

CONFERENCE INTERNATIONALE

Ouagadougou, Burkina Faso
27, 28 et 29 novembre 2007

E NJEUX ET PERSPECTIVES DES BIOCARBURANTS POUR L'AFRIQUE



Stakes and perspectives for biofuels in Africa:

The Case of Ghana

Authors :
Wisdom Ahiataku Togobo
Kwasi Twum Addo

Sous le Parrainage de :



Organisée par :



This document defines the content of national preparatory studies for the Ougadougou biofuels conference. The outline contains factual data collected through analysis of existing sources – and policy elements.

INTRODUCTION

Ghana lies within latitudes 4 degrees 44 minutes north and 11 degrees 11 minutes north as well as longitudes 3 degrees 11 minutes west and 1 degree 11 minutes east. Being situated in the tropical zone, temperatures vary with season and elevation. Except in the north two rainy seasons occur, from April to July and from September to November. In the north the rainy season begins in April and lasts until September. Annual rainfall ranges from about 1,100 mm (about 43 in) in the north to about 2,100 mm (about 83 in) in the southwest. The harmattan, a dry desert wind, blows from the northeast from December to March, lowering the humidity and creating hot days and cool nights in the north. In the south the effects of the harmattan are felt in January. In most areas the highest temperatures occur in March, the lowest in August.

Agriculture is the biggest employer in Ghana, engaging more than 60% of the working population, and continues to be the main sector of the economy. Cocoa is traditionally the most important crop and is the country's second largest export earner after gold.

The key resources that sustain social and economic growth are: gold, timber, industrial diamonds, bauxite, manganese, fish, rubber, and hydropower. Ghana's GDP in 2006 was USD 12.1 Billion.

Contribution of sectors to GDP	2000	2001	2002	2003	2004	2005*	2006*
Agriculture	35.3%	35.2%	35.1%	36.5%	38.0%	37.5%	36.7%
Mining & Quarrying	5.0%	4.7%	4.7%	4.7%	4.6%	4.6%	4.4%
Manufacturing	9.0%	9.0%	9.0%	9.0%	8.7%	8.7%	8.6%
Electricity & Water	2.7%	2.7%	2.7%	2.7%	2.6%	2.7%	3.0%
Construction	8.7%	8.8%	8.8%	8.9%	8.8%	9.1%	9.4%
Transport, Storage & Communication	4.3%	4.4%	4.4%	4.4%	4.4%	4.5%	4.6%
Wholesale & Retail Trade, Restaurants & Hotels	6.7%	6.8%	6.9%	6.9%	6.9%	7.1%	7.4%
Finance, Insurance, Real Estate and Business Services	4.3%	4.3%	4.3%	4.3%	4.3%	4.3%	4.5%
Government Services	10.1%	10.2%	10.1%	10.0%	9.7%	9.6%	9.7%
Community, Social and Personal Services	2.6%	2.6%	2.6%	2.6%	2.6%	2.5%	2.5%
Producers of Private Non-profit Services	0.9%	0.9%	0.9%	0.9%	0.9%	0.8%	0.8%
Net indirect Taxes	10.5%	10.4%	10.4%	9.2%	8.7%	8.5%	8.4%

Source: Ghana Statistical Services * Provisional Figures

From Table 1, it can be observed that the economic structure of Ghana has remained virtually the same since the dawn of the new millennium. It is envisaged that Agriculture will continue to be the number one contributor to GDP for the foreseeable future. This positions the country very well for Agro based activities such as bio-energy plantations.

General agricultural conditions:

There are 5 main agro-ecological zones defined on the basis of climate, reflected by the natural vegetation and influenced by the soils. These are Rain Forest, Deciduous Forest, Transitional Zone, Coastal Savanna and Northern Savanna (Guinea and Sudan Savanna).

Ghana's total surface area is 238,540 km² with actual land area of 230,020 km². The proportions of various forms of land use in Ghana is as follows:

Surface Area (ha), Land Use (Specific to Agriculture)		
	Hectares	%
Total Land Area (T.L.A.)	23,853,900	100
Agric. Land Area (A.L.A.)	13,628,179	57.1
Area under cultivation (2006)	6,904,000	28.9
Total area under irrigation (2006)	18,000	0.08
Area under inland waters	1,100,000	4.6
Others (forest reserves, savannah woodland, etc)	9,125,721	38.3

Sources: Survey Dep't, MOFA, Accra

Note: Percentages will not add up to 100, because area under cultivation is part of agric. land area, while area under irrigation is part of area under cultivation.

Main actors in the Agriculture Sector

Farming is predominantly on a smallholder family basis in Ghana. About 90% of farm holdings are less than 2 hectares in size. Farm ownership by industries and companies accounts for less than 10% and they are limited to large scale farms and plantations, particularly for rubber, oil palm and coconut and to a lesser extent, rice, maize and pineapples.

Main system of farming is traditional. The hoe and cutlass are the main farming tools. There is little mechanized farming, but bullock farming is practiced in some places, especially in the North. Agricultural production varies with the amount and distribution of rainfall. Soil factors are also important. Most food crop farms are intercropped. Mono cropping is mostly associated with larger-scale commercial farms.

Surface Area Planted for Starchy Staples ('000 ha.)

Crop	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
<i>Maize</i>	652	697	697	695	713	940	792	733	740	793
<i>Millet</i>	170	181	186	208	193	198	207	182	185	200
<i>Rice</i>	118	130	105	115	135	123	118	119	120	125
<i>Sorghum</i>	324	332	312	289	329	337	346	298	305	320
<i>Cassava</i>	589	630	640	660	726	794	807	784	750	790
<i>Cocoyam</i>	206	218	372	247	262	282	277	270	255	260
<i>Plantain</i>	225	246	253	244	265	277	286	281	290	299
<i>Yam</i>	187	211	243	261	287	300	321	311	300	325
Total	2,471	2,645	2,808	2,719	2,910	3,251	3,154	2,978	2,945	3,112

Table 2: Source: Statistics, Research and Information Directorate (SRID), MoFA.

According to the Crop Research Institute, on-farm research findings indicate that current land under cultivation could produce 2.5 – 4 times its current yield of food and cash crops where more effective extension and use of recommended technologies have occurred.

Family farming which accounts for over 90% while large/small companies in the case of rubber, coffee accounts for less than 10%

Existing agriculture policy

Lands are usually owned by families and clans and are usually held in trust of the owners by the traditional rulers. Lands for Government projects are obtained by Legislative Instruments (LI) passed by the Government and compensation is paid to the families and clans affected by the LI. Lands for private/individual projects are obtained under various terms ranging from outright sale, long lease, short lease and equity in the enterprise, share in profits or revenues. Recipients for private/individual land transactions are either the traditional rulers, heads of the families or clans.

Decision making on land use is taken at the national level when it involves projects of national interest, usually capital intensive projects such as township development, energy generation, metal mining and logging.

Table 3 Area Planted to Other Crops (Industrial, Fruits and Vegetables, 2006)

Crop	Area ('000 Ha)
Cocoa	1,835.0
Seed Cotton	17.0
Tobacco	0.7
Oil Palm	333.0
Tomato	30.0
Other vegetables	16.0
Pineapple	8.0
Others (coconut, banana, kola, etc)	1,552.10
Total	3,791.8

Source: Cocoa, seed cotton, tobacco and oil palm from Secondary data on Industrial Plantations and Agricultural Services Companies. The rest are SRID projections

PRODUCTION

The annual production of food crops in Ghana has seen very little growth over the past five years. This is depicted by tables 4 and 5 below.

Table 4 Production of Selected Food Crops ('000 Mt)

Crop	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Maize	996	1,015	1,015	1,013	938	1,400	1,289	1,158	1,171	1,189
Millet	144	162	160	169	134	159	176	144	185	165
Rice (paddy)	197	281	210	215	253	280	239	242	237	250
Rice (milled)*	118	169	126	129	152	168	143	145	142	150
Sorghum	333	355	302	280	280	316	338	287	305	315
Cassava	7,000	7,172	7,845	8,107	8,966	9,731	10,239	9,739	9,567	9,638
Cocoyam	1,530	1,577	1,707	1,625	1,688	1,860	1,805	1,716	1,686	1,660
Plantain	1,818	1,913	2,046	1,932	2,074	2,279	2,329	2,381	2,792	2,900
Yam	2,408	2,703	3,249	3,363	3,547	3,900	3,813	3,892	3,923	4,288
Total	14544	15,347	16,660	16,833	18032	20,093	20,371	19,704	20,008	20,555

Source: SRID

Table 5 Production of Industrial Crops (Mt.)

Year	Cocoa ¹	Coffee ¹	Sheanut ¹	Seed Cotton ²	Tobacco ³	Oil Palm ⁴
1997	322,490	2,880	21,504	24,953	2,020	955,505
1998	409,360	8,370	34,886	33,803	2,390	1,022,010
1999	397,675	3,965	17,465	38,127	2,556	1,031,919
2000	436,634	1,956	30,771	35,503	2,457	1,066,426*
2001	389,591	1,379	19,882	17,506	1,233	1,768,800*
2002	340,562	1,464	27,160	22,851	2,155	1,826,900*
2003	496,846	2,100	n.a.	16,822	2,150	1,889,400*
2004	736,975	n.a.	n.a.	20,155	2,359	1,955,300*
2005	740,000*	20,000	300,000	21,000	1,350	2,024,600*
2006	734,000*	n.a.	n.a.	n.a.	n.a.	2,097,400*

Sources: 1. COCOBOD, 2. Agricultural Development Bank. 3. British American Tobacco Co. 4. Oil Palm Companies (GOPDC, TOPP, BOPP, NOPL) and Individual Plantations.

* Value based on projection from past years' production.

It is also noted that less than 20% of land cover of Ghana is used for Agricultural which accounts for over 35% of GDP.

Type of Ownership

Farming is predominantly on a smallholder family basis in Ghana. About 90% of farm holdings are less than 2 hectares in size. Farm ownership by industries and companies accounts for less than 10% and they are limited to large scale farms and plantations, particularly for rubber, oil palm and coconut and to a lesser extent, rice, maize and pineapples.

Main system of farming is traditional. The hoe and cutlass are the main farming tools. There is little mechanized farming, but bullock farming is practiced in some places, especially in the North. Agricultural production varies with the amount and distribution of rainfall. Soil factors are also important. Most food crop farms are intercropped. Mono cropping is mostly associated with larger-scale commercial farms.

Table 6 Average Yield of Selected Food Crop Under Rainfed Conditions

Crop	Yield (Mt/Ha)	Achievable Yield (Mt/Ha)¹
Cassava	12.4	48.7
Plantain	8.5	20.0
Yam	12.5	49.0
Cocoyam	6.4	8.0
Maize	1.6	6.0
Rice (Paddy)	2.0	6.5
Cowpeas	0.8	2.6
Soybean	0.8	2.3
Groundnut	0.9	2.5
Millet	0.8	2.0
Sorghum	1.0	2.0
Sweet Potato	8.0	24.0
	9.5	12.0
Taro	0.4	1.0
	1.5	-
Cocoa	0.8	1.8
Coffee	35.0	-
Cashew	45.0	75.0
Orange	11.0	-
Pawpaw	50.0	72.0
Mango	0.8	-
Pineapple	0.8	-
Cotton	1.6	-
Rubber	7.5	15.0
Tobacco	8.0	15.0
Tomato	6.5	32.3
Garden eggs		
Pepper		

Sources: 1. SRID, MOFA

2. Crop Research Institute – Achievable yields.

¹ Indicates yields that have been achieved in cases where more effective extension and use of recommended technologies have occurred. The dashes indicate crops for which no on-farm research findings were available as far as potential yields were concerned. Data on achievable yields have been revised in line with new findings by the Crop Research Institute.

Table 7

<i>Crop type</i>	<i>surface area 2006 (‘000ha)</i>	<i>production 2006 (‘000 Mt)</i>	<i>type of ownership (family, village, industrial, other ...)</i>	<i>number of people involved</i>	<i>monetary value of annual production</i>	<i>Potential for biofuel production</i>
<i>Farming</i>						
Maize	793	1,171	family			
Millet	200	185	family			
Rice	125	237	family			
Sorghum	320	142	family			
Cassava	790	305	family			
Cocoyam	260	9,567	family			
Plantain	299	1,686	family			
Yam	325	2,792	family			
Seed Cotton	17		family			
Tobacco	1		Family/industrial			
Oil Palm	333	2097	Family/industrial			
Tomato	30		family			
Other vegetables	16		family			
Pineapple	8		Family/industrial			
Others (coconut, banana, kola, etc)	1,552		Family/industrial			
Cocoa	1,835	734	family			
<i>Forestry</i>						
<i>(of which used for fuel wood)</i>						
<i>Grazing, husbandry</i>						
<i>Unused land</i>						
<i>National total</i>						

Main actors in the Agriculture Sector

- Family farming which accounts for over 90%.
- large/small companies in the case of rubber, coffee accounts for less than 10%

3) Existing agriculture policy,

- System for allotment of available surfaces,

Lands are usually owned by families and clans and are usually held in trust of the owners by the traditional rulers. Lands for Government projects are obtained by Legislative Instruments (LI) passed by the Government and compensation is paid to the families and clans affected by the LI. Lands for private/individual projects are obtained under various terms ranging from outright sale, long lease, short lease and equity in the enterprise, share

in profits or revenues. Recipients for private/individual land transactions are either the traditional rulers, heads of the families or clans.

Decision making on land use is taken at the national level when it involves projects of national interest, usually capital intensive projects such as township development, energy generation, metal mining and logging.

4) Agricultural imports and exports

- Food imports/exports past ten years statistics

Main agricultural imports in the country are wheat, rice, maize and sorghum. Average annual wheat and rice import for the past ten years is 245,394 and 322,202 metric tons respectively. Maize and sorghum however accounts for 8,866 Mt and 1,700 Mt respectively. Annual average of these imports is about US\$180,000.

Main Agricultural non-traditional exports are pineapple, cotton seed and banana. Other exports include Cocoa, coffee, sheanuts among others.

Quantity and Value of Cereal Imports (1993 – 2004), Millions Tons, USD

Year	Wheat	Rice	Maize (Yellow)	Sorghum
1997 Quantity (mt)	219,615	76,074	67.28	-
Value \$ million	66.03	53.22	0.38	-
1998 Quantity (mt)	484,926	182,830	442.57	-
Value \$ million	84.18	106.04	1.51	-
1999 Quantity (mt)	181,645	241,610	201.21	-
Value \$ million	102.70	95.00	0.07	-
2000 Quantity (mt)	196,700	187,256	5,050	819
Value \$ million	72.03	65.03	0.73	1.18
2001 Quantity (mt)	168,816	311,513	10,589	4,040
Value \$ million	64.25	72.46	1.52	2.75
2002 Quantity (mt)	182,681	296,953	10,470	5,135
Value \$ million	78.59	68.85	2.08	2.25
2003 Quantity (mt)	147,779	797,705*	163	193
Value \$ million	50.70	124.66	0.07	0.002
2004 ^a Quantity (mt)	247,991	253,905	140	2.6
Value \$ million	84.32	119.15	0.086	0.77
2005 ^a Quantity (mt)	369,733	484,513	54,965	-
Value \$ million	99.69	138.94	12.31	-
2006 ^a Quantity (mt)	254,052	389,660	6,572	0.58
Value \$ million	46.37	159.47	1.43	-

Source: Ministry of Trade & Industry, Accra

* Part of this amount may have been trans-shipment to neighbouring countries. However, this could not be ascertained from the MOTI, PSI. ^a Figures from GSS.

8.10 Food Aid Imports (Mt)

Year	Wheat	Rice	Soya bean	Sorghum	Maize
2002	44,570	2,010	1,580	9,920	n.a.
2003*	47,360	667	670	3,500	698
2004*	25,578	6,751	n.a.	3,497	638
2005	20,566	600	n.a.	8,059	1,702
2006	42,378	425	n.a.	8,541	2,165

Source: World Food Program

*Revised with the inclusion of data for maize and rice. 2004 figures revised to actual amounts received.

Note: Food Aid imports of wheat and rice are accounted for in table 8.10 above.

n.a.: None of these commodities came into the country as Food Aid for that year.

Volume of Main Agricultural Non-Traditional Exports (Mt.)

Commodity	1998	1999	2000	2001	2002	2003	2004	2005	2006	% Change 05 - 06
Horticultural:										
Pineapple	21,941	33,440	28,512	34,933	46,391	45,145	71,805	46,694	60,751	30.1
Cotton Seed	4,396	17,699	10,051	15,578	6,297	9,145	9,933	7,355	5,354	-27.2
Kola nut	5,752	9,344	6,413	6,435	11,559	9,032	2,353	816	945	15.8
Yam	7,421	9,763	12,463	9,630	13,025	7,973	16,169	18,377	20,297	10.4
Vegetable/Condiment ¹	495	389	980	988	1,548	4,490	4,689	4,919	4,507	-8.4
Oranges (Fresh or dried)	451	707	1,242	1,336	15,213	4,307	742	5,846	6,283	7.5
Tinda	879	878	1,126	1,256	1,137	1,136	-	-	-	-
Tomatoes	534	471	2,033	4,539	4,961	4,369	607	0	-	-
Pepper/Chillies	2,088	2,420	2,819	5,281	4,687	4,674	282	483	-	-
Garden Eggs	1,184	1,338	1,080	1,295	1,512	1,867	697	124	92	-25.8
Banana	2,905	3,383	3,883	3,251	3,233	364	725	1,117	44,098	3,847.9
Mangoes	136	167	268	232	126	234	376	407	182	-55.3
Pawpaw	936	1,780	1,748	1,792	1,474	1,917	3,752	3,212	1,912	-40.5
Fish & Seafoods:										
Tunas Fish	6,608	15,409	13,733	16,881	17,810	13,431	26,600	19,448	45,476	111.8
Frozen Fish	4,716	4,061	6,720	5,122	1,779	5,321	18,589	69,936	28,052	-59.9
Lobsters/Shrimps, etc.	216	349	247	212	377	705	1,143	203	401	97.5
Processed Fish ²	2,832	2,859	5,198	6,027	5,328	6,043	1,790	10,584	9,673	-8.6
Cuttle	2,023	18,533	-	13,693	449	795	4,485	594	1,284	56.0
Fish/Octopus										
Processed & Industrial:										
Cashew Nuts	1,822	5,572	3,564	419	3,892	6,338	51,764	14,487	34,962	141.3
Cocoa Waste	8,899	9,552	5,551	10,309	8,588	-	-	7,829	3,993	-49.0
Raw/ Lint Cotton	1,054	8,818	10,847	10,323	3,640	40,302	3,551	3,862	5,793	50.0
Robusta Coffee	6,811	6,650	6,742	3,036	1,326	769	682	585	214	-63.4
Sheanuts	32,782	32,071	35,983	45,281	27,627	66,997	5,548	165,508	104,747	-36.7

Source: Ghana Export Promotion Council (GEPC), Accra.

¹includes spices and excludes tomatoes, chillies, garden eggs and tinda from 1997.

²Processed Tuna not included.

³Comprising only cuttle fish sales.

Value of Main Agricultural Non-Traditional Exports: (US \$ '000)

Commodity	1998	1999	2000	2001	2002	2003	2004	2005	2006	% Change (05-06)
Horticultural:										
Pineapple	8,769	13,055	11,853	13,450	15,520	14,378	22,069	13,430	19,086	42.1
Cotton Seed	578	1,250	855	2,588	363	220	1965	1,762	11,795	569.4
Kola nut	771	1,151	755	663	1,122	948	1893	125	944	655.2
Yam	4,756	6,497	7,172	4,739	2,428	4,442	8,400	10,951	141	-98.7
Vegetable/Condiment ¹	620	272	431	348	521	726	2536	3,976	2,444	-38.5
Orange (Fresh)	78	141	249	126	672	329	94	3,865	462	-88.0
Tinda	355	445	474	532	587	636	-	-	-	-
Tomatoes	125	128	446	757	1,096	427	56	-	39	-
Pepper (Chillies)	880	1,221	1,255	1,938	1,782	1,822	107	-	-	-
Garden Eggs	468	596	434	519	455	522	260	66	40	-39.4
Banana	2,688	3,220	3,695	3,189	3,250	227	209	489	10,330	2,012.5
Mangoes	110	103	118	78	70	108	164	135	83	-38.5
Pawpaw	725	1,218	161	993	864	737	1,267	1,081	937	-13.3
Fish & Seafoods:										
Tuna Fish	7,018	8,715	5,437	10,291	12,191	8,901	23,620	14,978	32,148	114.6
Frozen Fish	8,390	6,176	5,586	8,088	6,205	10,659	21,108	26,386	29,693	12.6
Lobsters/Shrimps, etc	911	1,604	902	975	1,051	2,612	1,013	843	1,780	111.2
Processed Fish ²	1,577	9	19	2,695	4,397	3,304	1,479	25,394	25,915	2.1
Processed Tuna	77,283	61,890	65,101	50,398	71,048	64,051	-	54,850	55,520	1.2
Cuttle Fish/Octopus	3,021	29,923	3,997	17,973	636	1,378	2,898	2,918	4,124	41.3
Processed & Industrial:										
Cashew Nuts	1,187	3,798	2,553	89	1,450	2,599	18,759	5,498	11,975	117.8
Cocoa Waste	3,608	3,713	2,021	4,739	2,728	2,590	-	2,288	709	-69.0
Processed Cocoa	74,221	56,596	60,636	69,320	86,041	136,024	-	71,741	152,237	112.2
Raw/Lint Cotton	8,535	8,415	9,904	8,530	6,143	46,051	3,773	4,053	4,427	9.2
Robusta Coffee	8,253	7,678	5,174	2,051	643	365	481	256	133	-48.0
Sheanuts	7,892	6,804	4,674	6,654	6,125	16,746	2,463	28,969	27,249	-5.9

Source: Ghana Export Promotion Council (GEPC), Accra.

- Figures not available

Environmental issues:

Ghana is a Party to: Biodiversity, Climate Change, Desertification, Endangered Species, Environmental Modification, Law of the Sea, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands. Ghana has also signed but not ratified the Marine Life Conservation protocol.

Rainfall Distribution by Agro-ecological zones

Ghana has two rainy seasons. Rainfall distribution is bimodal in the Forest, Transitional and Coastal Zones, giving a major and minor growing season; elsewhere (Guinea Savanna and Sudan Savanna), the unimodal distribution gives a single growing season

Agro-ecological Zone	Mean annual Rain (mm)	Growing Period (Days)	
		Major season	Minor season
Rain Forest	2,200	150 – 160	100
Deciduous Forest	1,500	150 - 160	90
Transitional	1,300	200 - 220	60
Coastal	800	100 - 110	50
Guinea Savanna	1,100	180 - 200	*
Sudan Savanna	1,000	150 - 160	*

Source: Meteorological Services Department, Accra.

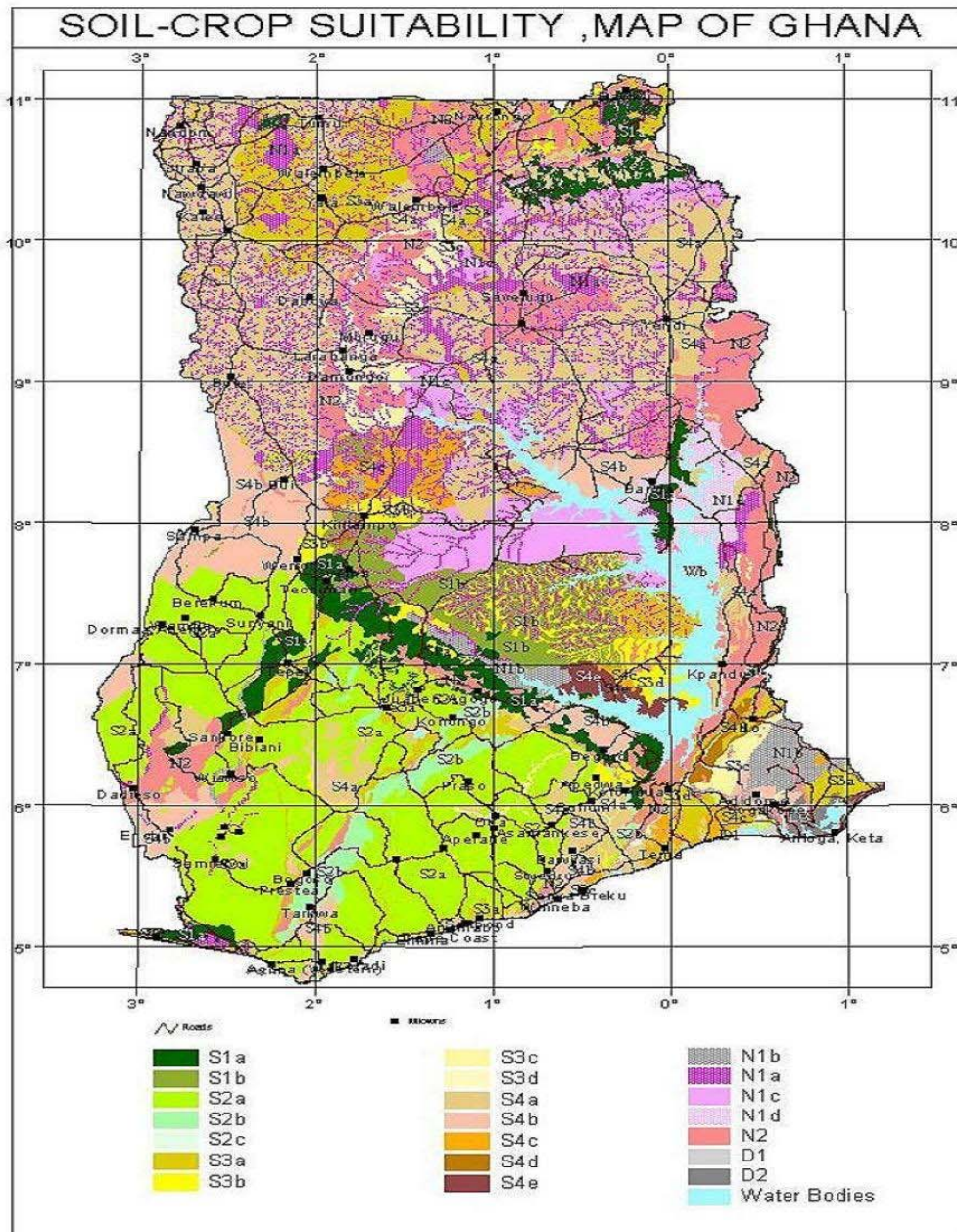
Water resources

Fresh water resource from rivers, ponds and lakes together accounts for about 4% of land cover in the country. However, main source of water for agriculture is rain fed. Irrigated farming accounts for less than 1.0% of arable land. Up-land irrigation from underground water is also practiced in some parts of the country.

Land quality;

Over 70% of total land in the country has very suitable soil with non-gravelly medium to moderate heavy texture highly suitable for cultivation of food and cash crops including energy crops.

Effect of erosion and pollution on agricultural is also very minimal except for occasional flooding (once a decade) in certain parts of the country. Bush fire has been the main cause of deforestation in the country. Other causes includes surface mining and the exploitation of forest for charcoal production.



LEGEND

- S1 Highly suitable areas for extensive mechanized cultivation of export and food crops, (cashew nut, sunflower, pineapples, maize corn, guinea corn, soybean, cassava, yams, cocoyams, plantain, beans etc.).
- S1a Highly suitable soils, non-gravelly medium to moderately heavy textured. Suitable for cocoa, coffee, black pepper, sweet berry, ginger, citrus, cocoyam, banana, rice, sugarcane and vegetables.
- S1b Have same characteristics as S1a above, but are situated in Savanna-transition vegetation zone. These areas are suitable for soybean, maize, yams, guinea corn, millet and groundnuts.
- S2 Suitable areas for extensive mechanical cultivation of export and food crops.
- S2a Crop suitability same as S1. Limitation to crop production may be due to gravelly subsoil horizons.
- S2b Crop suitability same as S2a above. Limitation to crop production may be due to either light or heavy textured soils.
- S3 Fairly suitable areas for the cultivation of crops such as maize, cassava, vegetables etc.
- S3a May consist of heavy plastic clays mostly imperfectly to poorly drained soils good for mechanized irrigation of rice, sugarcane, vegetables, maize and millet.
- S3b Mostly alluvial soils suitable for maize, guinea corn and vegetables.

- S3c Includes gravelly and moderately shallow soils. Could be hand cultivated for cassava, vegetables and maize.
- S4 Fairly to marginally suitable areas for the cultivation of crops.
- S4a Consist of gravelly, moderately shallow to shallow, imperfectly drained soils. Limited to hand cultivation of cassava, citrus, palm oil and mangoes. Soils may occur on upland or undulating of very steep slopes. Problem of soil erosion is predominant.
- S4b Soil may be imperfectly drained sands to loamy sands developed over beach sand or may have clay pan beneath the topsoil. Sandy areas may be used for groundnut and tiger nut cultivation.
- S4d Soils are mainly loose sands developed on coastal sand dunes. Suitable for coconut cultivation. May be mixed with organic manure for vegetable cultivation as in Anloga areas.
- N1 Unsuitable areas for upland arable and tree crops.
- N1a Predominantly poor to very poorly drained soils, which may be developed for rice, sugarcane and vegetables.
- N1b Terrace derived alluvial soils, which are dominated by rounded pebbles rendering them unsuitable for mechanized agriculture. May be suitable for maize, cassava, pepper cultivation.
- N1c Terrace derived soils, which contain surface pebbles and an indurated subsoil horizon. Soils may be left to prevailing grass vegetation for rough grazing of livestock.
- N1d Soils dominated by ground water laterites rendering them imperfectly to poorly drained. May be developed for paddy rice cultivation or vegetation should be left for rough grazing by livestock.
- N2 Very unsuitable areas for crop production. Soils are very shallow, gravelly, occurring on steep to very slopes. Should be reserved for forestry, wildlife and watershed protection.
- D Very unsuitable areas for crop production. Soils are very saline and may be utilized for mining of edible salt.

Energy context

Fossils Fuel.

The consumption of fossil fuel over the past seven years are detailed out in the table below:

NATIONAL PETROLEUM PRODUCTS CONSUMPTION

(UNITS IN LITRES, EXCEPT LPG IN KGS)

PRODUCTS	2000	2001	2002	2003	2004	2005
LPG	44,999,648	42,519,123	49,954,999	56,707,826	65,666,614	70,460,665
Gas Oil (Diesel)	790,695,840	813,926,690	852,512,318	896,957,186	1,008,137,950	1,045,569,250
Premium Gasoline	707,879,250	722,377,200	769,763,190	647,761,842	777,086,900	726,024,190
Kerosene	83,662,286	87,326,650	92,666,660	85,154,700	90,582,050	92,025,700
Premix	42,187,000	37,190,667	36,922,500	39,861,089	38,004,600	43,267,500
Fuel Oil	63,347,700	57,722,900	57,591,990	50,689,900	50,212,750	53,126,550
ATK	120,005,250	94,570,500	111,997,200	111,180,450	132,993,600	147,672,710
GBS Export	5,969,046	39,809,812	40,734,071	40,079,790	22,233,304	44,063,658
	1,912,346,020	1,895,443,542	2,012,143,028	1,928,392,783	2,184,917,768	2,222,210,223

Gasoil and Gasoline accounts for 47% and 33% respectively of total petroleum product consumption in Ghana. Each of the remaining products accounts for less than 4% with the exception of ATK which accounts for 7% of total consumption in 2005.

Petroleum products are used in the transport sector, homes, industries, public works and Agriculture. The mining companies (gold, manganese, bauxite, diamond) are the largest consumers of gasoil. Gas oil is also used by other vehicles that transport goods and people. It is also used for heating in industries, usually mixed with Residual Fuel oil in this case. The recent droughts that affected the output from the country's hydropower generation plants (1,200MW) saw a proliferation of thermal power systems that run on gas oil.

The country's thermal power generation plant of about 660MW capacity also runs on light crude. A natural gas pipeline project that is to bring gas from Nigeria to Ghana via Benin and Togo is near commissioning and will supply gas to the 660MW thermal plant and other thermal plants and industries in the country.

- In transport: Gasoline, Gas Oil and LPG are used in both private cars and commercial vehicles. Airlines also use Aviation Turbine Kerosene (ATK) and Premix for outboard motors for fishing boats.
- In the home: LPG for cooking and Kerosene for cooking and lighting;
- In industry: industrial boilers use fuel oil
- Public works sector: the main product used is bitumen for all road surfaces from local roads to motorways and on to aircraft runways;
- In agriculture: for tractors or other agricultural machines use gas oil

Natural Gas is presently not in use in Ghana, however, the West African Gas Pipeline Project would transport natural gas from Nigeria which would be used mainly for power generation. A Secondary Gas Pipeline Network would subsequently be developed to feed the gas to industries to fire their boilers and other applications that would be established.

Structure of Internal Market

The Petroleum Downstream sector is dominant in the country and this constitutes the Refining of Crude Oil, Storage, Transportation and Marketing to end users.

Regulated, liberalized

The country has an oil refinery, wholly owned by the Government. It has a refinery capacity of 45,000 barrels per day with an output of 1.8 million metric tones per annum that barely meets national demand. Refined products are imported to augment the short fall by procuring through a tender process superintended by the National Petroleum Authority.

Government stepped up deregulation of the petroleum downstream sector in February 2005 as part of reforms in the energy sector. This initiative was implemented to remove Government's direct involvement in the procurement and distribution of crude oil and finished products and further allow increased participation of the private sector in the petroleum industry to enhance competition and improve service delivery.

Distribution and Pricing of Petroleum Products

As part of the liberalization of the petroleum downstream sector, pricing of petroleum products is based on full cost recovery. The OMCs are also selling at different prices below the approved ceiling set by the NPA. Pricing for petroleum products would be made according to a pricing formula and without prior review or approval by an official authority. The relevant parameters have been incorporated in the formula to ensure that all costs and applicable taxes are fully recovered.

Adjustments in prices since deregulation have been well coordinated with marginal adjustments upwards and downwards to cushion the impacts of petroleum prices on the economy.

Private Sector Participation

With the liberalization of the sector, there has been vigorous competition amongst the OMCs which has seen entry of new companies and an increase in the number of retail outlets. Thus, the number of OMCs have increased from 28 to 37 since June, 2005 with over 1,500 retail outlets nationwide with the addition of about 150 new outlets since the 2005 when deregulation was accelerated.

National fossil fuel taxation/subsidization

Taxes and levies applied for the various petroleum products differ and these are made up of the 15% Excise Duty on ex-refinery price. Apart from the excise duties, there are other levies, which are being charged and are meant for specific institutions and functions in the energy sector and the country as a whole. The levies include the debt recovery levy, road fund, energy fund, exploration levy, social impact mitigating levy and cross-subsidy levy.

With respect to Gasoline, the average taxes and levies since beginning of 2007 31.1% of the final pump price while taxes and levies on diesel for the same period has averaged around 21.5% of the total pump price. Taxes on kerosene and LPG are however relatively lower hovering around 7.4% and -8.3% of pump price since February, 2007.

The cross-subsidization levy which forms part of the price build-up has been introduced to levy Premium Gasoline and reduce the price of Kerosene, Gas Oil and LPG which are intended to be used in commercial vehicles, homes and the rural areas

Access to modern energy services

Accessibility of Electricity in Ghana currently stands at 60% with over 3,000 communities connected to the national electrification grid. This has been made possible as a result of the ambitious national electrification programme embarked upon since 1990 to extend electricity all communities with population above 500 inhabitants by the year 2020. Before 1989, only 478 representing 15% of communities in the country had access to electricity.

Access to electricity within communities have stimulated economic growth in some parts of the country particularly for use to power mechanized tools for food processing such as grinding, milling hauling etc.,

Domestic Fuels

Biomass, mainly woodfuels (firewood and charcoal) is dominant in Ghana's energy equation. Most of this woodfuel is produced in the Savanna and Transitional Zone. Woodfuels accounted for about 69% of the total national energy consumption in 2000. It is used mainly for cooking and supply about 94% of the total energy consumed in the household sub-sector. Eighty four percent (84%) of rural households use firewood for cooking and 61% of urban households for the same purpose. Besides firewood and charcoal, LPG is the third predominant cooking fuel accounting for about 5.9% of household cooking fuel in Ghana.

Kerosene and electricity account for about 2.9% and 1.1% respectively. The production and marketing of woodfuels plays a crucial role in the livelihoods of the people in the Savanna and Traditional Zones, among whom 65% are women. This heavy reliance on woodfuels is threatening the country forest resources leading to deforestation in all parts of the country, and more severely in the northern zone. Because it is still the cheapest fuels, it will account for a preponderant share of total energy in the next decades.

<i>Regions</i>	<i>Population</i>	<i>No. of households</i>	<i>Electricity</i>	<i>LP Gas</i>	<i>Kerosene</i>	<i>Charcoal</i>	<i>Wood</i>	<i>Crop Residue /Others</i>	<i>No Cooking</i>
All Regions	18,912,079	3,698,337	1.1%	6.2%	2.0%	30.0%	55.8%	1.5%	3.5%
Greater Accra	2,905,726	625,744	2.2%	21.8%	4.3%	57.3%	8.8%	0.9%	4.8%
Ashanti	3,612,950	682,337	1.6%	4.8%	1.7%	36.2%	49.9%	0.8%	5.1%
Western	1,924,577	409,282	1.3%	4.1%	1.5%	25.1%	62.9%	1.7%	3.3%
Eastern	2,106,696	456,475	0.7%	3.3%	1.6%	22.0%	68.8%	0.3%	3.2%
Central	1,593,823	365,605	0.7%	3.1%	1.7%	29.2%	60.9%	0.6%	3.7%
Volta	1,635,421	345,722	0.3%	1.9%	1.5%	21.5%	72.3%	1.1%	1.4%
Brong Ahafo	1,815,408	342,695	0.6%	1.5%	1.1%	17.3%	75.6%	0.4%	3.5%
Northern	1,820,806	245,531	0.7%	1.0%	1.3%	11.7%	83.7%	0.3%	1.4%
Upper East	920,089	144,358	0.3%	0.9%	1.9%	11.6%	66.5%	18.2%	0.7%
Upper West	576,583	80,588	0.4%	0.7%	1.3%	16.5%	79.8%	0.4%	0.9%

Source: 2000 Population & Housing Census (Ghana Statistical Service - 2005)

Current and Planned Biofuel Production/use

Available plant suitable for bio-fuel production in Ghana includes oil palm, coconut, groundnut, shea nut, jathropha, sugarcane, cassava among others.

Ghana is presently focusing a lot of attention on developing the Jatropha plant as a feedstock for biodiesel production. The major benefit is the fact that the plant can be cultivated in all the geographical zones of the country.

Constraints/Challenges facing growth of the biodiesel industry

Institutional Issues

There is presently no clear institutional framework for biofuel development. Unlike other energy products such as the production and supply of electricity and petroleum products which are institutionalised, the production and supply of biofuels is not. The situation is understandable given that, for example, biodiesel, even though well known product in other parts of the world it has had virtually little or no attention in the Ghana energy setting. Interests in biodiesel, in Ghana, emerged as recently as the mid 1990s. Other biofuels, such as gasohol, have attracted more popular attention than biodiesel in the past, following from the global oil crisis of the late 1970s and early 1980s but nothing was done.

Quality concerns

Quality concerns likely to restrain the wide scale use of biofuel are inconsistent product quality and blending procedures in the industry. There is very little research on the agronomy and economic of potential bio-fuel crops in the country.

Public Awareness

There is a lack of awareness of the general public and policy makers about the technology and its potential benefits.

Unfavourable Investment Climate

The **investment climate currently does not support private sector financing of such projects**. Generally, Ghanaian banks and financial institutions have not been sympathetic to investing in energy projects. The support of the banks has been limited to a few large projects and also the provision of short-term loans to support the operations of the utility companies. It is worth noting however that, through the Ghana Investment Code, Government has provided fiscal incentives for the development of certain energy projects, particularly renewable energy projects which bio-fuels could generally be classified under.

Legal and Regulatory Issues

Presently, the legal and regulatory regime/framework have not been developed specifically for the biofuel industry. While the regulatory regime for petroleum fuels is institutionalised and clear, the same cannot be said of biofuels. The legislative and regulatory framework for petroleum products are embodied in the National Petroleum Authority (NPA) Act, 2005, Act 691. Depending on how biofuels are classified their regulation could be subsumed under Energy Commission Act 541 or the NPA Act 691. From the point of view of it being considered a renewable energy product, biofuels come under the regulatory mandate of EC while classifying them as petroleum products would bring their refining and marketing to be regulated by NPA. This issue has to be resolved fairly quickly in order to ensure unimpeded development of the industry in Ghana.

Absence of Policy framework

There is, presently, no policy framework and related strategy for the promotion and development of biofuels. A draft national bio-fuel policy has currently been submitted for Parliamentary approval. The Government of Ghana has proposed in its 2008 budget, the enactment of a National Renewable Energy Law which will include biofuels and other renewable energy resource in the national energy mix.

Projects in consideration/evaluation

Presently, cultivation of bio-fuel crops is done by the private sector as individual farmers, farmer cooperatives, and large scale plantation owners. Land acquisition for the cultivation of bio-fuel crops is negotiated privately with traditional landowners similar to the acquisition of land for cultivation of any cash crop.

Unfortunately there is very little data on the size of area cultivated for bio-fuels in the private sector se Some of the companies actively involved in the cultivation of jathropha are listed in the table below:

Institution	Funding sources
B1 Ghana Ltd	Private investment
ADRA/UNDP	UNDP-GEF/ADRA
New Energy	Donor funding
Gbimsi Women Group	UNIFEM/UNDP-GEF
Valley View University	University funds
Anuanum Industrial Company Ltd.	Anuanum Industrial Company Ltd.
Anglogold Ashanti, Obuasi	Anglogold Ashanti, Obuasi

Jatropha Oil Extraction initiatives

The extraction of jatropha oil is not a sophisticated technology and requires very simple equipment similar to those being used for production of groundnut oil or palm oil extraction. Besides the wide experience with oil extraction from groundnuts and palm kernel, some efforts have already been made with the extraction of jatropha oil.

Biodiesel 1, Ghana Limited owns a jatropha oil processing plant located in Accra. The plant has a processing capacity of 2,000 tonnes of seeds per month. Other local initiatives include a project by Annuanom Company Limited which is putting in place infrastructure to process jatropha seeds into oil for the production of biodiesel.

Intermediate Technology Transfer Unit (ITTU) of Suame, Kumasi manufactured the manual screw press that is used to extract oil under the Gbimsi project.

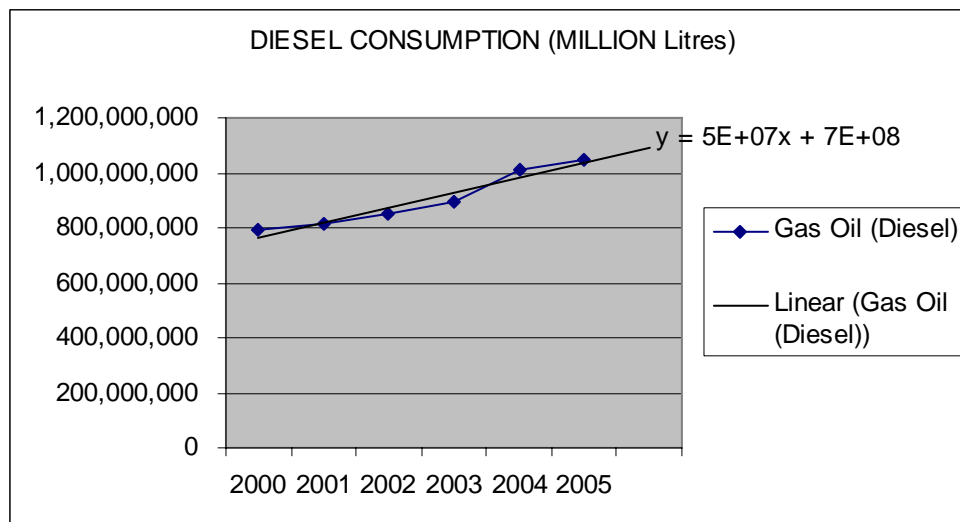
The Ghana Regional Appropriate Technology Industrial Services (GRATIS), a private engineering enterprise, also has the capability to manufacture machinery for the extraction of oil from the jatropha seeds. GRATIS currently has on the market oil extraction machines with capacities of 5 tonnes per day and 2 tonnes per day. The screw press oil expellers have oil expelling efficiency of about 30% and GRATIS intends to improve the efficiency to about 35%.

Bio-fuel Projections, Opinions, Policy Issues

The issues covered centered on the land size required for growing either of two crops, oil palm and jatropha, for the production of biofuel to meet national demand for gas oil.

The actual gas oil consumption for the period 2000 to 2005 was plotted and extrapolated (using regression methods) to the years 2010 and 2020. The corresponding land size required for both crops was also elicited.

1.



INDUSTRIAL OIL PALM PRODUCTION
2006

Oil Palm Company	Area cultivated ('000Ha)		Actual Crude Oil Production (MT)		Crude Oil Production/Hectare (MT)	
	2005	2006	2005	2006	2005	2006
GOPDC	32.2	35.7	36,383	40,021	1.1	1.1
BOPP	7.6	7.9	29,309	32,240	3.9	4.1
TOPP	13.2	13.7	29,045	31,950	2.2	2.3
NOPL	8.1	89	6,381	7,019	0.8	0.1

	2005	2010	2020
Diesel Consumption projections (Mt)	836,800	1,085,600	1,580,720
Land required to substitute Diesel with palm oil biofuel (km ²)	2,041	2,648	3,855
Land required to substitute Diesel with Jathropha biofuel (km ²)	1,372	1,780	2,591
Percentage Land cover with Palm oil substitution	0.9%	1.2%	1.7%
Percentage Land cover with Jathropha oil substitution	0.6%	0.8%	1.1%

Assumptions

Crude Palm Oil production	4.1	MT/Ha
Jathropha Oil Production	6.1	MT/Ha
Density of Diesel Oil	0.8	kg/lit
Density of Palm Oil	0.8	kg/lit
Density of Jathropha oil	0.8	kg/lit

The observations showed that the country will need to provide less than 2 percent of the total land size to meet gas oil requirements in the year 2020 using even the less output per surface area (oil palm). This approach assumes a calorific value of bio-fuel to be similar to that of diesel.

Surface Area (ha), Land Use (Specific to Agriculture)

	Hectares	%
Total Land Area (T.L.A.)	23,853,900	100
Agric. Land Area (A.L.A.)	13,628,179	57.1
Area under cultivation (2006)	6,904,000	28.9
Total area under irrigation (2006)	18,000	0.08
Area under inland waters	1,100,000	4.6
Others (forest reserves, savannah woodland, etc)	9,125,721	38.3

Sources: Survey Dep't, MOFA, Accra

Clearly land required for biofuel production will not in anyway compete with land for agriculture even in the foreseeable future. Currently, more than 50% of the agriculture land area is unutilized and could be used for energy crop production.

Impacts of projected production of biofuels

- **Energy Security.** To ensure a sustainable socio-economic development agenda into the long-term, it is important to reduce the country's dependency on external energy supply sources.
- Reduce huge oil import bill and save foreign exchange.
- Poverty reduction and wealth creation through employment generation.
- Improved export earning potential.
- Reduce impact on climate change as the cultivation and use of bio-fuels have neutral effects on carbon emissions.

What are the issues (food and non food crops)?

POLICY RECOMMENDATION

1 Encourage large-scale cultivation of bio-fuel crops

- Large scale cultivation should be private sector led.
- Government should fund the setting up of biofuel nurseries at the districts level through existing channels of Ministry of Food and Agriculture (MOFA). Private bio-fuel nurseries should also be allowed and encouraged.
- Financing schemes to enable farmers procure seeds on credit should be put in place.

2. Creating Demand for the product

- Awareness creation through educational campaign
- Use of selective "command and control" measures such as:
 - a. all Government vehicles which use diesel should switch to the use of biodiesel (B20);
 - b. all mass transportation fleet should be encouraged to switch to the use of biodiesel.

3 Sustaining Supply: Bio-fuels production, supply and marketing strategy should focus on the use of fiscal incentives and regulatory mechanisms that would facilitate entry into the bio-fuels market and also ensure the quality of the products is within acceptable standards.

4 Exportation of Bio-fuel

Institutional framework

In the past, attempts to nurture new industries have failed to yield the desired result because there has not been clear framework which allocated the requisite mandates to the relevant institutions. This has led to duplication of efforts and lack of direction. We propose Government to define a clear institutional framework for the operation of the bio-fuel industry.

Investment Incentives

The following fiscal incentives should be provided for investments in Biofuel industry:

- a. Machinery and equipment imported for bio-fuel production and supply should be zero rated for VAT, no imposition of ECOWAS Tax, and no imposition of NHIS Tax;
- b. Tax Holidays of up to 5 years, as the case may be, should be granted for investments in bio-fuel industry;

Bio-fuel Pricing

The present system whereby central Government generates revenues from the sale of petroleum products should not be circumvented to expedite the introduction of biofuels. However, the introduction of biofuels should be done with some incentives to attract users. In the light of the foregoing, we propose that central Government should seek the opportunities available in using carbon credits to offset some of the taxes and levies.

Current national policy with respect to biofuels

A National Biofuel Policy has been developed and submitted for parliamentary approval. Following from the acceptance of the National Biofuels Policy, there is the need to transform the policies into actionable activities under a National Biofuels Investment and Implementation Programme (NBIIIP).

GHANA

GEOGRAPHIC AND DEMOGRAPHIC BACKGROUND

The Country	: Republic of Ghana.
Capital	: Accra.
Population	: 18.9 Million* (2000 Population Census)
Population Growth rate	: 2.7% per annum
Geographic Location	: Latitude 4° 44'N and 11° 11'N; Longitude 3° 11' W and 1° 11'E.
Coastline	: 550 km long.
Principal mineral resources	: Gold, Bauxite, Manganese, Diamond.

LAND USE (SPECIFIC TO AGRICULTURE)

	Hectares	%
Total Land Area (T.L.A.)	23,853,900	100.0
Agric. Land Area (A.L.A.)	13,628,179	57.1
Area under cultivation (2006)	6,904,000	28.9
Total area under irrigation (2006)	18,000	0.08
Area under inland waters	1,100,000	4.6
Others (forest reserves, savannah woodland, etc)	9,125,721	38.3

Sources: Survey Dep't, MOFA, Accra

Note: Percentages will not add up to 100, because area under cultivation is part of agric. land area, while area under irrigation is part of area under cultivation.

Land Use (General)

Land Use	Area ('000 sq. km.)	% of Total
Savanna woodland	71	30
Bush fallow and other uses	60	25
Unimproved pasture	36	15
Forest reserves	26	11
Tree crops	17	7
Annual crops	12	5
Wildlife reserves	12	5
Unreserved forest	5	2
Total	239	100

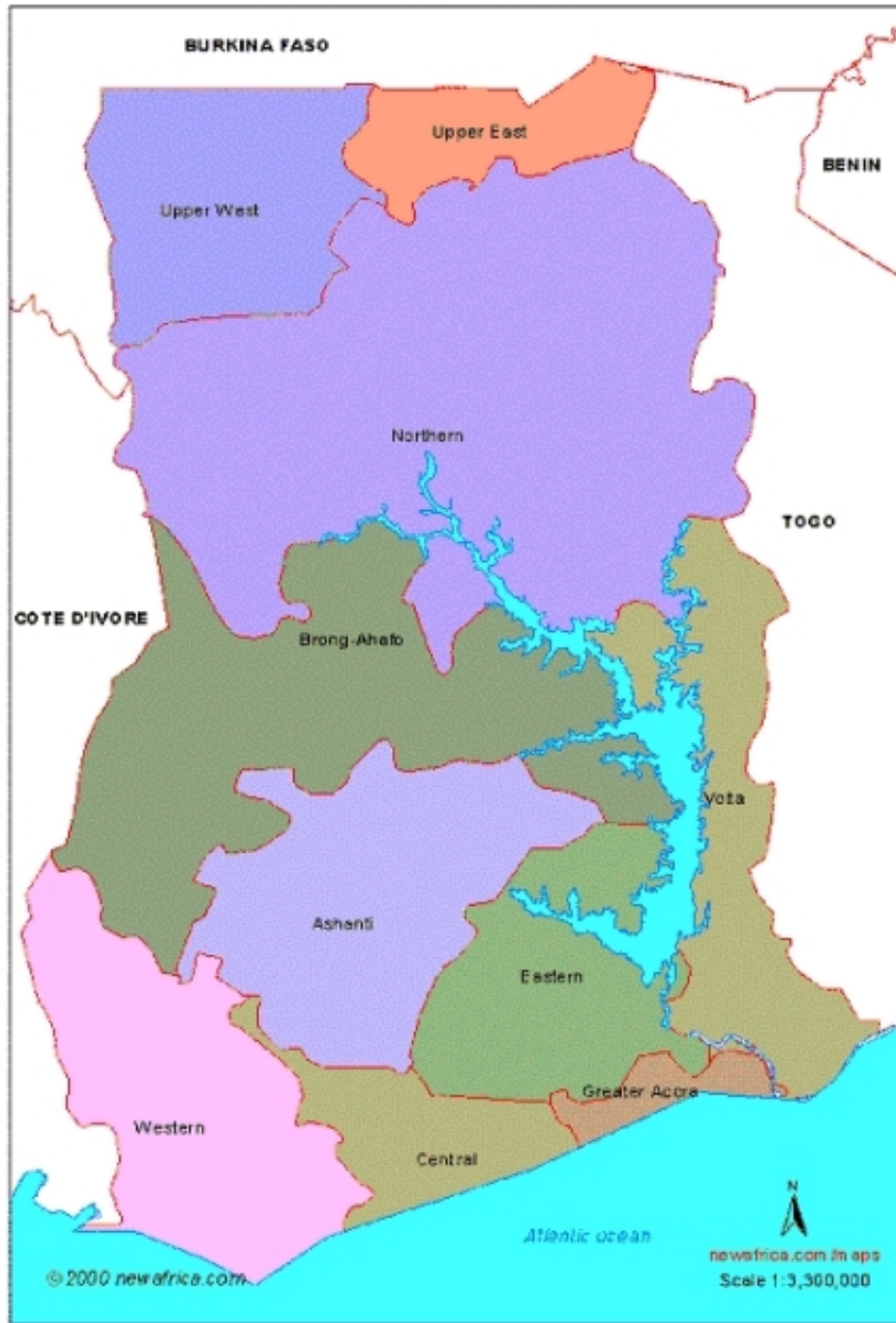
Source: Medium Term Agric. Development Program (MTADP) Document (1991).
Min. of Food and Agriculture, Accra.

Land Area By Region

Region	Area (000 sq. km.)	% of Total
Northern	70.38	29.5
Brong-Ahafo	39.56	16.6
Ashanti	24.39	10.2
Western	23.92	10.0
Volta	20.57	8.6
Eastern	19.32	8.1
Upper West	18.48	7.7
Central	9.83	4.1
Upper East	8.84	3.7
Greater Accra	3.24	1.4
Total	238.53	100.0

Source: The Ghana Survey Dept. Accra.

GHANA ADMINISTRATIVE MAP



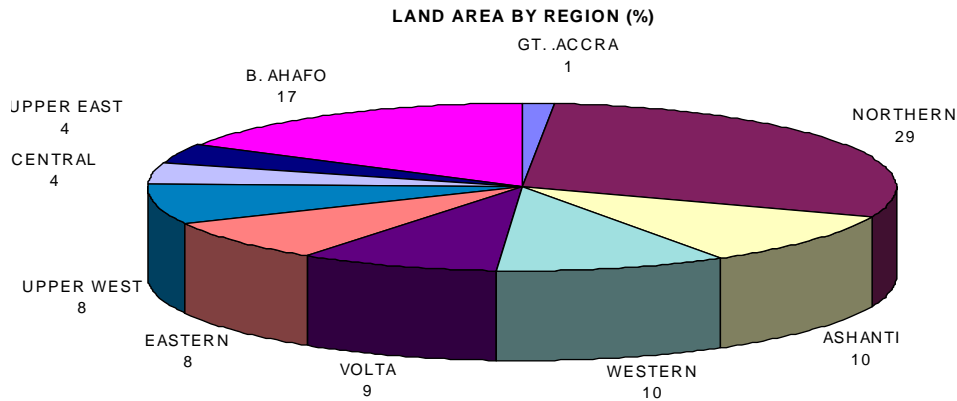


Fig. 1 (Based on Table 2.3)

Rainfall Distribution by Agro-ecological zones

Agro-ecological Zone	Mean annual Rain (mm)	Growing Period (Days)	
		Major season	Minor season
Rain Forest	2,200	150 – 160	100
Deciduous Forest	1,500	150 - 160	90
Transitional	1,300	200 - 220	60
Coastal	800	100 - 110	50
Guinea Savanna	1,100	180 - 200	*
Sudan Savanna	1,000	150 - 160	*

Source: Meteorological Services Department, Accra.

*Rainfall distribution is bimodal in the Forest, Transitional and Coastal Zones, giving a major and minor growing season; elsewhere (Guinea Savanna and Sudan Savanna), the unimodal distribution gives a single growing season.

Vegetation

Vegetation Zone	Area ('000sq. km.)	%
Guinea Savanna woodland	147.9	62.0
Deciduous Forest		
- Celtis-Triplochiton Association.	37.3	15.6
- Antiaris Chlorophora Association.	27.0	11.3
Rain/Deciduous Forest ecozone	8.4	3.5
Rain Forest	7.5	3.2
Thicket and grassland	4.5	1.9
Sudan Savanna woodland	1.9	0.8
Swamp and Lagoonal vegetation	1.3	0.6
Others	2.7	1.1
Total	238.5	100.0

Source: Min. of Lands and Forestry, Accra

Fertility Status of Soils of Some Regions

Region	Soil pH	% Organic matter	%Total Nitrogen	Available Phosphorus (mg/kg soil)	Available Calcium (mg/kg soil)
Ashanti					
1. Offinso-Ejura	5.3-7.8	1.5-3.0	0.2-0.3	0.12-12	50-100
2. Kwadaso-Juaso, Obuasi	4.3-7.0	1.5-3.0	0.1-0.2	0.12-12	50-100
Western	3.8-7.1	1.03-5.7	0.06-5.4	0.35-11.25	28-420
Brong Ahafo	3.5-6.7	0.34-1.69	----	0.12-64.25	16-140.3
Greater Accra	5.4-8.2	0.1-1.7	0.05-0.9	0.8-144	14-470
Upper East	5.1-6.8	1.1-2.5	0.06-0.14	1.75-14.75	43.5-151.5
Upper West	6.0-6.8	0.5-1.3	0.01-0.07	2.0-7.4	52-151.5
Northern	4.5-6.7	0.6-2.0	0.02-0.05	2.5-10.0	45-90

45) Source: Soil Research Institute, CSIR-Kumasi

FARM POPULATION

Rural Population By Region (2000)

Region	Est. Population (Ghana)			Est. Rural Population		Density (Pers/sq.km)
	Total Population	Annual Growth Rate	% of Total	Total Population	% Rural	
Ashanti	3,612,950	3.4	19.1	1,685,405	46.6	148.1
Gt. Accra	2,905,726	4.4	15.4	358,532	12.3	103.0
Eastern	2,106,696	1.4	11.1	1,378,782	65.4	109.0
Western	1,924,577	3.2	10.2	1,226,159	63.7	80.5
Northern	1,820,806	2.8	9.6	1,337,016	73.4	25.9
Brong-Ahafo	1,815,408	2.5	9.6	1,136,628	62.6	45.9
Volta	1,635,421	1.9	8.6	1,194,337	73.0	79.5
Central	1,593,823	2.1	8.4	995,418	62.5	162.2
Upper East	920,089	1.1	4.9	775,807	84.3	104.1
Upper West	576,583	1.7	3.0	475,735	82.5	31.2
Total or Av.	18,912,079	2.7	100.0	10,637,809	56.2	79.3

Source: Ghana Statistical Services (GSS): Based on 2000 Population Census

AGRICULTURAL OUTPUT

Principal Agricultural Produce and Area Planted to Selected Food Crops ('000 ha.)

Crop	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
<i>Maize</i>	652	697	697	695	713	940	792	733	740	793
<i>Millet</i>	170	181	186	208	193	198	207	182	185	200
<i>Rice</i>	118	130	105	115	135	123	118	119	120	125
<i>Sorghum</i>	324	332	312	289	329	337	346	298	305	320
<i>Cassava</i>	589	630	640	660	726	794	807	784	750	790
<i>Cocoyam</i>	206	218	372	247	262	282	277	270	255	260
<i>Plantain</i>	225	246	253	244	265	277	286	281	290	299
<i>Yam</i>	187	211	243	261	287	300	321	311	300	325
Total	2,471	2,645	2,808	2,719	2,910	3,251	3,154	2,978	2,945	3,112

Source: Statistics, Research and Information Directorate (SRID), MoFA.

Area Planted to Other Crops (2006)

Crop	Area ('000 Ha)
Cocoa	1,835.0
Seed Cotton	17.0
Tobacco	0.7
Oil Palm	333.0
Tomato	30.0
Other vegetables	16.0
Pineapple	8.0
Others (coconut, banana, kola, etc)	1,552.10
Total	3,791.8

Source: Cocoa, seed cotton, tobacco and oil palm from Secondary data on Industrial Plantations .and Agricultural Services Companies. The rest are SRID projections

Mean Annual Growth Rates for Area Planted to Selected Food Crops

Crop	Average Area ('000 ha.)		Growth Rate % 1995 - 2000	Average Area ('000 ha.)		Growth Rate % 2001-2006
	1995-1997	1998-2000		2001-2003	2004-2006	
1. <u>Roots & Tubers</u>						
Cassava	577.1	643.4	3.6	776.0	774.6	1.7
Cocoyam	208.1	279.2	3.8	273.8	261.5	-0.2
Yam	180.5	238.2	7.9	302.9	312.0	2.5
2. Plantain	222.0	247.6	2.8	276.2	290.1	2.4
3. <u>Cereals</u>						
Maize	668.4	696.1	0.2	814.9	755.3	2.1
Millet	184.3	191.8	1.5	199.2	189.1	0.7
Sorghum	324.1	310.9	-2.9	337.4	307.7	-0.6
Rice	107.6	109.8	-1.3	109.5	121.5	7.0

Production of Selected Food Crops ('000 Mt)

Crop	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Maize	996	1,015	1,015	1,013	938	1,400	1,289	1,158	1,171	1,189
Millet	144	162	160	169	134	159	176	144	185	165
Rice (paddy)	197	281	210	215	253	280	239	242	237	250
Rice (milled)*	118	169	126	129	152	168	143	145	142	150
Sorghum	333	355	302	280	280	316	338	287	305	315
Cassava	7,000	7,172	7,845	8,107	8,966	9,731	10,239	9,739	9,567	9,638
Cocoyam	1,530	1,577	1,707	1,625	1,688	1,860	1,805	1,716	1,686	1,660
Plantain	1,818	1,913	2,046	1,932	2,074	2,279	2,329	2,381	2,792	2,900
Yam	2,408	2,703	3,249	3,363	3,547	3,900	3,813	3,892	3,923	4,288
Total	14544	15,347	16,660	16,833	18032	20,093	20,371	19,704	20,008	20,555

Source: SRID

Mean Annual Production Growth Rates of Selected Crops

Crop	Average Production('000Mt.)		Growth Rate (%)	Average Production('000Mt.)		Growth Rate %
	1995-1997	1998-2000		2001-2003	2004-2006	
Roots & Tubers						
Cassava	6,907.4	7,707.9	5.9	9,645.4	9,647.8	1.4
Cocoyam	1,488.3	1,636.4	7.0	1,794.1	1,687.2	-0.3
Yam	2,269.5	3,104.9	13.6	3,753.2	4,034.4	3.8
Plantain	1,759.8	1,964.8	5.4	2,227.1	2,690.8	6.7
Cereals						
Maize	1,012.6	1,014.1	1.5	1,209.0	1,172.7	4.7
Millet	181.9	163.8	0.2	156.5	154.5	4.1
Sorghum	348.7	312.4	-2.9	311.2	300.5	2.4
Rice	211.4	235.2	5.6	257.4	242.8	-0.3

Based on table 4.1.5

Domestic Food Supply and Demand Position (2006)

Crop	Total Domestic Production ('000 Mt)	Production Available for Human Consumption* ('000Mt)	Per Capita Consumption (kg/Annun)	Estimated National Consumption ('000Mt)	Deficit/Surplus ('000 Mt)
Maize	1,189	832	42.5	943	-110
Rice (Milled)**	150	120	14.5	322	-202
Millet	165	116	9.0	200	-84
Sorghum	315	221	14.8	328	-108
Cassava	9,638	6,747	151.4	3,358	3,389
Yam	4,288	3,430	42.3	938	2,492
Plantain	2,900	2,465	84.0	1,863	602
Cocoyam	1,660	1,328	56.0	1,242	86
Groundnut	520	442	12.0	266	176
Cowpea	167	142	5.0	111	31
Total	19,993	15,842		9,571	6,272

Source: SRID

Notes: Estimated Population, based on 2000 census figure (18.9 m) and a growth rate of 2.7 % =22.18 m. * 70% of Domestic production for maize, millet, sorghum, and cassava.

80% for rice, yam, cocoyam and 85% for plantain, groundnuts, cowpea and cassava livestock feed, wastage and seed account for the discount.

** 60% of paddy rice which stood at 243,000 Mt for 2003.

Production of Industrial Crops (Mt.)

Year	Cocoa ¹	Coffee ¹	Sheanut ¹	Seed Cotton ²	Tobacco ³	Oil Palm (fruit) ⁴
1997	322,490	2,880	21,504	24,953	2,020	955,505
1998	409,360	8,370	34,886	33,803	2,390	1,022,010
1999	397,675	3,965	17,465	38,127	2,556	1,031,919
2000	436,634	1,956	30,771	35,503	2,457	1,066,426*
2001	389,591	1,379	19,882	17,506	1,233	1,768,800*
2002	340,562	1,464	27,160	22,851	2,155	1,826,900*
2003	496,846	2,100	n.a.	16,822	2,150	1,889,400*
2004	736,975	n.a.	n.a.	20,155	2,359	1,955,300*
2005	740,000*	20,000	300,000	21,000	1,350	2,024,600*
2006	734,000*	n.a.	n.a.	n.a.	n.a.	2,097,400*

Sources: 1. COCOBOD, 2. Agricultural Development Bank. 3. British American Tobacco Co. 4. Oil Palm Companies (GOPDC, TOPP, BOPP, NOPL) and Individual Plantations.

* Value based on projection from past years' production.

Actual Crude Palm Oil Production and Projections (Mt.)

Company	1995	1996	1997	1998	1999	2001	2002	2003	2004	2005	2006
GOPDC	15,067	22,850	17,112	22,876	20,537	24,850	27,335	30,068	33,075	36,383	40,021
TOPP	11,601	14,313	11,623	14,692	16,544	20,018	22,020	24,222	26,644	29,309	32,240
BOPP	14,664	17,298	15,089	15,733	16,395	19,838	21,822	24,004	26,404	29,045	31,950
NOPL	2,558	2,851	2,292	3,405	3,602	4,358	4,794	5,274	5,801	6,381	7,019
AMEEN	3,146	3,146	3,146	5,032	5,032	6,089	6,698	7,367	8,104	8,914	9,805
Sub-Total	47,036	60,458	50,262	61,738	62,110	75,153	82,668	90,935	100,029	110,032	121,035
<i>Medium-scale mills</i>	1,328	3,515	3,803	4,022	4,304	5,208	5,729	6,301	6,932	7,625	8,387
<i>Small-scale</i>											
Techno Serve	0	861	456	642	930	1,125	1,238	1,362	1,498	1,648	1,812
Kramer	74,230	81,653	89,818	98,800	108,680	131,503	144,653	159,118	175,030	192,533	211,786
Traditional	13,073	14,380	15,818	17,400	19,140	23,159	25,475	28,023	30,825	33,908	37,290
Sub-Total	87,303	96,894	106,092	116,842	128,750	155,788	171,366	188,503	207,353	228,088	250,888
Total	135,667	160,867	160,157	182,602	195,164	236,148	259,763	285,740	314,314	345,745	389,310

Source: 1995 to 2004 from The Palm Oil Industry in Ghana, GOPDC. 2005 and 2006 from SRID projections.