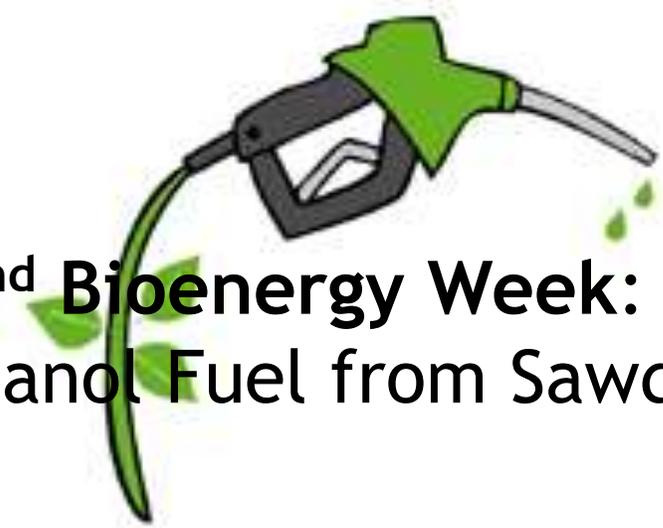


C_2H_5OH
(Ethanol Molecule)



2nd Bioenergy Week: Small-Scale Cellulosic Ethanol Fuel from Sawdust & Water Hyacinth Nigeria Example

Maputo, Mozambique, 5-9 May 2014



Femi Oye, DTM
SMEFUNDS, Nigeria
www.gebiofuels.com

SMEFUNDS - GEBIOFUELS

SMEFUNDS mission is to provide low cost, clean and safe cooking energy for households at bottom of the economic pyramid through 2G proprietary Cellulose ethanol bio process.

The organization creatively use Social Marketing to economically empower her independent distributors through Carbon Credit Earnings thereby lifting them out of poverty and fighting Climate Change in Africa.



Lignocellulosic Ethanol (2nd Generation)

The production of ethanol from lignin and cellulose makes it possible to use nonedible trees or grasses as feedstocks. With advanced conversion methods long chains of cellulose in woody materials are broken down and converted to fuel.

2nd generation biofuels are produced using more advanced technologies and better feedstock than 1st generation biofuels.

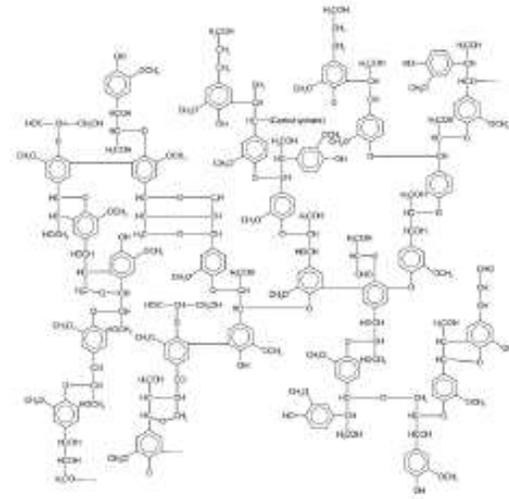
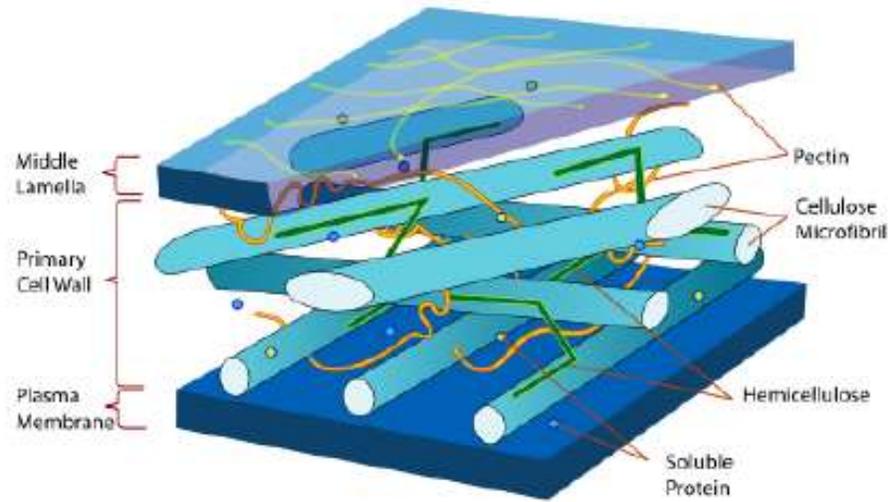
Characteristics and benefits from Cellulosic biofuels

- ▶ Food-fuel debate: Do not eat into our food supply because the feedstock consists of inedible biomass such as biological waste materials (e.g. used cooking oil, animal fats, food waste)
- ▶ Greenhouse gases: Carbon and other GHG emissions are reduced compared to 1st generation biofuels.
- ▶ Infrastructure: The currently existing petrol, Diesel or gas networks can be used for distribution of energy to end users.
- ▶ Advanced conversion to biofuel: Ability to break up lignocellulosic feedstock and convert it to fuel. If cellulose is broken down into fermentable feedstock, this indicates a 2nd generation biofuel

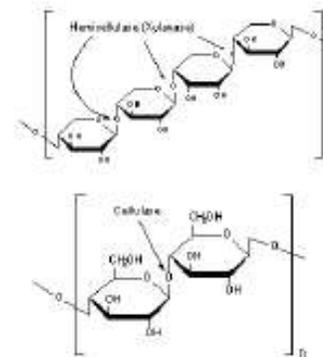
How Much Energy is Required?

- ▶ Currently we have a net energy ratio of 2.62:1.
- ▶ Cellulosic Ethanol use 80% less Energy input than Output unlike other 1st generation Ethanol. For every 1 BTU energy used, about 200% ethanol is produced. We only fire the plant to produce ethanol with the same energy from the plant. Improved technologies are underway.
- ▶ Cellulosic crops, not starch, will become the feedstock of choice in the future, the amount of energy contained in ethanol is significantly greater than the amount of energy used to make ethanol, even if the raw material used is corn (For the U.S)

Cellulosic Biofuel: BiomassUse



Polymer	Monomer	1 st Generation	2 nd Generation
Starch	C6 sugars	Transformed	Transformed
Cellulose	C6 sugars	Side product	Transformed
Hemicellulose	C5&6 sugars	Side product	Transformed
Lignin	N/A	Side product	Plant energy*



Referring to the process energy required for operating a Biofuel manufacturing facility

2ndGeneration: Mass Yields

Polymers*	TOTAL (%)
Starch	12.0
Cellulose	33.5
Hemicellulose	26.0
Lignin	18.5



81.5 % converted
(15.5 MJ / kg)

Incinerated
(~23.5 MJ / kg)

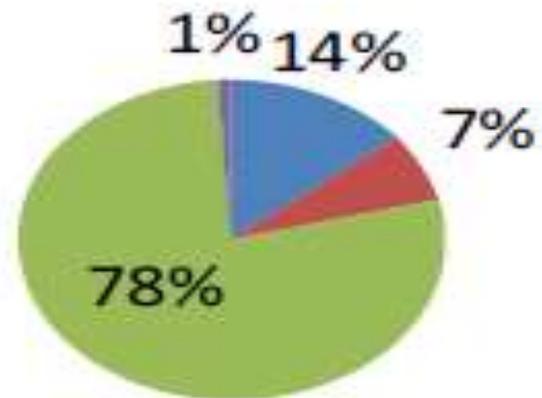
*N88n, Protein, ash, and fat contents (< 10 %) are not listed; adapted from Palu E. Hedin et al, J. Agric. Food Chem.

Nigeria: BACKGROUND

- ▶ 98 per cent of households lack access to quality clean cooking and lighting fuels.
- ▶ An estimate of 98% of Nigerians are not able to use quality cooking fuels (Biofuels, LPG cooking gas and electricity).
- ▶ Over 95,400 deaths occur per year as a result of traditional fuels such as wood and charcoal, and Nigeria's
- ▶ deforestation rate is one of the highest in the world with 3.3% of its forests lost each year.
- ▶ An average poor household spend 60% of daily earning on energy
- ▶ Nigeria import 98% of annual ethanol consumption from abroad
- ▶ \$9m is spent on Kerosene daily in Nigeria

Nigeria: Energy Supply

■ Oil ■ Natural gas ■ Biomass ■ Hydr0



Current ethanol demand in the country

Use	Substitution	Annual consumption (million litres)
Transportation	E 10 gasoline blend	1300
Household cooking and lighting	Paraffin (replacement with ethanol based cooking gel fuel)	3750
Manufacturing sector	Industrial ethanol demand (wines, chemical, raw materials, solvents, pharmaceuticals etc)	90
Total		5140

Source: (Elijah, 2010)

Estimated Consumption of Domestic Energy by Source/Type (Nigeria)

Energy Type	% of Population	Population Figure	Average Amt Spent a day	Aggregate Value
Gas	6%	9 million	100	900,000,000
Kerosene	24%	36 million	150	5,400,000,000
Wood	50%	75 million	-	-
Charcoal	10%	15 million	130	1,950,000,000
Electricity	10%	15 million	100	1,500,000,000
TOTAL				9,750,000,000

Source: Nigerian Alliance for Clean Cookstoves

Estimated Available Biofuel Gel Market (Nigeria)

Energy	% of Pop. Rate/Wk	Pop. Fig.	Consumption Annum (million)	Consumption/ Year(N) Annum
Gas	2%	3	9million	468million
Kerosene	12%	18	54million	208million
Wood	30%	45	135million	7,020million
Charcoal	4%	6	18million	736million
Electricity	3%	4.5	13.5million	702million
Total		11,934,000,000		

Source: SMEFunds Research

GEB Bio Process Summary

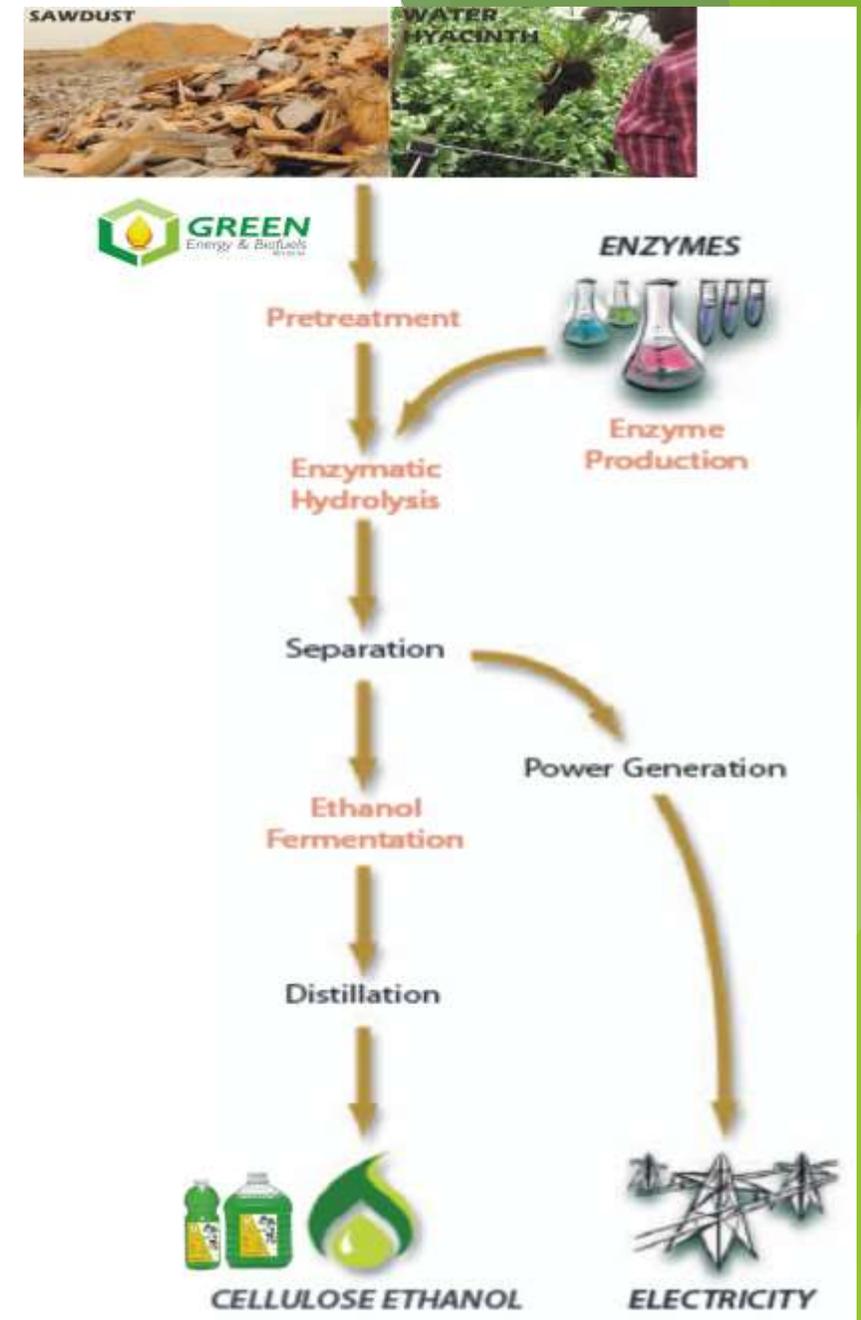
The process described here uses co-current dilute-acid, steam, and/or oxygen pressure pre-treatment of lignocelluloses biomass, followed by enzymatic hydrolysis (saccharification) of the remaining cellulose, and followed by fermentation of the resulting glucose and xylose to ethanol.

The process design also includes feedstock handling and storage, product purification, wastewater treatment, lignin combustion, product storage, and required utilities.

TECHNOLOGY: Energy

Economically feasible to convert biomass into cellulose ethanol using a combination of thermal, chemical and biochemical techniques.

The lignin in the plant fiber is used to drive the process by generating steam and electricity, thus eliminating the need for fossil CO2 sources such as coal or natural gas





GEB Modular Micro Distillery Plant



We convert wastes to Clean Energy: Our primary feed stock for BioGel



A stack of sawdust waste burning in open air in the Lagos slum



Workers paid to collect waste from sawmills to the dumpsite for burning in Lagos slum



Water hyacinth: It grows so fast and the concentration is so high in certain area of Lagos that fishermen can easily fish with their traditional boat



Water hyacinth in an experimental floating fish ponds area: The population tries to trap the water hyacinth and so control its development and can easily take it from water and dump it to be able to control their fish ponds



LITR



Gender, Distribution & Impact

- ▶ Two existing production plants running at 98% capacity
- ▶ 200,000 + Cook Stoves Sold; 2/3 of these in last 5 months
- ▶ 2 Million + Litres of Biofuel Gel Produced and Sold
- ▶ Over 18,000 Green Entrepreneurs Distribution Network (90% are Women)
- ▶ Successful implementation of any cook stove program hinges on the role(s) that Women play.
- ▶ Women use 22% more energy than men.
- ▶ Women Entrepreneurs account for more than 85% volume of ethanol gel consumption & distribution monthly.

Mama
Kike







- ▶ The price of the Gel fuel is just below the cost of kerosene in Nigeria (Less than \$1 per volume Litre)
- ▶ 0.75 liter of Gel fuel (Two filling) will provide a full day of cooking for a family of five (5).

Benefits: Biofuel Gel

- Heats up very quickly with high heat output.
- Non Spill, non explosive, no flare, and non toxic
- Highly safe and economical.
- If stove falls over accidentally the flames are contained in one place.
- 1 litre burns continuously for approx. 10 hours and more.
- If ingested, effects are not fatal but just unpleasant
- No Smoke or smell.
- When water comes into contact with gel whilst cooking, it does not splatter.
- www.thegreengel.com No black flame stains on cooking pots.



Benefits: BIOGEL COOK STOVES

- ▶ High quality, sturdy and durable 1 and 2 plate stove
- ▶ Lightweight and easy to travel with
- ▶ Easy and safe to operate
- ▶ Safer than kerosene stoves, with lower centre of gravity
- ▶ Non-liquid, so it will not spread like kerosene in case of spillage
- ▶ Comes with simmer plate
- ▶ Easy and safe to operate



Health Benefits

- It provides a significant health benefit to families otherwise dependent on dirty fuel.
- Eliminating dangerous smoke and gases from the home. Millions of families around the world still die yearly, mostly women and children, as a result of cooking smoke and other harmful gases

Environmental Benefits

- ▶ Cooking with Biofuel from sustainably produced energy crops reduces wood use and deforestation.
- ▶ Dramatically reduces greenhouse gas and soot (black carbon) emissions. This means a greatly reduced Global Warming Impact

Benefits: Carbon Credit Earnings



Shared Earning Incentives from Carbon Reduction Programme can fuel rapid adoption and improve the quality of lives

www.kikegreenstoves.org





PROVEN PLAN



CCN vs TRADITIONAL MARKETING

Development Partners



SUSTAINABLE
ENERGY FOR ALL



GLOBAL ALLIANCE FOR
CLEAN COOKSTOVES



small
WORLD
Carbon



FOR THE
PLANET

MEMBER

UNITED NATIONS
FOUNDATION



WE SUPPORT

energy future
COALITION

pangea



energy in
common



BANK OF INDUSTRY
...transforming Nigeria's industrial sector.



CTI
PEAN

CTI PRIVATE FINANCING ADVISORY NETWORK



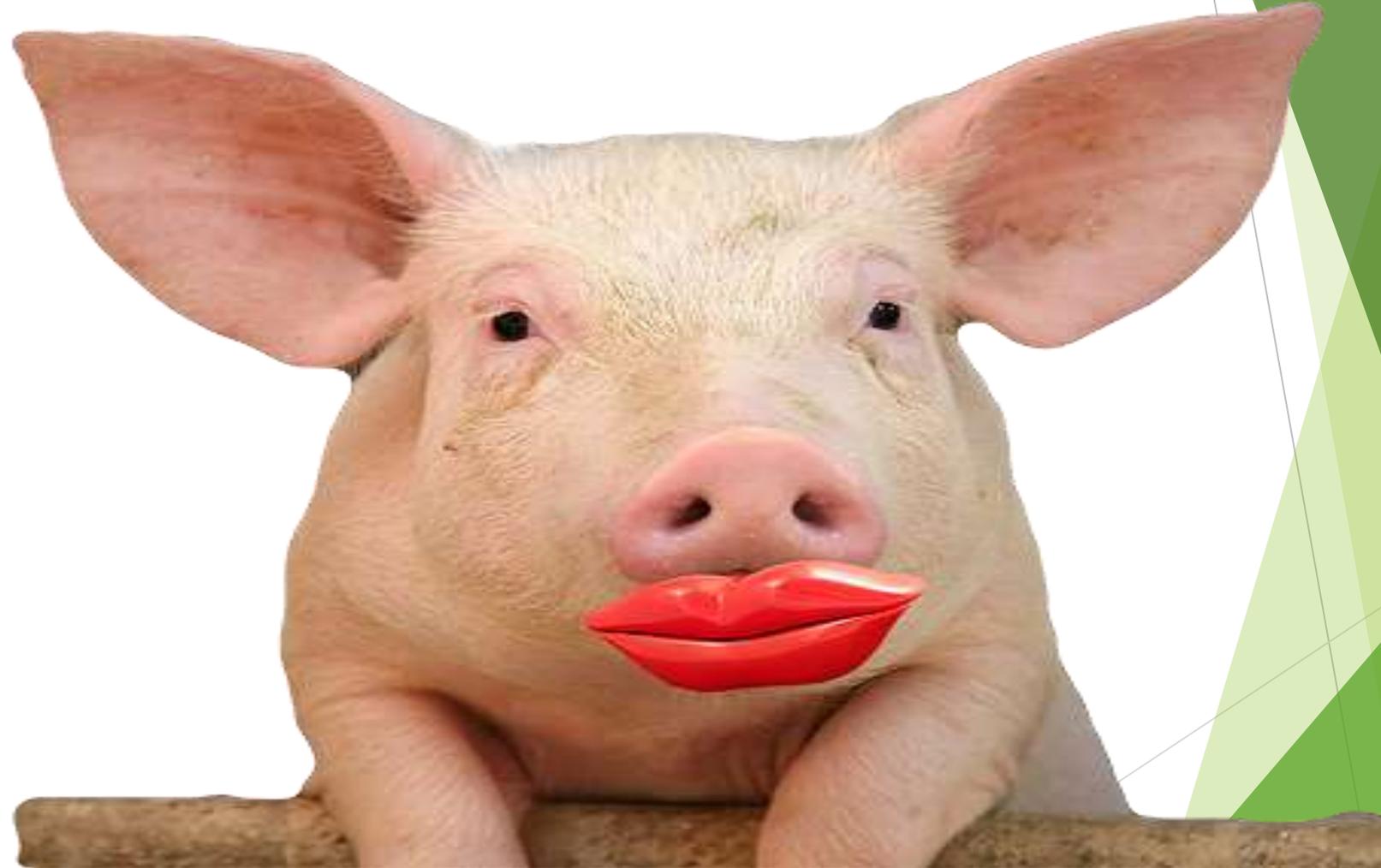
renewable
energy
& energy
efficiency
partnership

Ecobank
The Pan African Bank



GREEN
Energy & Biofuels
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**My Boss made-me-up after her 1st Million \$\$ in
Network Marketing!**



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Thank You!

