degraded land and these sources of land for development are recommended in the RSPO guidelines.

Plantation development starts with dividing the fields into pre-determined blocks. For most estates set up in the 1970s in Ghana the standard practice was to divide the fields into 40ha blocks and this blocking system is proposed for the nucleus and smallholder plantation development. Provision is made in a 40ha block for 3.8 km of surrounding and internal roads. Provision is also made for the construction of drains, bridges and culverts.

Land preparation

Manual and mechanical methods of land preparation are practiced in Ghana. The manual method employs labour with a cutlass to underbrush the vegetation. Small trees are felled with an axe and bigger trees with a chainsaw. (Burning is discouraged by the RSPO). Weeds are allowed to regenerate for a few weeks and then they are generally controlled using herbicides. The most dominant weed species on these parcels of land in Ghana tend to be Siam weed (Chromolaena odorata) and Thatch grass (Imperata cylindrica). Chemical control is the most effective method to eradicate these weeds.

The mechanical method employs the use of bulldozers to clear the land of vegetation and for uprooting the trees. The uprooted trees are piled into windrows. Windrowing trees is done with a bulldozer fitted with rakes.

land preparation using a bulldozer

Cover crop

A leguminous cover crop is sown to suppress weeds. The cover crop provides some nitrogen and organic matter. The most common type of cover crop is Pueraria phaseloides. 5kg/ha of fresh Pueraria seeds is the norm. A recently introduced cover crop is Mucuna bracteata which is deeper rooting and is credited with circulating more nutrients. The only limitation of Mucuna is, it is yet to seed in Ghana.

Lining and Pegging

The standard spacing used between oil palms is 9 metres which results in a plant population of 143 palms per hectare. Planting points are determined by using a measuring tape. A peg is then staked at each location.

Holing and Planting

Planting holes, deep and wide enough for the seedling to fit are dug with a spade. The seedlings are transported to the planting area and carefully lowered into the hole. The gap around it is filled with top soil and firmed up. One person can plant about 0.5ha/day. It must be ensured that the polythene bag is removed before planting. Any seedlings which fail must be replaced immediately with a healthy one.

Manuring

Manuring involves application of empty fruit bunches[1] (EFB) and chemical fertilizers. Where EFB is not available additional chemical fertilizer is applied. During the immature phase, blanket applications of fertilizer are recommended. The blanket application generally involves applying 150-500g/palm of compound fertilizer NPK 15:15:15. It is often the practice, in Ghana, to apply kieserite (Magnesium Sulphate) too. It must be noted that fertilizer application is crucial to the sustained growth of the oil palm industry.

[1] Bunch waste is very important because it helps improve the soil. Palm fronds also spread in the interrows of palm rot within 6 months and also provide organic matter for soil aggregation. The soil particles require more organic matter to join or aggregate together.

During the mature phase fertilizing is done to maintain fertility of the soils[2]. Before establishing the plantation a soil survey and soil analysis is carried out to determine nutrient composition, organic matter content and physical characteristics. Annual leaf analysis should subsequently be routinely carried out to monitor nutrient status. Generally the most important fertilizer required is muriate of potash (MOP) as a lot of potassium is removed when fruit is harvested. The amount of fertilizer which can economically be applied depends on a number of factors, particularly on the price of the fertilizer and the price of FFB as well as the yield potential of the individual palm. Fertiliser prices are driven largely by the price of crude oil. It is therefore not really practical to forecast long term fertilizer requirements as it depends on the situation and circumstances during any particular year.

(iv) Field maintenance and upkeep

Weed control

The purpose of weed control is to remove competitors and to create an accessible environment around each oil palm. The weed free environment around the transplanted oil palm seedling promotes rapid expansion of the canopy and girth of the seedling.

Hand weeding is recommended during the immature phase and chemical weeding combined with hand weeding during the mature phase. During the immature phase, hand weeding involves slashing weeds which have emerged through the cover crop 3-6 times in a year.

Circle weeding is done 3-4 times in a year to keep the area around the palms clean. No chemical spraying is recommended within the first three years because herbicides can scorch the foliage which is very tender at this stage. From the 4th year onwards, chemical weeding of paths and circles is often preferred. A control droplet herbicide applicator can cover 4-8 ha/day.

Well maintained plantation

[2] The soils are acid soils and are low in nutrient content, low in cation exchange capacity, low in water holding capacity, poor in aggregation of soil particles and high in aluminium toxicity.

Pests and Diseases

During the first three years provision is made to control Rattus tanezumi (rice rat), grasscutter (cane rat), Oryctes spp. [Large beetles/ Rhinoceros beetles] and Rynchophorus spp. From the 4th year onwards leaf mining insect (a tiny yellow beetle) Coelaenomenodera lameenisis Berti et Mariau must be monitored and controlled if necessary.

Leaf miner (Coelaenomenodera lameensis Berti et Mariau) is the most important pest of oil palm in Ghana. Heavy infestations can cause 90% defoliation which can subsequently lead to a 50% reduction in fruit over the following 3 years. Leaf miner outbreaks can be detected through regular census and appropriate control measures starting from biological agents to the use of pesticides. If infestation is advanced, control has proven costly and beyond the means of smaller producers. Leaf miner infestation has occurred in Ghana every decade especially on nucleus estates since it was first reported on Pretsea Oil Palm Estate [part of Norpalm] in 1970. GOPDC, TOPP, Jukwa State Oil Palm Estate were attacked between 1987 and 1989. Leaf miner attack occurred at TOPP in 1997 and at BOPP in 1990, 2004, 2007-2008. Juaben reported an attack of leaf miner during 2010 for which assistance was obtained from BOPP to control it. Therefore there is a probability that leaf miner infestation to warrant control is likely to occur at least twice on each nucleus estate over the next 15 years.

On diseases there has been no outbreak reported over the past 30 years. The only major disease to watch is fusarium wilt. Use of resistance planting material is recommended to prevent occurrence but a monitoring system can provide early warning to manage any outbreak. Ganoderma spp. is another potential threat and needs to be monitored. Lethal yellowing is a disease which is common to coconut palms but it is not a threat to oil palms.

Fire prevention

Estates often share boundaries with settlements hence there is a risk of accidental fires in plantations. Provision should be made for regular fire inspections and control. Steps should be taken to mitigate the risk of fire and boundaries should be patrolled frequently.

Pruning and sanitation

Pruning involves removal of low hanging palm fronds from the oil palms annually, usually during the low crop period. The fronds are spread evenly in the inter-row to rot.

Pruning in progress

(iv) Harvesting

Harvesting involves cutting and carrying the fresh fruit bunches (FFB) and any loose fruits to the roadside for loading into trucks for dispatch to the mill for processing. A harvester can cut and carry 0.75mt/day on average.

Harvesting using a long pole

The production of high quality crude palm oil is heavily dependent upon the quality of the raw material, specifically fresh fruit bunches with a good ripeness ratio that allows for extraction of the maximum amount of crude palm oil and kernel and minimizes free fatty acids.

Under-ripe fruit decreases the CPO extraction potential while over-ripe fruit increases the free fatty acids and therefore the quality is poorer.

The rule of thumb for the optimal time to harvest a fresh fruit bunch from a palm is when one loose fruit has fallen to the ground. At this time of ripeness the palm oil content of the bunch is at its highest and the free fatty acid level is still relatively low.

Harvesting interval

Ideally, every palm tree should be visited on a ten-fifteen day cycle. This is easier said than done. At peak crop times the quantity of fruit which needs to be harvested can be considerable and resources, human and others can become stretched. A shortage of labour at the time of peak crop can mean that harvesting intervals become extended to 20 days or more and heavy losses can occur. Loose fruits fall and can be lost, and/or rot on the ground and the FFA rises in the over ripe fruit. Note that the oil content in a single lose fruit is a high percentage of the single fruit weight as it is now detached from the bunch. Fresh fruit bunches that have lost loose fruits will obviously have a lower extraction rate.

Harvesting Standards

Harvesters must know not to cut under ripe (black) bunches. They must not include rotten bunches in their load and it must be ensured that stalks are cut level with the end of the bunch. (Long stalks increase the bunch weight and absorb oil during sterilization). It must be ensured that all loose fruits are collected and delivered to the loading point.

Transport

Once fresh fruit bunches are harvested they must be transported to the mill and sterilized within 24 hours. Sterilization stops the free fatty acid content rising and allows the fruit to be easily stripped from the bunches.

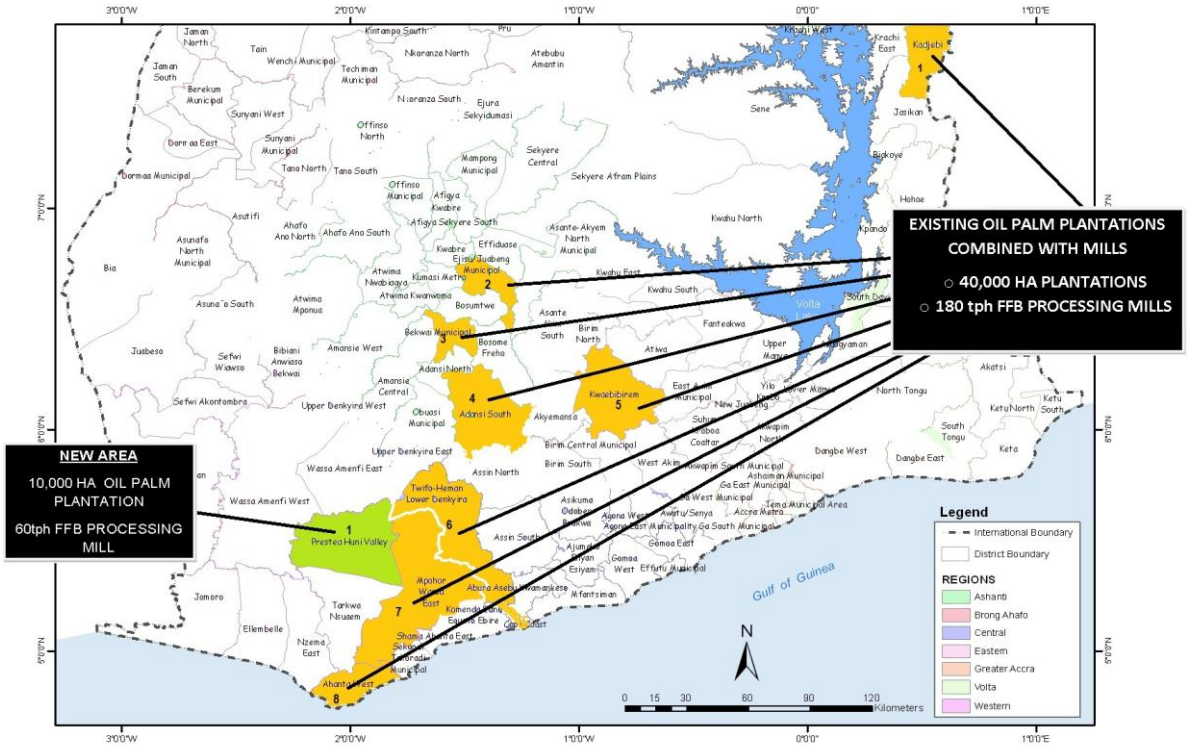
5.1.4 Infrastructure required

In considering the location of a new plantation/milling complex we would recommend locating the mill within Prestea-Huni Valley district (figure 5.4) that is far away from existing operations and will strategically serve new smallholders and out-growers plantations.

Spatial Corridor

The concept of spatial corridors as a development approach has become topical in recent years. The idea is that there are corridors or arteries of focused development where there can be synergy between the various economic activities that are going on. There is generally an anchor industry, such as mineral extraction and in the case of this study development of oil palm industry becomes the anchor industry at various parts of the oil palm growing areas in Ghana. This anchor industry is the catalyst for a whole lot of additional diverse activities which can piggy back on the development of the anchor industry but which could not justify the development of infrastructure on their own.

Figure 5.4 Proposed and existing oil palm plantations and FFB processing mills[3]



Road Infrastructure

A good road infrastructure is extremely important when considering the location of any new development. Consider a 60tph mill. This mill can easily have 1000mt of fresh fruit being delivered at peak times in a twenty four hour period. Continuous development of roads by Government of Ghana especially the Western and Eastern corridors (Text Box 4) will stimulate development of efficient system for transportation of FFB and other required goods in the oil palm development areas. If an average load of fruit is 8 tons that means 125 truckloads of fruit coming in to the mill daily. Also coming into a large milling operation are fuel, fertilizers, spares, staff transport, etc. Outbound logistics include palm oil. A 60tph mill can produce close to 300mt of oil in a day when working flat out. This means 15 loads of oil per day leaving the factory if the average load is twenty tons, and each vehicle which comes in, also goes out. Other outbound items can include EFB (30% of FFB weight in) and palm kernels. Poor roads mean lost time because journeys take longer than they should and breakdowns occur. All these result in decreased efficiency, increased cost and ultimately lower profitability.

[3] For locations see Figure 4.2.

Text Box 4 - CURRENT ROAD DEVELOPMENT PROGRAMS

1. EASTERN CORRIDOR:Tema-Asikuma-Hohoe-Jasikan-Yendi-Nakpanduri-Kulungugu

a) Hohoe – Poase Cement (50km):- *Design drawings have been completed. This will be funded as part of Phase I of the Eastern Corridor project under the Chinese Funding.*

b) Dodo Pepesu-Nkwanta (46km):- *Tenders will be re-launched before the end of 2010. This project will be funded wholly by the European Union.*

c) Nkwanta-Bimibilla-Yendi:- *A consultant has been engaged to undertake feasibility studies and detailed design of this stretch of the corridor. The studies and design are being funded by the ECOWAS Commission.*

d) *The Brazilian US$250million credit facility which was initially meant for the construction of a hydroelectric dam on the Oti River has been converted to the construction of part of the Eastern Corridor i.e. Damanko-Sakpeigu (126km)*

2. CENTRAL CORRIDOR: Accra-Kumasi-Techiman-Tamale-Bolgatanga-Paga Road

a) Achimota – Ofankor:- *80% of the works have been completed as against 58% completion in 2009. The expected completion date is May 2012.*

b) Nsawam Bypass:- *49% of the works have been accomplished as against 17% completion in 2009*

c) Nsawam – Apedwa Dualization:- *At present, 25% of the works has been completed as compared to 7% in August, 2009.*

d) Kumasi-Techiman (Lots 1 &2):- *The works have been completed*

e) Buipe – Tamale: - *Tender Evaluation report has been submitted to the World Bank for 'no objection' before an award of contract for implementation of the works.*

3. WESTERN CORRIDOR

a) Elubo-Asemkrom:- *50km out of 84km have been surveyed and designed. Tender documents are being prepared for tendering and award by the end of the year.*

b) Enchi-Benchema-Goaso-Sunyani:- *Sections of this stretch are in a satisfactory condition. Plans are being made for reconstruction of the sections in poor condition.*

c) Sunyani-Bamboi:- *Wenchi-Bamboi section has been completed.*

•

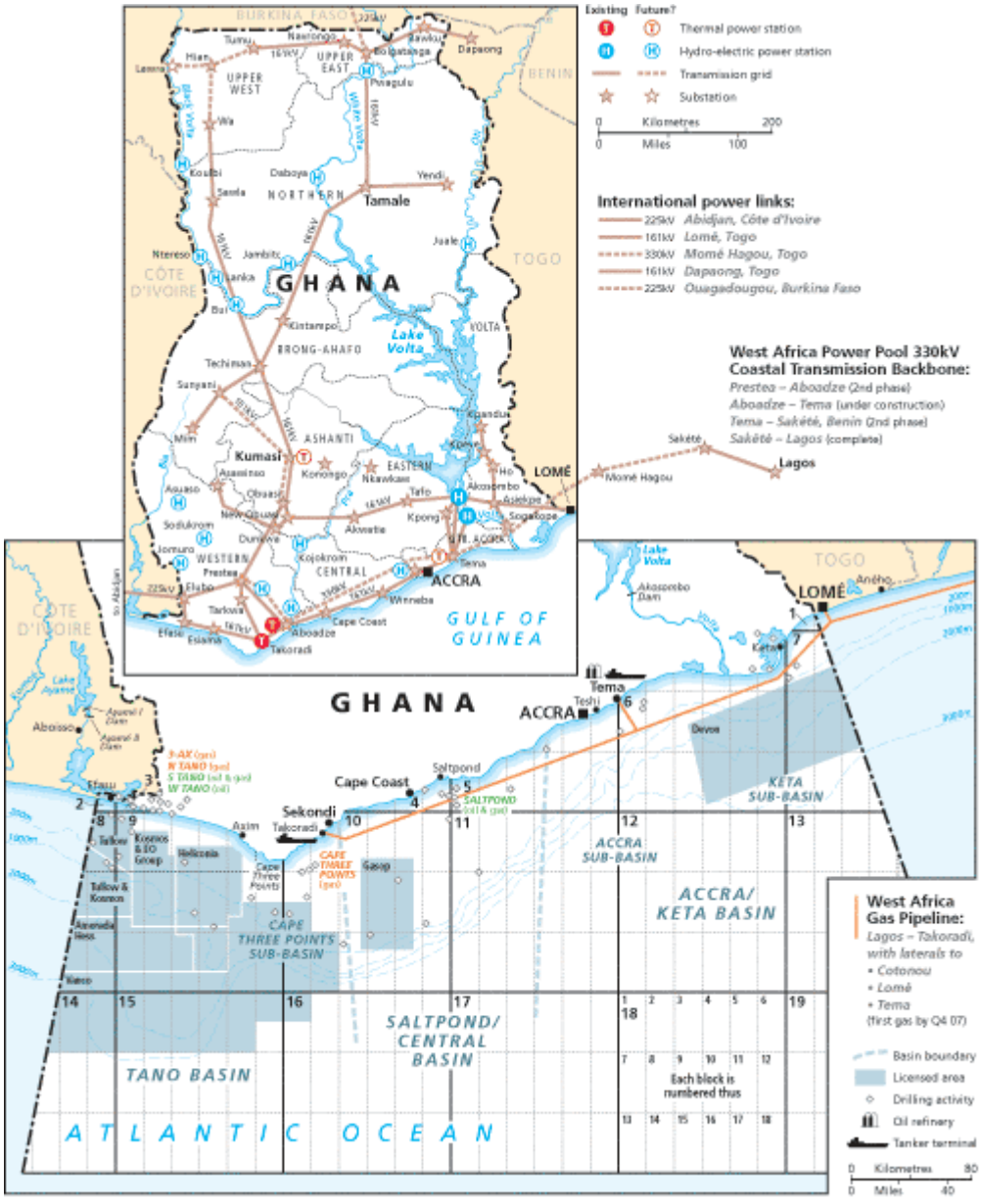
d) Tarkwa-Bogoso-Ayamfuri:- *The Tender Evaluation Report has been completed and forwarded to the European Union for review. EU has provided about 83 million Euros for the works which is scheduled to commence by early 2011.*

e) Ayamfuri-Asawinso:- *Draft Tender Documents for procurement of works have been submitted to the World Bank. Tenders are to be launched before the close of this year. The works are estimated to cost US$52 million.*

Power Supply

Larger oil palm mills are self sufficient in power once they are started up and running. Generally the fibre is burned to produce steam which is used to drive a turbine to generate power. However they do need reliable mains power for start up during the lean season and when the mill is only running on a part time basis. Many large mills around the world now incorporate cogeneration facilities which enable them to sell excess power into the electricity distribution system and earn additional revenue. The Ghanaian government has embarked on massive electric power distribution throughout the country (figure 5.5) especially in areas proposed for the development of new and replanting of existing low yielding oil palm plantations and establishment of new and expansion of processing mills

Figure 5.5: National Electric Power Distribution Grid



Water Supply

Oil palm mills use a large quantity of water when processing and so it is important to have a good supply close at hand. A river which runs year round is ideal. The proposed areas of development are well served by perennial rivers and streams. (Of course there are large quantities of waste water produced and this needs to be treated properly to bring the BOD/COD down to satisfactory levels before it can be discharged). Environmental management should be an important function at any palm oil mill but unfortunately it is completely neglected at many small mills to the detriment of the environment.

5.1.5 Yield Projections

Yield projections in mt FFB cover the 50,000ha development and the 110,000 ha replanting programmes.

(i)Smallholder development

a) Ashanti region: Yield Projections in mt FFB

2017	2018	2019	2020	2021	2022	2023	2024	2025
2000	6000	10000	10000	10000	12500	12500	12500	12500
		2000	6000	10000	10000	10000	12500	12500
				2000	6000	10000	10000	10000
						2000	6000	10000
								2000
2000	6000	12000	16000	22000	28500	34500	41000	47000

b) Central region: Yield Projections in mt FFB

2017	2018	2019	2020	2021	2022	2023	2024	2025
	2000	6000	10000	10000	10000	12500	12500	12500
		2000	6000	10000	10000	10000	12500	12500
			2500	7500	12500	12500	12500	15625
				2000	6000	10000	10000	10000
					2000	6000	10000	10000
						2000	6000	10000
							2000	6000
								2000
	2000	8000	18500	29500	40500	53000	65500	78625

c) Eastern region: Yield Projections in mt FFB

2017	2018	2019	2020	2021	2022	2023	2024	2025
	2000	6000	10000	10000	10000	12500	12500	12500
		4000	12000	20000	20000	20000	25000	25000
			2500	7500	12500	12500	12500	15625
				2000	6000	10000	10000	10000
					2000	6000	10000	10000
						2000	6000	10000
							4000	12000
								2000
	2000	10000	24500	39500	50500	63000	80000	97125

d) Volta region: Yield Projections in mt FFB

2017	2018	2019	2020	2021	2022	2023	2024	2025
	2000	6000	10000	10000	10000	12500	12500	12500
			2500	7500	12500	12500	12500	15625
					2000	6000	10000	10000
							2000	6000
	2000	6000	12500	17500	24500	31000	37000	44125

e) Western region: Yield Projections in mt FFB

2017	2018	2019	2020	2021	2022	2023	2024	2025
2000	6000	10000	10000	10000	12500	12500	12500	12500
		2000	6000	10000	10000	10000	12500	12500
			2500	7500	12500	12500	12500	15625
				4000	12000	20000	20000	20000
					4000	12000	20000	20000
						4000	12000	20000
							2000	6000
								4000
2000	6000	12000	18500	31500	51000	71000	91500	110625

(ii) 10,000ha Nucleus estate development

Western region: Yield Projections in mt FFB

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
4,000	20,000	57,000	99,000	125,000	130,000	140,000	150,000	150,000	150,000

(iii)110,000 replanting programme: Yield Projections in mt FFB

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Eastern		7,040	28,160	63,360	98,560	133,760	186,560	239,360	292,160	344,960
Western		6,160	24,640	55,440	86,240	117,040	163,240	209,440	255,640	301,840
Central		3,520	14,080	31,680	49,280	66,880	93,280	119,680	146,080	172,480
Brong Ahafo		2,200	8,800	19,800	30,800	41,800	58,300	74,800	91,300	107,800
Ashanti		2,200	8,800	19,800	30,800	41,800	58,300	74,800	91,300	107,800
Volta		880	3,520	7,920	12,320	16,720	23,320	29,920	36,520	43,120
Total		22,000	88,000	198,000	308,000	418,000	583,000	748,000	913,000	1,078,000

(v) National yield projection for all developments

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
New nucleus estate	4,000	20,000	57,000	99,000	125,000	130,000	140,000	150,000	150,000	150,000
New smallholder	-	4,000	18,000	48,000	90,000	140,000	195,000	252,500	315,000	377,500
Replanting		22,000	88,000	198,000	308,000	418,000	583,000	748,000	913,000	1,078,000
TOTAL	4,000	46,000	163,000	345,000	523,000	688,000	918,000	1,150,500	1,378,000	1,605,500

5.1.6 Number of farmers involved

(i) 40,000ha Smallholder development estimated cumulative number of farmers

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1,000	2,500	5,000	7,500	10,000	15,000	15,000	17,500	20,000	20,000	20,000	20,000

It is assumed that each smallholder will be allocated 2 ha.

(ii) 110,000 ha replanting programme

It is assumed that each independent smallholder already owns average 2ha of oil palm plantation which requires replanting. The total number of farmers to be assisted is therefore 55,000 farmers at the end of the 10 year replanting programme.

5.1.7 Participation of women

Women perform specific tasks in oil palm development, field maintenance and harvesting. Mill/plantation development can employ over 200 permanent workers and over 2,000 seasonal workers and studies have demonstrated that women form the majority of the workforce in the oil palm industry. During the plantation development stage which covers 3 years, 1 person is employed per 10 hectares per year for 3 years or 1 woman is employed per 7 ha per annum while 1 man covers 3 ha. During the mature stage which covers years 4 to 25, total persons employable is 1 person: 15ha or 1 woman: 10ha per year and 1 man: 5ha.

During the period of immaturity of the 50,000ha oil palm development it is estimated that average participation of women will be 3,500 per annum and at the stage of maturity women to be employed is estimated as 5,000 per year.

For the 110,000ha replanting programme the figure is estimated as 8,100 women per annum and the total requirement is estimated as 11,000 women per year during the period of maturity.

5.2 PROCESSING

5.2.1 Palm oil consumption in Ghana

Forecasted consumption of CPO is summarized in Figure 5.6.

5.2.2 Value added products

Forecasted CPO production in mt for the production of selected value added products is summarized in Figure 5.7.

Forecasted production of selected value added products in mt are summarized in Figure 5.8**.**

Figure 5.6: Forecasted consumption of CPO: 2011-2025

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CPO Domestic consumption	169,000	186,000	186,000	186,000	205,000	225,000	247,500	272,250	299,475	329,423	362,365	398,601	438,461	482,307	530,538
Unbranded local refined oil	7,000	7,000	7,000	7,000	7,000	7,000	7,700	8,470	9,317	10,249	11,274	12,401	13,641	15,005	16,506
Branded local refined oil	120,000	120,000	120,000	120,000	120,000	120,000	132,000	145,200	159,720	175,692	193,261	212,587	233,846	257,231	282,954
Sub-total	127,000	127,000	127,000	127,000	127,000	127,000	139,700	153,670	169,037	185,941	204,535	224,988	247,487	272,236	299,459
Magarine	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
Soap	67,633	72,903	78,583	84,707	91,307	98,422	106,091	114,358	123,269	132,875	143,229	154,389	166,420	179,387	193,366
Sub-total	102,633	107,903	113,583	119,707	126,307	133,422	141,091	149,358	158,269	167,875	178,229	189,389	201,420	214,387	228,366
TOTAL	229,633	234,903	240,583	246,707	253,307	260,422	280,791	303,028	327,306	353,815	382,763	414,377	448,907	486,623	527,825

Figure 5.7: Forecasted CPO production in mt for the production of selected value added products : 2011-2025

CPO PRODUCTION	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
PRODUCTION FROM EXISTING AREA	146,672	149,356	147,545	145,503	147,372	145,967	144,248	141,017	137,478	133,614	137,489	141,571	145,677	149,901	149,901
50,000 HA NEW DEVELOPMENT	-	-	-	-	-	800	4,800	15,000	29,400	43,000	54,000	67,000	80,500	93,000	105,500
110,000HA REPLANTING PROGRAMME	-	-	-	-	-	-	4,400	17,600	39,600	61,600	83,600	116,600	149,600	182,600	215,600
SMALL MILLS UPGRADING PROGRAMME	-	-	24,705	49,410	74,114	98,819	123,524	123,524	123,524	123,524	123,524	123,524	123,524	123,524	123,524
TOTAL PRODUCTION	146,672	149,356	172,250	194,913	221,486	245,586	276,972	297,141	330,002	361,738	398,613	448,695	499,301	549,025	594,525

Figure 5.8: Forecasted production of selected value added products in mt

Description	**2,011**	**2,012**	**2,013**	**2,014**	**2,015**	**2,016**	**2,017**	**2,018**	**2,019**	**2,020**	**2,021**	**2,022**	**2,023**	**2,024**	**2,025**
Refined oil	73,043	73,043	73,043	73,043	73,043	73,043	80,348	88,383	97,221	106,943	117,637	129,401	142,341	156,575	172,233
Soap stock	52,174	52,174	52,174	52,174	52,174	52,174	57,391	63,130	69,443	76,388	84,027	92,429	101,672	111,839	123,023
Magarine	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235	43,235
Soap	78,970	85,124	91,757	98,907	106,614	114,921	123,876	133,529	143,934	155,150	167,239	180,271	194,318	209,460	225,781

5.3 INDUSTRIAL APPLICATIONS

5.3.1 Holistic utilization of produce and by-products of oil palm

i) Use of Fatty Acid

Generally fatty acid is used for preparing soap in Ghana but there is a process called fat splitting by which Stearic Acid can be prepared which is used in the tyre, paint and pvc industries. Apart from this, during this process glycerin is produced as a by product which also has a high commercial use.

ii) Conversion of fatty acid to edible grade

Fatty acid which is non edible grade can be converted into edible grade by esterification glycerolysis. This product is used in making margarine and other bakery products.

iii) Extraction of oil from bleached spent earth

Generally spent bleached earth consists of 20 – 25% of oil. This oil can be extracted by heating and pressing method and the oil is used for making soap.

iv) Bio diesel from palm stearin

It will be costly to prepare bio diesel from CPO or palm olein but the market price of these products is increasing day to day. The best method to prepare bio diesel is from palm stearin and the process used of trans esterification. This also gives the by product glycerin which has a good economical value.

v) Preparation of hydrogen gas

Hydrogen gas can be prepared by electrolysis of demineralised water. This process produces hydrogen gas and oxygen. Hydrogen gas is used in hydrogenation of vegetable oil to produce margarine and other bakery products. In addition oxygen gas can be bottled for industrial use.

vi) Bio diesel from fatty acid

It is very economical to produce bio diesel from fatty acid by the process of acid esterification.

vii) Synthetic Lubricants

Although synthetic lubricants are not new, since the mid 1980s they have captured a major market share. This is the result of their excellent performance hence they are in high demand from equipment manufacturers and consumers because of fuel economy concerns and more recently environmental issues. As a result, synthetic lubricants are among the fastest growing outlets for raw materials which include fatty acids. Traditional fatty acid sources are projected to have a flat or minimal growth rate and alternate sources for fatty acids need to be developed to maintain a stable economic supply. Palm oil and palm kernel oil appear to offer the future stability of supply and profitability into the 21st century.

5.3.2 Downstream processing

The main downstream products which are manufactured in Ghana such as soap, cooking oil and margarine are in high demand. It is proposed that existing and new firms take advantage of given subsidies, tax incentives and well set traffic and non-tariff barriers to encourage them to compete locally and internationally.

5.4 ENGINEERING AND CAPITAL GOODS MANUFACTURING

i) Industrial manufacturing projects

The objective is to manufacture specific capital goods to support the oil palm industry. Specific capital goods proposed to be manufactured in Ghana are motors to run electric, diesel, bio fuel generated power units, water and vegetable oil pumps, steel cages, boiler systems, shafts and gears, bearings, bolts and nuts. Already Suame Magazine Industrial Development Organization (SMIDO), a private sector cluster of small scale capital goods manufacturing associations including service providers are gearing themselves to raise adequate capital and acquire technologies to facilitate the manufacture of the requirements of the oil palm, extractive (mining, oil and gas), transport industries and other manufacturing concerns. We propose that the government of Ghana forms a joint venture company or companies to facilitate successful operations of manufacturing above listed capital goods. These are already in high demand and with the projected growth of the oil palm industry demand is expected to increase considerably.

ii) Financial support required

The Government of Ghana has already provided 5 million to SMIDO to retool itself and BUSAC is expected to provide an additional US$3.5 million to SMIDO to finance upgrading its production facilities in order to serve the capital goods market.

5.5 OIL PALM RESEARCH REQUIREMENTS

The list of current research topics being undertaken at the CSIR Oil Palm Research Institute were described in chapter 2. This section describes future research requirements.

Productivity is dependent on good seeds, application of proven production practices and technologies in the plantations and processing factories and refined by multidisciplinary research. Over the next 15 years research should be focused on productivity improvement on soils and areas most climatically suitable for oil palm production and improved seeds with higher yields of palm oil per hectare in Ghana.

5.5.1 Seeds

(i) Productivity improvement

Research is needed to improve productivity in terms of CPO/ha/annum from the current national average of 0.72mt[4].

(ii) Development of drought tolerant oil palm materials

With the rapid changing / evolving climate in most parts of the oil palm belt in Ghana towards a reduced and less evenly distributed rainfall, long dry spells of about 4-5 months and a diminishing forest belt, it has become imperative to develop planting materials for the varying (drier) environments. Inadequate water supply reduces transpiration, photosynthesis and impairs root function. Studies have shown that different oil palm progenies have differing growth characteristics and associated stress responses. Differences in progeny root size may be advantageous for efficient water uptake during drought. This advantage could be manipulated by Breeders and Agronomists to produce drought tolerant progenies for increased production and to assure farmers of sustainable income.

5.5.2 Soils

Dominant soils in areas climatically suitable for oil palm in Ghana are middle to lower slope and valley bottom soils which are classified as Nzima, Kokofu and Temang series and also Bekwai series which is a summit and upper slope soil. These soils tend to be very acidic because of excessive leaching of bases.

Current FFB productivity is 10.4 – 10.5 mt/ha for Kokofu and Temang series, 13.4t/ha – 13.5t/ha for Nzima. For the Bekwai series yields of 8.7t/ha – 13.3t/ha have been reported (Asamoah and Nuertey, 2005)

Soil amelioration studies to reduce soil acidity levels (increase ph) in Nzima, Kokofu, Temang and Bekwai soil series are required.

Trials of oil palm seeds to be released by Ghana Sumatra Limited to determine CPO/ha/annum for planting on Nzima, Kokofu, Temang and Bekwai soil series located in areas with 230-260 mm moisture deficit are proposed.

Fertility levels of most soils in Ghana are inherently poor. Sedentary crop production without the appropriate addition of soil nutrients coupled with sound management practices results in steady decline in production and ultimately crop failure. The importance of fertilization have been underlined by many researchers who have stated that total crop uptake over 10 years were 428,700 tons nitrogen, 73,100 tons phosphorus and 414,900 tons potassium with over 50% in the grain and other edible parts. Oil palm like other perennials requires a constant supply of fertilizers. Many planters cannot afford the high cost of fertilizers hence the use of cheaper types

[4] 3mt to about 5mt is achieved in neighbouring la Cote D'Ivoire

especially in the Western region is justified. The need to fertilize oil palm for increased and sustainable production in Ghana is now critical considering the huge investment in the industry. To obtain predicted results and to ensure a sustainable oil palm industry, it is imperative to develop appropriate fertilizer recommendation for oil palm on benchmark soils.

The importance of soil microbial biomass has gained attention due of the high cost of inorganic fertilizers. These are important component in sustainable cropping systems especially where access to inorganic fertilizers are limited. Microbial biomass provides a rich source of nutrients for plants, readily available source of organic matter, increase soil aggregation, infiltration, microbial activity, structure, and water-holding capacity and can reduce soil compaction and erosion.

5.5.3 Rainfall

The amount and distribution of rainfall affect FFB yield as explained in chapter 3. Drought conditions seem to have become more frequent over the past decade compared to 3-4 decades ago.

Climate change may increase the frequency of extreme weather events particularly droughts in the future. Research needs to be continued[5] into breeding new oil palm varieties which can still yield 15mt FFB/ha or 3.75 mt CPO/ha/annum or more even when growing under less than ideal conditions including periods of drought.

Hartley (1988) stated the most favourable rainfall regime for oil palm cultivation as 2000mm/anum or more distributed evenly throughout the year with no marked dry seasons. Van der Vossen in 1969 delineated the suitability or otherwise of areas for oil palm cultivation in Ghana. The map showed areas climatically optimum as having 150 mm water deficit, favourable (250 mm water deficit) and suitable (400 mm water deficit) per year for economic oil palm cultivation in Ghana.

This map has been the basis for siting oil palm plantations in Ghana. However, since 1969 the climate in the oil palm belt of Ghana has evolved. Recent studies by Danso *et al*. (2008) have shown that water deficit values for areas around Kusi (optimum), Assin-Fosu (favourable) and Akumadan (suitable) zones for oil palm cultivation according to Van der Vossen (1969) have changed significantly from 150 to 250 mm, 250-350 mm and 400-570 mm. The changing climate has necessitated a review of the map delineating oil palm zones within Ghana.

There is need to review further the work by Van der Vossen in 1969 and to develop a current and detailed map that delineates areas climatically suitable for oil palm cultivation in Ghana.

[5] Ghana Sumatra has released recently four selected oil palm crosses which have the potential of yielding 17-20 MT/ha or greater.(November 2011)

5.5.4 Agronomy

Small scale oil palm farmers in Ghana intercrop their oil palm with food crops (cassava, plantain, maize, rice etc). Under the normal oil palm spacing of 8.8m x 8.8m triangular, food-crops can only be grown for the first four years before the oil palm canopy closes. However farmers would like to intercrop their palms continuously. To achieve this they prune the oil palm fronds excessively at the beginning of the cropping season to allow maximum sunlight penetration for effective growth of food crops. In order to sustain increase productivity of the crop mixtures, it is necessary to establish a practicable and economically viable fertility management strategy for the various spatial arrangement of food crops intercropped in oil palm.

Oil palm is predominantly grown as a monocrop. The competition for soil resources between weeds and oil palm has been a major challenge in plantation management, as aggressive and excessive growth of weeds depresses early crop growth and yield. The vast land area in an immature oil palm plantation containing different leguminous cover crops that are grown to smother weeds is a good niche for sheep production. The oil palm plantations provide not only a favourable climatic environment but also good quality forage with a high metabolisable energy and crude protein content for animal production.

The grazing activities of the livestock could also serve as a means of controlling the excessive weed growth on oil palm plantations and an opportunity to increase income by integrating small ruminants into their farming system.

However, the extent of the effect of oil palm-sheep on palm growth and production in Ghana is unknown. The questions associated with palm and livestock production such as the stocking rate effects, soil compaction due to grazing, the suppression effect of weeds to oil palm and the consequence of frond damage to yield, are yet to be quantified. The production of small ruminants under oil palm plantations must be promoted through researcher managed projects. The essence of which is to assess effect of sheep - oil palm integration and to develop a viable animal production system under oil palm.

5.5.5 Crop Protection

In Ghana, the oil palm leaf miner, *Coelaenomenodera lameensis* is the key pest of the oil palm among other insect pests. This pest can cause havoc on plantations and farms in outbreak situation and significant yield reduction (50%) within 2 years. Besides yield reduction, it is also very expensive to control the pest outbreak.

In addition, diseases such as Fusarium wilt can add to the complex problems of oil palm cultivation.

Such pests and disease problems can be kept to the barest minimum if effective Phytosanitory surveillance and monitoring systems are put in place and incorporated in any programme as technical back stopping for oil palm cultivation and also farmers are made aware to co-operate and avoid indiscriminate use of pesticides.

5.5.6. Downstream oil palm based products research programme

Processing of oil palm fruits and kernel in Ghana have always ended in the production of palm oil and in a few cases olein. This falls far short of the many by-products in the value chain of palm oil which can increase the income earning of processors and organisations involved in the export of vegetable oil products.

Research is required in Ghana to exploit these downstream products in the value chain and this requires the services of a Biochemist which is non-existent at the CSIR-OPRI. It is therefore important to establish a Biochemistry Division at the Institute.

As palm oil exports expand, contamination by pesticides as well as dilutions of oil using Sudan IV will be critical in maintaining export markets. Of importance will also be the issue of FFA content of microbial contaminants from small scale oil producers. This also requires the services of Biochemist.

5.5.7 Breeding

(i) Prospecting collecting and evaluation of the wild germplasm around Ghana.

Genetic variation is the key raw material in all crop improvement endeavours and because oil palm is indigenous to West Africa, there is considerable variation in the wild germplasm. However, due to urbanisation much of this is being lost and there is a need to collect and characterise as much germplasm as possible for future breeding.

5.5.8 Other Areas That Need Funding

(i) Capacity building is required e.g. training of experts in genetic diversity studies and marker genes assisted progeny selection

(ii) Equipment e.g. laboratory instruments for Breeding, Agronomy and Molecular Biology

(iii) Vehicles for field operations.

5.5.9 Lethal yellowing disease

Lethal-yellowing type disease or Cape Saint Paul Wilt Disease (CSPWD) of coconut has spread across the coastal belt of Ghana (see Figure 3.13 chapter 3) starting from the east (Keta area) in 1932 to the west (Half Assini) by 1990. The disease zone now stretches from Ampain in the west to Keta in the east along the coast.

The disease is caused by a ***phytoplasma*** and is found in Africa and the Caribbean. The symptoms of the disease on coconut are premature nut drop with or without yellowing of fronds and blackening of immature inflorescences. This is followed by progressive yellowing or in some instances browning of the crown from the older leaves upwards. Eventually, the crown turns yellow, dries up and then falls off, leaving a bare trunk or "telephone pole". Two types of spread of CSPWD have been observed. In one type, a local centre of infection appears in one or two coconut palms; this is followed by new cases appearing at random around the initial centre. The second is a "jump spread" whereby the disease appears at a spot remote from a known focus. This is then followed by a local spread in all directions.[6] There is a perception that Lethal Yellowing Disease could also impact on oil palm and research is required to determine whether this is the case.

5.5.10 Methods of dissemination of information among the operators

OPRI uses the Research Extension Linkage Committees for Sustained Communication Strategy. OPRI coordinates with the Western and Eastern Regional Committees. Through the Research Extension Linkage Committees, OPRI/MOFA farmers set priorities for research and extension activities on all crops. This strategy allows for a market or client driven approach to research and for effective dissemination of research findings through extension agents. Research extension linkage committees have been established by MOFA in all 10 regions of Ghana.

5.5.11 Collaboration with other foreign institutions engaged in oil palm and oil seeds research,

Seed and staff exchange programmes are being done with external research institutions notably Sumatra-Biosciences – staff orientation and exchange of commercial pisifera pollen and seeds produced and Aberystwyth University, UK for molecular characterization and genetic diversity analysis.

[6] Joe NKANSAH-POKU et al (Mars-Avril 2009) Cape Saint Paul Wilt Disease of coconut in Ghana: surveillance and management of disease spread OCL VOL. 16 N° 2

5.6 RELATION BETWEEN THE VARIOUS OPERATORS IN THE OIL PALM INDUSTRY

i) Role of Government

We propose that the Government of Ghana continue to play the leading role in moving the industry forward over the next 15 years through the creation of the Ghana Oil Palm Development Board, (GOPDB) along similar lines as the Malaysian Palm Oil Board which was established over 11 years ago (see Text box 5).

Text Box 5 – MALAYSIA PALM OIL BOARD (MPOB)

MPOB was incorporated by an Act of Parliament (Act 582) and established on 1 May 2000, taking over, through a merger, the functions of the Palm Oil Research Institute of Malaysia (PORIM) and the Palm Oil Registration and Licensing Authority (PORLA). The appropriate policy framework developed over the years since formation of MPOB by Government of Malaysia, led to rapid development of the Malaysian oil palm industry by various private and public institutions each handling some aspect of the industry in that country.

Functions of the proposed GOPDB are as follows:-

1. To implement policies and development programmes to ensure the viability of the oil palm industry of Ghana.
2. To conduct and promote research and development activities relating to the oil palm industry.
3. To regulate, register, co-ordinate and promote all activities relating to the oil palm industry.
4. To develop and promote efficient markets for oil palm products in Ghana.
5. To liaise and co-ordinate with other organisations inside and outside Ghana to further enhance the oil palm industry of Ghana.
6. To plan and implement training programmes and human resource development in line with the needs of the oil palm industry.
7. To serve as the resource and information centre including publication and dissemination of information on the oil palm industry.

8. To develop, promote and commercialise research findings as well as provide technical, advisory and consultancy services to the oil palm industry.

Funding as noted in chapter 2 is to be generated from a levy to be imposed by legislation. The quantum of the levy must be graduated according to the size of enterprise and negotiated between GOPDA and GOPDB.

ii) Creation of an apex body

In chapter 3 we discussed the revival of the industry apex body and we proposed that the Government gives adequate support to this body to assist it in implementing this master plan. The new body has taken the name of the defunct apex body of the 1980s and 1990s GOPDA.

iii) Relationships of industry players

GOPDA should play a gate-keeping/watchdog and peer-reviewing role in ensuring members adhere to sustainable agricultural practices as prescribed by the Round Table on Sustainable Palm Oil (RSPO) as described in chapter 6.

5.7 FINANCIAL ARRANGEMENTS

Costs and Economy of the Development Programme

i) Taxes and duties

GIPC has abolished the tax exemption for importation of vehicles by companies investing in the agricultural sector including the oil palm industry because of abuse of the exemption in the past.[7] It was noted in Chapter 2 that the right duties and taxes were not being paid by some vegetable oil and soap importers and traders whereas these products are among the major palm oil based products imported into Ghana. Since the proposed 50,000ha new plantation and 110,000 ha replanting programmes are all to be tackled as Government of Ghana programmes it is proposed that taxes on vehicles to be procured are exempted from taxes and duties.

ii) Different types of financing involved in the development programme.

Loan and equity financing are the two main types of financing available for the development projects proposed and these are discussed in more detail in chapters 4 and 7.

iii) Development of the agricultural credit and the scheme of settlement

We propose the development will follow both smallholder and outgrower credit and settlement schemes which have previously been successfully implemented in Ghana (chapter 2). In the new 50,000 ha development and 110,000 replanting programme extended credit repayment period of 18 years including grace period of 5 years is proposed. This extended repayment period was proposed to ensure that

[7] Pers. Comm. : Ghana Invesment Promotion Centre

beneficiaries will supply FFB to mills throughout commercial life span of the plantations.

Existing smallholder and outgrower schemes concentrated on extending credit in kind and in cash to qualified beneficiaries. However no attention was paid to the establishment of settlement schemes because it was assumed that the beneficiaries would improve their existing houses and/or construct new ones to allow for growth and development of their respective settlements. Indeed the team during their visits to stakeholders across that the country observed that most beneficiaries of previous smallholder and outgrower schemes have improved their existing houses and even built new houses hence the policy not to create new settlements was sound.

iv) Donor's role and private financing of the agricultural credit component.

We propose that donors continue to provide long terms loans at concessionary terms (chapter 4) to enable the industry to grow and develop over the next 15 years. On private financing of the agricultural component, private financing institutions must be encouraged to participate in the industry as equity partners (chapter 4) to ensure that the projects proposed will be developed successfully.

v) System of funding oil palm research

Industry players including the Government of Ghana have agreed to resource OPRI to deliver on its mandate[8]. Adoption of this position similarly led to the enactment of the law on funding oil palm research and development programs undertaken by Oil Malaysian Oil Palm Board[9] for more than three decades now where a research cess or levy of RM 11.00 (US$ 3.15) was imposed and collected on every tonne of CPO or PK produced[10]. Special research however continued to receive funding from the Government of Malaysia. With this source of funding Malaysian Oil Palm Board has been undertaking research and development along the entire oil palm supply chain. Major technologies have been developed by Malaysian Oil Palm Board that had made the transition from the laboratory to the market place. Again several comprehensive Codes of Practice for environmental, social, and economic management have been developed.

Industry players in Ghana again proposed levying a small percentage on production of CPO/PKO sold and also a small tax on imported CPO/PKO that are combined to fund OPRI function[11]. OPRI function forms part of the 8 functions [Section 5.6 (i)]

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[8] **A communiqué issued by the reconstituted Ghana Oil Palm Development Association following a meeting they held with the Minister of Food and Agriculture on 20Tth April 2011**

[9] The research cess (levy) of RM 11 (US$ 3.15) funded oil palm research and development in Malaysia since the 1970s.

[10] THEO Cheng Hai (November 2002):The Palm Oil Industry in Malaysia from Seed to Frying pan prepared for WWW Switzerland

[11] To conduct and promote research and development activities relating to the oil palm industry

of Ghana Oil Palm Development Board hence the fund to be generated from the levy will be split among these functions.

With various interventions proposed in this study Ghana must adopt the cess or levy of US$ 3.15 on every tonne of CPO or PKO produced and sold as well as a small tax on imported CPO/PKO and products made from CPO/PKO. Immediately a levy or tax of US$ 1 is proposed for the next 5 years followed by US$3.15 to be imposed by law from the 6th year onwards when considerable increase in CPO output will be achieved with the interventions. The levy estimated to be generated from increased CPO production alone with the interventions will average US$ 400,000 for the first five years and subsequently US$ 2.5 million per annum. Tax on current level of cooking oil import alone will average US$ 70,000 for the first 5 years and from the 6th year onwards US$ 450,000 per annum. Presently OPRI requires US$ 1.6 million per annum[12] to fund its research activities to deliver on its mandate.

[12] Pers. Comm. Dr. S. Dery Director Oil Palm Research Institute, Kusi

CHAPTER 6:
CROSS CUTTING – ISSUES

A. ROLES OF WOMEN

6.1 GENDER DISTRIBUTION

Women play an important role in both the production and sale of palm oil. Men and women experience many aspects of poverty differently and ignoring these differences risks further entrenching poverty and the subordination of women.

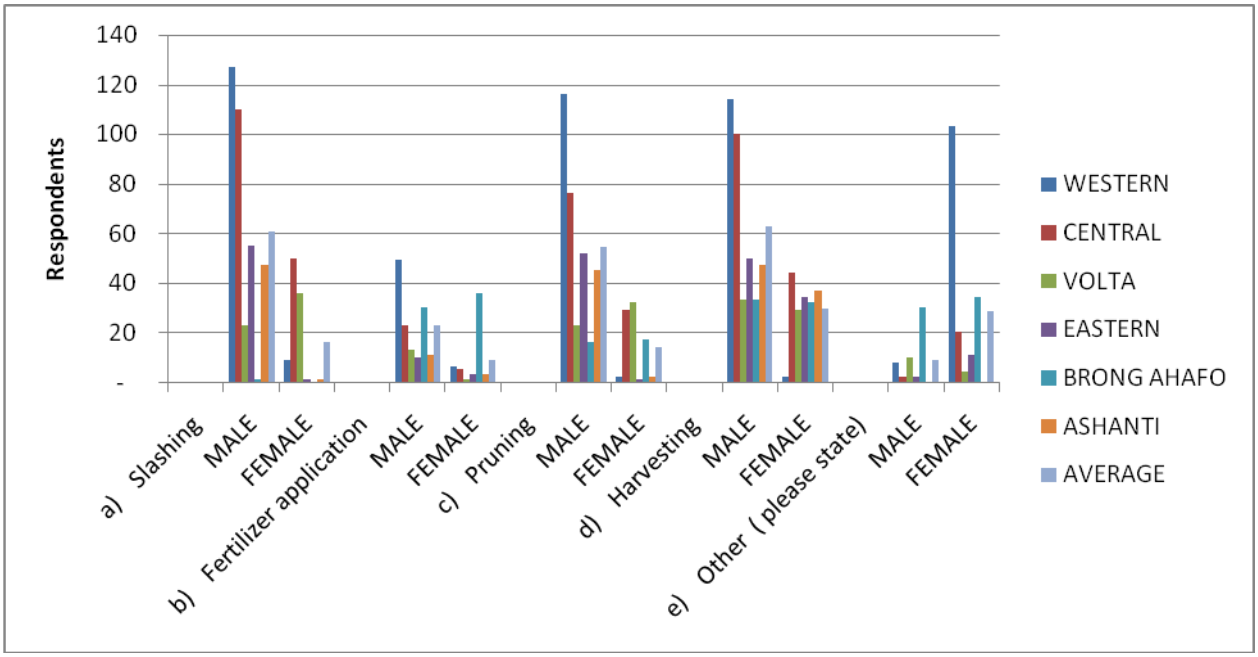
Women bear primary responsibility for child-rearing, cooking, washing, and collecting fuel-wood and water. According to Lalonde (2002), relatively few women work in modern or formal sector activities. According to the African Development Fund, in 2008, women accounted for 50.1 % of the total labour force in Ghana. There was a high concentration in the agricultural sector (51.1 %), followed by trade (27.4 %) and manufacturing (13.9 %). Of the economically active women, 21 % worked as unpaid family workers in agriculture as compared to 9.6 % of men. Most of the women (95 %) are employed in the informal sector against 80 % of the men. While a very small number of women own medium and large-scale enterprises, the majority are engaged in small or micro businesses, of which 60 to 80 % are located in rural areas. Women tend to operate the more traditional low-income businesses, such as food processing, street food vending, handicrafts, and dress-making, often with low potential for growth.

Palm oil is very important as an income earner for women. Although there are some exceptions in most cases it is women who are in charge of processing the oil palm fruits into palm oil and of selling the product in the local and even international markets. Although there seem to be more women engaged in sales and services, most of these jobs are either agro-based or done in conjunction with other activities to ensure regular and secure income all year round.

6.1.1 Gender distribution of labour on oil palm plantations

As expected, there is division of labour along gender lines (Figure 6.1). On oil palm plantations of all sizes, men tend to be engaged in activities which demand more physical exertion performing activities such as slashing or clearing of weeds, pruning of the oil palms and harvesting of fruits. Women are engaged in activities such as application of fertilizers, carrying of FFB, loose fruit picking and tending oil palm seedlings in nurseries.

Figure 6.1: Task distribution by gender on oil palm plantations

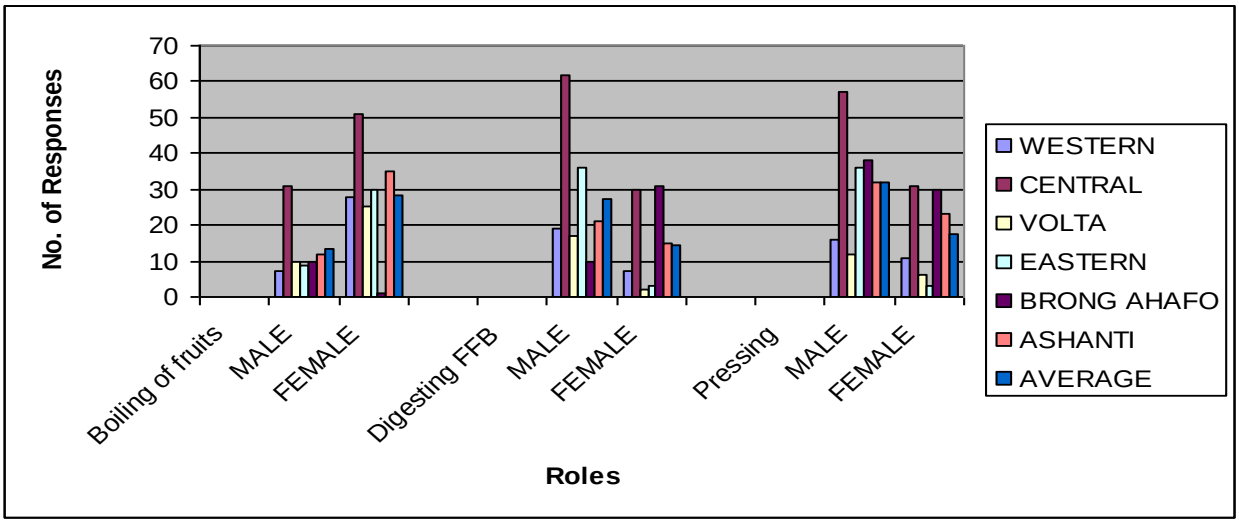


Source: July 2011 Socio-economic survey conducted by MASDAR International

6.1.2 Gender division of labour in palm oil production

As with oil palm farming, it is evident that there is division of labour along gender lines in palm oil production (Figure 6.2). Men carry out more physical tasks such as digesting of the FFBs and the running of manual presses.

Figure 6.2: Men and women's roles in palm oil processing



Source: July 2011 Socio-economic survey conducted by MASDAR International

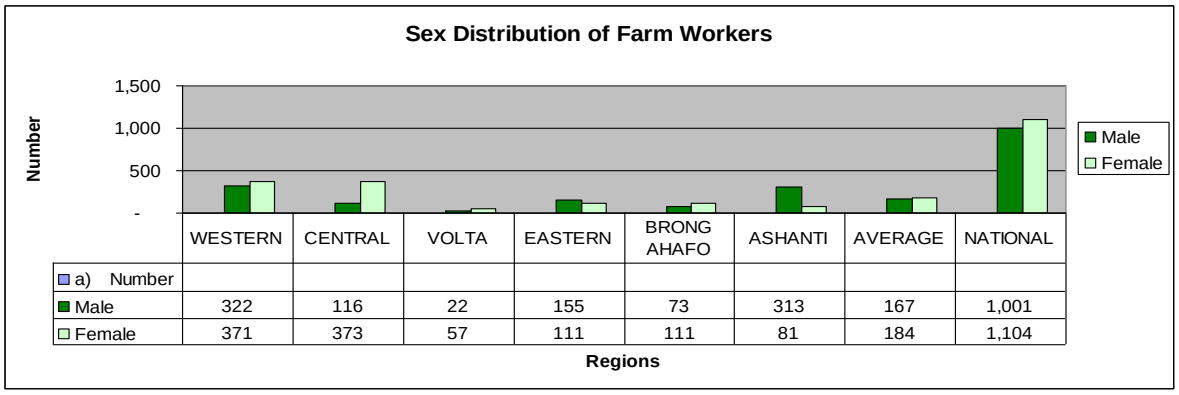
Women are responsible for most of the roles that are linked to cooking such as boiling the fruits and extracting the oil (Figure 6.3).

Figure 6.3: Women's role in cooking FFB and extraction of CPO

6.1.3 Sex Distribution of Farm workers

Figure 6.4 shows that more women work on the farms than men and this confirms similar results obtained in earlier studies and observations. In our survey a total of 1104 women against 1001 men were engaged in oil palm farming, however fewer women work on farms in the Eastern and Ashanti regions than men where male : female sex ratios obtained were 2:1 and 4:1 respectively.

Figure 6.4: Sex distribution of farm workers



a) Number	WESTERN	CENTRAL	VOLTA	EASTERN	BRONG AHAFO	ASHANTI	AVERAGE	NATIONAL
Male	322	116	22	155	73	313	167	1,001
Female	371	373	57	111	111	81	184	1,104

Source: July 2011 Socio-economic survey conducted by MASDAR International

6.1.4 Small scale mechanized FFB processing

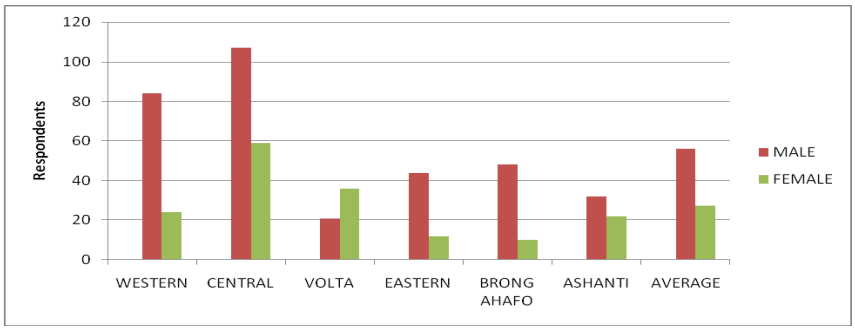
Until the introduction of semi-mechanized means for the production of palm oil in the 1970's, cracking of palm nuts into palm kernels and processing of palm kernel into palm kernel oil and cake on a small-scale was carried out almost entirely by women. Influx of men into palm oil production happened during the economic structural adjustment era of 1980s and early 1990s. The economy was stabilised but the social costs were high. Government support for state owned oil palm plantations was withdrawn because they were making heavy losses and the Government could no longer bear the burden of providing them with annual subventions. Most of the State Farms and Oil Palm Plantations therefore collapsed leading to a massive layoff of skilled labour in palm oil production and oil palm fruit production. A number of skilled labour from the defunct State Farms and Food Production Corporations oil palm plantations took advantage of the opportunities to go into oil palm farming and palm oil production and to invest in semi mechanized palm oil production and oil palm plantations.

6.2 WOMEN'S ACCESS TO RESOURCES

6.2.1 Women's Access to and Control of Land

Although women constitute a large proportion of the agricultural labour force, they lack the resources to improve their productivity and increase their income. Owing to their lack of decision-making powers within households and communities, women have limited access to critical resources such as land, labour, credit and markets. Women often also have limited bargaining power to increase their control over resources, both within families and with community and government decision makers. Male ownership of most land means that improvements through infrastructure provision may bypass women. Insecurity of land tenure is endemic and has bearing upon both poverty reduction and economic growth. Protection of land rights and prevention of abuse of traditional and institutional procedures are critical otherwise women, the poor, illiterate and the youth will be most at risk. As in most parts of the country and confirmed by the socio-economic survey undertaken, land ownership is dominated by men (Figure 6.5) with more than half of the respondents indicating that the land used for their farms was owned by men.

Figure 6.5: Land ownership by gender



Source: July 2011 Socio-economic survey conducted by MASDAR

6.2.2 Marketing

The survey revealed that women face major problems in marketing their products due to a lack of bargaining power – though this problem is faced by all smallscale producers. Due to inadequate infrastructure and high transport costs, 90% of farm produce is head-loaded at the village level mainly by women and children. The general lack of all weather farm-to-village access roads (Figure 6.6) and limited access to intermediate means of transport (i.e. bicycles, push-carts, etc.) imposes significant drudgery on rural populations and contributes significantly to post harvest losses. It is anticipated that the building and/or rehabilitation of roads including feeder roads will favour female players in particular and the industry in general , in this respect.

Figure 6.6: Flooded road linking an oil palm farming community to the outside world

6.2.3 Women's Access to Credit and Business Capital/Incentives

Focus Group discussions revealed that women do have problems with credit. It is therefore important that any projects that seek to address their needs in the industry must seek to address the issue of credit. The new version of the EDIF fund for instance will be favourable in this respect.

In terms of accessing other inputs, women are hampered in terms of availability of time. The dual nature of their roles, both productive and reproductive means that women have less time for training and networking activities which can enhance their performance. This has major implications for the development of their small scale industries. If one is to compare the case of the women processors at the 'wayside mill' at Nkwantanan near Kade, to that of the organised women's group at Aboasa in the Asuogyamang District (both communities in the Eastern region), the need for networking and self-organisation for improved performance cannot be over emphasised.

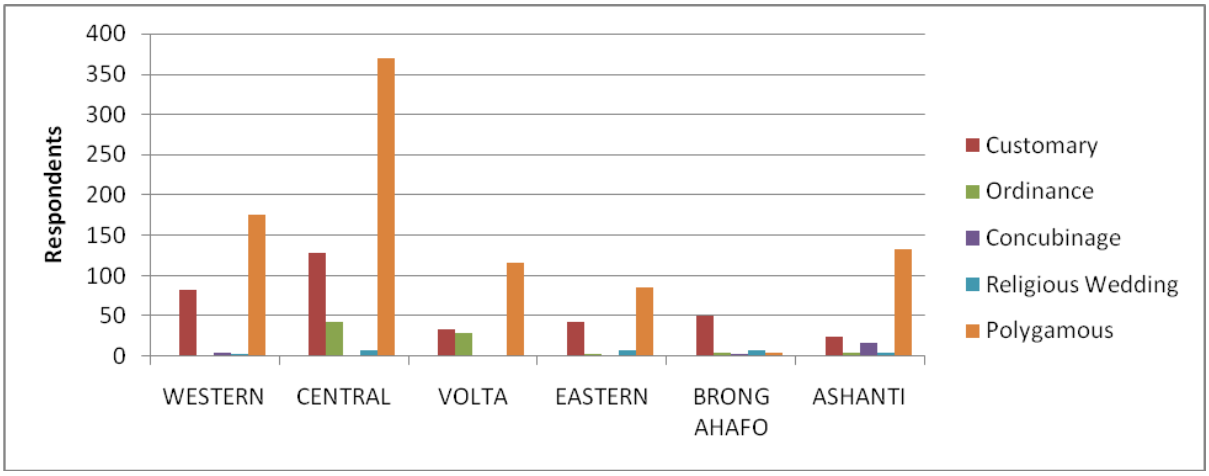
On oil palm plantations women do most of the work in the nurseries and regular, maintenance around the trees. High numbers of women work on the plantations, up

to 60% in some cases, however issues of work safety and decision making capacity remain. Concerns have been expressed about safety from the use of herbicides and pesticides in the nurseries and on the farms. Moreover, with lower levels of literacy, most of these women may not be fully abreast with the information provided during their training, nor do they have the voice to make management changes that would improve their conditions of work.

6.3 DOMINANT KINDS OF MARITAL ARRANGEMENTS

The most dominant kind of marriage identified in the areas was the polygamous marriage (Figure 6.7). Owing to its pluralistic nature and subsequent issues of resource distribution and inheritance, it is important to note that this kind of union has important gender implications that impact more negatively on women than men.

Figure 6.7: Dominant kinds of marriage

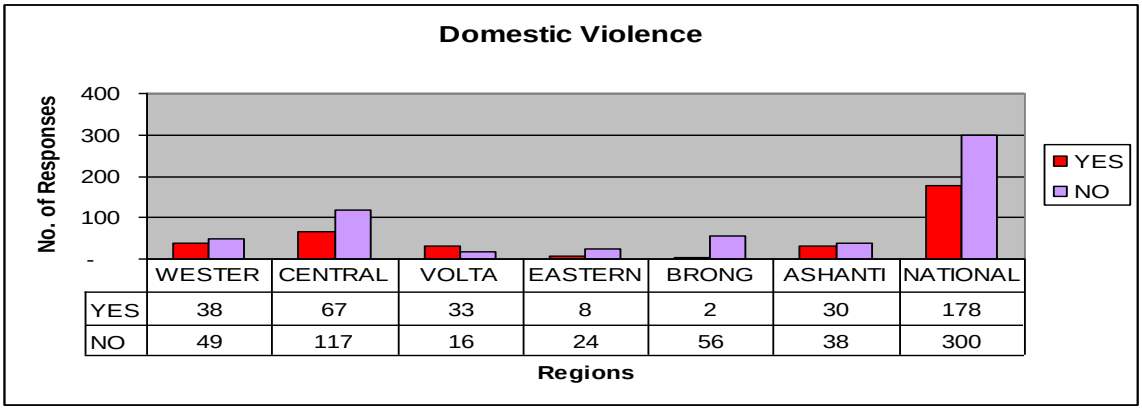


Source: July 2011 Socio-economic survey conducted by MASDAR International

6.4 DOMESTIC VIOLENCE

One gender issue that cannot be overlooked is domestic violence. As is often the case when it comes to issues of such personal nature, many respondents in our socio-economic survey avoided the question and most of them said that it was not a problem in their community. However, it is significant that over 50% of the respondents admitted that domestic violence exists (Figure 6.8).

Figure 6.8: Incidence of domestic violence



Source: July 2011 Socio-economic survey conducted by MASDAR International

B: ENVIRONMENTAL ISSUES

6.5 IMPACT OF EXPANSION OF OIL PALM PRODUCTION AND PROCESSING ON THE ENVIRONMENT

6.5.1 Plantations

Independent smallholder farmers inter crop their oil palm plantations with local staples like yams, cocoyam, maize, cowpeas and cassava and even in some cases with another cash crop like cocoa (Figure 6.9).

Figure 6.9: Smallholder oil palm plantation intercropped with maize

The large oil palm estates on the other hand are distinguished by their pure stand of oil palms, systematic layout, and advanced infrastructure (Figure 6.10).

Figure 6.10: Pure stand oil palm plantation

The most serious adverse effects of expansion of oil palm in Ghana on the environment will be:

a) Transformation of the forest ecosystem from its resilient, diversified, ecologically balanced traditional economy;

b) Displacement of farming of food crops leading to shortages of local staple foods;

c) Scarcity of forest products such as “bush meat” (game), medicinal plants and wood for construction and fuel;

d) Polluting effect of chemical fertilizers which are applied to boost oil palm yields and agrochemicals for controlling pests, diseases and weeds;

e) Spread of leaf miner pest previously found attacking oil palm plantations in Western, Central and Eastern regions recently attacking oil palm plantations in Ashanti region,

f) Increase in populations of the highly destructive rodent known as Tanezumi rat or rice rat (*Rattus tanezumi)* or locally as billa which destroys young oil palm trees and food crops.

6.5.2 Mills

Mills of all sizes generate:

a) Palm oil mill effluent (POME) ;

b) Solid waste –empty fruit bunches (EFB), fibre, palm kernel shells (PKS) , ash and clinker from boiler furnaces;

c) Flue gas from burning of shells from palm nut, fibre or wood used for cooking oil palm fruit, preparing palm oil, palm kernel for production of palm kernel oil and cake (PKC),

d) Sound at abnormal levels from moving machine parts, adjusting steam pressure while sterilizing (cooking) oil palm fruit and operating boilers for steam production.

a) Palm Oil Mill Effluent has particular environmental implications:

Water is converted into steam which is used in processing FFB into palm oil, oil palm nuts are also cracked and separated into palm kernel which is processed into palm kernel oil (PKO) and palm kernel cake (PKC). For medium-large scale mills for every tonne of FFB, a tonne of treated water is used. Hence at the end of processing, sludge, which is a mixture of water, palm oil and dirt is retained in a pit long enough to separate the palm oil to the top and the sludge to the bottom by settling. The sludge is discharged into ponds as palm oil mill effluent (POME).

POME is discharged into water bodies indiscriminately especially by small palm oil producing mills. While small scale mills do not have structures in place for disposal

of POME, the medium-large scale mills do have the structures although not always adequate enough (Figure 6.11). POME is rich in nutrients and when released into water bodies can lead to rapid loss of oxygen in the water thereby denying aquatic life oxygen, eventual death of aquatic life and eventually loss of aquatic biodiversity. POME can nourish the soil if treated in ponds and pumped back into furrows between palms or unto windrows of EFB for composting (figure 6.12). Pumping back treated effluent to nourish the soil reduces the risk of POME entering water bodies and increases nutrient availability for uptake by oil palms hence supplementing fertiliser requirements. POME can also be used to produce methane gas for cooking and power generation.

Figure 6.11: POME treatment pond

Figure 6.12 : Open POME gravity irrigation channel

6.6 MANAGEMENT OF WASTE AND BY-PRODUCTS

6.6.1 Introduction

The principal by-products from fresh fruit bunch processing into crude palm oil are empty fruit bunches (EFB) and palm oil mill effluent (POME) – both produced in large quantities. Other organic farm waste comprises fronds, shells, and fibrous waste from processed fruit. Small quantities of human and inorganic waste are generated as in any farming and agro-industrial operation. In varying quantities at the different estates, inorganic wastes comprise used lubricant oils, expired chemicals, some scrap metal, concrete, plastic and cardboard litter. At every mill, flue gas is emitted into the atmosphere.

BOPP, GOPDC, NOPALM and TOPP, have zero burning and zero waste policies and have made substantial progress towards achievement of those policies. Most opportunities for the conversion of wastes to by-products are well understood and are being pursued vigorously.

Nevertheless, the estates could adapt a few techniques from each other, without detriment to their individual profitability. Better understanding and common interest in attainment of all feasible improvements in safety, health and environment would emerge. The best possible (albeit difficult) outcome would be – through the identification of common interests throughout the industry – to find ways of drawing the artisanal millers into processing and environmental improvement. It is hoped that the RSPO initiative and formation of an Apex body will help to facilitate this need.

6.6.2 The Large Estates

(i) TOPP, Twifo-Ntafrewaso

Principal by-products are EFB and palm oil mill effluent (POME), both of which are generated in very large quantities at TOPP – approximately 20,000 tonnes and 25,000 m^3 per year respectively. In addition, the process generates large (though not enormous) volumes of fronds and vegetative dust, fibre and shell. Non-organic solid wastes arising from the operation of the mill are small quantities of sand (which gets into the process stream along with the fruit bunches), scrap metal and obsolete equipment, empty chemical containers, and boiler ash. Some concrete waste is created from ancillary works and some chemicals become waste when they pass their expiry dates while still unused. These chemicals include reagents in small quantities for the laboratory, paint, lubricants, and unknown quantities of unspecified herbicides and insecticides. Liquid effluent is mainly sludge (POME) plus run-off from floor washing and storm water off the roofs and hard-surfaced ground. Emissions into the air comprise flue gases and particles from the boilers. Noise is generated by machinery within the plant and by vehicles. Most empty fruit bunches (which used to be burned) are returned to the plantation where they decompose between the palm trees, returning nutrient to the soil. Some EFB are used as mulch (Figure 6.13). Laying mulch around palms help retain soil moisture, inhibits weed growth and may enrich the soil through decomposition of the mulch material. Surplus palm fronds are also used as fertilizer.

Figure 6.13: EFB mulched around a young palm

There is a move by progressive palm oil producers towards composting of EFB. Some POME can be used in the production of the compost. The main advantage is that a more concentrated product is produced which can be applied at the most appropriate places, the volume of compost produced is less than half that of EFB and there is therefore major transport cost savings to be captured in applying this by-product back to the field.

Palm oil effluent is first discharged from the mill to a fat trap from which fatty solids are skimmed by hand. The effluent passes to three holding ponds (where BOD and COD are reduced anaerobically) and then pumped into cascades of long narrow holding troughs or furrows within the plantation from which some water evaporates and some seeps into the plantation where it serves as fertiliser. The furrows are pervious to allow slow infiltration into the soil. Solid residue is eventually removed from the furrows and, again, used as fertiliser. The drawback of this system is that fertilisation occurs where it is least needed, in the valley bottoms. As a waste disposal process, it achieves its objectives but in terms of conferring benefit to the soil, it is not perfect. This deficiency in distribution is reduced by introducing sluice gates along the furrows to retain the POME at regular intervals.

Most shells and kernel waste at the factory are used as fuel in the boiler. Surplus shells and kernel waste are used as road-fill; and some is sold to buyers for fuel and export (now a rapidly growing opportunity in the oil palm value chain). Sand, boiler ash and surplus shells are also used as road-fill. The estate roads are unsurfaced clay and gravel tracks, which become slippery in wet weather.

Expired chemical containers are returned to chemical dealers. Expired chemicals are recovered by the EPA for disposal by officially authorised procedures.

Boiler smoke and soot are emitted through an 18-metre tall stack. The plume is visible from outside the factory but seems to be without odour. This is controllable by both design and operation so as to meet the EPA requirements.

A strong (though not unpleasant) odour pervades the factory area and downwind of the effluent holding ponds. Undoubtedly it is the smell of rotting fruit and decomposing EFB and POME. No odour is detectable within the plantation, even where EFB had been deposited, or anywhere beyond the vicinity of the plant.

Noise emission is minimised by fixing silencers to exhausts and by rubber-lining ducts and cyclones within the plant. Noise levels still exceed 85 decibels at some points within the plant but do not exceed 70 decibels on average (permitting normal conversation) at the factory edge. No industrial noise is audible at the mill fence.

A Safety, Health and Environment (SHE) Policy has been adopted by TOPP and is scrupulously observed. All workers within the plant wear helmets and, where necessary, masks and earmuffs. Even the labourers retrieving domestic waste from the estate houses wear protective clothing including gloves and masks. Such precautions are rare in most parts of Africa.

Safety records, rules and goals are prominently displayed at numerous locations around the plant and the estate and safety issues are discussed in weekly safety meeting. Audible and visible warnings of hazards are operated within the plant. Surfaces are generally free of slippery material (grease and palm waste) and where (as at the unloading ramp) bunches are inevitably spilled, workers with spikes and brushes remove the dropped materials.

Production managers and engineers conduct SHE inspections daily. Teams of workers and managers conduct monthly inspections. Safety committee members and village committee members conduct inspections quarterly. Statutory inspections are conducted periodically on pressure vessels and lifting gear. Inspections give rise to reports and immediate rectification of serious risk; measures for the aversion of renewed hazard are recommended. TOPP has completed a baseline assessment based on the RSPO P&C and will probably apply for a certification audit soon.

(ii) BOPP: Adum Banso

Waste management principles and practices at BOPP are the same as at TOPP because they were under Unilever Management until Wilmar Africa Holding took over BOPP recently. That being so, it is not surprising that differences found are other than in the layout. The effluent ponds are much further from the plant at BOPP, with the result that little odour is detectable around the plant and offices. More furrows are used for the infiltration of effluent at BOPP. BOPP, like TOPP has also conducted a baseline assessment based on the RSPO P&C and will probably go for certification soon

(iii) Ghana Oil Palm Development Company (GOPDC) : Kwae

Cleaner production, rehabilitation of degraded land and RSPO certification as a producer of palm oil and palm kernel oil are the performance objectives of GOPDC. The company runs the largest plantation in Ghana but remains dependent on out-growers for a significant proportion of raw material. Some out-growers are minority shareholders in GOPDC and utilise their equity as collateral for credit.

POME is passed through a tricanter, which separates oil, water and cake – the latter being an exceptionally good fertiliser. Effluent then passes through two anaerobic ponds and one aerobic lagoon, which is an artificial wetland where reed growth is encouraged. Thereafter, the effluent is trucked to hilltop areas where it is sprayed onto the ground.

EFB and surplus palm fronds are placed between alternate lines of palms as fertiliser. The alternation allows ready access on foot along the line where EFB were placed. Fronds take longer to decompose and are difficult to walk over.

A geographical information system (GIS) has been developed whereby spatial information plotted in ArcView is linked with a database which stores agronomic information on planting, fertilisation, weeding and yields, and relates it to other data on, for example, rainfall and wind, ownership and any experimental processes. Smallholdings are being integrated into the GIS: cadastral data first (for which information is collected by GPS in the field and through consultation with the farmers) and subsequently by the addition of the same agronomic data as for the core estate.

The commitment to continual environmental improvement is linked with safety and health measures intended to minimise loss through injury and morbidity, while ensuring that appropriate treatment is available at the estate clinic and, in case of emergency, through co-operation with the nearby diamond mine with which another clinic is operated. Main risks being addressed are traffic accidents, snakebite, burns through contact with steam or hot machinery, and head injuries sustained during maintenance work in confined spaces.

(iv) Norpalm Ghana Ltd: Pretsea

Norplam owns the former National Oil Palm Ltd estate near the villages of Ewuseijo and Aboade in Western Region. Like the other large plantations, EFB are returned to the plantation as mulch and fertilizer. POME is passed through four anaerobic effluent ponds before being pumped to the fields. Shells are used as fuel and as road-making material. All fibrous waste is used as fuel during the wet season. During dry seasons, surplus fibrous waste is returned to the plantation as fertiliser.

CPO is bulked in large storage tanks and taken out by road tanker. The adjoining main road is currently being rebuilt to a high standard. The mill is fully operational following significant refurbishment.

6.6.3 Village Small Scale Palm Oil Mills

Small scale oil palm fruit processing into palm oil has evolved from being highly labour intensive to the use of machinery and equipment required to process larger quantities of palm fruit bunches to meet demand for palm oil. These innovations have progressed from the development of individual machines to carry out particular operations to machines that combine several operations in the process.

Pounding (digestion) and oil extraction are the most tedious and essential operations in traditional palm fruit processing; therefore early efforts of the Engineering

Department of Kwame Nkrumah University of Science and Technology, Gratis Foundation and private engineering firms notably Agricultural Engineers, Accra and Fateco, Accra concentrated on manufacturing machinery and equipment for handling these tasks. In small-scale processing, digestion, the breaking up of the oil-bearing cells of the palm fruit's mesocarp, is the most labour intensive hence mechanical means to handle this task has been produced. Presses (mainly hydraulic) have also been manufactured to handle extraction of palm oil from macerated flesh of the palm fruit. There are equipment and machinery manufacturers who supply the industry with inferior quality and low cost equipment and machinery hence palm oil extraction rates suffer.

Small scale palm oil processing facilities is referred to in this study as artisanal mills and has been established by individuals and cooperative societies with and without Government support throughout oil palm growing areas in Ghana since 1960s. It is estimated that there are over 1,200 small scale palm oil mills[1] established throughout the six regions where oil palm is grown in Ghana. These artisanal millers are producing palm oil and palm kernel oil for the local and international market but with disregard for safety, health, hygiene, purity of the product, waste management, and use of child labour.

Major interventions introduced by the Government of Ghana especially through World Bank assistance in the 1990s (the intermediate technology small palm mills [ITSPM][2] programme) as well as availability of machinery and equipment from local manufacturers have helped in proliferation of these mills. The village small scale palm oil mills appear to be managed by unprofessional operators or people with only minimal skills hence are unable to attract funding to improve facilities.

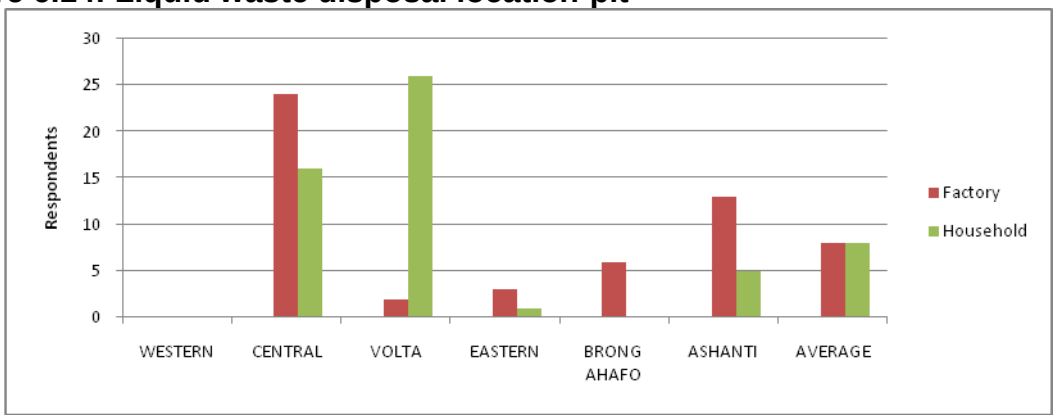
All of the premises seen were congested, with most operations under small thatched roofs supported by poles. The labour force works in close proximity to hot vats, pots and drums of hot oil, open-fronted furnaces and baskets of raw and processed nuts. Typically, the floor is pitted with holes and depressions, slippery with oil and strewn with discarded materials. Effluent drains from the floor and runs off into natural watercourses. The surroundings are littered with discarded fruit bunches and other waste matter, being pecked over by chickens and vultures.

Most of respondents in Central, Volta, Eastern, Brong Ahafo and Ashanti Regions dispose of their liquid waste either in the factory pit, effluent pond or in the open. However in Western region liquid waste is disposed off in the open. (Figures 6.14, 6.15 and 6.16).

[1] Study team assessment

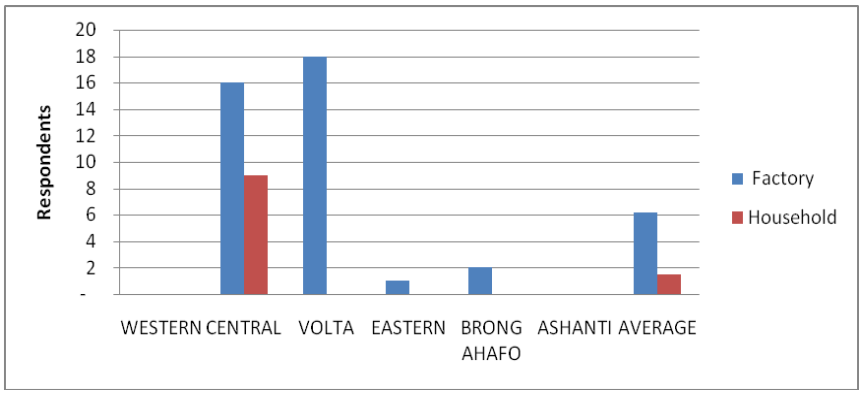
[2] Cathy Silverstein & James G. Herne (October 1994) : An impact evaluation and economic analysis of Technoserve's PL-480 Title II monetization program in Ghana.

Figure 6.14: Liquid waste disposal location-pit



Source: July 2011 Socio-economic survey conducted by MASDAR

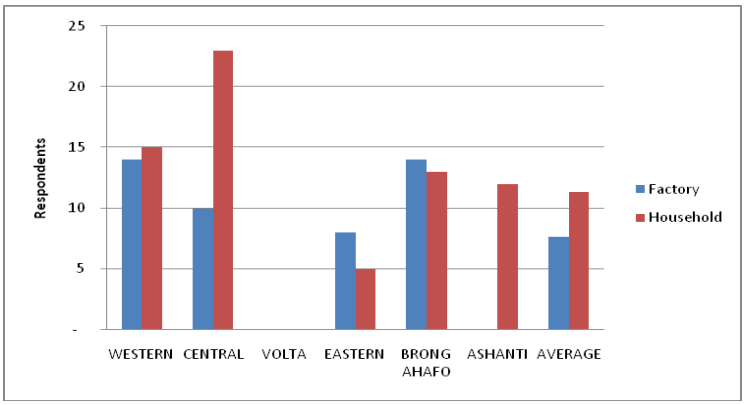
Figure 6.15: Liquid waste disposal location-effluent pond



Source: July 2011 Socio-economic survey conducted by MASDAR

Figure 6.16 indicates that liquid waste was disposed of in the open in Western and Ashanti Regions. Only in Central Region was household and small scale mills liquid waste disposed of in effluent ponds.

Figure 6.16: Liquid waste disposal in the open



According to respondents in Volta Region no liquid waste was disposed of in the open. They used pits or effluent ponds (Figure 6.15)

6.6.4 Other Environmental Issues

(i) Smoke

Thick smoke is released into the atmosphere and hangs over mills and communities causing discomfort to employees and people living in the immediate vicinities of these palm oil and palm kernel oil production facilities. (Figure 6.17).

Figure 6.17: Smoke released from palm oil and palm kernel oil processing

(ii) Sanitation

Cleanliness of small scale factory premises remains a major issue of concern as housekeeping practices are not observed at all small scale palm oil mills and is inadequate at factory premises throughout Ghana (Figure 6.18). It is important to transform these small scale mills into well organised mills with proper layout of machinery, equipment and utensils to ensure compliance with acceptable palm oil processing standards. It is equally crucial that mill owners and managers pay attention to cleanliness of their factory premises to avoid health and safety risks associated with poor housekeeping as a very large proportion of palm oil produced by these small-scale millers is meant for domestic consumption as food

Figure 6.18: Sanitation of small scale palm oil production area

(iii) Forest fires

Forest fires are another environmental issue. Farmers often consider that the most efficient way to prepare land for an oil palm plantation is to burn the existing vegetation. Fires used to prepare land can easily spread out of control. They damage wildlife, natural habitats and ecosystems and cause heavy losses of properties of people living in the vicinities of the fires. Most of the plantation managers in Ghana declared that uncontrolled use of fire for land preparation is not a major issue, however, farmers need to be educated on prevention measures to avoid the kind of destruction caused by forest fires in parts of the oil palm producing areas of Asia.

6.7 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

EIA is a planning and a decision making tool, required by law and applied in Ghana to ensure implementation or development of any undertaking[3] which may have a significant negative impact on the environment. EIA involves the gathering and analysis of all relevant information on likely consequences of an undertaking being implemented in a given area; and what appropriate mitigations or alternative measures must be considered, in order to ensure environmentally sound and sustainable implementation or development. The main stages in the EIA process include screening, scoping and the actual EIA. The key actors in EIA for a Proposed Project are:-

- Environmental Protection Agency (EPA)
- Relevant Metropolitan/Municipal/District Assembly
- Relevant Ministry and Departments
- Affected communities and interested parties

All stakeholders must be effectively consulted/ involved for their inputs to address any concerns and requirements of theirs in the EIA.

Some players in the oil palm industry have neglected EIA as a tool in planning new oil palm developments, replanting programmes, mill rehabilitation and expansion programmes. Strict enforcement of EIA in the oil palm industry must be undertaken by relevant Government agencies like EPA, Foods and Drugs Board, Ghana Standards Board, Factory and Inspectorate Division of the Ministry of Employment and Social Welfare. The recently approved Ghana National Interpretation of the P &Cs of the RSPO makes this a major requirement for certification and as industry players aspire to certification this problem will be minimised.

[3] undertaking means an activity, a project, ,a structure, an investment, a plan or a programme

6.8 ROUNDTABLE FOR SUSTAINABLE PALM OIL (RSPO)

6.8.1 Why RSPO?[4]

Although oil palm is GM free and has the highest yield per hectare of any oilseed crop, it is recognized that there are environmental and social pressures on its rapid expansion to eco-sensitive areas, particularly in tropical areas of Asia, Africa and South America. Rapid expansion has put considerable pressure on the environment because development of new plantations has resulted in the destruction of large tracts of forests with high conservation value and has threatened biodiversity in these ecosystems. Another adverse effect on the environment is the use of fire for preparation of land for large scale oil palm plantings which contributed to the problem of forest fires in the late 1990s.

Expansion of oil palm plantations has also given rise to social conflicts between indigenous communities and growers in some places over rights of land use.

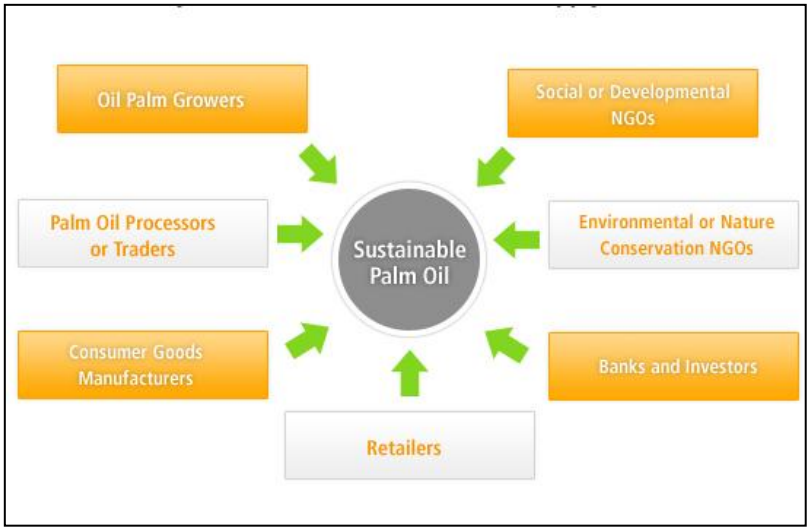
These negative developments, led to large scale consumers threatening to boycott palm oil. In 2001 therefore, WWF started to explore the possibilities of organising a Roundtable on Sustainable Palm Oil to address the unsustainable production of palm oil. The result was an informal co-operation among Aarhus United UK Ltd, Golden Hope Plantations Berhad, Migros, Malaysian Palm Oil Association, Sainsbury's and Unilever together with WWF in 2002. A preparatory meeting was held in London on 20 September 2002 and this was followed by a meeting in Gland on 17 December 2002. These organizations constituted themselves as an Organizing Committee to organize the first Roundtable meeting and to prepare the foundation for the organizational and governance structure for the formation of the RSPO.

The inaugural meeting of the Roundtable took place in Kuala Lumpur, Malaysia on 21 - 22 August 2003 and was attended by 200 participants from 16 countries. The key output of this meeting was the adoption of the Statement of Intent (SOI) which is a non-legally binding expression of support for the Roundtable process. As of 31 August 2004, forty seven organisations had signed the SOI.

On 8 April 2004, the "Roundtable on Sustainable Palm Oil (RSPO)," was formally established under Article 60 of the Swiss Civil Code with a governance structure that ensures fair representation of all stakeholders throughout the entire supply chain (Figure 6.19).

[4] www.rspo.org

Figure 6.19: Palm oil supply chain shows the various actors involved in the sustainable palm oil production



Source: RSPO.org

The seat of the association is in Zurich, Switzerland, the Secretariat is based in Kuala Lumpur with a RSPO Liaison office in Jakarta. The multi-stakeholder representation is shown in the governance structure of RSPO in a way that seats in the Executive Board and project level Working Groups are fairly allocated and represented in each sector. Thus, RSPO lives out the philosophy of the "roundtable" by giving equal rights to each stakeholder group to bring group-specific agenda to the roundtable, facilitating traditionally adversarial stakeholders and business competitors to work together towards a common objective and making decisions by consensus.

Sustainable palm oil is seen as a way forward to continue to supply the world with its much needed vegetable oil without harming the planet and its people.

6.8.2 Standards and Certification

RSPO is a not-for-profit association that unites stakeholders from seven sectors of the palm oil industry - oil palm producers, palm oil processors or traders, consumer goods manufacturers, retailers, banks and investors, environmental or nature conservation NGOs and social or developmental NGOs - to develop and implement global standards for sustainable palm oil. From its inception the RSPO was clear that sustainable palm oil is both about producing it and using it hence its objective "Promoting the Growth and Use of Sustainable Palm Oil".

To implement the global standards the Executive Board has approved principles and criteria [P&C] to guide production and use of sustainable palm oil. The P&C is generic and needs to be ratified by national working groups. It is expected that palm oil producers and users are to be certified through strict verification of the social, environmental issues, and the crop and oil production processes against the P&C.

RSPO Certification will become a seal of approval of origin of palm oil purchase, movement and use within the supply chain.

There are two forms of certification currently available - the grower and supply chain certifications. Certification involves the use of standards, codes, or rules and regulations against which an audit or inspection is performed. It can be done internally, externally and/or using independent organizations (third party). Consumers and traders in a supply chain need independent third-party certification to ensure that they comply with standards or requirements.

6.8.3 The Principles and Criteria (P&C) of RSPO

In November 2005, the RSPO approved a set of principles and criteria for sustainable palm oil production. Looking beyond the completion of the P&C, the RSPO Executive Board realised the need to ensure that its implementation is not just up to expectations of stakeholders, but congruent or compatible with the norms, laws and values of countries, or sovereign states. This crucial step was expected to address key concerns at local or regional levels giving rise to specific points and emphasis placed on unique situations and complementing national laws with a higher benchmark (where applicable) for industry to achieve. This buy-in to such a process is critical, and it is expected that once national interpretation processes begin, RSPO members in countries where this exercise will take place would lead them.

The 8 principles and underlying criteria [P&C] are set out in full as follows:

Principle 1: Commitment to transparency

Criterion	Indicators that trigger major non-conformities
Criterion 1.1 Oil palm growers and millers provide adequate information to other stakeholders on environmental, social and legal issues relevant to RSPO Criteria, in appropriate languages & forms to allow for effective participation in decision making.`	Indicators: Records of requests and responses must be maintained.
Criterion 1.2 Management documents are publicly available, except where this is prevented by commercial confidentiality or where disclosure of information would result in negative environmental or social outcomes.	Indicators: Documents that must be publicly available include: • Land titles/user rights (criterion 2.2). • Health and safety plan (4.7). • Plans and impact assessments relating to environmental and social impacts (5.1, 6.1, 7.1, 7.3). • Details of complaints and grievances (6.3). • Negotiation procedures (6.4). • Continuous improvement plan (8.1).

Principle 2: Compliance with applicable laws and regulations

Criterion	Indicators and Guidance
Criterion 2.1 There is compliance with all applicable local, national and ratified international laws and regulations.	Indicators: • Evidence of compliance with relevant legal requirements.
Criterion 2.2 The right to use the land can be demonstrated, and is not legitimately contested by local communities with demonstrable rights.	Indicators: • Documents showing legal ownership or lease, history of land tenure and the actual legal use of the land. • Where there are, or have been, disputes, additional proof of legal acquisition of title and that fair compensation has been made to previous owners and occupants; and that these have been accepted with free prior and informed consent. • Absence of significant land conflict, unless requirements for acceptable conflict resolution processes (criteria 6.3 and 6.4) are implemented and accepted by the parties involved.
Criterion 2.3 Use of the land for oil palm does not diminish the legal rights, or customary rights, of other users, without their free, prior and informed consent.	Indicators: • Maps showing extent of recognised customary rights (criteria 2.3, 7.5 and 7.6) • Copies of negotiated agreements detailing process of consent (criteria 2.3, 7.5 and 7.6)

Principle 3: Commitment to long-term economic and financial viability

Criterion	Indicators and Guidance
Criterion 3.1 There is an implemented management plan that aims to achieve long-term economic and financial viability.	Indicators: • A documented business or management plan (minimum 3 years).

Principle 4: Use of appropriate best practices by growers and millers

Criterion	Indicators and Guidance
Criterion 4.1 Operating procedures are appropriately documented and consistently implemented and monitored.	Indicators: • A mechanism to check consistent implementation of procedures Recommended indicator: SOPs current & authorised.
Criterion 4.2 Practices maintain soil fertility at, or where possible improve soil fertility to, a level that ensures optimal and sustained yield.	
Criterion 4.3 Practices minimise and control erosion and degradation of soils.	
Criterion 4.4 Practices maintain the quality and availability of surface and ground water.	Recommended indicator: Protection of water courses and wetlands, including maintaining and restoring appropriate riparian buffer zones along all bodies of water at or before replanting.
Criterion 4.5 Pests, diseases, weeds and invasive introduced species are effectively managed using appropriate Integrated Pest Management (IPM) techniques.	Recommended indicator: An IPM Plan is documented and current
Criterion 4.6 Agrochemicals are used in a way that does not endanger health or the environment. There is no prophylactic use, and where agrochemicals are used that are categorised as World Health Organisation Type 1A or 1B, or are listed by the Stockholm or Rotterdam Conventions, growers are actively seeking to identify alternatives, and this is documented.	Indicators: • Justification of all chemical use. • Chemicals should only be applied by qualified persons who have received the necessary training and should always be applied in accordance with the product label. Appropriate safety equipment must be provided and used. All precautions attached to the products should be properly observed, applied, and understood by workers. Also see criterion 4.7 on health and safety. • Storage of all chemicals as prescribed in FAO Code of Practice (see Annex 1). All chemical containers must be properly disposed of and not used for other purposes (see criterion 5.3).
Criterion 4.7 An occupational health and safety plan is documented, effectively communicated and implemented.	Indicators: The health and safety plan covers the following: • A health and safety policy, which is implemented and monitored. • The responsible person should be identified. There are records of regular meetings between the responsible person and workers where concerns of workers about health, safety and welfare are discussed. • Recording of occupational injuries. Suggested calculation: Lost Time Accident (LTA) rate (either specify acceptable maximum, or demonstrate downward trend).
Criterion 4.8 All staff, workers, smallholders and contractors are appropriately trained.	Indicators: • Records of training for each employee are kept.

Principle 5: Environmental responsibility and conservation of natural resources and biodiversity

Criterion	Indicators and Guidance
Criterion 5.1 Aspects of plantation and mill management that have environmental impacts are identified, and plans to mitigate the negative impacts and promote the positive ones are made, implemented and monitored, to demonstrate continuous improvement.	Indicators: • Documented impact assessment.
Criterion 5.2 The status of rare, threatened or endangered species and high conservation value habitats, if any, that exist in the plantation or that could be affected by plantation or mill management, shall be identified and their conservation taken into account in management plans and operations.	Indicators: Information should be collated that includes both the planted area itself and relevant wider landscape-level considerations (such as wildlife corridors). This information should cover: • Presence of protected areas that could be significantly affected by the grower or miller. • Conservation status (e.g. IUCN status), legal protection, population status and habitat requirements of rare, threatened, or endangered species, that could be significantly affected by the grower or miller. • Identification of high conservation value habitats, such as rare and threatened ecosystems, that could be significantly affected by the grower or miller. If rare, threatened or endangered species, or high conservation value habitats, are present, appropriate measures for management planning and operations will include: • Ensuring that any legal requirements relating to the protection of the species or habitat are met.
Criterion 5.3 Waste is reduced, recycled, re-used and disposed of in an environmentally and socially responsible manner.	
Criterion 5.4 Efficiency of energy use and use of renewable energy is maximised.	
Criterion 5.5 Use of fire for waste disposal and for preparing land for replanting is avoided except in specific situations, as identified in the ASEAN guidelines or other regional best practice.	Indicators: • Documented assessment where fire has been used for preparing land for replanting.
Criterion 5.6 Plans to reduce pollution and emissions, including greenhouse gases, are developed, implemented and monitored.	Indicators: • An assessment of all polluting activities must be conducted, including gaseous emissions, particulate/soot emissions and effluent (see also criterion 4.4).

Principle 6: Responsible consideration of employees and of individuals and communities affected by growers and mills

Criterion	Indicators and Guidance
Criterion 6.1 Aspects of plantation and mill management that have social impacts are identified in a participatory way, and plans to mitigate the negative impacts and promote the positive ones are made, implemented and monitored, to demonstrate continuous improvement.	Indicators: • A documented social impact assessment. • Evidence that the assessment has been done with the participation of affected parties. Participation in this context means that affected parties are able to express their views through their own representative institutions during the identification of impacts, reviewing findings and plans for mitigation, and monitoring the success of implemented plans.
Criterion 6.2 There are open and transparent methods for communication and consultation between growers and/or millers, local communities and other affected or interested parties.	Indicators: • Documented consultation and communication procedures.
Criterion 6.3 There is a mutually agreed and documented system for dealing with complaints and grievances, which is implemented and accepted by all parties.	Indicators: • The system resolves disputes in an effective, timely and appropriate manner. • Documentation of both the process by which a dispute was resolved and the outcome. • The system is open to any affected parties.
Criterion 6.4 Any negotiations concerning compensation for loss of legal or customary rights are dealt with through a documented system that enables indigenous peoples, local communities and other stakeholders to express their views through their own representative institutions.	Indicators: • Establishment of a procedure for identifying legal and customary rights and a procedure for identifying people entitled to compensation. • The process and outcome of any negotiated agreements and compensation claims is documented and made publicly available.
Criterion 6.5 Pay and conditions for employees and for employees of contractors always meet at least legal or industry minimum standards and are sufficient to meet basic needs of personnel and to provide some discretionary income.	Indicators: • Documentation of pay and conditions.
Criterion 6.6 The employer respects the right of all personnel to form and join trade unions of their choice and to bargain collectively. Where the right to freedom of association and collective bargaining are restricted under law, the employer facilitates parallel means of independent and free association and bargaining for all such personnel.	Indicators: • A published statement in local languages recognizing freedom of association.

Criterion 6.7 Child labour is not used. Children are not exposed to hazardous working conditions. Work by children is acceptable on family farms, under adult supervision, and when not interfering with education programmes.	Indicators: • Documentary evidence that minimum age requirement is met.
Criterion 6.8 The employer shall not engage in or support discrimination based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, or age.	Indicators: • A publicly available equal opportunities policy including identification of relevant/affected groups in the local environment.
Criterion 6.9 A policy to prevent sexual harassment and all other forms of violence against women and to protect their reproductive rights is developed and applied.	Indicators: • A policy on sexual harassment and violence in the workplace and records of implementation.
Criterion 6.10 Growers and mills deal fairly and transparently with smallholders and other local businesses.	Indicators: • Current and past prices paid for FFB shall be publicly available. • Pricing mechanisms for FFB and inputs/services shall be documented (where these are under the control of the mill or plantation).
Criterion 6.11 Growers and millers contribute to local sustainable development wherever appropriate.	

Principle 7: Responsible development of new plantings

Criterion	Indicators and Guidance
Criterion 7.1 A comprehensive and participatory independent social and environmental impact assessment is undertaken prior to establishing new plantings or operations, or expanding existing ones, and the results incorporated into planning, management and operations.	Indicators: • Independent impact assessment, undertaken through a participatory methodology including external stakeholder groups.
Criterion 7.2 Soil surveys and topographic information are used for site planning in the establishment of new plantings, and the results are incorporated into plans and operations.	Indicators: This activity should be integrated with the SEIA required by 7.1.
Criterion 7.3 New plantings since November 2005 (which is the expected date of adoption of these criteria by the RSPO membership), have not replaced primary forest or any area containing one or more High Conservation Values.	Indicators: This activity should be integrated with the SEIA required by 7.1.
Criterion 7.4 Extensive planting on steep terrain, and/or on marginal and fragile soils, is avoided.	Recommendation: "Extensive" needs to be defined and indicators clarified
Criterion 7.5 No new plantings are established on local peoples' land without their free, prior and informed consent, dealt with through a documented system that enables indigenous peoples, local communities and other stakeholders to express their views through their own representative institutions.	Indicators: This activity should be integrated with the SEIA required by 7.1. Guidance: Refer also to criteria and guidance for 2.2, 2.3, 6.2, 6.4 and 7.6 for indicators of compliance.
Criterion 7.6 Local people are compensated for any agreed land acquisitions and relinquishment of rights, subject to their free, prior and informed consent and negotiated agreements.	Indicators: • Documented identification and assessment of legal and customary rights. • Establishment of a system for identifying people entitled to compensation. • This activity should be integrated with the SEIA required by 7.1. Recommended indicator: Copies of negotiated agreements
Criterion 7.7 Use of fire in the preparation of new plantings is avoided other than in specific situations, as identified in the ASEAN guidelines or other regional best practice.	Indicators: • Documented assessment where fire has been used for preparing land for planting. • This activity should be integrated with the SEIA required by 7.1.

Principle 8: Commitment to continuous improvement in key areas of activity

Criterion	Indicators and Guidance
Criterion 8.1 Growers and millers regularly monitor and review their activities and develop and implement action plans that allow demonstrable continuous improvement in key operations.	Indicators: The action plan for continual improvement should be based on a consideration of the main social and environmental impacts and opportunities of the grower/mill, and should include a range of indicators covered by these principles and criteria. As a minimum, these must include, but not necessarily be limited to: • Reduction in use of certain chemicals (criterion 4.6). • Environmental impacts (criterion 5.1). • Waste reduction (criterion 5.3). • Pollution and emissions (criterion 5.6). • Social impacts (6.1).

6.8.4 Why Smallholder Certification?

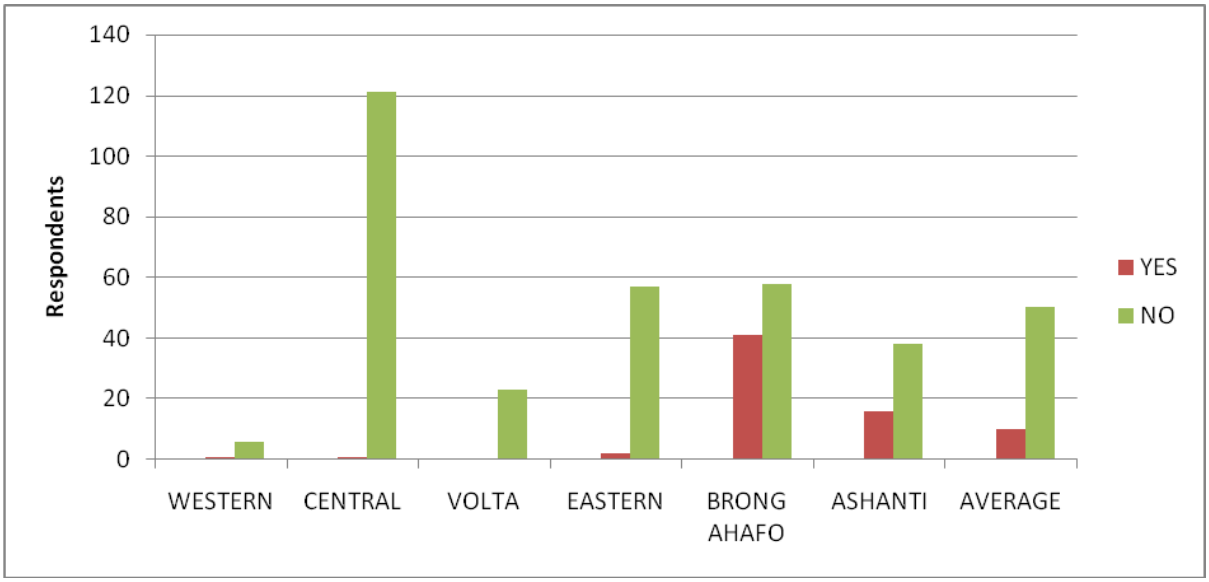
Smallholders represent a significant portion of oil palm cultivation worldwide. Globally, three million smallholder heads of family are involved in the oil palm sector (Teoh 2010). While data collection on cultivated area is not consistently available everywhere, there is significant variation in key regions. In view of their number, their role in certification is important.

A number of companies have already become RSPO certified through different approaches: either achieving certification on a specific (segregated) portion of their supply, or by producing a given amount of sustainable palm oil and receiving corresponding certificates ("book and claim"). Achieving full certification that includes all smallholders, however, poses significant challenges for companies in terms of ongoing compliance – especially with independent smallholders. These challenges include the cost of monitoring compliance and the difficulty of ensuring traceability in a shifting supply base. Companies have also reported difficulties convincing smallholders of the benefits of certification, especially where discussions centre on price premium.

6.8.5 Knowledge of RSPO among independent smallholders and small scale millers

Figure 6.20 shows that less than a sixth (61 out 364) of the respondents in our socio economic survey had any knowledge of the RSPO.

Figure 6.20: Knowledge of RSPO



Source: July 2011 Socio-economic survey conducted by MASDAR International

6.8.6 The RSPO Approach in Ghana[5]

TOPP and BOPP operating under Unilever Ghana Limited and GOPDC became the driving force behind the process of consultations among stakeholders in the oil palm industry in Ghana on the benefits and necessity of RSPO. The industry rallying around RSPO created the common platform similar to GOPDA where major industry issues were discussed among members and with the Government of Ghana in the 1980s and early 1990s. One major requirement of RSPO was the buy-in of the RSPO P&C. The stakeholder consultations in Ghana resulted in the formation Ghana National Interpretation Working Group [GNIWG] with the secretariat hosted by GOPDC.

6.8.7 National Implementation and Interpretation of the P&C by GNIWG

On March 2, 2011 at Kuala Lumpur RSPO approved the National Interpretation of the Principles and Criteria for sustainable palm oil in Ghana. Ghana became the first country in Africa to receive this endorsement. The NI paved the way for future RSPO certification of oil palm growers in Ghana, setting out clear indicators for the development of sustainable palm oil appropriate to the local context. Darrel Webber, the Secretary General of the RSPO Secretariat commented that: *"This leap towards promoting sustainable palm oil in Ghana is a landmark achievement for Africa, the new frontier for sustainable palm oil, blazing the trail for other countries within this continent to emulate. "This signifies a historical milestone for Africa, in particular West Africa, the very origin of oil palm which we hope will catapult the continent onto the sustainable pathway for the benefit of People, Plant and Prosperity. "It is indeed inspiring to see people and nations coming together to play an instrumental role in shaping change for a sustainable future. The RSPO congratulates the NI Working Group and encourages all oil palm growers in Ghana and eventually, others within the African continent to seek certification"*

Central to the philosophy of RSPO as a multi stakeholder organization, is that the NI is developed as a result of intense research, dialogue, feedback and collaboration within a Working Group comprising key constituents in markets involved; which usually includes representatives from each stakeholder group in the palm oil supply chain; local communities; regulatory and governmental bodies; and NGOs.

The Ghana National Interpretation Working Group (GNIWG) comprised experts from various areas including Processors, Traders, Agronomy, Milling and Research; Environment and Natural Resources; Legal License and Social; and Economics and Labour; in order to embody diverse perspectives.

Gert Vandersmissen, Chairman of GNIWG further commented that: *"In the beginning, we faced some challenges in getting the various stakeholders together but as soon as all parties realized the significance of this initiative, we had support beyond expectations. We are thrilled about the first Ghanaian Certified Palm Oil to be and what the future holds for sustainable palm oil in Africa."*

[5] Ghana RSPO website and stakeholder engagements

The Ghana National Interpretation [NI] is based on two documents a) generic RSPO Principles & Criteria published in 2007 which provided guidance for large scale producers and b) the generic guidance for scheme and independent smallholders published on 2nd July 2009

Ghana NI was prepared for large scale growers after 4 meetings which were held between 2nd November 2009 and 20th September 2010. Preparation of Ghana NI involved revision of national indicators and guidance, incorporation of relevant international and national laws and regulations, use of outcomes of the second public consultation and the 1st meeting of the Scheme Smallholder Working Group held in May 2010.

The large estates in Ghana began piloting implementation of the NI soon after its completion. Three of them believe they can reach RSPO compliance in 2012 if not 2011.

One challenge of the scheme is how compliance of independent smallholders with RSPO P& C can be achieved. The scheme outgrowers and smallholders are already provided with extension services and other support (such as finance and inputs) from the large plantations. Although, there are initiatives in the oil palm industry for smallholders schemes to achieve RSPO compliance the results are not conclusive.

The RSPO is an initiative that is here to stay and as time passes it will be essential to be RSPO compliant to be able to effectively market palm oil products. It is also likely that non certified palm oil may trade at a discount.

CHAPTER 7:
CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

1. Global demand for oilseeds is booming and is forecast to grow over 40% in the next 10 years.

2. Of the 17 major vegetable oils traded on the international market, palm oil is the most important and accounts for more than half of the global import and export trade of all vegetable oils.

3. Palm oil is 5 to 10 times more productive than other oil bearing crops and has the lowest requirement for inputs of fuel, fertilizers and pesticides per tonne of production.

4. Ghana is well placed to expand its oil palm production both as a strategy for import substitution, and, if the world price remains high, to export both regionally and globally.

5. The Ghana oil palm industry consists of both large scale estates with their associated mills, smallholders and outgrowers producing for industrial consumption; and the smallscale sector including artisanal mills supplying low quality oil for the local market (where it is favoured). Any strategy for oil palm development must cover both sectors.

6. The strategy for oil palm development should lead to increased production, improved milling and expanding into downstream processing activities.

7.2 RECOMMENDATIONS

7.2.1 Viable Projects

We propose 7 projects as follows:

Project 1: Establishment of 10,000 ha nucleus estate and 60 tph mill plantation company.

Project 2: 40,000 ha Smallholders Development Scheme including a Smallholder Services Entity and a Road Maintenance Fund.

Project 3: Village Level Replanting Programme (110,000ha)

Project 4: Smallscale Mills Transformation Programme.

Project 5: Industrial Palm Oil based Manufacturing projects.

Project 6: Support Services and Industries.

Project 7: Basic Supportive Infrastructure.

Each project has been written up as a detailed concept note in a format which can be submitted to development partners for funding consideration. The 7 concept notes are included at the end of this chapter.

7.2.2. Timetable and Action Plan

Figure 7.1 presents an overall timetable for the implementation of the proposed projects over the next 15 years. Figure 7.2 presents an action plan for the implementation of the new large scale plantation milling complex and associated smallholder developments (projects 1 and 2). It demonstrates that if the land acquisition process can be completed in 2012, then it is possible that planting can be undertaken by 2016 and a mill commissioned and operational by 2018 in time for the first volumes of fruit. Peak volumes of fruit will not be achieved until 2022.

FIGURE 7.1 PROPOSED TIMETABLE FOR PROJECT IMPLEMENTATION

PROJECT	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1. Establishment of nucleus estate and mill															
2. Smallholder Development Scheme															
3. Village level Replanting Programme															
4. Small scale mills transformation programme															
5. Industrial Palm Oil based manufacturing projects															
6. Support services and Industries															
7. Basic supportive infrastructure															

FIGURE 7.2 ACTION PLAN FOR PROPOSED NUCLEUS ESTATE AND ASSOCIATED SMALLHOLDER DEVELOPMENT

ACTIVITY	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1.Land acquisition															
2.Government enter JV agreement with private sector operator															
3.Secure funding for smallholder developments															
4.Contract production of seedlings															
5.Contract out planting and immature stage maintenance of estates															
6.Nursery production															
7.Clearing and planting by contractor															
8.Immature upkeep by contractor															
9. Selection of smallholders															
10.Signing of tripartite GoG/Mill operator/smallholder contracts															
11.Settlement of smallholders															
12. Handover from development contractor to smallholder															
13. Harvesting and upkeep.															
14 Mill commissioned															

7.3 TAX INCENTIVES FOR PRIVATE INVESTORS

7.3.1 Existing Incentives

The Ghana Investment Promotion Centre Act, 1994, provides for some automatic incentives and benefits relevant to the agricultural sector. Full details can be viewed at http://www.gipc.org.gh

Tax incentives are granted by the Ministry of Finance and Economic Planning upon application through the Ghana Investment Promotion Centre (GIPC) as follows:

a) Free Transferability of Dividends and Profits

An enterprise registered with the GIPC is guaranteed unconditional transferability through any authorised dealer bank in freely convertible currency of dividends or net profits attributable to the investment, payments in respect of loan servicing where a foreign loan has been obtained, fees and charges in respect of any technology transfer agreement registered under the Act, and the remittance of proceeds (net of all taxes and other obligations) in the event of sale or liquidation of the enterprise or any interest attributable to the investment.

b) Personal Remittances

Expatriate personnel employed or engaged in a registered enterprise are permitted to make remittances not exceeding the total official wage of the expatriate abroad through authorised dealer banks.

c) Immigration Quota

Registered enterprises are entitled, upon application to the Ghana Immigration Service, to an initial automatic maximum immigration quota commensurate with the paid up capital. For enterprises with a paid up capital of between US$10,000.00 and US$100,000,00, the said quota is one (1) person. For enterprises with a paid up capital of between US$100,000.00 and US$500,000.00 have a quota of two (2) persons. Enterprises with a paid up capital of more than US$500,000.00 are entitled to a quota of up to four (4) persons.

d) Duties and other Taxes

Registered enterprises are also entitled to such benefits and incentives as may be applicable to such enterprise under the Internal Revenue Act and under Chapters 82, 84, 85 and 98 of the Customs Harmonised Commodity and Tariff Code ("Harmonised Code") scheduled to the Customs, Excise and Preventive Law, 1993 (PNDCL 330) and any other law in force. The chapters of the Customs Harmonised Commodity and Tariff Code referred to above specify items that have been zero-rated under the Customs and Excise (Duties and other Taxes)

Act, 1996 (Act 512). Where the plant, machinery, equipment or parts of any enterprise are not zero-rated under the Harmonised Code, the enterprise may submit an application for exemption of import duties, sales tax or excise duties on the plant, machinery, equipment or parts to the Centre. Such applications are usually granted.

e) Special Incentives

The GIPC Board may negotiate special incentive packages with the approval of the President in order to promote identified strategic or major investments. Tax exemptions have been granted where the beneficiaries are engaged in projects of strategic importance to the Ghanaian economy, or where the project is one that serves as a primary project from which other secondary projects would evolve. It should be noted however that the grant of tax exemptions or waivers is subject to parliamentary approval in accordance with Article 174(2) of the Constitution which provides that where an Act confers power on any person or authority to waive or vary a tax imposed by that Act, the exercise of the power of waiver or variation is subject to the prior approval of Parliament by resolution.

f) Bilateral Investment Treaties

Ghana has concluded bilateral investment treaties with a number of countries including the United States, United Kingdom, the Netherlands, France and Germany. Ghana has also ratified the Convention on Settlement of Investment Disputes between States and Nationals of Other States (ICSID). Further, as a member of the World Trade Organisation (WTO), Ghana has signed WTO investment rules, which are the Agreement on Trade-Related Investment Measures (TRIMS), Agreement on Trade-Related Intellectual Property Rights (TRIPS) and the General Agreement on Trade in Services (GATS).

Where there is a disagreement between the investor or licensee and the government as to the method of dispute settlement to be adopted, the choice of the investor or licensee shall prevail

7.3.2 Incentives in Leading Producing Countries

i) Incentives for the Agricultural Sector

Main Incentives for the Agricultural Sector

- Pioneer Status
- Investment Tax Allowance
- Incentives for Food Production
  - Incentive for New Projects
  - Incentives for Existing Companies which Reinvest
  - Tax Incentives for 'Halal' Food Production
- Incentives for Reinvestment in Food Processing Activities

Additional Incentives for the Agricultural Sector

- Reinvestment Allowance
- Incentive for Reinvestment in Resource-Based Industries
- Accelerated Capital Allowance
- Agricultural Allowance
- 100% Allowance on Capital Expenditure for Approved Agricultural Projects
- Tax Exemption on the Value of Increased Exports
- Incentives for Companies providing Cold Chain Facilities and Services for Food Products
- Double Deduction for Expenses to Obtain "Halal" Certification and Quality Systems and Standards Certification

ii) Incentives for the Manufacturing Sector

Main Incentives for Manufacturing Companies

- Pioneer Status
- Investment Tax Allowance

Incentives for Relocating Manufacturing Activities to Promoted Areas or economic zones
Incentives for High Technology Companies
Incentives for Small and Medium-Scale Companies
Incentives to Strengthen Industrial Linkages
Enhanced Incentives for the Utilization of Oil Palm Biomass
Additional Incentives for the Manufacturing Sector

- Reinvestment Allowance
- Accelerated Capital Allowance
- Accelerated Capital Allowance on Equipment to Maintain Quality of Power Supply
- Incentive for Industrialised Building System
- Tax Exemption on the Value of Increased Exports
- Group Relief

7.3.3 Recommendations

Incentives listed in the leading palm oil producing countries are more targeted to all sectors of the oil palm industry. We therefore recommended the same incentives are extended to existing and new investors.

7.4 NEW LEGISLATIVE MEASURES

(i) Legislatives measures in leading producing countries

The main legislative measures behind the success of the oil palm industry in leading producing countries (e.g. Indonesia – see annex 4) are:

a) The Government took over areas available for oil palm cultivation.
b) The Government allocated areas to private and state-owned plantation companies, which controlled both the large scale operations on extensive areas and individually operated smallholder schemes
c) Local governments were given greater authority to promote regional development, while seeking to ensure that private companies had a long term commitment to the areas they were investing in. Under these laws, government could issue permits for the conversion of forest areas up to 200 hectares, while areas over 200 hectares remained the responsibility of a national authority.

(ii) Recommendations

It is recommended that a law is passed for the creation of land banks. Land from the banks can then be allocated to existing estates especially mills and refineries without corresponding size of oil palm plantations and prospective investors depending upon their choices of location and the types of enterprises they intend to undertake.

EXECUTIVE SUMMARY

This masterplan study for the development of the oil palm industry in Ghana was prepared by MASDAR International Consultants for the Ministry of Food and Agriculture, under the programme for the promotion of perennial crops funded by Agence Française de Développment (AFD) and the Kreditanstalt fur Wiederaufbau (KFW).

Chapter 1 reviews the historical background to Oil Palm production in Ghana and describes the world wide palm oil market. The chapter concludes that palm oil has a number of important comparative and competitive advantages:

- Global demand for oilseeds is booming, driven largely by rising consumption of vegetable oils, animal feeds and personal care products, and in part by demand for biofuels. Global demand for vegetable oils is forecast to grow by 40%+ over the next 10 years.
- Of the 17 major vegetable oils traded on the international market, palm oil is the most important. It accounts for more than half of the global import and export trade of all vegetable oils.
- Demand for palm oil is growing particularly fast:-
    - It is the most competitively priced vegetable oil
    - There is growing usage in a wide range of products
    - Demand is growing internationally, regionally and within Ghana
- Unlike other commodities, the global slowdown appears to have had little impact on palm oil demand
- Palm oil is 5 to 10 times more productive than other oil bearing crops and has the lowest requirement for inputs of fuel, fertilizers and pesticides per tonne of production
- About 80% of current world palm oil production is consumed in the form of food. Rising food demand coupled with growing demand for non-food uses is likely to sustain the continued rapid growth in demand for palm oil in the foreseeable future.
- With an estimated world wide population increase of 11.6 percent and a 5 percent increase in per capital consumption, an additional 28 million tonnes of vegetable oils will have to be produced annually by 2020. Palm oil is well placed to meet this demand with the lowest requirement for new land. An additional 6.3 million ha would need to be planted for oil palm; in contrast, if the increased demand were to be satisfied by soybean oil

production, an additional 42 million hectares of land would need to be cultivated.

Consequently, it is concluded that there is a strong rationale for increasing oil palm production in Ghana.

Chapter 2 describes the current status of the Oil Palm industry in Ghana including the current areas under production and the contrast between cultivation, marketing and processing by large estates and those by smallholders and outgrowers. The total area under oil palm in Ghana is some 336,000 hectares (ha). Currently, independent small holdings are producing over 1.2m mt fresh fruit bunches (FFB) and estates are processing over 400,000 mt FFB per year. Yields on the estates in Ghana are much higher than on small holdings although they are still lower than what is being achieved in the Far East and La Cote d'ivoire. This positions Ghana as a relatively high cost producer in the context of the global industry.

Much of the fruit that is produced by the independent smallholders comes from dura palms and is processed in the village and is only suitable for local consumption because the quality is not satisfactory for industrial processing. It is, however, favoured on the local market. On the other hand the estates are predominantly of tenera palms which have a higher extraction rate and most of the crude palm oil from these operations goes for industrial processing.

The chapter also reviews the research and support services available to the industry in Ghana and the constraints currently restricting its further development. It describes the apex body (Ghana Oil Palm Development Association-GODPA) which had become dormant but was resuscitated in 2011.

The strengths and weaknesses of the existing oil palm industry in the country are assessed and again it is concluded that the growing demand for oil palm, its positive impact on employment generation and the availability of downstream processing capacity in Ghana all bode well for a substantial expansion of the industry.

Chapter 3 presents the feasibility for expanding the oil palm industry in Ghana with particular reference to climatic and soil suitability. The most important climatic factors are rainfall and water deficit and a further analysis is undertaken to update the original work done by Van der Vossen to determine those areas climatically suitable and climatically favourable for oil palm development. New guidelines to determine potential areas for oil palm development are developed based on:

- Climatic conditions
- Soil suitability
- Population
- Road infrastructure and distance to existing and proposed mills
- Economic development.

Soil suitability ratings have been determined both through field sampling and laboratory analysis and previous relevant soil fertility studies.

Chapter 3 also includes a socio economic analysis of the main palm oil producing areas. This is based on a survey undertaken in Western, Central, Ashanti, Brong Ahafo, Eastern and Volta regions. A stakeholder survey using key informant interviews informed the study team about the social and environmental impacts, both positive and negative of oil palm production. Of particular note are the health, safety and sanitation risks to those people working in the informal processing sector.

The areas of Ghana found suitable for further oil palm development are grouped into six blocks which have been chosen because:

- They fall within climatically suitable and favourable areas where the soils are also either highly suitable or moderately suitable
- A work force is readily available and there will be economic empowerment through regular employment.

Chapter 4 outlines our proposed plans for oil palm development in the key areas of production, processing and value added. In terms of production we propose that oil palm plantation development should occur in both the large scale estate sector and the small scale independent smallholder sector. In particular we propose:-

1. A 10,000 ha oil palm nucleus estate and processing mill company to be situated in the Prestea-Huni Valley district.

2. Smallholder oil palm development associated with the above nucleus estate on a scale of 5000ha per year to a total development of 40000ha.

3. Village sector replanting programme – 110,000ha outgrower development where each independent smallholder is to be assisted to plant an average of 2ha of oil palms.

For processing, we propose additional milling support as follows:

1. A new processing mill to be associated with the proposed 10,000 ha nucleus estate.
2. A village level small scale mill transformation programme to support 1200 small scale mills throughout the country.

For value added we propose expansion of cooking oil, soap, synthetic lubricants and margarine because of their high demand. It is further proposed that existing companies which are already engaged in manufacturing down stream products from oil palm are given tax incentives to expand their facilities in rural areas.

Chapter 4 also summarises the potential sources of funding for the proposed projects

Chapter 5 describes in more detail where our proposed developments are to take place and estimates the impact they will have on oil palm production and on the farming community. This chapter also recommends the research needs which have been identified.

Chapter 6 deals with key cross-cutting issues including the roles of women and environmental issues. The latter is particularly important because oil palm developments in other parts of the world have had serious negative environmental impacts which have been addressed through the Roundtable on Sustainable Palm Oil (RSPO) which was formed in 2004 with the objective of promoting the growth and use of sustainable oil palm products through credible global standards and engagement of stakeholders. The chapter describes RSPO and its implications for the industry in Ghana.

Chapter 7 summarizes our conclusions and recommendations. It presents concept notes together with terms of reference for 7 potential projects in a format that can be presented to potential funders. This format is:

1. Project summary description
2. Consistency with the Food and Agriculture Sector Development Policy (FASDEP 11)
3. Consistency with the Millennium Development Goals and the Policy, Programming Framework, and Aid Effectiveness of the Donors.
4. Problem and Opportunity Analysis
5. Stakeholder Analysis and Potential Impact
6. Strategy Analysis, Lessons Learnt and Link with Complementary Actions
7. Proposed Project Description
8. Assumptions, Potential Risks and Their Mitigation
9. Project Costs, Returns and Finance.
10. Proposed Hierarchy of Project Objectives, Results and Indicators (logical framework).
11. Project Terms of Reference

Concept notes have been prepared for the following projects:

1. Establishment of a nucleus estate and mill plantation company
2. Smallholders Development Scheme including a Smallholders Service Entity and a Road Maintenance Trust Fund
3. Village level Replanting Programme to be carried out by existing medium - large scale plantation companies which are engaged in production and processing of FFB into palm oil and palm kernel/palm kernel oil and/or a Government Body to be termed Independent Smallholder Services Entity to be set up under MOFA to involve well trained Agricultural Extension Assistants
4. Village Small Scale Mills Transformation Programme
5. Industrial Palm Oil Based Manufacturing Projects.
6. Support services and industries
7. Basic supportive infrastructure

The chapter concludes with an action plan and timetable for implementation.

The master plan includes 8 annexes of supporting material. The most important of these is Annex 8 which is a large Excel work book (supplied electronically) which contains all the formula needed to determine project costs, returns and finance. Manipulation of this workbook will enable further analysis to be done if key parameters (such as CPO price and yield) change. CPO price assumed is US$ 970/mt at peak FFB yield of 15mt/annum gave IRR of 26% for the 50,000ha development proposed (10,000ha nucleus estate- including 60tph FFB processing mill and associated 40,000ha smallholder/outgrower schemes).

The proposed developments will involve 160,000 ha of oil palm (10,000 ha nucleus estate, 40,000 ha smallholder development and 110,000 ha replanting programme) producing up to 1.5 million mt of additional FFB by 2025. Milling capacity will be increased through the construction of a new 60 tph FFB processing mill and the transformation of up to 1200 small scale mills. The proposed developments are spread over the existing oil palm producing areas of Ghana and, in addition to creating a new large-scale estate and mill complex, will directly affect 75,000 small scale oil palm producers and 1200 artisanal mill owners.

We believe that this is an achievable plan which should make Ghana self sufficient in palm oil, with the opportunity to export into surrounding regions.

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