



THE REPUBLIC OF UGANDA

# Biomass Technology in Uganda: The Unexploited Energy Potential

## OVERVIEW

Biomass is material from plants and animals. It is a renewable source of fuel for producing energy. Biomass technologies break down organic matter to release stored energy from the sun. This technology is critical for social economic development in Uganda. All rural households and 98% of urban households use biomass energy for cooking. Biomass can be a significant source of modern and clean form of energy like electricity.

Despite its importance as a major fuel, biomass receives little recognition and prioritization in terms of funding. The level of biomass technology in Uganda is low.

This policy brief discusses the unexploited potential of the biomass technology and highlights the efforts for its implementation. The brief also gives recommendations on how the technology can be promoted.

## KEY ISSUES

- Inadequate awareness of the availability of appropriate technologies to harness the biomass.
- Despite the economic importance and significance as a major fuel, biomass has received little recognition in terms of prioritization and funding.
- High upfront cost is a critical barrier to adoption of improved biomass technology.

## Introduction

Biomass is derived from waste residues in several forms such as scrap wood, mill residues, and forest resources. Biomass is a diverse resource and is easy to harness because unlike some other forms of renewable energy, it is not site specific. It is available in many forms such as trees, bush (multistemed plants and scrub), grass and forbs, papyrus and reeds and vegetal waste. Other biomass types include; biogas from animal and human waste, and biofuels including ethanol and bio diesel.

The potential for biomass to contribute to Uganda's energy development is recognized in the Renewable Energy Policy (2007). The Energy for Sustainable Development (ESD) report (1995) presented a detailed analysis of biomass demand in Uganda. It revealed that woody biomass provided about five times the value of electricity and petro derived energy combined.

Biomass can be a significant source of modern and clean forms of energy like electricity and is already happening in the sugar industry.

## Biomass Demand and Supply

For more than three decades, both government agencies and private sector have promoted use of efficient stoves as a measure to manage the wood demand side, but without much success. Adoption of efficient charcoal and fuel wood stoves is about 10% or less in both urban and rural areas.

Total tree biomass demand is estimated at 44 million tones of wood. About 3.5 million tones of vegetal waste mainly used in industries. The household sector accounts for the bulk of biomass used (74% of delivered energy) followed by the industrial sector (18%). The commercial sector and Institutions take 5% and 3% respectively.

**Table 1: Sustainable biomass supply**

Biomass type	Sustainable harvest (million tonnes)	Percentage
Tree biomass	26.3	51
Bush	10.5	21
Papyrus and reed	4.5	9
Farm level vegetal waste, stalks of maize, sorghum, cotton stalks etc	6.2	12
Agro processing vegetal waste, bagasse	1.4	3
Grass, forbs	1	2
Sub-total	51	100%

Source: Biomass Strategy 2013

It is estimated that tree biomass, which is the main form of traditional biomass can only supply 26 million tones (Table 1) on a sustainable basis. Biomass situation analysis indicates that Uganda's main challenge is not sufficient supply of biomass but rather the technology to utilize the diverse forms of biomass. There is a wide range of non-traditional forms of biomass that have not been utilized mainly due to lack of technology to harness them.

Technology advancement has turned bagasse<sup>1</sup>, once a big disposal problem in the sugar industry, into one of the major sources of energy for thermal electricity production.

On the other hand, there is little or no use of other forms of biomass that are abundantly available (and can be sustainably supplied like bush, grass, forbs, a variety vegetal waste, papyrus and reeds). In addition, there is a big potential of harnessing a variety of biofuels for energy purposes. There is inadequate awareness of the availability of appropriate technologies. The high upfront costs associated with these technologies, is also a big barrier for investment and adoption of these technologies.

## Justification for the Biomass Technology

Assessment of demand and supply shows that demand for tree biomass outstrips supply. Uganda has got a high potential to use biomass in a sustainable manner.

<sup>1</sup> Bagasse is a fibrous matter that remains after sugarcane or sorghum stalks are crushed to extract their juice.

Uganda's soils and climate supports relatively faster growth rates of biomass within the region. In addition, there is high potential to diversify to other forms of biomass rather than only focusing on tree biomass.

As the assessment of the biomass supply shows, biomass from bush can sustainably supply 10 million tones of biomass annually. Introducing technologies to make briquettes from bush and other "inferior" forms of biomass would in the short term halt depleting the tree resource.

Interventions by projects like Forest Income Enhancement and Forest Conservation (FIEFCO) have shown that introducing fast growing shrubby plants like Sesbania and Caliandra enable households to quickly meet their fuel needs in addition to provision of fodder for goats, sheep and cattle.

Biomass is in different forms such as biofuels and solid. Biofuels include fuels derived from biomass conversion, as well as solid biomass, liquid fuels, various biogases and a number of biofuels. Solid biomass includes wood, wood dust, agricultural residue, municipal solid waste, tree care waste, forest residue etc. Largely due to lack of awareness and appropriate technologies, utilization is never maximized. Energy crops including grasses, reeds plus commercial forestry plantations have a potential for utilizing biomass to provide clean energy forms like electricity generation. By applying the right technological interventions to avoid supply and

demand wastage, Uganda can have biomass surplus.

Scaling up and promotion of multipurpose shrubs and trees on small farm holdings, introducing appropriate technologies to utilize the inferior forms of biomass and introduction of efficient wood to charcoal transformation technologies can increase biomass supply.

The demand side may be easily managed through fuel substitution and introduction of efficient technologies. Because biomass will continuously play a major role in the economy of Uganda for several decades to come, investment in efficient, clean and less polluting biomass energy devices should be a priority if energy consumption targets are to be achieved.

Production of improved biomass energy technologies (cook stoves and fuels) is an income generating activity capable of growing into a full blown industry employing thousands of people. Although there is considerable market for appropriate improved biomass energy technologies both in urban and rural areas, there is lack of intensive promotion and marketing. Initial market risks have to be taken up by development agencies and government through a Public Private Partnerships (PPPs) approach. The micro enterprises that form the bulk of investment in the biomass energy sub sector cannot afford the risks and also meet the market development costs. There is thus need for innovative funding mechanisms.

## Biomass Technology in Uganda

The level of biomass technology in Uganda is low. The project, “*Modern Energy from Biomass for Rural Development*” implemented by MEMD is also not prioritized. Some of the hindering factors to the technology include; facts of biomass energy contribution to Uganda’s social, economic and industrial growth are not well known; Biomass is considered a backward form of energy; and clean forms of biomass are not well known and therefore not well understood.

## Budget Allocation of Biomass Technology compared to Sector Budget

The modern energy to Biomass technology has been increasing slightly since 2011/12. However, the project is one of the least funded among the energy sector projects (Table 2).

**Table 2: Budget Allocation (Ug shs Billions)**

Financial Year	11/12	12/13	13/14	14/15
Approved development budget	1,325	1,547	1,335	1,768
Average project Funding	76.88	67.8	68.6	75.9
Biomass technology	0.2	1	1	3.93
% of Social Sector	0.01	0.06	0.07	0.2

Source: *Approved Budget Estimates FY 2011/12-14/15*  
MOFPED

In addition, the project under performed in over 80% of its targets by December 2014. Poor performance was majorly due to limited funding of the project, and prolonged procurement process.

## Potential of Biogas from Human waste- A case of Schools

Bio latrine systems were constructed in 10 schools to generate energy especially for cooking. One such school was Kitagobwa Secondary School, with an adequate population of 761 students to sustain biogas production from human waste. Bio latrine systems turn human waste into a source of clean energy. Human waste collected in the digesters is processed to make organic manure. As the waste biodegrades, the digester captures methane gas which is used for lighting and cooking. Social institutions with high populations like schools can reduce their energy costs significantly using biogas. Biogas also reduces the effects of climate change as it saves the country’s forestry cover.





Left-Right: Bio-digester; plastering works on the bio-latrine at Kitagobwa SS, Ngando sub county, Butambala District

## Conclusion

Biomass technology has got potential to contribute to Uganda's energy development. However, facts of biomass energy contribution are not well known by key stakeholders. Biomass is considered a backward form of energy. Clean forms of biomass are not well known and thus not promoted. Generally, the contribution of biomass to energy production has not been appreciated. As a result, biomass development has not been prioritized and therefore limited funding to the project.

## Recommendations

1. The MEMD should enhance awareness of opportunities for investment in biomass energy production.
2. The MEMD should spearhead multi-sectoral planning and development of a framework for information gathering, archiving and dissemination. Various government agencies for example National Forest Authority, Uganda Bureau of Statistics National Environment Management Authority, and MEMD should be key contributors to the system with clearly agreed upon mandates, responsibilities and obligations.
3. There is need for MEMD to lobby for "Innovative Financing Mechanisms" in a Public Private Partnership arrangement with government and development partners providing financial resources to test

improved technologies.

4. The MEMD should train professionals in the biomass industry.

## References:

- MEMD Biomass Energy Strategy (BEST) (Kampala, 2013)
- MFPED Semi-Annual Budget Monitoring Report FY 2014/15 (Kampala 2015)
- MFPED Approved Estimates of Revenue and Expenditure (Recurrent and Development) (Kampala, 2012)
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