BIOMASS ENERGY DEVELOPMENT IN EAST AFRICA: KENYA

COMPETE KICK-OFF MEETING
1ST/2ND MARCH 2007 IN MUNICH

BY

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ABOUT ESD/A

- ESD is a world leading carbon and sustainable energy firm with offices in UK, Bulgaria, China, Kenya, TZ & soon RSA
- ESDA is a leading consultancy firm, based in whose mission is to work with clients to **build sustainable energy infrastructure in Africa**
- ESDA was established in 1993 and became part of ESD UK in 2002
- We have a diverse client base including government, private sector, UN, WB, Donors & communities.
- We have biomass projects in UK, Africa, China

Biomass Energy Types

- **Broadly divided into three:**
  - Taditional (charcoal, firewood & agri-residue)
  - Modern Biofuel (Biogas, Biofuel (ethanol and biodiesel)
  - Cogeneration - Electricity and heat for industrial purpose

Traditional Biomass: Existing situation (2)

•Freely available
•Land clearing
•Low calorific value
•Indoor Air Pollution
•Respiratory problems

•Not freely available,
• Relatively cheap
•Takes time to fetch
•Deforestation
•Indoor Air Pollution
•Respiratory problems

Pilot demonstration of eco-charcoal

SUSTAINABLE CHARCOAL

1. Set up of short rotation forestry and

2, modern kilns installation for sustainable charcoal

Pilot demonstrations

- Tanzania in partnership with Rural Livelihood Development Company (RLDC)
- In Turkana Kenya with OXFAM --

On-going sustainable practices

- Tree farming for charcoal is slowl becoming the norm in Kenya
- New charcoal law encourages association of charcoal producers

Hunt for efficient kilns for carbonization

Research on sustainable Transport & Markets





Why govts have not promoted charcoal

- Negative environmental impacts
  - Deforestation
  - biodiversity loss
  - Pollution and GHG emissions
  - Indoor Air Pollution
- Influence of powerful lobby groups
  - Environmental NGO's
  - Petroleum companies

What has changed?

- Realization that charcoal is an intricate part of socio-cultural life, it will not go away
- Charcoal is NOT the course of deforestation, but land use change to agriculture and settlement are main culprits
- Charcoal's potential to alleviate poverty, generate income and enhance livelihoods
- Cheaper, non renewable source of energy if harvested sustainably
- Sustainable's charcoal's potential to attract carbon finance

Savannah Land use change in Narok Kenya

BAMBURI CEMENT – ALTERNATIVE FUELS PROGRAMME

Major Environmental Impacts of Cement Industry

1. High CO_2 emissions due to the chemistry of the clinker burning process (decalcination of limestone) (pozzolana)
2. High energy requirement in the kilns for clinker burning (temperatures to 1500^{O}C) and

Mitigating measures:

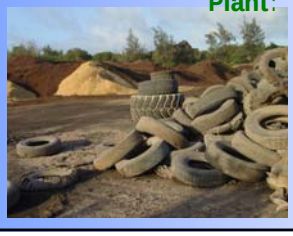
1. Clinker substitution (up to 30% without impact on quality); e.g..volcanic ash or low-grade limestone in East Africa
2. Substitution of fossil fuels through biomass (agricultural waste, plantation biomass) industrial waste (waste oil, tyres, plastics)

The Bamburi – Lafarge CO_2-reduction commitment

Bamburi Cement – in line with it's parent company Lafarge, has committed to a reduction of CO_2 emissions per ton of cement produced of 20% in the 20 years between 1990 and 2010.

Alternative fuels used at Mombasa Plant:

Cashewnut shells



Used tyres & coffee husks

Sawdust

Used plastic cement bags

Biofuel: Plantations for Carbon-Neutral Fuel

Objectives

1. Produce wood as fuel for the cement kilns to substitute fossil fuels
2. Reduce green-house gas emissions through substitution of fossil fuels
3. Sustainably utilize Bamburi's mining reserve land
4. Reduce fuel costs
5. Involve communities

Projected energy production

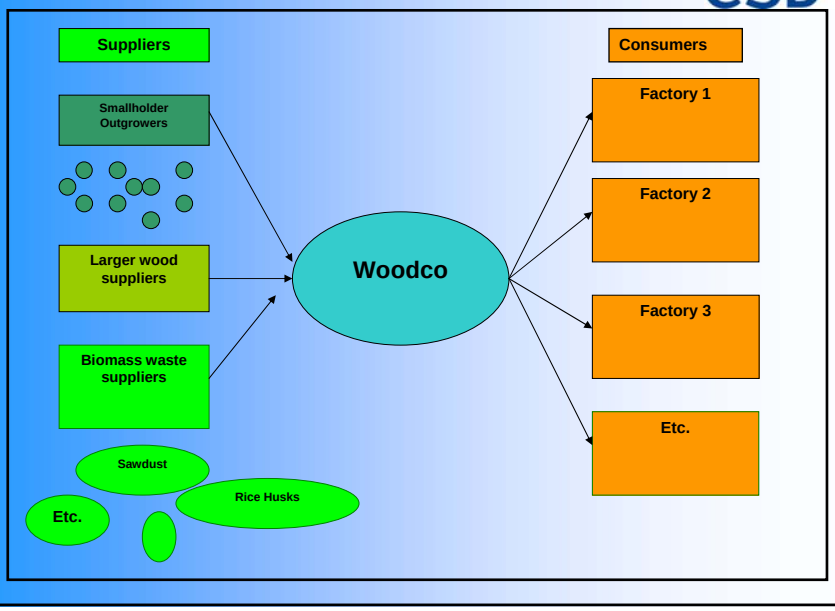
- Approx. 9% of fuel requirements of Mombasa Plant
- Continuous supply from year 7 onwards
- Energy costs estim. 20% lower than coal
- Expected to earn carbon credits from biomass fuel

Implementation

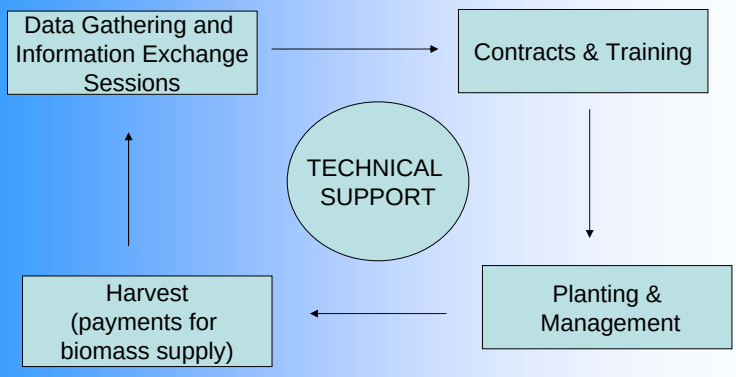
- Approx. 900ha of mining reserve land available for plantions
- Approx.15ha new quarries available for plantations per year
- Outgrower schemes (community plantations)
- Plantations to be established over 6 years, harvesting starting from year 7

Biofuel nursery in Vipingo

Woodco Model for the tea industry



Process & Management Roles of Wood-Co



BIO FUEL PROGRAMME FOR KENYA

ESDA is a member of the National Biofuel Committee, whose mandate is to come up with a biofuel strategy for Kenya. This include recommendation of biodiesel crops. Focus is now on

- –*Jatropha curcas*
- –Coconut (*Cocos nucifera*)
- –Castor oil (*Ricinus communis*)
- – *Croton megalocarpus*

Oil seeds hand press

12.000 Liter per day bio-diesel processor

Model: BK-12000-SS

Jatropha Seeds

Processed Bio-diesel

R & D Questions for Bio-diesel

- Raw materials – what species are best suited for production of bio-diesel, and which eco-zone can they grow?
- What land tenure arrangements are needed for production of bio-diesel?
- What is best model? - Plantation or out-grower schemes or a mixture of both? (Holds key to sustainability, livelihood enhancement and equity)
- Social/logistical aspect – Are farmers and other community aware and are they willing
- Economic feasibility – What is the opportunity cost of setting up a bio-diesel project? Is it profitable to the community?
- Financial feasibility – investor willing to partner?

Plantation vs Small Outgrower

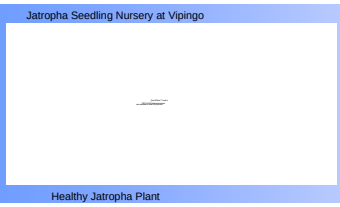
- **Plantation**
  1. High investment
  2. Efficient (mechanized)
  3. High production & profit
  4. Land owner and labourers
  5. Vulnerable to Corruption?
  6. Sustainability concerns?
  7. Livelihood concerns?
  8. Easily attracts investments
  9. High security concerns

- **Out-grower with nuclear**
  1. Low investment
  2. Can be efficient
  3. Ownership & equity
  4. Can be sustainable
  5. Enhanced livelihoods
  6. Low security concerns
  7. Environmentally sound
  8. Consistent with the objective of agroforestry in ASAL?

Jatropha in Mombasa

Jatropha Seedling Nursery at Vipingo

•Small scale planting of Jatropha is already practiced at the Coast.
•The Jatropha is mainly for traditional medicine.
•It is also planted as a live hedge.



Healthy Jatropha Plant

Jatropha with young fruits

Depending on soil type and how well-cared for, fruit production can begin in 3 - 6 months after planting.

Jatropha leaf attacked by Red Beetles (Diani)

Jatropha with drying tip

Issues still requiring attention:

- Economic viability (feasible land sizes)
- Proper care for the plants, and how to protect from diseases
- Processing
- Development of markets

Issues in Bio-ethanol

- There are very high quality concerns in ethanol production
- Power alcohol was introduced in Kenya as a fuel blend for gasoline in 1983, but discontinued in 1993.
- The challenge was quality, management and pricing problems which led to closure
- Ethanol production has potential to compete with food crop production especially in sugar growing zone
- Recent NDI (UNDP) show people in sugar growing zones are some of the poorest

Cogeneration potential from sugar belt

- With appropriate investment, bagasse can be used to generate steam and electricity to power the sugar factories and export enough power to light up western and Nyanza.
- This could displace energy produced from fossil fuels and result to an annual saving of US$ 90 million of foreign exchange.
- It also qualifies for carbon finance as methane is displaced
- First CDM project in Kenya is from Mumias Sugar Company

Thank you!

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