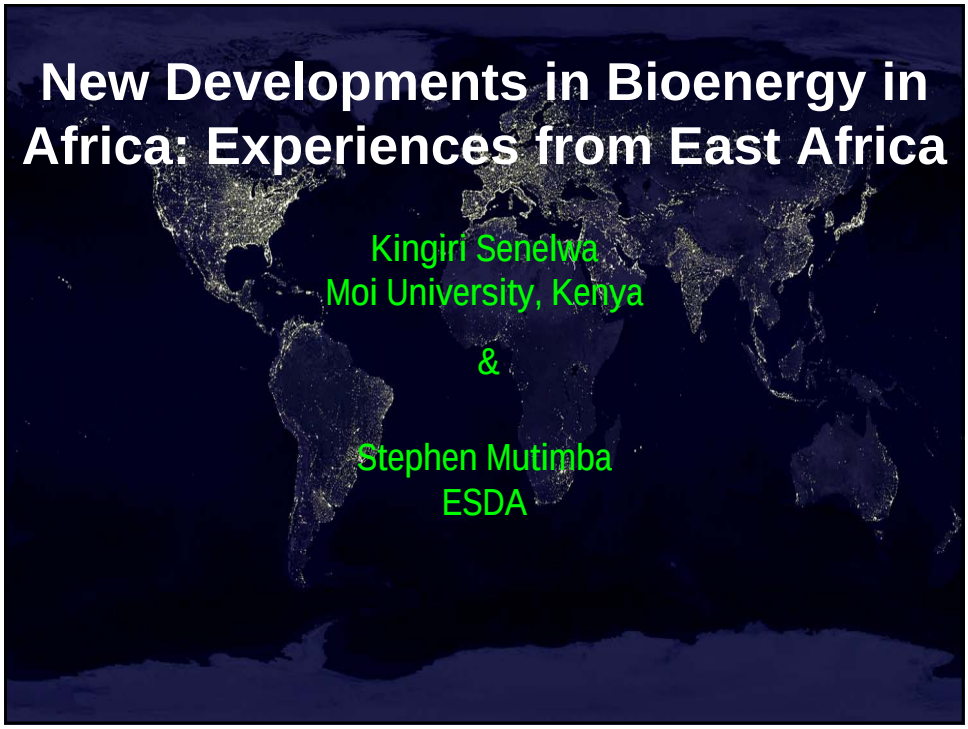

# New Developments in Bioenergy in Africa: Experiences from East Africa

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Some Observations

- More than 70% of the population of East Africa live in rural areas
- All countries in Eastern Africa are net importers of petroleum
- Biomass accounts for up to 80% of primary energy
- For the domestic sector, the contribution is even higher
- Low access rates by households to commercial fuels
  - 3% for electricity
  - 1% for petroleum products
- How do we currently use the biomass and where does it come from?

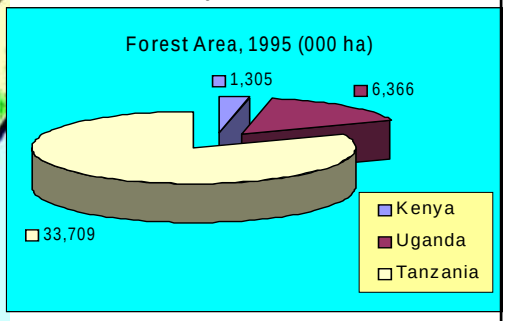
## Biomass Energy Sub-Sector

- Traditional biomass
  - Woodfuel (firewood and traditional charcoal), crop resides meets 60-90% of total energy
  - There are a number of concerns – environmental, IAP & health, deforestation, livelihoods
- Improved Biomass
  - Most urban households adopted improved stoves
  - Uncoordinated efforts for sustainable production – woodlots, agroforestry, residue use
  - Efforts aim to improve charcoal kilns
- Modern Biomass
  - Co-generation: opportunities in sugar, pulp, timber industries
  - Gasification: no proper experiences in the sub-region
  - Ethanol: Kenya has past experience with molasses
  - Biodiesel: No experience in region. Work beginning
  - Biogas: between 100 and 1600 digesters in each country
- Traditional use of biomass energy will continue by the poor due to its availability, versatility & apparent affordability. Though it is not their preferred fuel, but very convenient for poor societies rural areas.

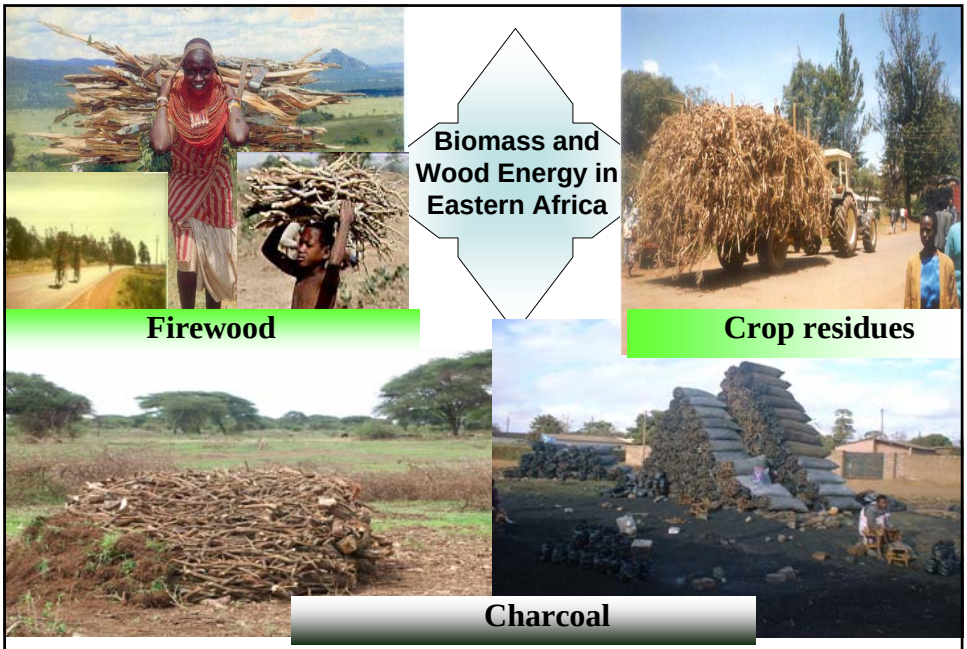
# Forests in East Africa

East Africa is relatively dry:

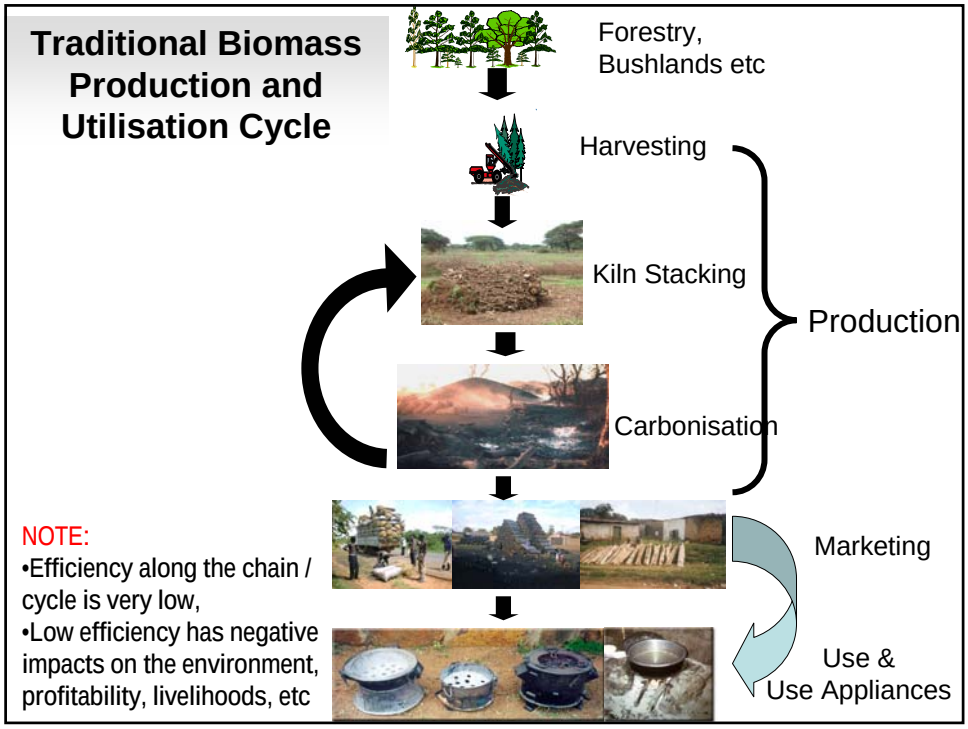
- **Influenced by Sahara desert**
- Only 25% of land is forested
- EA is the least forested region in SS Africa
- In E. Africa, Kenya is least forested


Of interest is the implication of the scant, dispersed & localized nature of forests resources on wood and woody biomass utilization, socio-economics, peoples livelihoods and the environment.




The picture is unlikely to change in the foreseeable future




# What is happening in the Biomass Sector?

- Look at what is happening based on where the biomass comes from, how we harvest it, how we use it and the implications of using the biomass.
- We look at some of the activities in the broader bioenergy sector, mostly in Kenya, a few examples from Uganda and Rwanda

# Movements / activities in the Biomass Sector

- Diminished Resource Base:
  - Increasing awareness by the public regarding scarcity
    - Increased Agroforestry and Woodlots on farms in the region – private initiatives
      - Income & livelihood options for farmers – tree farming is one of the best farm enterprises
      - Companies/large scale farms getting into tree farming
        - » Wood for industries – cement, tobacco, tea, Pulp and Paper, etc
      - FD (FAO) activity looking at feasibility of tree outgrower schemes
      - Pilot contract tree growing for charcoal production
    - Dedicated energy crops
    - Farm woodlots to supply household requirements
  - Need to coordinate these activities – currently haphazard
  - It is too early to say whether tree farming will have an impact on agricultural activities, and whether markets for the produce will be sustained
  - Policy on forestry recently revised – recently come into force with inauguration of the board.
    - Draft policy to guide charcoal activities as addendum to the forest law
  - The Ministry of Energy runs biomass demonstrations in the country

## Movements / activities in the Biomass Sector (Contd).

- Biofuel - Energy crops
  - Jatropha – has been a catch word in some areas in Kenya
    - Infancy stage with more questions than the answers available
    - Other crops ….
  - Sunflower – established farming / agricultural and processing systems, but for the food industry
    - Whether usage as energy can compete is not known
    - The potential is there, especially since it is grown as a second ‘off season’ crop
  - Castor, coconut, etc
  - Maize (?????), soya, sorghum???

Movements / activities in the Biomass Sector (Contd).

- Firewood & Charcoal
  - Increasing dissemination of improved biomass cooking stoves in E. Africa

| | |
|---|---|
| Kenya | 1450000 |
| Tanzania | 54000 |
| Uganda | 52000 |
| Burundi | 20500 |
| Rwanda | 30000 |

- A lot of activity in charcoal kilns
  - research level,
  - demonstration,
  - Field application

Movements / activities in the Biomass Sector (Contd). Others

- Ethanol
  - Ethanol plant used surplus molasses that could be dumped as waste to produce ethanol, and was used initially to blend petrol at a ratio of 1:9.
  - Two plants in Kenya operational – Food and Chemical (Government), and Spectre International (Private) – both in the Western Kenya Sugar belt
  - Although the two plants are still operational the ethanol is not expressly used as a source of fuel
  - Some concerns that some of the molasses being exported
  - Potential in the region is significant.

# Cogeneration in Sugar Industries

## *Attractive Option in the Region*

| Country | Sugar (x 103t) | Sugar Cane (a) (x 103t) | @31bars (b) | Cogeneration Potential (GWh) | |
|---|---|---|---|---|---|
| | | | | @ 44 bars(c) | @ 82 bars (d) |
| Burund | 21 | 191 | 10 | 13 | 21 |
| Kenya | 423 | 3,845 | 1922 | 269 | 423 |
| Tanzania | 190 | 1,727 | 86 | 121 | 190 |
| Uganda | 244 | 2,218 | 111 | 155 | 244 |

Movements / activities in the Biomass Sector (Contd).

- Biogas
  - Technology is reasonably well established
  - Two large plants linked to the ethanol plants – generate gas that has displaced fuel oil for internal use. The plants have reported significant savings in energy costs that have improved their general profitability
  - Many other stand alone plants dotted around the country / region.
    - Currently, there is a significant research and demonstration efforts by both research institutions and the private sector
  - Significant movement in biogas activity in Rwanda

## Sustainability Issues

- Traditional Biomass Use
  - Desertification, loss of biodiversity
  - Acute respiratory infections from indoor air pollution
  - Air pollution (photo-oxidants, acid rain, irritants)
  - Greenhouse Gases ($CO_2$, $CH_4$, $N_2O$)
  - Disruption of ecosystem functions (e.g. water cycling etc)
  - Unsustainable wood production practices
- Modern Biomass Use
  - Food security concerns
  - Environmental concerns on monoculture
    - The most popular woodlot species are Eucalypts – one of the most demonized / politicized plantation species
  - Markets still underdeveloped

## Challenges Facing the Biomass Sector

- Environmental
  - Indoor air pollution
  - Contribution to climate change
- Technical
  - Low efficiency
  - Weak industrial attention until recently
  - Poor standards & quality control
- R&D
  - Poor data
  - Poor funding
- Financial
  - High investment cost
  - Poor credit facilities
- Competition with other uses
- Poor supply base