



TRAGRIMACS

Sunflower Production: a key economic solution from agriculture



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**World Bank
Ghana Office**



SNV



MINISTRY OF FOOD AND AGRICULTURE



**University of Ghana
Agric Faculty & Chemistry Dept.**

Tema Oil Refinery

**EMPRETEC GHANA
FOUNDATION**

**GHANA INVESTMENT
PROMOTION
COUNCIL**

Food & Drugs Board

**GHANA EXPORT
PROMOTION
COUNCIL**



MINISTRY OF ENERGY



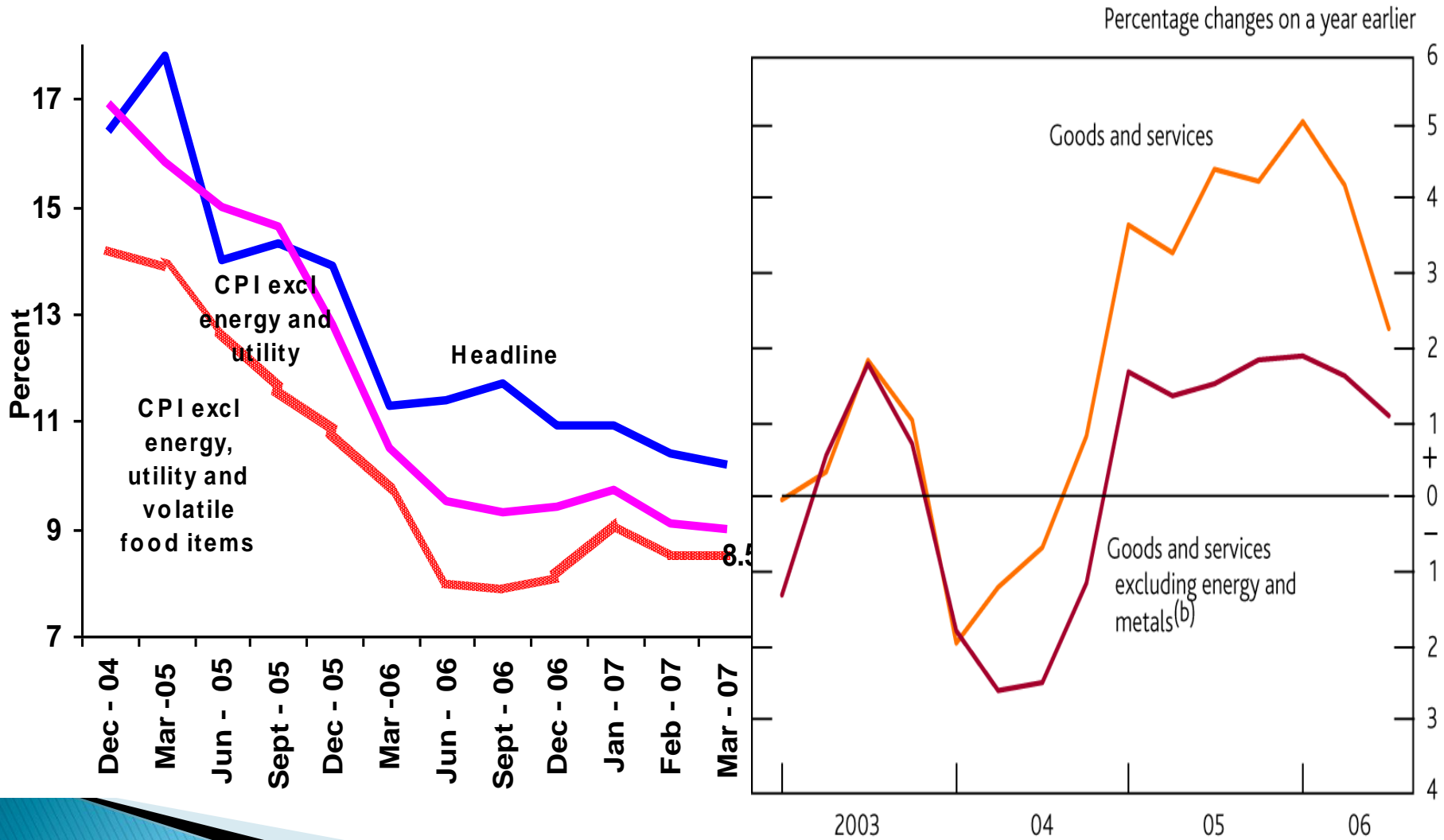
**MINISTRY OF
YOUTH & SPORTS**



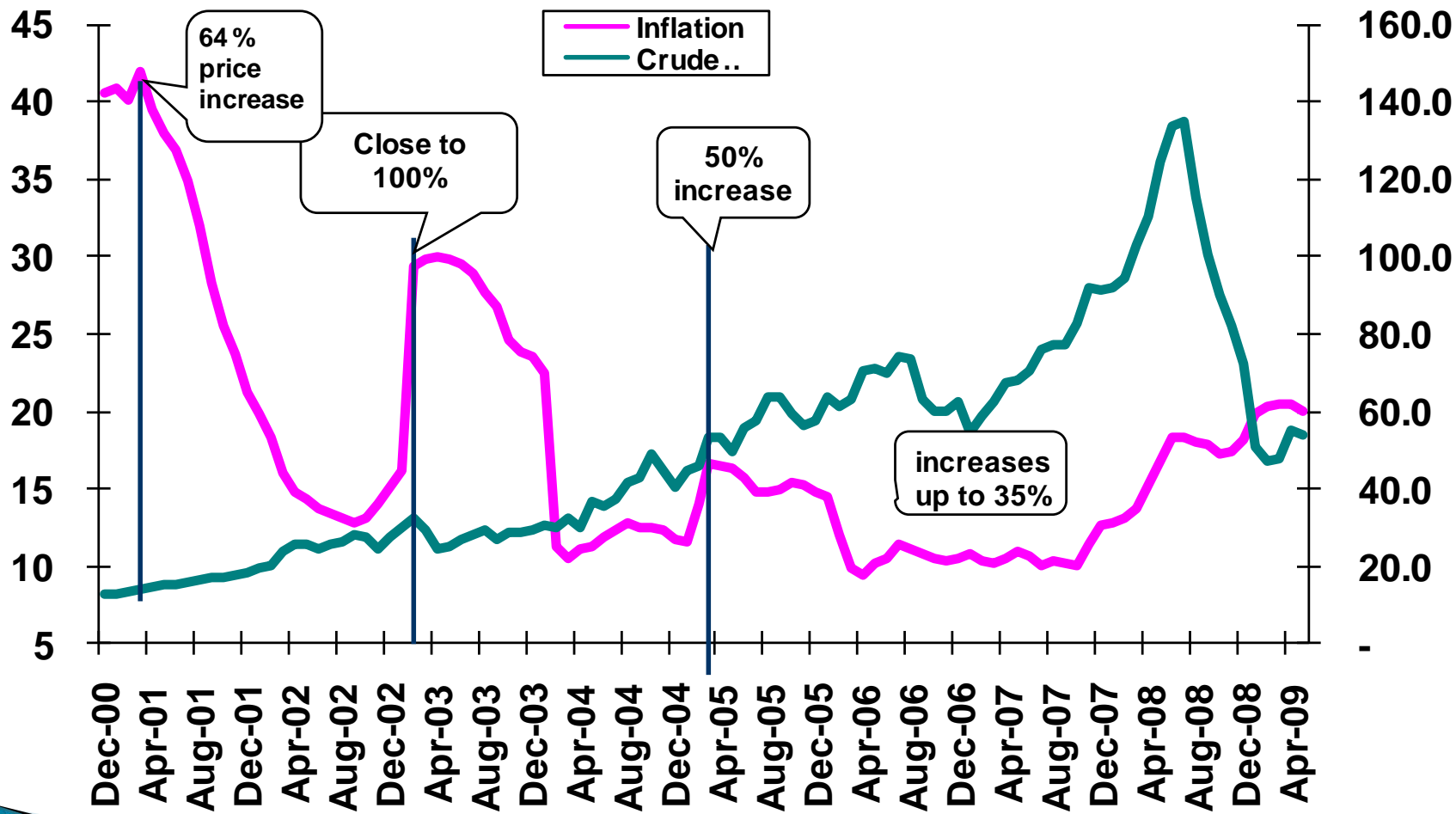
Is History a Guide?

- ▶ There are relationships among energy sources – oil, electricity, etc.
- ▶ The industrial sector has always been the hardest hit in episodes of energy crises.
- ▶ Economic output declines with energy shortages in line with sector intensity
- ▶ E.g. industry fell from 5.4% in 1993 to 3.4% in 1994.
- ▶ It also fell from 6.4% in 1997 to 3.2% in 1998
- ▶ In 2007, impact was mitigated by proactive deployment of generators by VRA
- ▶ Given the industrial weight of 25.4%, then output decline based on history is estimated at about 2% over one year

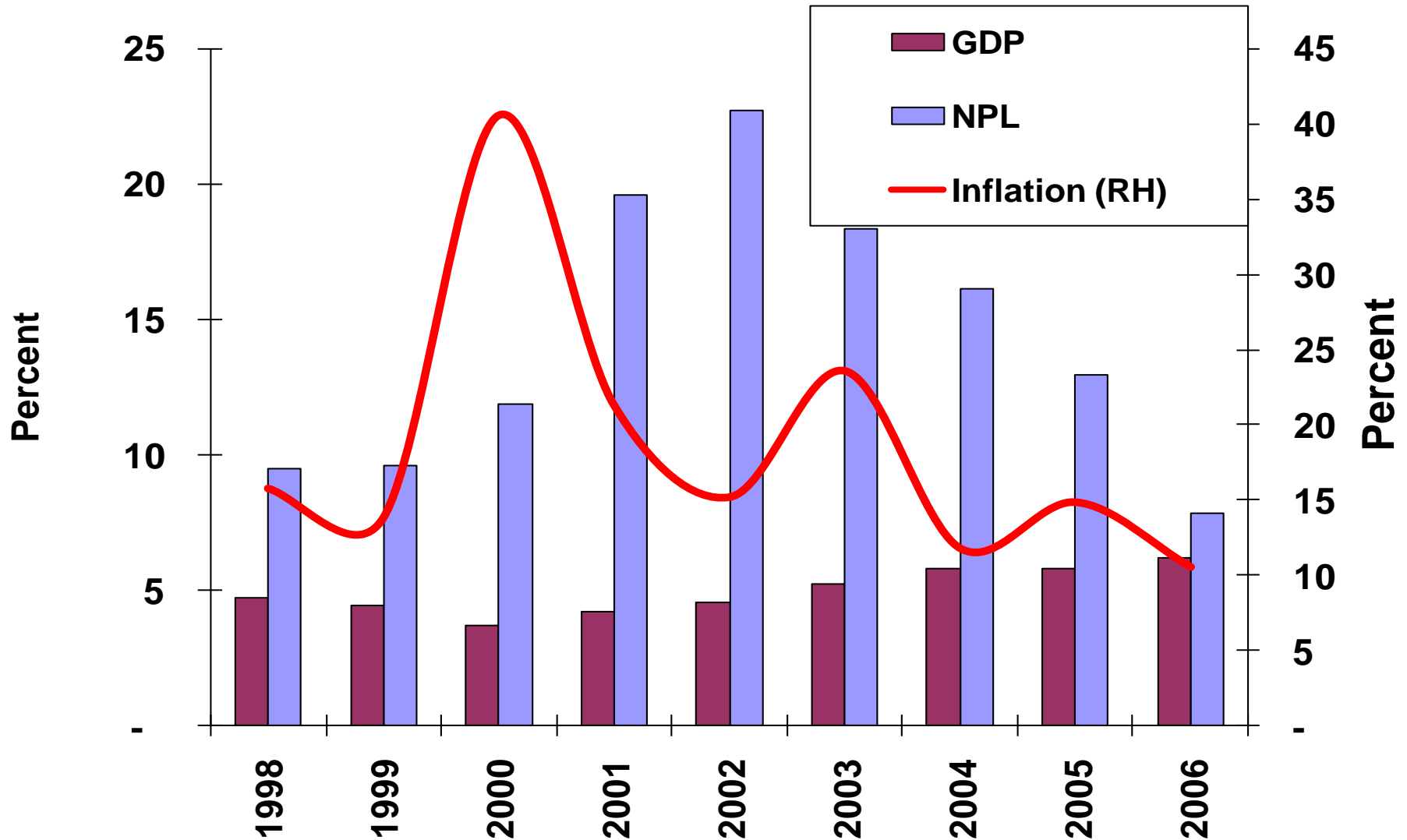
Energy & Food price volatility – Major Contributors to price stability...



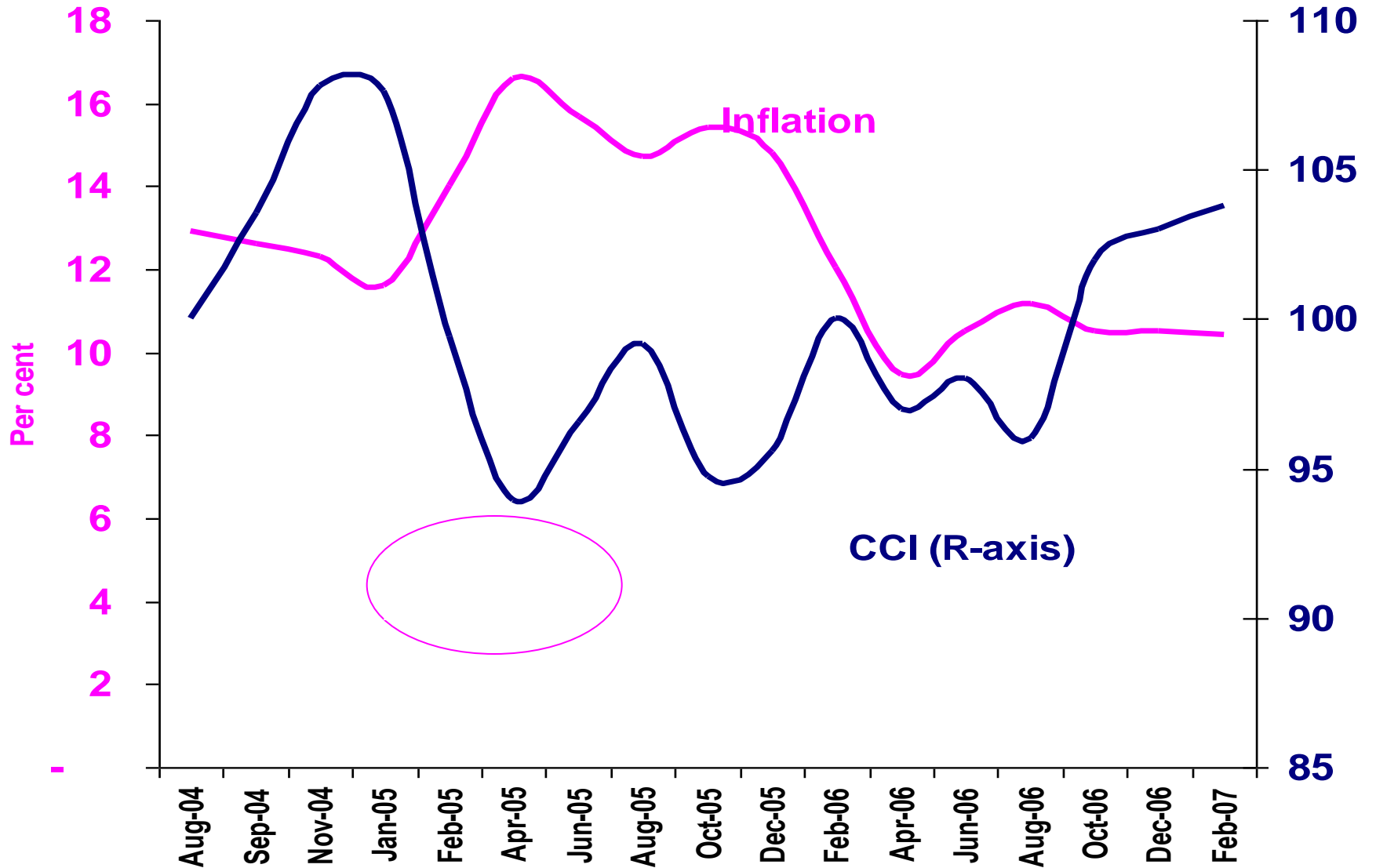
Impact of Petroleum price movement on inflation in Ghana



Real GDP Growth has been inversely associated with Inflation and loan delinquency ...



Overall CCI and Inflation



Solution Suite

Energy Sources – Hydro

Solutions

- Weather derivatives

Energy Source – Fossil Fuels

Solutions

- Commodity derivatives
- Using Options, swaps, forwards/futures

Untapped alternative source – Bio Fuel

- **using sunflower oil**
- 

RISKS AND MITIGANTS

a. Excessive rainfall

Excessive rainfall in any particular season could lead to floods and destroy crop yield.

Mitigant

To avoid floods on the farms, high land topography areas are selected for the project farms.

Use of Agro climatology to plan cropping activities

b. Bush fires could burn the farm before harvesting.

Mitigant

- Construct fire belts
- Maintain security on the farms
- Harvest on time

c. Diseases and pests could attack plants and reduce yield.

Mitigants

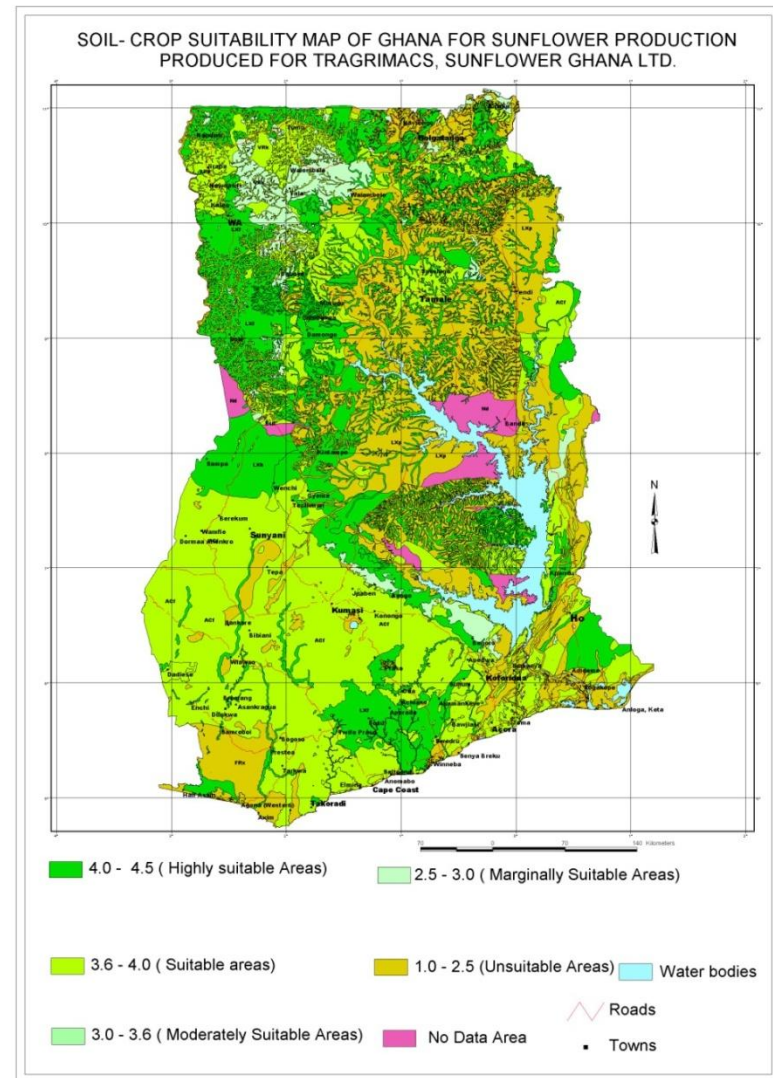
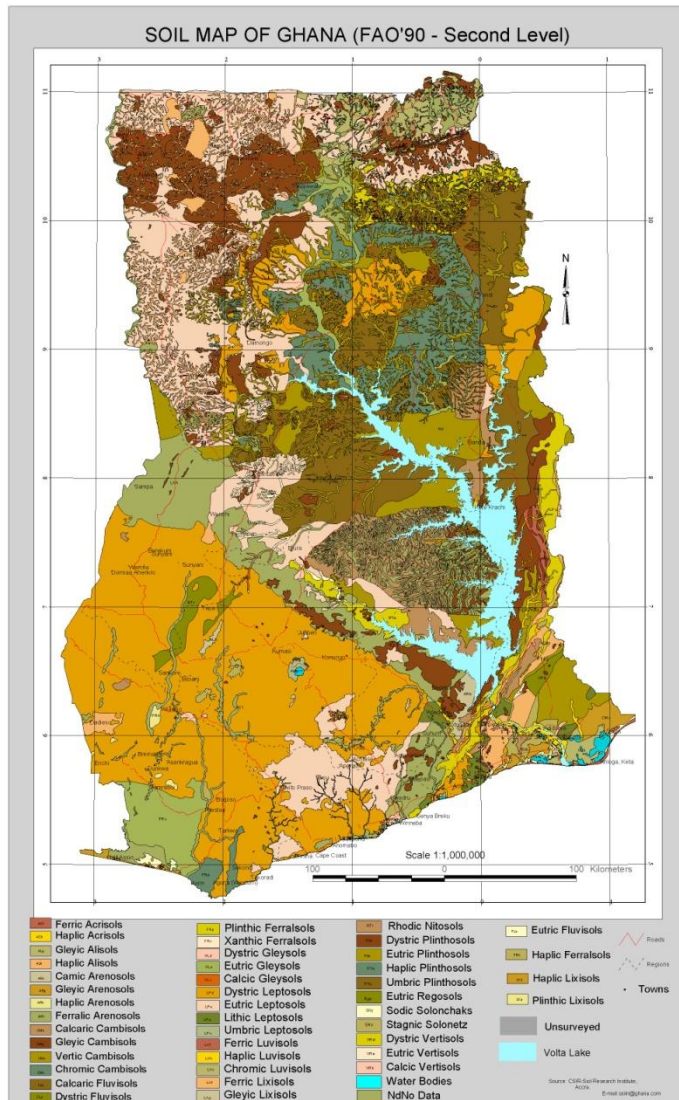
Disease and pest resistant varieties are used.

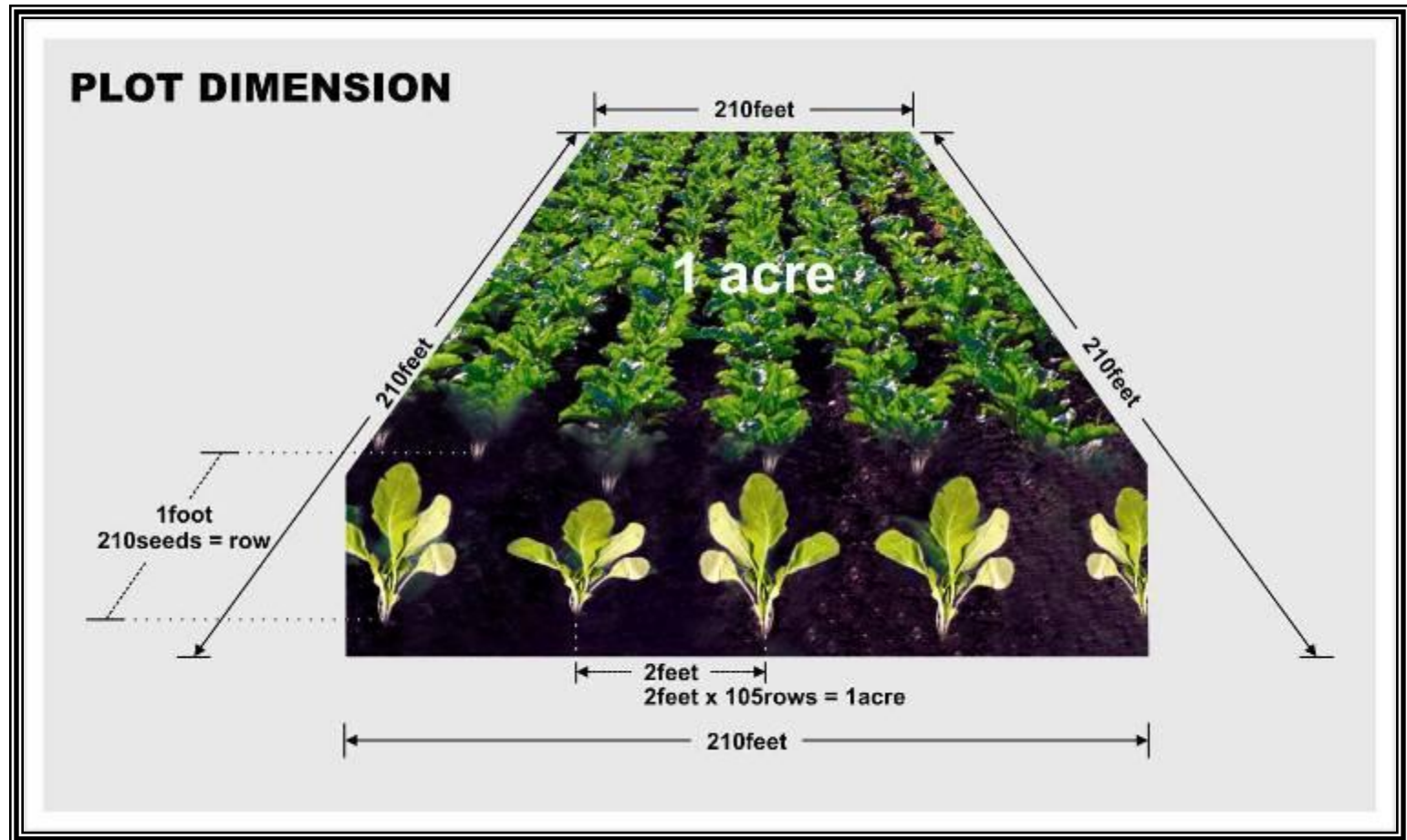


Prospects & Potentials of Sunflower in Ghana Today

- Great Export potential
- Import substitution
 - Over US\$2.0 billion import of crude oil annually
 - Over US\$12.0 Million of imports by canned fish manufacturers Annually
 - Over US\$5,000,000 imports of Cake Annually
- Solution to Poultry Industry
- Significant Institutional demand for Bio-Diesel
 - VRA requires over 2,000 MT of bio-diesel daily
 - 5% bio content Law imminent
- Job creation opportunities – politicians' eye
- Highly profitably due to cheap labour, etc

Soil crop suitability map of Ghana for sunflower





1Acre = 210 feet * 210 feet

1 Hectare = 2.5 acres

1 hectare = 525 feet * 525 feet

1 Hectare = 10,000 square metres

Available Institutional demand for Bio-Diesel in Ghana today

Daily Graphic

GHANA'S BIGGEST
SELLING NEWSPAPER
SINCE 1950

MONDAY, OCTOBER 26, 2009. NO. 18056. PRICE: GH¢1.00

VRA ENGAGES SAHARA

Story: Michael Donkor

SAHARA Oil Company Limited of Nigeria has been temporarily engaged to supply the Volta River Authority (VRA) with crude oil to feed the Aboadze Thermal Plant.

The deal involves the supply of 100,000 barrels of crude oil at a cost between \$36 million and \$52 million on a monthly basis. This follows the suspension of the tender for the supply of oil to the VRA to feed the Aboadze Plant.

The Chief Executive Officer of the VRA, Mr Kwaku Andoh, who disclosed this to the *Daily Graphic*, said a committee had been set up by the management of the VRA to inquire into the tendering process.

The tender, which was opened in 2008, had four companies submitting their proposals to supply crude oil to the VRA, but serious questions have been raised about the propriety of the whole tendering process.

The Aboadze Thermal Plant, which depends on crude oil to generate electricity, was activated in 2000 to support the Akosombo Dam when the country was faced with energy crisis.

Currently, the plant generates 220 megawatts of power to augment that generated at Akosombo.

Mr Awotwi said the VRA had no contract with any oil marketing company to supply oil to it.

To lift oil for Aboadze Thermal Plant

The Deputy Chief Executive Officer of the VRA, Mr Maxwell E.Y Odoom, explained further that Sahara Oil had been engaged to supply the authority with crude oil on cargo basis because it had in the past supplied the VRA with 100 per cent pure crude oil.

He said in accordance with the VRA's policy, every year the

tender was re-opened for companies to submit their proposals for consideration to supply crude oil.

He said to ensure that the oil was not contaminated, the VRA had chartered a vessel which constantly lifted the oil and delivered

• *Continued on Page 3*



TRAGRIMACS

day ago,

☆ **Abdul Noor Wahab** [show details](#) Mar 16 (16 hours ago) [↩ Reply](#)

Dear Sir,

I just noticed that the fuel consumption rates that I sent for the smaller diesel units were incorrect. The input fuel consumption that were used was wrongly entered. I am therefore resubmitting the fuel consumption for the smaller units:

Between 2,150 bbls/day and 4,680 bbls/day OR 341,850 litres/day – 743,662 litres/day depending on the size of the unit.

Between 302 metric tons/day – 670 metric tons/day (for a density of 0.883 metric ton/m³)

313 metric tons/day – 680 metric tons/day (for a density of 0.914 metric ton/m³)

Kindly do a re-assessment and get back to us.

Sorry for the inconvenience.

Regards,

A.N.Wahab

Abdul Noor Wahab to show details Feb 22

Dear Sir,

Further to the request by my Director (Ing. Sam-Appiah) to provide the fuel requirements in litres and metric tons, please find below the fuel requirements

1. Quantity consumed per month for a 100 MW Light Crude Oil (LCO) gas turbine is about **173,000** barrels. Same as
 - 27,507,000 litres/month
 - 24,288.68 metric ton/month (density of 0.883 metric ton/m³) or
 - 25,141.40 metric ton/month (density of 0.914 metric ton/m³)

2. For the smaller diesel units the consumption is about 45 – 60 barrels/day depending on the size of the unit.
 - 7,155 – 9,540 litres/day
 - 6.32 – 8.42 metric ton/day (density of 0.883 metric ton/m³) or
 - 6.54 – 8.72 metric ton/day (density of 0.914 metric ton/m³)

Regards,

Ing. A.N.Wahab

Dear Mr. Sulemana,

Thanks for your feedback. I have requested Wahab to send to you again the requisite fuel volumes in barrels/ litres/ cubic metres and also in metric tons for a better appreciation of the size of the fuel consumption we are talking about.

The issue for us to critically examine and confirm is not only the fuel specification, but also the **quantities of fuel required per day or per month and how reliably you can meet the demand**. I will advise that we do not rush into signing any MOU (binding) that we may not be able to deliver on. Per our business culture and the onerous responsibility on VRA to reliably meet the nation's energy needs, we have very little room for defaults in our supply chain (fuel in this case) and we normally come down very hard on anyone who would have a contract with us and would fail to deliver. This is because we cannot hide such a short coming from the nation! For this reason we are very careful about MOUs and contracts without the proper due diligence.

Wahab will get back to you with the volumes for your further perusal/consideration.

Best regards

Ing. William E. Sam-Appiah

Director, Engineering Services

Volta River Authority

P.O. Box MB77

Accra

Ghana



VOLTA RIVER AUTHORITY

Phone: 233-21-221124/664941-0
Fax: 233-21-662610
Telex: 2022 VOLTA GH
E-mail: paffairs@accra.vra.gov.gh

P.O. Box MB 77
ACCRA, GHANA

Date: 6th May, 2010

Our Ref: EXR/1090/01/654

Your Ref:

The Chief Executive Officer
Tropical Agricultural Marketing and Consulting Services
P.O. Box AD 464
Adabraka

Dear Sir,

RE: QUALITY EVALUATION OF SUNFLOWER BIODIESEL

With reference to your letter dated January 19, 2010 and reference number TR/TBF/01/2010, we wish to note that the samples requested for further analyses were received in our lab on 22nd April 2010.

Necessary analyses were carried out in our lab to determine if your sunflower biodiesel fuel conforms to our delivered fuel specifications. The results of the analyses show that both the crude and refined biodiesel samples meet the specifications of delivered fuel and hence, suitable for use at our Thermal Power Stations.

Please find attached a copy of the analyses results.

Yours faithfully,

Kwaku A. Awotwi
Chief Executive



VOLTA RIVER AUTHORITY

Phone: 233-21-221124/664941-9
Fax: 233-21-662610
Telex: 2022 VOLTAGH
E-mail: paffairs@accra.vra.com

P.O. Box MB 77
ACCRA, GHANA

Date:

May 14 2010

Our Ref: EXR/1090/011/666

Your Ref:

The Chief Executive Officer
Tropical Agricultural Marketing and Consulting Services
P.O Box AD 464
Adabraka

Dear Sir,

RE: QUALITY EVALUATION OF SUNFLOWER BIODIESEL

We refer to your letter dated January 19, 2010 and your subsequent delivery of samples of sunflower derived from biodiesel for testing on April 22, 2010. The results of our analysis indicate that both the crude and refined samples meet the specification for use in our thermal plants.

We note that VRA currently needs about 1.6 million barrels per year for each 110 MW thermal plant. Given the importance of fuel to our operations, it is critical that we are assured of reliable and adequate supply before we can consider entering into any arrangement with you for fuel supply. Accordingly, we will kindly request the following information:

- Background on your company (experience in biodiesel production, financial and technical capacity etc)
- The guaranteed minimum volume that could be supplied on regular basis
- Indicative price per cubic meter

We look forward to hearing from you soon.

Yours faithfully,

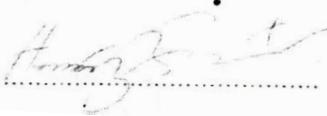
Kweku A. Awotwi
CHIEF EXECUTIVE

**VOLTA RIVER AUTHORITY
TAKORADI THERMAL POWER STATION
RESULTS OF ANALYSIS OF 'AS DELIVERED' LIGHT CRUDE OIL**

Type of Sample: Sunflower Biodiesel (Crude and Refined)
Source: Tropical Agricultural Marketing and Consulting Services

Sample Analyzed at: TIPS lab and TOR Lab
Date Sample Delivered: 22/04/10
Laboratory Ref. No.: CBDO(Sunflower)/220410/0830
RBDO(Sunflower)/220410/0830

| PARAMETER | ASTM TEST METHOD | UNITS | VRA SPECIFICATION FOR 'AS DELIVERED' FUEL | ANALYSIS RESULTS | |
|---------------------------------|--------------------|--------------------|---|------------------|---------|
| | | | | CRUDE | REFINED |
| Viscosity @ 37.8° C | max | D445 | cSt | 5.8 | |
| Viscosity @ 37.8° C | min | D445 | cSt | 1.8 | **** |
| Density @ 15.6° C | max | D1298 | Kg/m ³ | 960 | 918.5 |
| API Gravity | min | D1298 | Kg/m ³ | 15.9 | 876.0 |
| Pour Point | max | D97 | ° C | 12 | **** |
| Flash Point | min | D56, D93 | ° C | -40 | **** |
| Nitrogen, Total | | | mg/L | 120 | **** |
| Ash Content | max | D482 | Wt% | 0.015 | 0.0025 |
| Water and Sediment (BS&W) | max | D1796, D473 | Vol% | 1.0 | < 0.1 |
| Filtrable Dirt | max | D2276 | mg/100ml | 5 | **** |
| Sulphur | max | D129, D4294, D1552 | Wt% | 0.2 | **** |
| Wax Content | | | Wt% | 6.5 | **** |
| Wax Melting Point | | | ° C | 27 | **** |
| Trace Metal Contaminants | TEST METHOD | | | | |
| Sodium and Potassium (Na + K) | max | ICP-AES | ppmw | 10 | 3.7 |
| Vanadium (V) | max | ICP-AES | ppmw | 0.5 | 0.1 |
| Lead (Pb) | max | ICP-AES | ppmw | 1.0 | < 0.01 |
| Calcium (Ca) | max | ICP-AES | ppmw | 9.0 | 2.7 |
| Magnesium (Mg) | max | ICP-AES | ppmw | 5 | < 0.01 |
| Nickel (Ni) | max | ICP-AES | ppmw | 5 | 0.2 |
| | | | | | 0.4 |

Snr. Chemist: 

Date: May 4, 2010



GHANA STANDARDS BOARD



P. O. Box MB 245 Accra - Ghana, Tel: (233-21) 506991 - 4, 500065/6
Fax: (233-21) 500092, 500231

EXECUTIVE DIRECTOR: **DR. GEORGE B. CRENTSIL**

Our Ref: **GSB/TED/MAT/101.2/A/VOL**

Your Ref:

Date: **2010-01-18**

Date:

The Chief Executive Officer
Trop. Agric. Mkt. & Consultancy Services
P.O. Box AD 464.
Adabraka, Accra.

Dear Sir,

QUALITY EVALUATION OF BIODIESEL

Reference is made to your request dated 12th January, 2010 for the analysis of the above sample.

The test results indicated that the sample, biodiesel (Tropical Agricultural Marketing & Consultancy Services) met the requirements of the standard. It is therefore of acceptable quality.

We acknowledge receipt of an amount of two hundred Ghana cedis (GH¢ 200.00) being full payment in respect of this work.

Yours faithfully,

K. ACHEAMPONG
DIRECTOR, TESTING DIVISION,
For: EXECUTIVE DIRECTOR.



GHANA STANDARDS BOARD

FORM

TITLE: Analytical Test Report

Doc. No. TES-GSB-FM-T09-B

Our Ref.: GSB/MAT/101.9/A/Vol.

Your Ref.:

TO: The Chief Executive Officer
Trop. Agric. Mkt. & Consultancy Services
P.O. Box AD 464.
Adabraka, Accra.

| <u>Codes</u> | |
|---|----------|
| Generalised Product Code | PP..... |
| Specific Product Code | BD |
| Officer Responsible for Report | SA |
| Code of Approving Officer | EA |
| Period of Report | 01/2010 |
| Lab. No.: 50 Dept.: MS Source Code: 2 Yr.: 10 | |

LABORATORY CONDUCTING TEST:

Materials Science Laboratory
Ghana Standards Board
P.O. Box MB 245
Accra.

NAME OF SAMPLE: Biodiesel (Trop. Agric. Mkt & Cons. Services) **SAMPLE SIZE:** 1 x 5L
DATE RECEIVED: 2010-01-12 **DATE OF REPORT:** 2010-01-18
SOURCE/PURPOSE: Tropical Agricultural Marketing & Consultancy Services / Quality Evaluation

| TEST CODE | TEST CONDUCTED | UNIT | RESULTS | TEST METHODS | SPECIFICATION GS 944 : 2008 |
|-----------|----------------------------|-------------------|---------------------------------------|--------------|--------------------------------|
| VIE | Visual Examination | - | Clear yellow liquid free of sediments | Visual | - |
| DEN | Density @ 15°C | kg/m ³ | 883 | ASTM-D- 1298 | 860 - 900 |
| KIV | Kinematic Viscosity @ 40°C | cSt | 5.1 | ASTM-D-445 | 1.9 – 6.0 |
| FLP | Flash Point | °C | >150 | ASTM-D- 93 | 130 (min) |
| WAC | Water Content | mg/kg | Not detected | ASTM-D- 95 | 500 (max) |
| SUA | Sulfated Ash | % m/m | Not detected | ASTM-D- 874 | 0.02 (max) |
| CEN | Cetane Number | - | 48 | ASTM-D- 976 | 47 (min) |
| SUL | Sulphur | % wt. | Not detected | ASTM-D- 2622 | 0.05 (max) |
| EVP | Evaporation @ 360 °C | % vol | 99 | ASTM-D- 86 | 90 (min) |

Lab. No. 50-MS2-10



GHANA STANDARDS BOARD FORM

TITLE: Analytical Test Report

Doc. No. TES-GSB-FM-T09-B

REMARKS: The sample, biodiesel (Trop. Agric. Mkt & Cons. Services), met the requirements of the standard.
It is therefore of acceptable quality.

SIGNATURE
[Handwritten Signature]

REPORTED BY: STEPHEN ADU

DESIGNATION: (STANDARDS OFFICER)

DATE: 2010-01-18

SIGNATURE
[Handwritten Signature]

APPROVED BY: E.N.A. ARDE-ACQUAH

DESIGNATION: (HEAD, MATERIALS SCIENCE DEPT.)

DATE: 2010.01.18

Note: The results relate only to the items tested

- Conditions:**
1. Not valid without Ghana Standards Board's Seal.
 2. This report does not signify that product tested has been certified.
 3. Not to be used for litigation and advertisement without written consent of the Director of Ghana Standards Board.
 4. This report shall not be reproduced except in full without the written approval of the Executive Director of Ghana Standards Board.



GHANA STANDARDS BOARD

P. O. Box MB 245 Accra - Ghana; Tel: (233 - 021) 500065, 500066, 506991 - 4 (Lines)
Fax: (233 - 021) 500092



EXECUTIVE DIRECTOR:

ADU G. DARKWA

Our Ref: GSB/FOD/FA2/566-567

Your Ref:

Date: 2009-10-16

Date:

Tropical Agric & Marketing
Consultancy Sunflower Ghana Ltd
P.O.Box AD 464,
Adabraka
Accra

Dear Sir

ANALYTICAL REPORT

Please find attached, test report on samples of **Sunflower oil** and **Jatropha oil**,

Lab. # 566-567 /FA2/09 submitted for analysis.

Thank you,

Yours faithfully,

**KWABENA ACHEAMPONG
DIRECTOR, TESTING DIVISION
for: EXECUTIVE DIRECTOR**



GHANA STANDARDS BOARD
FORM

TITLE: Analytical Test Report

Doc. No. : TES-PPC-HOD-FM-002

Your Ref.:

Our Ref.:.....

TO: Tropical Agric & Marketing
Consultancy Sunflower Ghana Ltd
P.O.Box AD 464,
Adabraka
Accra

| <u>Codes</u> | |
|---|-------|
| Generalized Product Codes | ..... |
| Specific Product Code | ..... |
| Officer Responsible for Report | ..... |
| Code of Approving Officer | ..... |
| Period of Report | ..... |
| Lab. No. 566 Dept. FA Source Code 2 Yr 2009 | |

LABORATORY CONDUCTING TEST

Food Laboratory
Ghana Standards Board
P.O. Box MB 245
Accra

NAME OF SAMPLE: Sunflower Oil

SAMPLE SIZE: 1 x 1L

DATE RECEIVED: 2009-09-24

DATE OF REPORT: 2009-10-14

SOURCE / PURPOSE: QUALITY EVALUATION

| TEST CODE | TEST CONDUCTED | UNIT | RESULTS | TEST METHODS | SPECIFICATIONS |
|-----------|--|---------|---------|---------------|--------------------------|
| | Matter Volatile at 105°C | % | 0.2 | ISO 662:1998 | GS 525:2003 0.2 (Max) |
| | Free Fatty Acids | % | 1.4 | ISO 660:1996 | - |
| | Refractive Index | | 1.472 | IUPAC 2:102 | 1.461-1.468 |
| | Peroxide value | Meq/kg | 2.74 | IUPAC 2.501 | - |
| | Relative Density (20°C/water at 20°C) | | 0.9174 | IUPAC 2.101 | 0.918-0.923 |
| | Saponification value | mgKOH/g | 135.51 | ISO 3657:1988 | 188-194 |



GHANA STANDARDS BOARD
FORM

TITLE: Analytical Test Report

Doc. No. : TES-PPC-HOD-FM-002

Your Ref.:

Our Ref.:

TO: Tropical Agric & Marketing
Consultancy Sunflower Ghana Ltd
P.O.Box AD 464,
Adabraka
Accra

| <u>Codes</u> | |
|---|-------|
| Generalized Product Codes | ..... |
| Specific Product Code | ..... |
| Officer Responsible for Report | ..... |
| Code of Approving Officer | ..... |
| Period of Report | ..... |
| Lab. No. 567 Dept. FA Source Code 2 Yr 2009 | |

LABORATORY CONDUCTING TEST

Food Laboratory
Ghana Standards Board
P.O. Box MB 245
Accra

NAME OF SAMPLE: Jatropha Oil

SAMPLE SIZE: 1 x 1L

DATE RECEIVED: 2009-09-24

DATE OF REPORT: 2009-10-14

SOURCE / PURPOSE: QUALITY EVALUATION

| TEST CODE | TEST CONDUCTED | UNIT | RESULTS | TEST METHODS | SPECIFICATIONS |
|-----------|--------------------------|------|---------|--------------|----------------|
| | Matter Volatile at 105°C | % | 0.02 | ISO 662:1998 | |
| | Free Fatty Acids | % | 3.9 | ISO 660:1996 | |



GHANA STANDARDS BOARD

Page 3 of 3

FORM

TITLE: Analytical Test Report

Doc. No. : TES-PPC-HOD-FM-002

REMARKS: Nil.

Note: The results relate only to the items tested

SIGNATURE: 

SIGNATURE: 

REPORTED BY: ALICE DONYA

APPROVED BY: FELICIA I. ADAM (MRS)

DATE: 2009-10-16

DATE: 2009-10-16

Conditions:

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VOLTA RIVER AUTHORITY

Phone: 233-21-221124/6649-1-3
Fax: 233-21-662610
Telex: 2622 VOLTAGH
E-mail: paffairs@accra.vra.gov.gh

P.O. Box MB 77
ACCRA, GHANA

Date: 6th May, 2010

Our Ref: EXR/1090/01/654

Your Ref:

The Chief Executive Officer
Tropical Agricultural Marketing and Consulting Services
P.O. Box AD 464
Adabraka

Dear Sir,

RE: QUALITY EVALUATION OF SUNFLOWER BIODIESEL

With reference to your letter dated January 19, 2010 and reference number TR/TBF/01/2010, we wish to note that the samples requested for further analyses were received in our lab on 22nd April 2010.

Necessary analyses were carried out in our lab to determine if your sunflower biodiesel fuel conforms to our delivered fuel specifications. The results of the analyses show that both the crude and refined biodiesel samples meet the specifications of delivered fuel and hence, suitable for use at our Thermal Power Stations.

Please find attached a copy of the analyses results.

Yours faithfully,

Kwaku A. Awotwi
Chief Executive

CHIEF EXECUTIVE

Yield / Income and expenditure for Sunflower Production by Scale

| | | Scale 2 | Scale 3 | Scale 4 | Scale 5 |
|---------------------------------|------------|-------------------|-------------------|-------------------|--------------------|
| Cost of Seed Production | Cost/Acre | 30,000 Acres | 40,000 Acres | 50,000 Acres | 60,000 Acres |
| Production Cost/Acre | 345.0 | 20,100,000 | 26,800,000 | 33,500,000 | 40,200,000 |
| Income from crude oil | | | | | |
| Revenue from oil | 630 | 37,800,000 | 50,400,000 | 63,000,000 | 75,600,000 |
| Revenue from cake | 275 | 16,484,400 | 21,979,200 | 27,474,000 | 32,968,800 |
| Total Revenue | 905 | 54,284,400 | 72,379,200 | 90,474,000 | 108,568,800 |
| | | | | | |
| Less Production cost | | 20,100,000 | 26,800,000 | 33,500,000 | 40,200,000 |
| | | 34,184,400 | 45,579,200 | 56,974,000 | 68,368,800 |
| Less Processing cost | | | | | |
| Incidental Expenses (GHC35/100) | 34 | 2,040,000 | 2,720,000 | 3,400,000 | 4,080,000 |
| Processing cost of 1MT | 33 | 2,000,000 | 2,666,667 | 3,333,333 | 4,000,000 |
| Cost of drums @ GHC10 each | 120 | 7,200,000 | 9,600,000 | 12,000,000 | 14,400,000 |
| Transportation | 50 | 3,000,000 | 4,000,000 | 5,000,000 | 6,000,000 |
| | | | | | |
| | | 14,240,000 | 18,986,667 | 23,733,333 | 28,480,000 |

BIO_DIESEL PROCESSING

| | | Scale 1 | Scale 2 | Scale 3 | Scale 4 | Scale 5 |
|--------------------------------------|--------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| Total processing cost | 717 | 28,673,680 | 43,010,520 | 57,347,360 | 71,684,200 | 86,021,040 |
| TOTAL COST | 1,299 | 51,567,013 | 77,350,520 | 103,134,027 | 128,917,533 | 154,701,040 |
| INCOME FROM BIODIESEL | | | | | | |
| 1 Lt Biodiesel @ GHC 0.90/LT GHC 910 | 917 | 36,684,000 | 55,026,000 | 73,368,000 | 91,710,000 | 110,052,000 |
| Revenue from cake @ GHC 150/MT | 275 | 10,989,600 | 16,484,400 | 21,979,200 | 27,474,000 | 32,968,800 |
| Glycerol @ GHC 0.50/KG | 510 | 20,380,000 | 30,570,000 | 40,760,000 | 50,950,000 | 61,140,000 |
| Total Income | 1,701 | 68,053,600 | 102,080,400 | 136,107,200 | 170,134,000 | 204,160,800 |
| NET INCOME FROM BIO DIESEL | 402 | 16,486,587 | 24,729,880 | 32,973,173 | 41,216,467 | 49,459,760 |
| ROCE | | 32% | 32% | 32% | 32% | 32% |

Readiness for commercial Viability

- Ready Market for both edible sunflower oil and bio-diesel
- Ready Farmer-based Organizational Network for effective out-grower scheme
- Completed, reliable research results that provide solid project input-output support
- Solid multi-disciplinary professional support
- Available land area to support required production
- Available farm machinery
- Installed low capacity oil expeller and bio diesel processor

Needed support

- Working Capital Finance – US\$ 5.0 million
- Equipment – commercial extruders, Biodiesel Processor & refinery – US\$ 7.0 million

Tragrimacs Agricultural Mechanization



Land Banks for Sunflower Cultivation

























Inspecting threshed seeds.



Bagged sunflower seeds



Weighed seeds



Calculating amount to be paid.



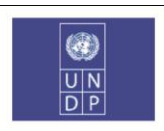
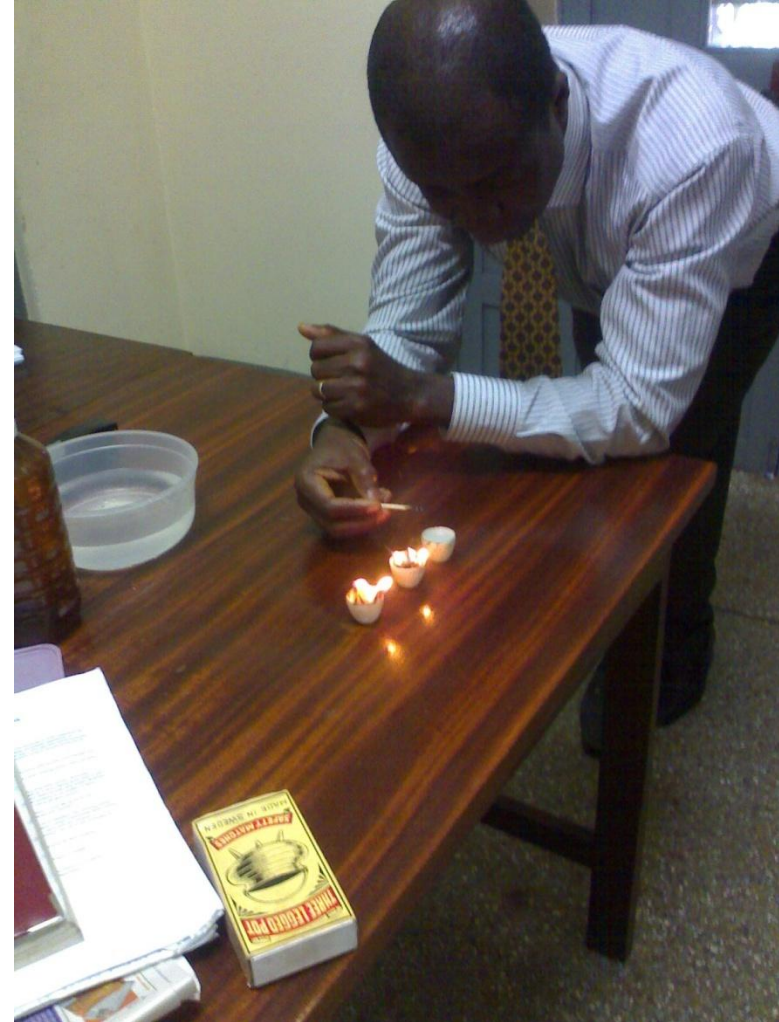






TRAGRIMACS







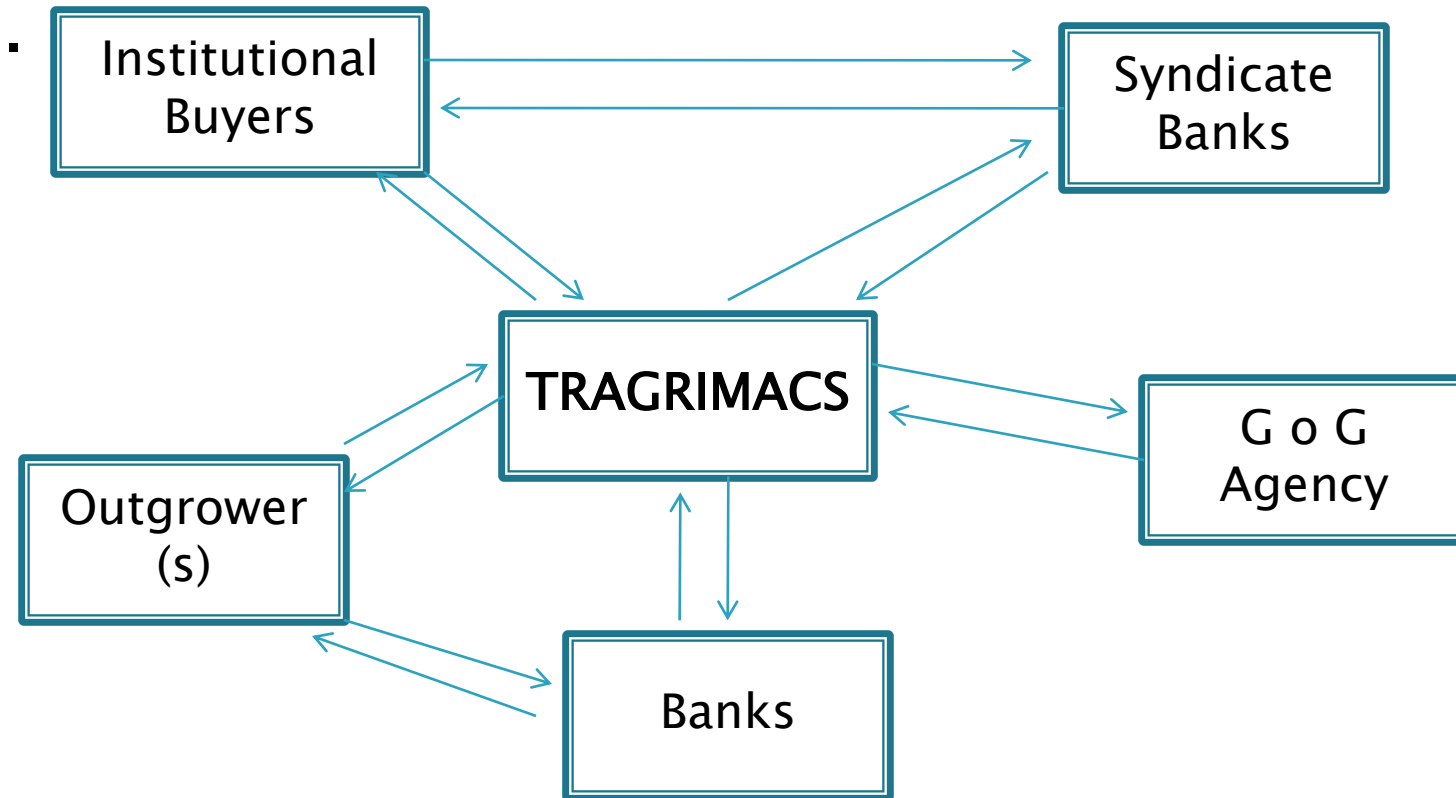


BIODiesel refinery.

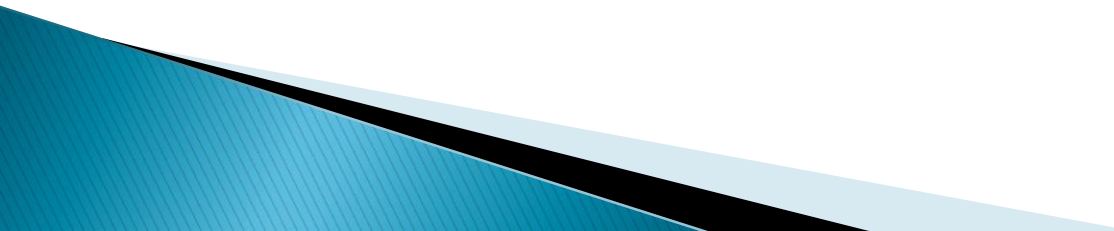


Filling a truck with BIODiesel from sunflower.

Crop Nationalization



Way forward

- ▶ Effective PPP to provide financial support
 - ▶ Efficient management of a nucleus -out-grower farming concept
 - ▶ Effective collaboration with stakeholders to nationalize sunflower production as the next foreign exchange earner
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Thank You